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1. Introduction

1.1 Background

1.1.1 This Environmental Statement (ES) has been prepared on behalf of VPI Immingham LLP (VPI, the Applicant) to accompany an application for Planning Permission under the Town and Country Planning Act 1990 (as amended) (the TCPA) for the construction and operation of a proposed gas-fired power station of up to 49.9MW output capacity and associated infrastructure (the 'Proposed Development') on land adjacent to the existing Combined Heat and Power (CHP) Plant at South Killingholme, Immingham ('the Site', see Figure 1.1 and Figure 3.1 in Volume 2 of this ES).

1.1.2 This ES has been prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') and presents the findings of an Environmental Impact Assessment (EIA).

1.1.3 All the land required for the Proposed Development is referred to within this ES as 'the Site'. The Site lies entirely within the administrative boundary of North Lincolnshire Council (NLC). NLC the relevant planning authority for the application for planning permission under the terms of the EIA regulations.

1.2 The Applicant

1.2.1 VPI owns and operates the existing CHP plant at South Killingholme, one of the largest CHP plants in Europe, providing both electricity and steam to the adjacent oil refineries and electricity to the National Grid.

1.2.2 VPI was acquired by Vitol in 2013, an energy trading company based out of Rotterdam, the Netherlands.

1.3 The Proposed Development

1.3.1 The Proposed Development, referred to as VPI-Immingham Energy Park 'A', is a gas fired power station with a maximum gross electrical output of up to 49.9MW and will export electricity to the UK electricity transmission system (the 'National Grid') through the existing substation infrastructure on the adjacent CHP site. Gas engines are to be employed to generate the electricity.

1.3.2 The proposed power station is intended to supply electricity as required by the National Grid, typically to meet short term periods of high demand, to address shortfalls in supply from intermittent sources or to meet technical demands of the network.

1.3.3 The Proposed Development would be fuelled using natural gas from the UK gas transmission network provided through a new pipeline to be connected to the existing gas reception facility on the existing CHP site.

1.3.4 The Proposed Development will be located on a parcel of land leased from the adjacent Lindsey Oil Refinery (LOR) located to the north of the CHP Plant.

1.3.5 The Site and its surroundings are described in Chapter 3: Description of the Site of this ES and a detailed description of the Proposed Development is presented in Chapter 4: The Proposed Development.

1.3.6 Environmental impacts arising from the Proposed Development have been studied systematically as part of the EIA process, and the results are presented within this ES. The baseline for the assessment has been derived from measurements and studies in and around the Site. This is explained further in Chapter 2: Assessment Methodology, and in the methodology section of each technical assessment chapter.

1.3.7 The EIA process has considered impacts resulting from the enabling, construction, operation, maintenance and decommissioning phases of the Proposed Development, and the ES proposes measures to avoid, reduce or mitigate any significant adverse effects on the environment. It also identifies any 'residual' impacts, defined as impacts remaining following the implementation of mitigation measures.

1.3.8 The EIA also considers the potential cumulative impacts of the Proposed Development with other relevant known proposed or consented schemes, as outlined in Chapter 14: Cumulative and Combined Effects.

1.3.9 It should be noted that the Applicant's parent company (Vitol), is investigating the opportunity to develop a further power project on a site adjacent to the existing CHP plant. This is at an early stage of evaluation but it is likely to require an application for a Development Consent Order (DCO) under the Planning Act 2008. As there are no details yet available regarding the potential environmental effects associated with the scheme, it is not yet possible to evaluate potential cumulative effects of the Proposed Development with this scheme. Cumulative effects of the two schemes would therefore be assessed in any future DCO application.

1.4 The EIA Scoping Exercise

1.4.1 The Applicant considers the Proposed Development as falling under Schedule 2 of the EIA Regulations, specifically, Part 3(a), "*Industrial installations for the production of electricity, steam or hot water (unless included in Schedule 1)".* The total area of the Proposed Development is 3.2ha in area and therefore exceeds the applicable threshold of 0.5ha, and with the Applicant considering that the Proposed Development has the potential to give rise to potentially significant environmental effects if they are not appropriately controlled or mitigated, the decision was made to consider the Proposed Development as 'EIA development' within the terms of the EIA Regulations.

1.4.2 Accordingly on the 20th December 2017, the Applicant submitted a request for the opinion of NLC as to the scope and level of detail of the information to be provided in the environmental statement (a "scoping opinion") under Regulation 15 of the EIA Regulations. This request was accompanied by an EIA Scoping Report. A copy of this report is included with this ES as Appendix 1A.

1.4.3 On 31st January 2018, NLC responded with a Scoping Opinion. A copy of this correspondence is included within this ES as Appendix 1B. In accordance with Regulation 18 of the EIA Regulations, this ES is based on that Scoping Opinion. Compliance with the points raised in the Scoping Opinion (both by NLC and their consultees) is demonstrated by the table shown in Appendix 1C (Volume 3 of this ES). This table signposts where to find the relevant information in this ES.

1.5 Environmental Statement

1.5.1 This ES is submitted to support the planning application. The information presented in this ES describes the findings of the EIA.

1.5.2 Table 1.1 below summarises where the requirements of Regulation 18 and Schedule 4 of the EIA Regulations have been met by this ES.

Table 1.1. Requirements of the EIA Regulations

Requirement	Where information is provided
A description of the proposed development comprising information on the site, design, size and other relevant features of the development.	Chapter 4: The Proposed Development
A description of the likely significant effects of the proposed development on the environment.	Chapters 7 to 13
A description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment.	Chapters 7 to 13
A description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment.	Chapter 6: Need and Alternatives
A non-technical summary of the information above.	Non-Technical Summary (NTS)
A description of the location of the development.	Chapter 3: Description of the Site
A description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases.	Chapter 4: The Proposed Development
A description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used.	Chapter 4 and Chapters 7 to 13
An estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases.	Chapters 4 and 7 to 13
A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	Chapter 6: Need and Alternatives
A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	Chapter 3 and Chapters 7 to 13

Requirement	Where information is provided
A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	Chapter 2: Assessment Methodology Chapters 7 – 13 Appendix 7B: Greenhouse Gas Emissions Assessment
A description of the likely significant effects of the development on the environment resulting from, inter alia: a. The construction and existence of the development, including, where relevant, demolition works; b. The use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; c. The emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; d. The risks to human health, cultural heritage or the environment (for example due to accidents or disasters); e. The cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; f. The impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; g. The technologies and the substances used.	Chapters 7 to 13 and Chapter 14: Cumulative and Combined Effects
A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Chapters 7 to 13
A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.	Chapters 7 to 13
A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned.	Chapter 2: Assessment Methodology

1.5.3 Feedback from the EIA Scoping stage as well as issues raised through the consultation process both informal and formal has informed the EIA process.

1.5.4 Ongoing refinement of the concept design together with feedback from the consultation process has resulted in the evolution of the project design and definition since the Scoping Report. This is described in detail in Chapter 6: Need, Alternatives and Design Evolution.

1.6 Consultation

1.6.1 The Applicant conducted a single community consultation event to Killingholme Parish Council on Monday 5th March. This was conducted to present the findings of the draft ES and informed the development of the final ES. In addition, informal consultation between the Applicant, the local planning authority and other consultees has been undertaken throughout the EIA process.

1.7 References

None Applicable.

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Tables

2. Assessment Methodology

2.1 General Assessment Approach

2.1.1 This Environmental Statement (ES) has been prepared to satisfy the requirements of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations') (see Chapter 1: Introduction, Section 1.6 and Table 1.1).

2.1.2 In preparing this ES (in line with the EIA Regulations as it forms part of the EIA process), reference has been made to the Environmental Impact Assessment Guidance at Gov.uk, preparing an Environmental Statement, paragraphs 34 to 42 inclusive.

2.1.3 Reference has also been made to the Scoping Opinion received from NLC (Appendix 1B of this ES), dated 31 January 2018 and the advice contained within it regarding assessment methodology, topics and presentation of the ES; as well as to consultee comments both formal and informal.

2.1.4 Based on the Scoping Opinion, this ES includes assessments of the following environmental topics:

- Air Quality and greenhouse gas emissions;
- Noise and vibration;
- Landscape and visual amenity;
- Ecology and nature conservation;
- Cultural heritage;
- Ground conditions and hydrogeology; and
- Surface water, flood risk and drainage.

2.1.5 In addition, the cumulative and combined effects of the above topics have also been assessed and included in this this ES.

2.2 Non-Significant EIA issues

2.2.1 Section 6 of the EIA Scoping Report (Appendix 1A of this ES) concluded that a number of topics did not need to be considered as part of this EIA and could be scoped out (non-significant EIA issues). These topics are:

- Traffic and Transport;
- Waste Management;
- Socio Economics;
- Population and Health;
- Electronic Interference;
- Aviation; and
- Accidental Events/ Health and Safety.

2.2.2 In response to this section, the Scoping Opinion stated:

> *"NLC agrees with the findings of Section 6 of the scoping report with regards to the non-significant issues which can be 'scoped out' and would therefore not form part of the Environmental Statement."*

2.2.3 Accordingly, these issues are not considered further in an EIA context.

2.2.4 In relation to Accidental Events /Health and Safety and further to the information provided in the Scoping Report, the Applicant can clarify that the majority of emergency response plans and contingency measures will be dealt with in the Environmental Permit, which is required for the operation of the Proposed Development and determined and regulated by the Environment Agency.

2.2.5 Prevention of any accidents associated with hazardous materials storage and use will be addressed under the Environmental Permit for the operational power station and through the CEMP for the construction phase. At this stage, based on the proposed volumes of hazardous materials to be stored at the Proposed Development, the site would not require a Hazardous Substances Consent or a lower tier Control of Major Accident Hazards (COMAH) licence.

2.3 Environmental Statement

2.3.1 This ES summarises the outcomes of the following EIA activities, where relevant:

- Establishing the baseline conditions;
- Consultation with statutory and non-statutory consultees;
- Consideration of relevant local, regional and national planning policies, guidelines and legislation relevant to this EIA;
- Consideration of technical standards for the development of significance criteria and specialist assessment methodologies;
- Design review;
- Review of secondary information, previous environmental studies, publicly available information and databases;
- Canvassing of expert opinion;
- Physical surveys and monitoring;
- Desk-top studies; and
- Modelling and calculations;

2.3.2 These activities enable the prediction of impacts in relation to the baseline, and assessment of the significance of effects on environmental receptors. The term 'impact' refers to changes arising from the Proposed Development, whereas the term 'effect' is used to describe the result of the impact on a receptor.

2.3.3 Each technical chapter follows the same structure outlined below (more information on these is provided below where appropriate):

- Introduction;
- Legislation and Planning Policy Context;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Development Design and Impact Avoidance;
- Likely Impacts and Effects;
- Mitigation and Enhancement Measures;
- Limitations or Difficulties;
- Residual Effects and Conclusions; and
- References.

2.3.4 The assessment chapters of this ES (Chapters 7 to 13) describe as necessary their spatial scope including their rationale for determining the specific area within which the assessment is focussed. The study areas are a function of the nature of the impacts and the locations of potentially affected environmental resources or receptors.

2.3.5 The approach to assessment has been to assess the environmental impacts of the Proposed Development at key stages in its construction and operation/ use and, where possible, decommissioning.

Sustainability and Climate Change

2.3.6 Sustainability matters have been incorporated into the design of the Proposed Development and a greenhouse gas (GHG) emissions assessment has been prepared which summarises the carbon footprint of the Proposed Development. This is presented in Appendix 7B (ES Volume 3). A standalone sustainability and climate change chapter has therefore not been prepared for the ES.

2.4 Development Design, Impact Avoidance and Mitigation

2.4.1 The design process for the Proposed Development has been influenced by the findings of early environmental appraisals and the EIA process, and therefore the Proposed Development has been sited, and has had a number of measures embedded into the concept design, to avoid or minimise environmental impacts. The key aspects where the design has evolved are described in Chapter 6: Need, Alternatives and Design Evolution.

2.4.2 In addition, each technical chapter sets out specific measures that have been incorporated into the design of the Proposed Development to avoid or minimise impacts, and any industry standard impact avoidance measures that will be implemented. These include compliance with best practice guidance documents (e.g. pollution prevention guidelines). The initial assessment has been undertaken on the basis of these measures being implemented (i.e. they are 'embedded mitigation').

2.4.3 Implementation of the impact avoidance and minimisation measures relied on in the assessment will be secured through the planning permission, through imposition of planning conditions.

2.4.4 Once the likely effects have been identified and quantified, consideration has then been given to any further mitigation (over and above anything identified within the Development Design and Impact Avoidance sections of each technical chapter) that may be required to mitigate any significant adverse effects identified. The residual effects (after the implementation of mitigation) have then been assessed and presented in each technical chapter. Significant residual effects are also summarised in Chapter 15: Summary of Significant Residual Effects and Mitigation.

2.5 Rochdale Envelope

2.5.1 Due to the fact that a number of key commercial decisions in respect of the Proposed Development are yet to be taken, the Applicant has undertaken a parameter based or 'Rochdale Envelope' approach to the EIA.

2.5.2 The Rochdale Envelope approach is derived from planning case law[1] and is described in the Overarching National Policy Statement for Energy (EN-1) (Ref 2-1) as:

[1] R. v Rochdale MBC ex parte Milne (No. 1) and R. v Rochdale MBC ex parte Tew [1999] and R. v Rochdale MBC ex parte Milne (No. 2) [2000]

"…a series of maximum extents of a project for which the significant effects are established. The detailed design of the project can then vary within this 'envelope' without rendering the ES inadequate."

2.5.3 In the case of the Proposed Development, the Applicant's key parameters relate to the number and sizing (output) of the gas engines. Details of the parameters and the approach taken are included in Chapter 4: The Proposed Development and in the relevant sections of the technical chapters.

2.6 Impact Assessment Methodology and Significance Criteria

2.6.1 Impacts are defined as changes arising from the Proposed Development, and consideration of the result of these impacts on environmental receptors enables the identification of associated effects, and their classification (major, moderate, minor and negligible, and adverse, neutral or beneficial). Each effect has been classified both before and after mitigation measures have been applied. Effects after mitigation are referred to as 'residual effects'.

2.6.2 The classification of effects is undertaken with due regard to the following:

- Extent (local, regional or national) and magnitude of the impact;
- Effect duration (whether short, medium or long-term);
- Effect nature (whether direct or indirect, reversible or irreversible);
- Whether the effects occur in isolation, are cumulative or interactive;
- Performance against environmental quality standards and in the context of relevant legislation, standards and accepted criteria;
- Number of receptors affected;
- Sensitivity of receptors;
- Compatibility with environmental policies; and
- Professional experience and judgement of the assessor.

Further details are provided in each technical assessment chapter.

2.6.3 Where it has not been possible to quantify effects, qualitative assessments have been carried out, based on available knowledge and professional judgment. Where any uncertainty exists, this has been noted in the relevant technical chapter in the Limitations section.

2.6.4 To enable comparison between technical topics and aid understanding of the EIA findings, standard terms are used wherever possible to classify effects throughout the ES (major, moderate, minor and negligible), and effects are also described as being adverse, neutral or beneficial. Where the quality standards for each technical discipline result in deviations in the standard assessment methodology, these are described in the relevant chapters as applicable.

2.6.5 Definitions of the standard terms are provided below:

- Magnitude:
  - Negligible – imperceptible effects to an environmental resource or receptor;
  - Minor – slight, very short or highly localised effect;
  - Moderate – limited effect (by extent, duration or magnitude);

- Impact:
  - Major – considerable effect (by extent, duration or magnitude) of more than local scale or in breach of recognised acceptability, legislation, policy or standards;
  - Adverse – detrimental or negative effects to an environmental resource or receptor;
  - Neutral – effects to an environmental resource or receptor that are neither advantageous or detrimental; and
  - Beneficial – advantageous or positive effect to an environmental resource or receptor

2.6.6 Moderate and major effects are generally considered to be 'significant' for the purposes of the EIA Regulations, in accordance with standard EIA practice.

2.6.7 Each of the technical chapters provides further description and definition of the assessment criteria relevant to each topic. Where possible, this has been based upon quantitative and accepted criteria (for example, noise assessment guidelines), together with the use of value judgement and expert interpretation to classify effects.

2.6.8 In general, the classification of an effect is based on the magnitude of the impact and sensitivity or importance of the receptor, using the matrix shown at Table 2.1. Where there are deviations away from this matrix (due to the technical guidance for a specific assessment topic), this is highlighted within the relevant technical chapter and the reason for the variation explained.

Table 2.1. Classification of Effects

Magnitude of Impact	Sensitivity / importance of receptor			
	High	Medium	Low	Very low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very low	Minor	Negligible	Negligible	Negligible

2.6.9 In the context of the Proposed Development, short term effects are considered to be those associated with the construction phase and which cease when construction works are completed; long term effects are those associated with the completed, operational development and which last for the duration of the operational phase. Effects may also be permanent (irreversible) or temporary (reversible) and direct or indirect.

2.6.10 Effects on areas on the scale of the North Lincolnshire unitary authority area (or similar scale, even if they occur across local authority boundaries) are considered to be at a regional level, whilst effects that cover different parts of the country, or England as a whole, are considered to be at a national level. Smaller scale effects are considered to be at a local level.

2.6.11 There are no significant transboundary effects associated with the Proposed Development.

2.7 Cumulative and Combined Effects

2.7.1 As required by the 2017 EIA Regulations, the various technical chapters also consider the interrelationships of effects, also sometimes referred to as combined effects (those that could be caused by various impacts of the Proposed Development acting in combination such as noise and dust impacts acting together at a single receptor). In particular these are considered in Chapter 10: Ecology and Nature Conservation, which considers the combined

effects of noise, air quality, habitat loss, disturbance etc. on ecological receptors; and summarised in Chapter 14: Cumulative and Combined Effects.

2.7.2 In addition to combined effects, it is important to consider the potential for cumulative effects with other developments planned or consented in the vicinity of the Proposed Development. These issues are further explained and discussed in Chapter 14: Cumulative and Combined Effects.

2.8 References

Ref 2-1 Department of Energy and Climate Change (DECC) *Overarching National Policy Statement for Energy (EN-1)* The Stationery Office, 2011.

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3. Description of the Site

3.1 Site Location

3.1.1 The Proposed Development Site (termed the 'Site') is located immediately to the north of the existing VPI CHP power station and east of the Lindsey Oil Refinery (LOR) in North Killingholme, Lincolnshire DN40 3DZ.

3.1.2 Immingham Dock is located approximately 1.75km to the south east at its closest point. The Humber ports facility is located approximately 1.25km north at its closest point and the Humber Refinery is located approximately 500m to the south.

3.1.3 The nearest conurbations are the villages of North and South Killingholme located approximately 1.7km west and southwest of the Site. The nearest residential property is a single property on Marsh Lane located approximately 650m to the east of the Site boundary at its closest point. The Site location is shown on Figure 1.1 (ES Volume 2).

3.1.4 The Site area extends to circa 3.2 hectares (ha) in area. The full extent of the Site is shown on Figure 3.1 (ES Volume 2).

3.1.5 The Site lies entirely within the administrative area of North Lincolnshire unitary authority.

3.1.6 The Site consists of the following areas:

- The Power Plant Site, on which the principal components of the Proposed Development will be situated;
- Temporary Construction Laydown area for the receipt, storage and partial assembly of the project equipment and materials to be installed or constructed;
- Site access, both for temporary construction purposes and for operational access; and
- Gas and Electrical connection corridors to the existing CHP site to the south of the Site.

3.1.7 The different areas of the Site are described below and illustrated in Figure 3.2 (ES Volume 2).

3.1.8 Access to the Site from public roads for both construction and operation will be via the existing entrance for LOR off Rosper Road. During the construction phase, traffic serving the Proposed Development would be directed via the private road network associated with the existing car park to a new temporary access road to be constructed along the southern boundary of the existing car park.

3.1.9 During the operational phase, traffic would enter the Site via the access from Rosper Road turning south to run along the existing road to the east of the existing LOR canteen building, to enter the site by a new permanent access at the southwest corner of the existing car park.

3.2 Power Plant Site

3.2.1 The Power Plant Site consists of an area of land of approximately 1.25 ha in area located immediately to the south of the existing LOR canteen building. The Power Plant Site is a level area of land approximately 6m Above Ordnance Datum (AOD) and is currently undeveloped and consists of disturbed ground with limited vegetation.

3.2.2 The Power Plant Site is bounded as follows:

- North: Undeveloped land proposed as Construction Laydown area for the Proposed Development (see below), currently used for temporary vehicle parking;

- East: Undeveloped land beyond Rosper Road;
- South: Pipework and services related to the operation of Humber oil refinery, LOR and other facilities, a vegetated drainage ditch and access trackway and the CHP plant operated by the Applicant; and
- West: Vegetated land, access trackways and ponds associated with the drainage system for LOR. Beyond is a private railway line and LOR itself. A single tower (pylon) associated with a high voltage transmission line is present approximately 20m from the Site boundary.

3.3 Gas and Electricity Connections

3.3.1 Gas and electricity connections would be supplied from tie-ins to existing services located on the existing adjacent CHP plant. These connections would largely be overground and will likely include a new above ground pipe bridge passing over the existing third party pipelines, drainage ditch and access roadway. The proposed connection routes are shown on Figure 3.2: Parts of the Site (ES Volume 2).

3.4 Construction Laydown Areas

3.4.1 The Construction Laydown area consists of an area of land, approximately 0.4ha in area, located immediately to the north of the Power Plant Site and west of the existing LOR canteen building. The land is undeveloped and consists of bare compacted ground and is currently used for temporary vehicle parking.

3.5 Surrounding Area

3.5.1 The Site is located in an area comprising a mix of industrial and agricultural activities. In addition to the activities identified above, the land to the east of the Site on the other site of Rosper Road comprises agricultural fields extending approximately 1km toward the Humber Estuary before industrial activities associated with the storage and export of gas and oil and other port activities commence along the banks of the Estuary itself, approximately 1.4km from the Site at is closest point.

3.5.2 LOR itself is located to the east of the Site with the CHP plant located immediately to the south. Humber refinery is located approximately 500m to the south of the Site at its closest point.

3.5.3 A private railway spur runs north-south to the immediate west of the Site. This spur services LOR and joins the main rail line approximately 400m south west of the Site. This rail line is a public railway line running between Cleethorpes and Barton on Humber.

3.5.4 Given the Site's location, the nature and scale of the Proposed Development and the character of the surrounding area, no transboundary effects are predicted to arise from the Proposed Development that would affect any other European Economic Area state. No further consideration is therefore made in this ES to transboundary effects.

3.6 Site History

3.6.1 A review of historical mapping indicates that the Site has been undeveloped since the earliest mapping. It is likely the land was used for farming purposes until the development of the neighbouring refineries in the 1970s. A more detailed review of the history of the Site is included in Chapter 12: Ground Conditions and Hydrogeology of this ES. The pre-history of the Site as inferred from the Archaeological record is assessed in Chapter 11: Cultural Heritage of this ES.

3.7 Potential Environmental Sensitivities and Receptors

3.7.1 When undertaking an EIA it is important to understand which receptors have the potential to be affected by the Proposed Development.

3.7.2 Key receptors for each topic area have been identified as part of the assessment process and details are included in the relevant technical chapters (Chapters 7-13). A summary is also provided below.

3.7.3 Where distances are quoted in this ES the distance is defined (unless otherwise stated) as the shortest distance between two described locations, for example from the closest point of the Site boundary to the closest point of a designated site boundary.

Residential Receptors

3.7.4 Key receptors include:

- The single residential property located on Marsh Lane approximately 650m east of the Site;
- The villages of South and North Killingholme, located approximately 1.7km west /southwest of the Site;
- The town of Immingham, located approximately 2.5km south of the Site at its closest point; and
- Residential properties in the vicinity of Chase Hill Road, located approximately 2.25km northwest of the Site.

3.7.5 There are no designated Air Quality Management Areas (AQMA) within 5km of the Site.

Designated Nature Conservation Sites

3.7.6 There are a number of statutory and non-statutory nature conservation sites in the vicinity of the Site. They include the following:

- Humber Estuary Special Conservation Area (SAC), Special Conservation Area (SPA) Ramsar site, and Site of Special Scientific Interest (SSSI) located 1.4km north east of the Site. This area is the only one within the study area to carry statutory designations;
- Eastfield Road Railway Embankment Local Wildlife Site (LWS), located 1km west of the Site;
- Burkinshaw's Covert LWS, located 400m northeast of the Site;
- Station Road Field LWS, located 400m north of the Site; and
- Rosper Road Pools LWS, located 600m south of the Site.

Cultural Heritage

3.7.7 There are no cultural heritage assets or records within the Site.

3.7.8 There are no World Heritage Sites or Registered Battlefields within 5km of the Site. There is one Registered Garden (Brocklesby Park) located approximately 5km south west of the Site.

3.7.9 There are six Scheduled Ancient Monuments (SAMs) within 5km of the Site. These are:

- Manor Farm moated site, located approximately 2km west of the Site;

- North Garth moated site and associated enclosures, located approximately 2.4km northwest of the Site;
- Moated site and associated earthworks at Baysgarth Farm, located approximately 2.6km northwest of the Site;
- Manor Farm moated site, East Halton, located approximately 3.5km north of the Site; and
- Thornton Abbey Augustinian monastery, including gatehouse, precinct, medieval road and bridge, moat, fishponds, post-Dissolution college and school, and house, located approximately 4.6km northwest of the Site.

3.7.10 There are 5 listed buildings located in and around the settlements of North Killingholme and East Halton, all within 3km of the Site. Of these, two are Grade I Listed Churches (The Church of St Denys at North Killingholme and the Church of St Peter at East Halton. There is a Grade II* Listed Manor House, associated with the Scheduled Monument at Manor Farm 2km west of the site. There are also two Grade II listed buildings within 2.5 km, one of which is also associated with Manor Farm.

3.7.11 There are no Conservation Areas within 5km of the Site.

3.7.12 In addition, there are three listed lighthouses (the Killingholme lighthouses) located approximately 1.6km to the east of the site on the banks of the Humber River.

Surface Water

3.7.13 There are two surface water features located within the Site to the west and south west. These are associated with the main route of the treated surface water and process water effluent from the neighbouring refinery prior to treatment at the existing VPI CHP plant site effluent plant (to the south of the Site) and subsequent discharge.

3.7.14 The following notable watercourses have been identified in close proximity to the Site:

- A land drain running parallel with and directly adjacent to the southern Site boundary (a North East Lindsey IDB drain);
- Watercourse 9A (a North East Lindsey IDB drain) located approximately 50m to the south east of the Site to the east of Rosper Road;
- A series of land drains approximately 50m to the west of the Site;
- A series of land drains approximately 120m to the north of the Site;
- South Killingholme Main Drain located 500m to the south west of the Site; and
- The Humber Estuary, located approximately 1.4km to the west.

3.7.15 An open water body associated with the drainage of LOR is situated to the west of the Site.

3.7.16 In addition, the area surrounding the Site is drained via a network of small land drainage ditches that convey surface water from the surrounding greenfield areas located between the Site and the Humber Estuary.

3.7.17 The Site is located entirely within Flood Zone 3 classified as having a 'high risk' of flooding from fluvial or tidal sources. Flood Zone 3 comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1.0%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. The site is not located within an area defined as Functional Floodplain (Flood Zone 3b).

3.7.18 There are no formal flood defences in close proximity to the proposed works; however, there are tidal flood defences in place along the entire south bank of the Humber Estuary. The existing defences to the north and east of the proposed development comprise a

combination of earth embankments topped by concrete wave return walls and small areas of reclaimed land. However, the Site is not located in an area shown on Environment Agency's flood maps to benefit from flood defences.

3.7.19 A Flood Risk Assessment has been prepared to accompany the planning application.

Geology & Hydrogeology

3.7.20 The Site is overlain by a layer of Made Ground associated with previous industrial developments in the area. The Superficial geology is understood to include Devensian Till overlying the bedrock of the Burnham Chalk formation.

3.7.21 The Site is not located within a Source Protection Zone. The superficial geology is characterised as a Secondary 'A' Undifferentiated Aquifer, whilst the bedrock geology is classed as a Principal Aquifer.

Landscape

3.7.22 The Site is not located within or adjacent to any national or regional designations for landscape protection (e.g. Area of Outstanding Natural Beauty (AONB) or Green Belt land). The Site is located with National Character Area 41: the Humber Estuary (Ref 3-1), which is focussed on the expanse of the Humber Estuary and associated low-lying land. There are no Public Rights of Way (PRoW) across the Site or immediately adjacent to it. With the nearest ProW being March Lane approximately 500m to the south east of the Site.

3.8 References

Ref 3-1. Natural England (2014a) *National Character Area 41 – the Humber Estuary*. Natural England, Worcester.

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Tables

4. The Proposed Development

4.1 Introduction

4.1.1 The Proposed Development comprises a gas-fired power station with a gross electrical output of up to 49.9 megawatts (MW_e).

4.1.2 The Proposed Development is intended to supply electricity when required by the National Grid, typically to meet short term periods of high demand, to address shortfalls in supply from intermittent sources or to meet technical demands of the network. This is expected to be weighted towards the winter period, for a few hours at a time. However, as the operation of the plant is driven by the dynamics of the energy market, the plant could run for longer periods, at any time of day, up to the maximum allowed under its Environmental Permit.

4.1.3 Construction work on the Proposed Development, assuming planning permission is granted, would not commence until a final investment decision has been made by VPI and a contractor appointed. Following the award of the contract, the appointed contractor would carry out a number of detailed studies to inform the technology selection for the Proposed Development and also to optimise its layout and design before starting work at the Site.

4.1.4 It follows that it has not been possible for VPI to fix all of the design details of the Proposed Development at this stage and has therefore sought to incorporate sufficient design flexibility. This relates to the dimensions and configuration of structures and buildings, including the number and size of gas engines to be utilised.

4.1.5 Incorporating this flexibility in the dimensions and configuration of structures and buildings to also allows the Applicant to optimise the plant to help meet UK energy demands.

4.1.6 As discussed in Chapter 2: Assessment Methodology of this ES, and in order to ensure a robust assessment of the likely significant environmental effects of the Proposed Development, this Environmental Impact Assessment (EIA) has been undertaken adopting the principles of the 'Rochdale Envelope'.

4.1.7 This involves assessing the maximum (and where relevant, minimum) parameters for the elements where flexibility needs to be retained. Where this approach is applied to the specific aspects of the EIA, notably in assessing air, noise and visual impacts, this has been confirmed within the relevant chapters of this Environmental Statement (ES) and the worst-case potential environmental effects are reported. Justification for the need to retain flexibility in certain parameters is also outlined in this chapter and in Chapter 6: Need, Alternatives and Design Evolution.

4.1.8 In accordance with this approach, two potential indicative layouts (termed Indicative Layout 'A' and Indicative Layout 'B') have been developed which illustrate the maximum extent of the Proposed Development in terms of its potential environmental impact. Indicative Layout A shows the maximum extent of larger gas engines housed within an engine hall, while Indicative Layout B shows the maximum number of smaller containerised engines that would be located outside, without an engine hall. These are shown illustratively on Figures 4.1 a-d inclusive (ES Volume 2).

4.1.9 It is important to note that these layouts are for illustrative purposes only, to indicate maximum extents, and there may be variations in between, such as a number of mid-size engines that fall in between the maximum extents.

4.1.10 The Rochdale Envelope, amongst other things, allows flexibility in respect of the following:

- The number of gas engines (up to 33);
- The number of emissions stacks (up to 33);

- The orientation of the gas engines and components within the Proposed Power Plant Site; and
- The height, width and length of building/structures (maximum dimensions have been applied to define the Rochdale Envelope – see Table 4.1 later in this section).

4.1.11 Subject to the planning and other consents being granted (and an investment decision being made), work on site could commence in early 2019 and will consist of approximately 18 months of construction work with the Proposed Development expected to commence commercial operation in 2020.

4.2 Components of the Proposed Development

4.2.1 The Proposed Development will consist of a number of gas-fired reciprocating engines within the parameters described in Section 4.3 below.

4.2.2 The Proposed Development will include the following key elements:

- An engine hall up to 15m height housing up to 7 gas engines each associated with a stack of up to 35m in height external to the building and a bank of fin fan coolers up to 7m high (Indicative Layout 'A' only); or
- Up to 33 containerised gas engines, each associated with an stack of between 10m and 15m (Indicative Layout 'B' only).

4.2.3 In addition there are a number of ancillary elements that are common to both layouts and are not anticipated to vary as a result of the Rochdale Envelope, although their location within the Site boundary may alter depending on the layout adopted. These elements are:

- Gas pipeline to the adjacent VPI CHP site. This may include an section of above ground pipeline to pass over the existing services, drainage ditch and roadway bordering the Site;
- Gas receiving compound to monitor and regulate the flow of gas to the Site;
- Black start unit (skid mounted diesel fired generator);
- Raw/fire water tank and fire pump for fire control purposes;
- Treated water tank to facilitate cooling of the engines;
- Transformers to allow the export of electricity at the correct voltage;
- Gatehouse to control access to Site;
- Workshop and stores;
- Diesel tank for the storage of fuel for the black start unit;
- Lubrication oil tank, to facilitate the operation of the engines; and,
- Offices, workshops and a control module to facilitate the operation of the power station.

Electricity Generation Plant

4.2.4 The Applicant proposes to use reciprocating engines as the means of generating electricity.

4.2.5 In a reciprocating engine, fuel is combusted in the cylinders of a multi-cylinder gas engine, utilising the air that is usually first pressurised by turbo charger(s) and then compressed by the pistons. The force developed turns a crank shaft, which then turns an alternator, which generates the electricity for export to the electricity network.

4.2.6 Reciprocating engines have been widely used for power generation, particularly for peaking and back-up generation, because of their ability to start up and shut down quickly and operate flexibly across a range of loads.

4.2.7 Each engine will have a dedicated stack associated with it, for the discharge of exhaust gases to atmosphere.

Fin Fan Cooling System

4.2.8 The engines require cooling through a closed loop cooling system and fin fan cooler arrangement. These fans are external to any structure and use air as the cooling medium. A small amount of water is retained in the closed loop system with top up periodically required; there is no steam cycle installed and therefore no need for large volumes of cooling water to be abstracted from or returned to the river.

4.2.9 In Indicative Layout A, the engines will be cooled through connection to a bank of fin fan coolers positioned externally to the building.

4.2.10 In Indicative Layout B, as the engines would not be enclosed in a building, cooling would be achieved locally to each containerised unit.

Black-start Capability

4.2.11 The Proposed Development may also provide a 'black-start' capability which would provide the capability to start the selected technology without any assistance from the National Grid electricity transmission system, in the event of a total or partial shutdown of the UK transmission system (so called 'black-start' capability). The Proposed Development could then be used to help restart the national transmission system; power stations without black-start capability need to draw power from the transmission system to start operation. It is not possible to accurately predict the likely frequency or duration of black-start events. However, historically black-start events have been very infrequent in the UK.

4.2.12 The inclusion of black start capability will require the use and storage of diesel or distillate fuel in above ground tank(s) within the Site; although natural gas would continue to be the fuel used during normal plant operation. The diesel would only be used to support black-start operations or to provide emergency supplies if connection to the grid system was lost.

4.2.13 Distillate fuel or diesel would be stored in above ground storage tanks (AST) of less than 30m^3 capacity, adjacent to the black-start area, with an associated unloading area.

Gas Supply and Treatment Infrastructure

4.2.14 A new gas connection pipeline would link into the existing gas supply infrastructure on the Applicant's adjacent CHP site. The new gas connection route would run from the CHP plant via a new above ground pipebridge over the existing services, ditch and roadway along the southern boundary of the Proposed Development Site to a new Gas Reception facility on the Site where the gas would be metered and conditioned to that required for the selected technology for the Proposed Development. The connection route is shown on Figure 3.2 (Volume 2 of this ES).

4.2.15 Gas treatment could include filtering, pressure and temperature regulation and metering of the natural gas. A 'pigging' facility could also be included, which allows a 'Pipeline Inspection Gauge' (PIG) to be passed along the pipeline for periodic cleaning and maintenance checks.

Electricity Switchyard Station and Grid Connection

4.2.16 The Proposed Development would connect, via transformers on the Site, to the National Grid most likely by the existing 15.75 to 400kV connection located on the CHP plant. The connection route is shown on Figure 3.2 (Volume 2 of this ES).

4.2.17 The connection between the Proposed Development and the grid connections would comprise either overhead or below ground cables, or a combination of both. The route of the electrical connection would be the same as the gas connection.

Fire Fighting Equipment and Fire/ Raw Water Storage Tanks

4.2.18 The fire protection strategy for the Proposed Development would be developed to comply with the requirements of the Building Regulations 2010 (Ref 4-1) and the Building Regulations and Fire Safety Procedural Guidelines (Ref 4-2). Appropriate standards would also be referenced to provide the necessary fire safety design. Additional fire protection would be provided with reference to British Standards.

4.2.19 The Proposed Power Station Site would include a fire/ raw water storage tank and a fire water pump house to be used in the event of a fire.

4.2.20 In case of a fire, the outlet connection from the surface water attenuation system would be closed and surface run-off (i.e. fire-fighting and rain water) would be contained within the Site.

Sewerage and Drains

4.2.21 Foul drainage from the welfare facilities would be directed to a bioreactor or septic tank for treatment; the clean overflow water would drain to the existing surface water drainage ditches and the solids emptied from the tank / bioreactor as required.

Surface Water Drainage Attenuation

4.2.22 An Outline Drainage Strategy is included in Section 6 of the Flood Risk Assessment. This describes that the preferred drainage solution for the Proposed Development will be to ensure that flooding on site is mitigated to an acceptable level during the design event and any flooding is directed to non-critical areas. It is also required to prevent surface water flows originating within the Site from causing or exacerbating flooding to surrounding areas. Therefore in line with EA advisory recommendations, CIRIA SuDS manual best practice guidelines and local planning policy sustainable drainage systems should be used as a preferential option.

Control Building, Workshop, Stores and Office Building

4.2.23 A control building would be provided to facilitate control of the power station. This would also include contain a workshop, stores for spare parts, etc., offices and staff welfare facilities. Operational control of the Site could also be through the existing Control Room on the adjacent CHP Site.

Security Fencing and Gatehouse

4.2.24 Security systems would be provided in respect of the Site. This could include paladin (or similar) fencing and intruder alarms. A Gatehouse would control access to the Site.

Landscaping

4.2.25 As no significant environmental effects are predicted as a consequence of the Proposed Development (see Chapter 9: Landscape and Visual Amenity of this ES), no specific landscaping mitigation measures are proposed. Enhancement in the form of tree planting to the periphery of the Site would assist in reducing the visibility of the Proposed Development from visual receptors to the east including those at viewpoint 1 and viewpoint 2, and users of Rosper Road.

Construction Laydown Area and Contractors' Compound

4.2.26 Figure 3.2: Parts of the Site (ES Volume 2) shows the area of land to be used for construction laydown and the contractors' compound. This area would be used for the unloading and storage of construction materials, construction site offices and construction contractor welfare facilities and parking. Some pre-fabrication of materials and components may also be undertaken within this area.

4.2.27 The area would be underlain by semi-permeable surfacing such that it is a level surface that allows surface water and rainwater to percolate through it. No hazardous materials would be stored unbunded within the laydown area.

Water Supply and Treatment Infrastructure

4.2.28 The small amount of cooling water needed for auxiliary systems is maintained in a closed loop system and would be topped up using water provided by a small water treatment plant on Site. This plant would be fed from the raw water tank. This tank in turn would be fed either by pipeline from the existing CHP plant or delivered by road tanker.

Car Parking and Cycle Storage

4.2.29 There would be provision for several car parking spaces on Site; additional car parking spaces would be provided on the adjacent CHP site, if required.

Access

4.2.30 It is anticipated at this stage that there would be one primary access point to the Proposed Power Plant Site and Construction Laydown Area for vehicles during construction. This would be via the existing private road owned by LOR, which joins Rosper Road, approximately 1 km north of the junction with Humber Road. This in turn allows easy access to the A160 and to the Immingham and Killingholme Dock facilities. This access road is a purpose built road that serves the existing LOR and is wide enough to allow access by construction traffic without the need for alteration.

4.2.31 Access to the Site during operation would be via the existing highway access from Rosper Road. Some minor adaptation to the roadways within the Site and existing signage only is anticipated.

External Lighting and CCTV

4.2.32 Lighting would be required for the safe construction and operation of the Proposed Development, during the hours of darkness. This lighting will be restricted to focussed point of use lighting where possible. The exception would be any lighting required for security purposes.

4.2.33 CCTV and other security measures are anticipated to be required for security purposes at the Site.

4.3 Design Parameters

4.3.1 A number of the design aspects and features of the Proposed Development cannot be confirmed until the tendering process for the design and construction of the generating station has been completed. For example, the enclosure or building sizes may vary, depending on the contractor selected and their specific configuration and selection of plant.

4.3.2 Focussed use of the Rochdale Envelope approach has therefore been adopted to present a worst-case assessment of potential environmental effects of the different parameters of the Proposed Development that cannot yet be fixed. These include the specific locations of

emission points within the Proposed Power Plant Site, the number of units to be installed, the massing of structures and buildings and the final stack heights, to allow flexibility in selection of preferred technology. Wherever an element of flexibility is maintained, alternatives have been assessed and the worst-case impacts have been reported in the relevant chapters of this ES.

4.3.3 As outlined previously, the envelope has considered ranges from up to thirty three containerised units in the open air and larger units (likely five or seven) housed within a dedicated building. Each environmental discipline has considered which of these represents the worst case scenario for the potential environmental effect and that scenario has been assessed in the associated chapter.

4.3.4 The maximum dimensions for these structures are shown in Tables 4.1 and 4.2 for both layouts.

Table 4.1. Maximum dimensions of the main structures common to all Indicative layouts

Building	Length (m)	Width (m)	Height (m)	Maximum area (m^2)
Gas receiving compound	25	20	7	500
Workshop/stores/offices	30	15	10	450
Station Transformers	10	7	4	70
Step-up Transformers	16	12	10	192
Lube oil Tank	12	7	5	84
Diesel Tank	12	7	5	84
Raw water /Fire water Tank	12	-	10	110
Treated Water Tank	12	7	5	84
Fire Pump Container	8	5	5	40
Black Start Module	8	5	5	40
Gatehouse	8	8	6	64

Table 4.2. Maximum dimensions of the main structures specific to Indicative Layout 'A' only (7 x 7.5MW gas engines)

Building	Length (m)	Width (m)	Height (m)	Maximum area (m^2)
Gas engines (contained within an engine hall – the dimensions shown are for the building)	60	28	15	1680
Stacks	3.5 (diameter)	-	35	66
Control Module	13	35	15	455
Fin fan coolers	13	35	8	455

Table 4.3. Maximum dimensions of the main structures specific to Indicative Layout 'B' only (33 x 1.5MW gas engines)

Building	Length (m)	Width (m)	Height (m)	Maximum area (m^2)
Gas Engine area*	47	80	7	3,760*
Stacks	>1 (diameter)	-	15	
Control Module	8	6	7	455

* Maximum area occupied by the containerised gas engines not a single structure

4.4 Proposed Development Operation

Hours of Operation

4.4.1 The Proposed Development would need to be available at all times. It is most likely to run during periods of low electricity supply or high demand, or when required to provide technical services to support the National Grid. This is expected to be weighted towards the winter period, for a few hours at a time. However, as the operation of the plant is driven by the dynamics of the energy market, the plant could run for longer periods, at any time of day, up to the maximum allowed under its Environmental Permit.

Site Staff

4.4.2 Operation of the Proposed Development is anticipated to create up to 6 operational roles, which may be new jobs or integrated with other VPI operations. Temporary and contractor employees associated with maintenance activities would also be employed as required.

Maintenance

4.4.3 Maintenance would be undertaken in accordance with the original manufacturer's recommendations and/or industry best practice as dictated by the number of running hours or condition/age of the plant. Due to the predicted low annual running hours, it is likely that there would be several years between each significant plant overhaul period.

Environmental Management

4.4.4 The Proposed Development would comply with the Medium Combustion Plant Directive (MCPD) (Ref 4-3) and would be regulated by the Environment Agency through an Environmental Permit. Specific details regarding control of air emissions and a summary of emission limit values for the Proposed Development are set out in Chapter 7: Air Quality.

4.5 Proposed Development Construction

Construction Programme and Methods

4.5.1 A Construction Environmental Management Plan (CEMP) would be prepared by the contractor. A framework CEMP (Appendix 4A – ES Volume 3) sets out the key measures to be employed during the main works phase to control and minimise the impacts on the environment. It describes how monitoring and auditing activities would be undertaken, in order to ensure that mitigation measures are carried out and are effective. The contractor CEMP must be in accordance with the principles set out in the framework.

4.5.2 Construction of the Proposed Development is due to start as early as Q1 2019 and could take up to 18 months to complete (including design and procurement). Once the buildings are erected, the contractor would commence the erection of plant (e.g. gas engines, transformers and stack(s)) on a phased programme of approximately 18 months.

4.5.3 Table 4.4 gives an indication of the construction programme if that were to be the case.

Table 4.4. Indicative Construction Programme

	2018				2019				2020				2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Main civil works																
Plant installation																
Gas and electrical connections																
Commissioning																

Earthworks

4.5.4 Some earthworks may be required to re-profile the Site, to produce a level platform for the Proposed Development, excavate foundations and/or remove surplus material or remediate contaminated soils. However, it is assumed that there will not be significant volumes of spoil or waste arisings generated from these works that require off-site disposal and that material will be re-used on Site where possible,

4.5.5 If any excess spoil material is generated during construction it would be stored temporarily within the Site and then reused as part of the construction works in accordance with the CEMP and in accordance with best practice.

4.5.6 Soils would be managed in accordance with the Defra Construction Code of Practice for the Sustainable Use of Soil on Development Sites (Ref 4-4) to minimise impacts on soil structure and quality. Appropriate measures to minimise short-term and long-term impacts on land drainage are included in the framework CEMP.

4.5.7 The framework CEMP incorporates measures to prevent an increase in flood risk during the construction works. For example, topsoil and other construction materials would be stored outside of the highest flood risk areas and only moved to the temporary works area immediately prior to use. As appropriate, a permit would be obtained from the Environment Agency for the temporary storage of materials within the flood plain, although this would be minimised where possible through the siting of stockpiles and timing of works.

Main Civil and Process Works

4.5.8 The contractor would prepare and level the Proposed Power Plant Site, followed by piling (if required) and excavation for main foundations. Lighter structures may have raft foundations. If piling is required, this will be subject to a risk assessment to prevent contamination of the underlying soils and groundwater.

Construction of Gas Connection Pipeline

4.5.9 A new gas connection pipeline would link into VPI's existing gas supply infrastructure. The pipeline would be installed by using a high level pipebridge to pass from the existing CHP gas connection to the gas receiving facility on the Site over the existing roadway, drainage ditch and pipework. The pipe would be circa 150mm in diameter.

Construction of Water Connections

4.5.10 The Proposed Water Connections (potable and industrial water) are located within the existing VPI site.

Construction Staff

4.5.11 It is estimated that there would be up to 100 personnel contracted to work on the Site at the peak of construction.

4.5.12 Construction staff are anticipated to travel to the Site via the existing trunk road and local networks. The Applicant would seek to maximise sustainable transport options, such as public transport, cycling and car share, in accordance with its current practice and policy.

Construction Working Hours

4.5.13 Construction working hours would generally be Monday to Friday 07:00 to 19:00 and Saturday 08:00 to 18:00. However, it is likely that some construction activities would be required 24-hours at certain times. This is because certain construction activities cannot be stopped, such as concrete slip forming, if this is required. Where on-site works are to be conducted outside the core hours, they would comply with any restrictions agreed with the local planning authorities, in particular regarding control of noise and traffic. 24-hour working for certain activities has, therefore, been assessed in Chapter 8: Noise and Vibration. It is also proposed that some work may be carried out through the night, so long as it does not cause existing ambient noise or vibration levels at sensitive receptors to be exceeded. Chapter 8: Noise and Vibration sets out specific mitigation and control measures required to prevent disturbance from night time construction activities.

4.5.14 Given the above, activities that could generate a noise nuisance would not be carried out at night, including but not limited to certain piling methods, use of impact wrenches, concrete scabbling, use of reversing alarms, and concrete jack hammering, subject to the outcome of a construction noise assessment in accordance with British Standard BS5228. A noise monitor would be installed at the boundary of the Site, with a night time noise limit to be enforced at this monitor during construction (and the limit to be agreed with North Lincolnshire Council).

Construction Traffic

4.5.15 A maximum of up to 50 HGVs per day are predicted to access the Site at the peak of construction. The predicted daily profile of HGV movement at the peak of construction is shown in Table 4.5. This profile is based on experience from other similar power plant construction sites and information provided by original equipment manufacturers and shows that the arrival and departure of HGVs from the Site would be spread over the day. The profile shows that deliveries would be restricted to between 07:00 and 19:00 hours.

Table 4.5. Daily HGV Profile during Peak Month of Construction

Hour Beginning	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00
HGVs In	2	3	3	4	4	3	2	2	2	2	2	1
HGVs Out	2	2	3	4	4	3	2	2	3	2	2	1

4.5.16 Abnormal loads associated with the development are likely to arrive to site around months 6–8 of construction. At the current time it is not known which final option will be chosen for the plant, and therefore the number and size of abnormal loads is not known at this time. However they are expected to be of moderate size and weight large given the scale of the plant.

Construction Site Access

4.5.17 It is anticipated at this stage that there would be one primary access point to the Proposed Power Plant Site and Construction Laydown Area for vehicles during construction. This will

be via the existing private road owned by Lindsey Oil Refinery, which joins Rosper Road, approximately 1km north of the junction with Humber Road. This in turn allows easy access to the A160 and to the Immingham and Killingholme Dock facilities. This access road is a purpose built road that serves the existing Lindsey Oil Refinery Site and is wide enough to allow access by construction traffic without the need for alteration.

Storage of Construction Plant and Materials

4.5.18 At the end of the shift, mobile plant would be returned to a secure overnight plant storage area, where drip trays can be utilised under the various types of plant, if needed.

4.5.19 Storage areas for hazardous or potentially polluting materials would be located in a separate, locked, where appropriate bunded and secure area. Material data sheets would be available for all these materials and the Control of Substances Hazardous to Health (COSHH) assessments kept within the relevant risk assessment for the task.

Hazard Prevention and Emergency Planning

4.5.20 The Applicant aims to protect human health by safely and responsibly managing site activity. A Health and Safety Plan covering the works, commissioning and operation of the Proposed Development would be written. Competent and adequately resourced duty holders as defined in the Construction (Design and Management) (CDM) Regulations (Ref 4-5) would be appointed, such as Principal Designer and Principal Contractor. The Applicant would ensure that its own staff, its designers and contractors follow the Approved Codes of Practice (ACoP) laid down by the CDM Regulations.

4.5.21 Written procedures clearly describing responsibilities, actions and communication channels would be available for operational personnel dealing with emergencies.

4.5.22 Management of the gas supply would be carefully controlled in accordance with UK requirements. The Environmental Permit for the Proposed Development would consider potential abnormal operation scenarios and prevention or minimisation of accidents through management procedures.

Construction Environmental Management Plan (CEMP) and Site Waste Management Plan (SWMP)

4.5.23 In accordance with policy requirements, through the ongoing design, the Applicant would seek to ensure that the Proposed Development is designed, constructed and implemented to minimise the creation of waste, maximise the use of recycled materials and assist the collection, separation, sorting, recycling and recovery of waste arisings, as far as practicable.

4.5.24 The Applicant would require that the contractor produces and maintains a CEMP to control site activities to minimise impacts on the environment. This would include industry best practice measures, and specific measures set out in this ES including the use of wheel washes and dust suppression where appropriate. A framework CEMP has been produced and is included within Appendix 4A (ES Volume 3). The contractor CEMP must be in accordance with the principles set out in the framework.

4.5.25 In order to manage and monitor waste generated on Site, a framework SWMP has been developed as part of the framework CEMP. It would allow waste streams to be estimated and monitored and goals to be set with regards to the waste produced. The final CEMP will incorporate the principles of the SWMP as appropriate.

4.5.26 The Applicant would require that the contractor separates the waste streams on Site, prior to them being taken to a waste facility for recycling or disposal. All waste removal from Site would be undertaken by licensed waste carriers and taken to licensed waste facilities.

4.6 Decommissioning

4.6.1 The proposed development is capable of a life expectancy of 20 years or more, depending on running hours. Eventually decommissioning would involve the removal of the plant. The gas and electricity connections would be disconnected and made safe. Gas engines are modular, transportable and small scale, thus allowing for units to be easily removed and reused elsewhere (depending on its condition) or alternatively dismantled on Site and removed. Therefore, decommissioning is not anticipated to present any significant environmental effects beyond those assessed for the construction period of the Proposed Development.

4.7 References

Ref 4-1 HM Government, Building Regulations 2010.

Ref 4-2 Department of Communities and Local Government (2007) Building Regulations and Fire Safety Procedural Guidelines. DCLG, London.

Ref 4-3 European Commission (2015) Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants.

Ref 4-4 Defra (2009) Construction Code of Practice for the Sustainable Use of Soil on Development Sites.

Ref 4-5 HM Government (2017) The Construction (Design and Management) Regulations 2015

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5. Planning Policy Framework

5.1 Introduction

5.1.1 This chapter provides an overview of planning policies and other guidance relevant to the Proposed Development, with topic specific policy detailed in the relevant topic chapters (Chapters 7-13 of this ES).

5.2 Statutory Development Plan (local planning policy)

5.2.1 The following planning policy documents from the statutory development plan are considered most relevant to the Proposed Development:

- North Lincolnshire Core Strategy (Adopted June 2011);
- North Lincolnshire Local Plan (Adopted May 2003); and
- North Lincolnshire Housing and Employment Land Allocations Development Plan Document (Adopted March 2016).

5.2.2 The Industrial Development Supplementary Planning Guidance ('SPG') (2003), whilst not comprising part of the statutory development plan, is also a material consideration.

Core Strategy (2011)

5.2.3 The policies considered to be of most relevance are as follows:

- CS12 – South Humber Bank Strategic Employment Site;
- CS16 – North Lincolnshire's Landscape, Greenscape and Waterscape;
- CS17 – Biodiversity;
- CS18 – Sustainable Resource Use and Climate Change;
- CS19 – Flood Risk;
- CS20 – Sustainable Waste Management; and
- CS25 – Promoting Sustainable Transport.

Local Plan (2003)

5.2.4 The policies considered to be of most relevance are as follows:

- IN1 – Industrial Development Location and Uses;
- IN3 – Industrial and Commercial Development in the South Humber Bank Area;
- LC1 – Special Protection Areas, Special Areas of Conservation and RAMSAR Sites;
- LC5 – Species Protection;
- LC7 – Landscape Protection;
- LC12 – Protection of Trees, Woodland and Hedgerows;
- LC20 – South Humber Bank- Landscape Initiative;
- HE9 – Archaeological Excavation;
- DS1 – General Requirements;

- DS7 – Contaminated Land;
- DS11 – Polluting Activities;
- DS13 – Groundwater Protection and Land Drainage;
- DS15 – Water Resources;
- DS16 – Flood Risk;
- T1 – Location of Development;
- T2 – Access to Development; and
- T18 –Traffic Management).

Housing and Employment Land Allocations Development Plan (2016)

5.2.5 The Site is identified as falling within Employment Land Allocation SHBE-1 South Humber Bank.

5.2.6 The document states that the South Humber Bank area requires the following:

"900 hectares (gross area) of B1 (Offices/Light Industrial), B2 (General Industry) and B8 (Storage and Distribution) port related activities to take special advantage of its location within an existing port environment, flat topography and being adjacent to a deep water channel of the Humber Estuary.

…The expected port related activities on the site will in the main be heavy industrial users meaning pollution and waste control measures will be crucial to the success of the site in sustainability terms."

5.3 Other Material Considerations

5.3.1 The National Planning Policy Framework ('NPPF') was adopted in March 2012. The policies contained within the NPPF are expanded upon and supported by the 'Planning Practice Guidance', which was published in March 2014.

5.3.2 The NPPF sets out the Government's planning policies for England and how these are to be applied. It is a material consideration in planning decisions made by local planning authorities.

5.3.3 The National Policy Statements ('NPSs') and Marine Policy Statements ('MPSs') make up the policy framework for examining and determining Nationally Significant Infrastructure Projects ('NSIPs'). As the proposed development is not considered to be a NSIP, neither the NPS or MPS are directly relevant, but they do form material considerations in the determination of the application.

5.3.4 The following NPSs are relevant:

- Overarching National Policy Statement for Energy ('EN-1');
- National Policy Statement for Fossil Fuel Electricity Generating Infrastructure ('EN-2');
- National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines ('EN-4'); and
- National Policy Statement for Electricity Networks Infrastructure ('EN-5').

5.3.5 There is no relevant MPS, as the Proposed Development does not directly affect a marine area.

5.3.6 There are also numerous documents produced by National Grid that are relevant in terms of the need that existing for the Proposed Development and power plants of its kind.

5.4 References

Ref 5-1. North Lincolnshire Council (2011) *Core Strategy*

Ref 5-2. North Lincolnshire Council (2003) *Local Plan*

Ref 5-3. North Lincolnshire Council (2016) *Housing and Employment Land Allocations Development Plan Document*

Ref 5-4. The Industrial Development Supplementary Planning Guidance ('SPG') (2003)

Ref 5-5. Department of Communities and Local Government (2012) National Planning Policy Framework. DCLG, London

Ref 5-6. Overarching National Policy Statement for Energy (‘EN-1’)

Ref 5-7. National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (‘EN-2’)

Ref 5-8. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (‘EN-4’)

Ref 5-9. National Policy Statement for Electricity Networks Infrastructure (‘EN-5’)

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6 Design Evolution and Alternatives

6.1 Introduction

6.1.1 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') require that the ES should include a description of reasonable alternatives studied which are relevant to the Proposed Development and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects (for example in terms of development design, technology, location, size and scale).

6.1.2 The consideration of alternatives and design evolution has been undertaken with the aims of preventing or reducing adverse environmental effects (following the mitigation hierarchy of avoid, reduce and, if possible, remediate) while maintaining operational efficiency and cost-effectiveness. The design has continued to evolve in response to ongoing surveys and technical studies up to the point of submission of the application. Mitigation measures that have been included within the design of the Proposed Development are referenced in each technical chapter (Chapters 7 – 13).

6.1.3 A number of alternatives have been considered for the Proposed Development, which are discussed below, including:

- Alternative technologies; and
- Alternative sizing of gas engines.

6.2 Project Need

6.2.1 National Grid ('NG') is responsible, as the operator of the electricity and gas transmission systems, for ensuring that at all times there is sufficient generation capacity to manage potential uncertainties associated with generation output and demand fluctuation. This includes ensuring that there is spare capacity within the system and sufficient reserves of power to deal with unforeseen circumstances.

6.2.2 The NG report on the electricity transmission system 'Operating the Electricity Transmission Networks in 2020' (Ref 6-1) highlights that the UK transmission system is changing fundamentally, moving from a relatively predictable generation base with the closure of aging coal and nuclear power stations, to one that includes a significant proportion of less predictable renewable energy generation; which, particularly in the case of wind and solar, make a much more variable contribution to generation (dependant on weather conditions) when compared with more traditional coal and gas fired power stations. The report estimates that in 2020 approximately 28% (26.7 gigawatts ('GW')) of the UK's generation fleet could consist of wind power, underlining the potential for substantial fluctuations in generation output.

6.2.3 The Energy Reform White Paper of July 2011 (Ref 6-2) states that the UK faces increasing security of supply risks from around the end of this decade. It goes on to state that this is due to two main factors:

- Around a quarter of existing generation is closing; and
- A significant proportion of new generation is likely to be more intermittent and less flexible.

6.2.4 Furthermore, that modelling indicates de-rated capacity margins will fall below 10 percent around the end of this decade, and will significantly increase the risk of costly voltage reductions and blackouts.

6.2.5 The 'Energy: Chapter 1, Digest of United Kingdom Energy Statistics' report (Ref 6-3) produced by the Department for Business Energy and Industrial Strategy ('BEIS') reaffirms the risks set out above; confirming that in 2015 energy consumption in the UK increased and, as witnessed in previous years, there was a further switch in the main sources of electricity generation away from the fossil fuel of coal to more low carbon generation, such as wind and solar. Generation from coal fell by 25% (as a number of plants closed or switched to burning biomass) and renewables increased by 29%. The overall renewables share of generation increased to a record 25% share of generation. This not only highlights the potential for substantial fluctuations in generation output, but the continued decline of more predictable forms of generation.

6.2.6 In response to this situation, in July 2014 the Government introduced a policy of 'Electricity Market Reform' ('EMR'). This included the 'Capacity Market'; where reliable forms of capacity (both demand and supply side), such as gas-fired power stations, are made available to provide 'back-up' and ensure security of supply when demand is high. In accordance with government policy, gas-fired power plants (as part of the Capacity Market) form an integral part of NG's strategy to ensure that the UK continues to benefit from secure and reliable electricity supplies as it moves toward a low carbon generation system and greater reliance on technologies such as wind and solar power. Largely as a result of this move toward a generation fleet that includes a much greater proportion of wind and solar power, there is a greater need for operating reserves. The provision of additional, reliable forms of power generation is therefore clearly in the national interest in terms of ensuring the future security of UK electricity supplies.

6.2.7 The need that exists for new electricity generating infrastructure, such as that proposed, is confirmed in the NPSs for energy infrastructure. Of these NPSs, EN-1 sets out the 'need' for new energy infrastructure. Part 2 of the EN-1 outlines the policy context and paragraph 2.1.2 highlights the need for infrastructure that produces energy, when energy is considered to be *"vital to economic prosperity and social well-being".* The energy NPSs consider the vital role that large infrastructure plays in securing energy supplies.

6.2.8 The Government's commitment 'The road to 2050', set out in Section 2.2, seeks to meet the UK's legally binding target to cut greenhouse gas emissions by at least 80% by 2050, compared to 1990 levels. It identified a number of key themes of Government energy policy, including the transition to a low carbon economy; the power sector and carbon emissions; electricity market reform; and the security of energy supplies.

6.2.9 Paragraphs 2.2.16- 2.2.19 states that the Government is looking at a variety of reforms in order to promote investment so as to replace aging infrastructure. Paragraph 2.2.20 states that in order to manage the risks to achieving security of supply the UK needs:

- Sufficient electricity capacity to meet demand at all times, including a 'safety margin of spare capacity' to accommodate unforeseen fluctuations in supply or demand;
- Reliable associated supply chains (for example, fuel for power stations) to meet demand as it rises; and
- A diverse mix of technologies and fuels (and fuel supply routes), so that it does not rely on any one technology or fuel.

6.2.10 Paragraph 3.3.15 states the urgency at which new energy infrastructure should be brought forward as soon as possible and certainly within the next 10-15 years.

6.2.11 In light of this policy and government guidance, it is clear that there is a significant and demonstrable need for the Proposed Development, in terms of security of supply, achieving a low carbon future, and replacing ageing generating stock.

6.3 Site Selection

6.3.1 The Site has been selected by the Applicant for the development of a generating station, as opposed to other potentially available sites for the following reasons:

- The Site is currently vacant and it situated in an area immediately surrounded by major industry and power generation;
- The Site has excellent electrical grid, gas, water and transport links and is a brownfield site which is considered more attractive to redevelop for large scale power generation than a greenfield one;
- The Site benefits from a lease held by the Applicant that permits operation of the Proposed Development;
- The Site is adjacent VPIs existing CHP power station providing synergies with the existing workforce, services and utilities; and
- The Site is located in close proximity to the National Electricity and Gas Transmission Networks, through existing connections on the adjacent CHP Site.

6.3.2 Since the Scoping Report was issued (December 2017) the Applicant has sought to refine the area within the Site boundary indicated at the time. To this effect a much smaller area has been identified (3.2ha as opposed to 4.9ha). This area sits to the west of the larger area of land away from Rosper Road and has been selected partially due to its distance from the road and residential receptors that would allow any impact of the development to be lessened.

6.3.3 In addition other areas of land have been added to the Site boundary solely for the purposes of facilitating access to the Site for construction of operation. In particular, the access road to the Lindsey Oil Refinery to the north of the Site has been added as well as routes through the existing car park.

6.3.4 These have been added solely to facilitate access to the Site as the Applicant considered this preferable to the construction of a new access off Rosper Road. So while the extent of the Site boundary might be greater than that considered at the time of the issue of the Scoping Report; no modifications or changes of use are proposed for those areas.

6.4 Alternative Technologies

6.4.1 Since the Scoping Report was issued (December 2017) the Applicant has sought to refine down, as far as practicable, the number of areas where flexibility needs to be maintained. As such, the Applicant has determined to select only gas engines for the Proposed Development.

6.4.2 Gas engines tend to be smaller capacity than other generating technologies, (in particular gas turbines) and therefore have lower mass emissions of pollutants to air and correspondingly lower stacks. Use of gas engines allows the Applicant to install a highly flexible plant to help meet short term electricity demand and also potentially offer black start capability.

6.4.3 Natural gas is proposed to be the fuel for the Proposed Development as it is cleaner than other fossil fuels, does not require bulk on-site storage, presents fewer environmental and safety hazards and allows a plant to be able to operate flexibly and rapidly on demand.

6.5 Alternative Sizing of Gas Engines

6.5.1 Gas engines come in a wide variety of sizes in terms of for gas engines available. This includes options for use of multiple gas engines of c. 1.5MW in containerised units or a

smaller number of larger output (up to c. 10MW capacity) gas engines, housed within a dedicated building, as previously discussed in Chapter 4: Proposed Development of this ES.

6.5.2 Where the sizing and number of gas engines has the potential to materially change the environmental effects of the Proposed Development (i.e. air quality and noise emissions and landscape and visual impact), the various options have been considered in this ES and environmental effects associated with a worst-case are presented. This is in accordance with the Rochdale Envelope approach described in Chapter 2: Assessment Methodology of this ES.

6.5.3 Retention of flexibility in the selection of engine sizes is required by the Applicant for commercial purposes to allow the Applicant to conduct a competitive tendering exercise. This exercise will be informed by the parameters of the Rochdale Envelope described in the ES.

6.6 References

Ref 6-1 'Operating the Electricity Transmission Networks in 2020' (June 2011)

Ref 6-2 Energy Reform White Paper of July 2011

Ref 6-3 Digest of United Kingdom Energy Statistics' report (July 2016)

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Tables

7. Air Quality and Greenhouse Gas Emissions

7.1 Introduction

7.1.1 This chapter of the Environmental Statement (ES) addresses the potential effects of the Proposed Development on air quality.

7.1.2 The assessment considers:

- The present-day and future baseline conditions during construction and in the opening year of the Proposed Development;
- The effects of construction of the Proposed Development on air quality for human health and ecosystems, with respect to associated construction traffic, construction plant emissions and construction dust;
- The effects of operational process emissions associated with the Proposed Development on air quality for human health and ecosystems; and
- The cumulative effects of emissions associated with the Proposed Development and other committed developments in the vicinity.

7.1.3 This chapter is supported by Figures 7.1 – 7.3, provided in ES Volume 2 and Appendices 7A and 7B provided in ES Volume 3. Appendix 7A details the dispersion modelling assumptions and results undertaken to support this Chapter. Appendix 7B presents a Greenhouse Gas assessment.

7.2 Legislative and Planning Policy Context

7.2.1 The principal air quality legislation within the United Kingdom is the Air Quality Standards Regulations 2010 (Ref 7-1), which transposes the requirements of the European Ambient Air Quality Directive 2008 (Ref 7-2) and the 2004 Fourth Air Quality Daughter Directive (Ref 7-3). The Regulations set air quality limits for a number of major air pollutants that have the potential to impact public health, such as nitrogen dioxide (NO_2), carbon monoxide (CO) and particulate matter (PM_{10}, which is particulate matter of 10µm diameter or less). The Regulations also include an exposure reduction objective for $PM_{2.5}$ ($PM_{2.5}$ is particulate matter of 2.5µm diameter or less) in urban areas and a national target value for $PM_{2.5}$.

7.2.2 The Environment Act 1995 (Ref 7-4) requires the UK Government to produce a National Air Quality Strategy (NAQS), last reviewed in 2007 (Ref 7-5), containing air quality objectives and timescales to meet those objectives. The objectives apply to outdoor locations where people are regularly present and do not apply to occupational, indoor or in-vehicle exposure. It requires local authorities to undertake an assessment of local air quality to establish whether the objectives are being achieved, and to designate Air Quality Management Areas (AQMA) if improvements are necessary to meet the objectives. Where an AQMA has been designated, the local authority must draw up an Air Quality Action Plan (AQAP) describing the measures that will be put in place to assist in achieving the objectives. Defra has responsibility for coordinating assessments and AQAPs for the UK as a whole.

7.2.3 The current objectives and assessment criteria applicable for this assessment for the protection of human health are presented in Table 7.1. Concentrations are expressed in micrograms per cubic metre (µg/m^3).

Table 7.1. Air Quality Strategy Objectives (NAQS) – Protection of Human Health

Pollutant	NAQS Objective (µg/m^3)	Averaging Period	Percentile	To be Met By
Nitrogen Dioxide (NO_2)	200	1-Hour Mean	99.79th (or not to be exceeded more than 18 times/year)	31 Dec 2005
	40	Annual Mean	-	31 Dec 2005
Particulate matter (PM_{10})	50	24-Hour Mean	90.4th (or not to be exceeded more than 35 times/ year)	31 Dec 2004
	40	Annual Mean	-	31 Dec 2005
Particulate matter ($PM_{2.5}$)	25	Annual Mean	-	2020
Carbon monoxide (CO)	10,000	8 hour, daily running mean	-	31 Dec 2003

7.2.4 For the protection of vegetation and ecosystems, a number of Critical Levels have been developed; Critical Levels are defined as "*concentrations of pollutants in the atmosphere above* which *direct adverse effects on...plants [and] ecosystems...may occur according to present knowledge*" (Ref 7-6). The critical levels apply at all relevant ecological areas regardless of habitat type. The Critical Levels applicable to this assessment are shown in Table 7.2.

Table 7.2. Critical Levels (CLs) - Protection of Vegetation and Ecosystems

Pollutant	Objective (µg/m^3)	Averaging Period	Notes
Oxides of Nitrogen (NO_x)	75	24-Hour Mean	100th Percentile
	30*	Annual Mean	-

*denotes objective set in Air Quality Standards Regulations 2010

7.2.5 In addition to the above Critical Levels, there are non-legislative limits, called Critical Loads that have been derived for different habitats covering the deposition of nitrogen and acidifying species; Critical Loads are defined as "*a quantitative estimate of exposure to one or more pollutant below which significant harmful effects on specified elements of the environment do not occur according to present knowledge*" (Ref 7-6). The habitat-specific Critical Loads relevant to this assessment are presented in Appendix 7A (ES Volume 3) and in Chapter 10: Ecology and Nature Conservation, of this ES.

Environmental Permitting Regulations

7.2.6 The Environmental Permitting (England and Wales) Regulations 2016 (EPR) (Ref 7-7) apply to all new installations and transpose the requirements of the EU Industrial Emissions Directive (IED) (Ref 7-8) and the Medium Combustion Plant Directive (MCPD) (Ref 7-9) into UK legislation. Under the IED and EPR, the operator of an installation covered by the IED is

required to employ Best Available Techniques (BAT) for the prevention or minimisation of emissions to the environment, to ensure a high level of protection of the environment as a whole. Individual generating units of less than 50MW thermal input rating (50MWth) (such as the gas engines associated with the Proposed Development) are covered by the MCPD and EPR, unless the individual units are each rated more than 15MW thermal input and are capable of discharging to a single stack; such aggregated units are classified as a Large Combustion Plant and fall under the IED. The plant would be designed to comply with the requirements of the IED or MCPD, depending on the capacity of the installed units and in accordance with Environment Agency (EA) guidance. Performance against the relevant Emission Limit Values (ELV), as defined in the IED or MCPD, would be regulated through an Environment Permit, issued by the Environment Agency.

7.2.7 Where legislative ambient air quality limits or objectives are not specified for the pollutant species potentially released from the Proposed Development, Environmental Assessment Levels (EALs), published in the EA's Risk Assessments for Specific Activities: Environmental Permits guidance (Ref 7-10) can be used to assess potential health effects on the general population. The EALs applicable in this assessment for the protection of human health from pollutants that could be emitted from the Proposed Development are presented in Table 7.3.

Table 7.3. Environmental Assessment Levels (EAL) – Protection of Human Health

Pollutant	EAL ($\mu g/m^3$)	Averaging Period
Carbon Monoxide (CO)	30,000	1-Hour Mean

Industrial Emissions Directive

7.2.8 The IED provides operational limits and controls to which plant must comply, including ELVs for pollutant releases into the air. Depending on the final size of the selected units for the Proposed Development, the operational generating station at the Proposed Development may fall under the Large Combustion Plant (LCP) requirements (Chapter III) of the IED, if the largest size gas engine considered in this study are employed.

7.2.9 In addition, European BAT reference documents (BRefs) are published for each industrial sector regulated under the IED, and they include BAT-Achievable Emission Values (BAT-AELs) which are expected to be met through the application of BAT. The current version of the LCP BRef (Ref 7-11), includes BAT-AELs which have been applied in the assessment of the largest units considered within this study.

Medium Combustion Plant Directive

7.2.10 The MCPD provides operational limits and controls to which plant must comply, for plant with a rated thermal input of between 1MWth and 50MWth, including ELVs for pollutant releases to air. Depending on the final size of selected units, the operational generating station at the Proposed Development may fall under the MCPD, if the smaller sized units considered in this study are employed. The UK government has recently published a statutory instrument to transpose the requirements of the MCPD into legislation through an amendment to the EPR (Ref 7-12).

Local Planning Policy

7.2.11 North Lincolnshire Council (NLC) adopted the North Lincolnshire Local Development Framework – Core Strategy in 2011 (Ref 7-13), including the policy CS18: Sustainable Resource Use and Climate Change, which states that:

"The Council will actively promote development that utilises natural resources as efficiently and sustainably as possible. This will include…

(10) Ensuring development and land use helps to protect people and the environment from unsafe, unhealthy and polluted environments, by protecting and improving the quality of the air, land and water."

(11) Supporting renewable sources of energy in appropriate locations, where possible, and ensuring that development maximises the use of combined heat and power, particularly at the South Humber Bank employment site and where energy demands for more than 2MW are required for development.

(12) Supporting new technology and development for carbon capture and the best available clean and efficient energy technology, particularly in relation to the heavy industrial users in North Lincolnshire, to help reduce CO_2 emissions.

7.2.12 The Proposed Development lies within the South Humber Bank (SHBE-1) Allocated Employment Site, identified within the adopted Local Development Framework – Development Plan Document (Ref 7-14)[1] for potential future development. The document identifies the potential for environmental impacts from development on locally present protected conservation areas (including the Humber Estuary Special Area of Conservation (SAC), Sites of Special Scientific Interest (SSSI) and Local Nature Reserves), and on nearby residential areas, and therefore the potential requirement for air quality assessment of proposed developments to be carried out.

Other Guidance

7.2.13 The EA Risk Assessments for Specific Activities: Environmental Permits guidance (Ref 7-10) provides guidance on the assessment of Best Available Techniques and of impacts from permitted installations, primarily for the purposes of Environmental Permitting.

7.2.14 Defra has also published technical guidance LAQM TG(16) (Ref 7-15) to assist local authorities in fulfilling their duties in relation to Local Air Quality Management. Parts of this guidance, and associated tools, are also useful in assessing the impacts of individual developments within the planning process.

7.2.15 The Institute of Air Quality Management (IAQM) in collaboration with Environmental Protection UK (EPUK) has published several guidance documents relating to planning and development works, including:

- 'Land-Use Planning & Development Control: Planning For Air Quality' (Ref 7-16), which describes the indicative criteria to trigger the initiation of an air quality assessment for a development, together with guidance on the content of an air quality assessment, impact description and significance determination with reference to air quality standards. The guidance states that it is not intended to be applied to the assessment of air quality impacts on designated nature conservation sites; and
- 'Guidance on the assessment of dust from demolition and construction' (Ref 7-17), which presents guidance on qualitative assessment of risk of dust emissions from construction and demolition activities and the level of good practice mitigation that should be applied.

[1] formerly South Humber Gateway area (IN1-1) identified within the Employment Land Review (Ref 7-15)

7.3 Assessment Method and Significance Criteria

Consultation

7.3.1 The consultation undertaken with statutory consultees to inform this chapter, including a summary of comments raised *via* the formal scoping opinion (Appendix 1B, Volume 3 of this ES) is summarised in Table 7.4.

Table 7.4. Consultation Summary Table

Consultee or organisation approached	Date and nature of consultation	Summary of Response	How comments have been addressed
North Lincolnshire Council	January 2018 (Scoping Opinion)	**Ecology and Nature Conservation** The applicant will need to provide all of the information reasonably required for NLC to determine whether there will be a likely significant effect on the Humber Estuary SAC, SPA and/or Ramsar site. The application will need to be considered in combination with other plans and projects and the applicant is advised to review the Humber Nature Partnership In-combination Database for information on other plans and projects in the area. **Air Quality** The submitted scoping report identifies that air quality is to be considered as part of the Environmental Statement via an Air Quality Impact Assessment. The council's Environmental Health Officer has confirmed that this approach is acceptable and that they are satisfied with the proposed extent of this assessment.	**Section 7.3**. Predicted changes in air quality relative to the baseline and the absolute emission levels, with application of mitigation as necessary, have been provided in **Sections 7.4** and **7.6**. No additional action required.
EA	25 January 2018 (Scoping Opinion)	No specific comments on air quality were made by the EA.	No further action required. An environmental permit application will be prepared for the operational power station.
Natural England	Scoping Opinion	Despite consultation taking place, no response has been received from Natural England with regards to the scoping report.	No further action required.

Scope of the Assessment

7.3.2 Matters that are scoped into the ES are judged likely, without effective mitigation, to have the potential to cause significant effects. Matters that are scoped out of the ES are those which

it is considered are not likely to lead to significant effects, regardless of mitigation. Where insufficient information is available in relation to a particular matter to make a reasonable judgement at this stage, a precautionary approach is adopted and that matter is scoped in. The decision to scope out matters is based upon factors such as a high degree of separation between the Proposed Development and the receptor, the lack of impact pathways, or the known low value or low sensitivity of impacted resources/ receptors.

7.3.3 Based on the above, those potential air quality impacts associated with the activities detailed in Table 7.5 have been scoped out of further assessment:

Table 7.5. Potential Air Quality Impacts Scoped Out From Further Assessment

Potential Air Quality Impact	Details	Rationale for Screening
Construction phase traffic emission impacts on ambient air quality	Exhaust emissions from traffic associated with the construction phase of the Proposed Development	Construction vehicle movements are predicted to peak at 126 two way movements of LDVs, and 50 HDVs per day (the time of the LDV and HDV peaks are not concurrent). These predicted movements are below the screening criteria for further assessment of potential air quality effects. See additional details below the table.
Operation road traffic emissions	Exhaust emissions from traffic associated with the operational phase of the Proposed Development.	Operational vehicle movements are predicted to significantly less than those associated with construction activities, therefore are well below the screening criteria for further assessment of potential air quality effects.
Odour	Exhaust emissions from the combustion of fuel.	The Project will operate using natural gas which is odourless (unless odorised for domestic use) and which combusts in an odourless way. As such, the assessment of odour has been scoped out and will not be considered further in this chapter.
Plume Visibility	Overshadowing effects due to condensation of water vapour from flue stack and/ or cooling technology.	Negligible risk of visible plume due to low water content of the fuel and high flue gas temperature. Fin fan coolers do not give rise to visible plumes during their operation as they are air cooled, with the water used in a closed loop system.

Scoping Out of Traffic Emissions

7.3.4 In order to scope out the assessment of potential traffic impacts during construction, operation and decommissioning of the Proposed Development, the EPUK/IAQM Land-Use guidance (Ref 7-16) provides indicative screening criteria to aid the determination of whether a traffic air quality assessment is required. The IAQM/EPUK guidance states that, in terms of road traffic, an assessment is required where the development will:

- Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5 tonnes gross vehicle weight). A change in LDV flows is considered to be an increase of more than 100 Annual Average Daily Traffic (AADT) movements within or adjacent to an AQMA, or more than 500 AADT elsewhere;

- Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5 tonnes gross vehicle weight). A change in HDV flows is considered to be an increase of more than 25 AADT within or adjacent to an AQMA, or more than 100 AADT elsewhere; and
- Realign roads, i.e. changing the proximity of receptors to traffic lanes. Where the change is 5m or more and the road is within an AQMA.

7.3.5 The Proposed Development is located over 5km from the closest AQMA and is not anticipated to lead to a change in traffic flows on any roads covered by an AQMA, as such the factors related to non-AQMA changes are applicable to this assessment. The Traffic Statement, accompanying the Planning Application for the Proposed Development, sets out predicted changes in traffic flows associated with the construction, operational and decommissioning phases of the development. The predicated increase in LDV and HDV movements associated with the Proposed Development is well below the limits set out in the EPUK/IAQM guidance. Therefore impacts from vehicle emissions during construction, operation and decommissioning have been scoped out.

Impact Assessment

7.3.6 The potential emissions to air from construction and operation of the Proposed Development have been determined or estimated, and key local receptors have been identified, together with the current local ambient air quality.

7.3.7 The potential concentrations resulting from the projected emissions arising from the operational Proposed Development have been predicted using atmospheric dispersion modelling techniques where appropriate, which has enabled the assessment of the impacts associated with the Proposed Development on the existing local ambient air quality and in particular on the identified sensitive receptors. The assessment methodology for each type of emission is detailed below.

Assessment of Dust Emissions Generated During Construction Works

7.3.8 'Dust' is defined in British Standard (BS) 6069-2:1994 (Ref 7-18) as particulate matter in the size range 1µm - 75µm (microns) in diameter, and is primarily composed of mineral materials and soil particles.

7.3.9 Respirable particulate matter (PM_{10}) is composed of material with an aerodynamic diameter of less than 10µm, and includes the size fractions of greater concern to impacts on human health. The majority of construction dust is larger than 10µm in diameter and, therefore is typically associated with material depositing onto property and potential amenity effects, although there is evidence that PM_{10} and $PM_{2.5}$ emissions may result from construction activities. Particulate matter may therefore have an effect whilst airborne, or as a result of its deposition onto a surface. Consequently the nature of the impact requiring assessment varies between different types of receptor.

7.3.10 The movement and handling of soils and spoil during the Proposed Development construction activities is anticipated to lead to the generation of some short-term airborne dust. The occurrence and significance of dust generated by earth moving operations is difficult to estimate, and depends heavily upon the meteorological and ground conditions at the time and location of the work, and the nature of the actual activity being carried out.

7.3.11 At present, there are no statutory UK or EU standards relating to the assessment or control of dust. Therefore the emphasis of the regulation and control of construction dust should be the adoption of Best Practicable Means (BPM) when working on site. It is intended that significant adverse environmental effects are avoided at the design stage and through embedded mitigation where possible, including the use of good working practices to minimise dust formation.

7.3.12 The IAQM provides guidance for good practice qualitative assessment of risk of dust emissions from construction and demolition activities (Ref 7-17). The guidance considers the risk of dust emissions from unmitigated activities to cause human health (PM_{10}) impacts, dust soiling impacts, and ecological impacts (such as physical smothering, and chemical impacts for example from deposition of alkaline materials). The appraisal of risk is based on the scale and nature of activities and on the sensitivity of receptors, and the outcome of the appraisal is used to determine the level of good practice mitigation required for adequate control of dust.

7.3.13 The steps in the assessment are to:

- Identify receptors within the screening distance of the Application Site boundary;
- Identify the magnitude of impact through consideration of the scale, duration and location of activities being carried out (including earthworks, construction and trackout);
- Establish the sensitivity of the area through determination of the sensitivity of receptors and their distance from construction activities;
- Determine the risk of significant impacts on receptors occurring as a result of the magnitude of impact and the sensitivity of the area, assuming no additional mitigation (beyond the identified development design and impact avoidance measures) is applied;
- Determine the level of mitigation required based on the level of risk, to reduce potential impacts at receptors to insignificant or negligible; and
- Summarise the potential residual effects of the mitigated works.

7.3.14 According to the guidance, receptors potentially affected by dust soiling and short term concentrations of PM_{10} generated during construction activities, are limited to those located within 350m of the nearest construction activity, or within 50m either side of a public road or highway used by construction traffic (up to a distance of 500m from the construction site entrances). Ecological receptors are limited to those located within 50m of the nearest construction activity and/or within 50m either side of a public road or highway used by construction traffic (up to a distance of 500m from the construction site entrances).

Assessment of Emissions Generated from Construction / Decommissioning Site Plant (Non-Road Mobile Machinery - NRMM)

7.3.15 The construction phase for the Proposed Development could potentially commence in 2019 and take up to 18 months to complete, as described in Chapter 4: The Proposed Development, of this ES.

7.3.16 There are likely to be emissions to air during construction activities arising from on-site construction plant or Non-Road Mobile Machinery (NRMM). The IAQM guidance (Ref 6-17) states:

> *"Experience of assessing the exhaust emissions from on-site plant … and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur."*

7.3.17 The assessment of construction site plant has referenced the IAQM construction dust initial screening distance criteria (Ref 7-17). A qualitative assessment of the potential for impact from NO_2 and PM_{10} emissions from NRMM on identified receptors is therefore considered appropriate based on the criteria outlined in the above guidance.

Assessment of Operational Process Emissions

7.3.18 Both the IED and MCPD (Refs 7-8, 7-9) define ELVs for gas engines for NO_x, SO_2 and PM_{10}, however emissions of SO_2 and PM_{10} from gas-fired plant are at such low levels relative to the air quality objectives that they are considered to have a negligible impact and therefore present minimal risk to the achievement of the PM_{10} and SO_2 air quality objectives. These emissions have therefore been screened from further assessment within the operational process emissions from the plant.

7.3.19 Emissions of CO are not subject to ELVs within the MCPD, although there is a BAT-AEL set within the IED. Emissions of CO may not be negligible, however based on project experience and professional judgment, emissions of CO are typically very unlikely to present a risk to achievement of the relevant NAQS objective or EAL. Emissions of CO have been included within the assessment at emission levels quoted by the gas engine Original Equipment Manufacturers (OEMs). However it is the emissions of NO_x that have been used to define stack heights, as there is typically a greater risk from developments with combustion plant to achievement of the relevant objectives for NO_2 and NO_x than for CO.

7.3.20 Emissions from the Proposed Development, assumed to be operational by 2020, have been assessed using the EA Risk Assessment methodology (Ref 7-10) in order to identify where proposed emissions can be screened out as having a negligible impact. The impact assessment has been conducted conservatively assuming the current 2017 ambient air quality baseline conditions as the opening baseline and therefore the potential impacts from an earlier opening date – were that to occur - would be unchanged from those reported in this ES Report.

7.3.21 Detailed dispersion modelling using the atmospheric dispersion model ADMS5.2 has been used to calculate the concentrations of pollutants at identified receptors. These concentrations have been compared with the appropriate NAQS, critical level, critical load or EAL as appropriate, (collectively referred to as “Air Quality Assessment Levels (AQAL)) for each pollutant species, as summarised in Tables 7.1–7.3.

7.3.22 Dispersion modelling calculates the predicted concentrations arising from the emissions to atmosphere, based on Gaussian approximation techniques. The model employed has been developed for UK regulatory use.

7.3.23 The assessment has been based on the operational design parameters for the Proposed Development, including the alternative plant technologies and configurations under consideration for the Proposed Development, using a Rochdale Envelope approach. The worst-case operational scenarios, with respect to the potential air quality impacts, have been determined and are reported in this chapter and the accompanying Appendix 7A provided in ES Volume 3.

7.3.24 The determination of optimum stack heights for each engine technology option under consideration has been driven by the predicted impacts from NO_x, however in order to present a worst case assessment stack heights have been assumed to be at the lowest potential stack height, as these lead to higher impacts at the receptor locations. Therefore any increase in stack height for the operational development – within the Rochdale Envelope assessed will result in lower impacts than those presented in this assessment.

7.3.25 The assessment of worst-case long-term and short-term emissions resulting from the operation of the Proposed Development has been undertaken by comparison of the maximum process contributions at identified sensitive human health receptors with the NAQS annual mean and hourly mean objectives, and Critical Levels for ecological receptors, taking into consideration the baseline air quality, in accordance with EA risk assessment methodology (Ref 7-10), and factoring the medium- to long-term impacts for annual operating hours, as described in Appendix 7A provided in ES Volume 3.

7.3.26 There is also potential for cumulative impacts from other committed developments in the vicinity of the Proposed Development. These are considered within Chapter 14: Cumulative and Combined Effects of this ES.

7.3.27 An assessment of nutrient nitrogen enrichment has been undertaken by applying published deposition velocities to the predicted annual average NO_2 concentrations at the identified statutory habitat sites, determined through dispersion modelling, to calculate nitrogen deposition rates. These deposition rates have then been compared to the Critical Loads for nitrogen published by UK Air Pollution Information System (APIS) (Ref 7-6).

7.3.28 Increases in acidity from deposition contributions of NO_2 from the process contribution have also been considered. In this assessment, the nitrogen kilo equivalent (Keq/ha/yr), which are the units in which acidity Critical Loads are described, have been derived from nitrogen deposition modelling values using standard conversion factors (Ref 7-19). The acidity deposition rates and baseline deposition rates have been used within the Critical Load Function Tool (Ref 7-6) to determine whether the contribution would result in exceedance of the defined Critical Levels for the habitat features present. Process contributions of SO_2 to the acidity deposition rate have been assumed to be zero as the emissions from the process are negligible. Non-statutory habitat sites have not been assessed as the sensitive species present at these receptors and their associated Critical Loads for nutrient and acid deposition are not on public records.

Study Area

7.3.29 The study area for construction phase impacts has been applied, with reference to the IAQM guidance (Ref 7-17), extending up to 500m from the site for the identification of human health receptors.

7.3.30 The study area for operational phase impacts extends up to 2km from the Proposed Development Power Plant Site in order to assess the potential maximum impacts at sensitive human health receptors, as in practice, the predicted impacts become negligible beyond this distance with the stack heights associated with the Proposed Development. The ecological study area has been extended to up to 10km from the power plant area for the Proposed Power Plant Site, in line with EA's Risk Assessment methodology (Ref 7-10).

Significance Criteria

Evaluation of Significance – Construction Dust and Emissions from NRMM

7.3.31 For potential amenity effects, such as those related to dust deposition, it is proposed that a Construction Environmental Management Plan (CEMP) is employed, that will include control and mitigation measures as necessary, to minimise the potential for nuisance impacts during construction of the Proposed Development. A framework Construction Environmental Management Plan (CEMP) is included with this application, which sets out the principles that the appointed contractor will need to take into account in preparing the CEMP for construction. It is proposed that the CEMP will be secured through a planning condition.

7.3.32 The IAQM guidance (Ref 7-17) does not provide a method for the evaluation of impacts on receptors from construction dust or exhaust emissions from NRMM, rather it provides a means to determine the level of mitigation required to avoid significant impacts on receptors. The guidance indicates that application of appropriate mitigation should ensure that residual effects will normally be 'not significant'.

Evaluation of Significance – Point Source Emissions

Human Health Impacts

7.3.33 For a change of a given magnitude, the IAQM (Ref 7-16) has published recommendations for describing the magnitude of impacts at individual receptors and describing the significance of such impacts. This terminology has been changed where appropriate in order to maintain consistency with the rest of this ES – where the IAQM uses 'substantial' this has been changed to 'major', and 'slight' has been changed to 'minor'; other IAQM terms are consistent with those presented in this ES Report.

Table 7.6. Effects Descriptors at Individual Receptors – Annual Mean Impacts

Long Term Average Concentration at Receptor	Percentage Change in Annual Mean Concentration				
	Up to 0.5% Imperceptible	0.5-1% Very low	2-5% Low	6-10% Medium	>10% High
75% or less of AQAL	Negligible	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	Negligible	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Negligible	Minor	Moderate	Moderate	Major
103-109% of AQAL	Negligible	Moderate	Moderate	Major	Major
110% or more of AQAL	Negligible	Moderate	Major	Major	Major

Table 7.7. Effects Descriptors at Individual Receptors – Short-term Impacts

Criteria	Predicted Peak Hourly Mean NO_2 Process Contribution ($\mu g/m^3$)	Predicted Peak 8-Hour Rolling CO Process Contribution (µg/m3)	Effect Descriptor
<10% of AQAL	< 20	<1,000	Negligible
10 – 20% of AQAL	20 – 40	1,000 – 2,000	Minor
20 – 50% of AQAL	40 – 100	2,000 – 5,000	Medium
>50% of AQAL	> 100	>5,000	Major

7.3.34 The IAQM guidance (Ref 7-16) is explicit that the judgement of significance only applies to an overall effect and not to an effect at an individual receptor; consequently, a 'moderate' adverse effect at one receptor may not mean that the overall effect is significant; other factors need to be considered. However it indicates further that 'negligible' impacts are likely to lead to effects that are 'not significant' and 'major' impacts describe the potential for 'significant' effects.

7.3.35 In addition to the criteria set out in the IAQM guidance, as shown in Tables 7.6 and 7.7 above, the Environment Agency outline the following criteria in their EPR Risk Assessment (Ref 7-10). The Environment Agency EPR Risk Assessment screening criteria for comparison of process contributions with Air Quality Strategy objectives state that an emission may be considered 'imperceptible' (or negligible) where:

- Short-term PC <=10% of the NAQS; and
- Long-term PC <=1% of the NAQS.

7.3.36 Where the PEC is not predicted to exceed the NAQS objective and the proposed emissions comply with the BAT associated emission levels (or equivalent requirements) the emissions are considered acceptable by the EA.

7.3.37 Impacts of the Proposed Development have been assessed relative to both the adapted IAQM/EPUK criteria and EA screening criteria.

Ecological Impacts

7.3.38 The impact of point source emissions on ecological receptors with statutory designation e.g. SACs, SPAs, RAMSAR and Sites of Special Scientific Interest (SSSI) has been evaluated using the Environment Agency criteria for short-term and long-term objectives for ecological receptors; for short-term impacts, where the PC >100% of the objective the Environment Agency guidance indicates such an impact would not be acceptable.

Table 7.8. Effects Descriptors at SPA/SAC/Ramsar/SSSI

Averaging Period	Percentage Change	Effect Descriptor
Annual mean PC/AQAL	<1%	Imperceptible
Annual mean PEC/AQAL	<70%	Negligible
Short term PC/AQAL	<10%	Negligible
Short term PC/AQAL	10-100%	Minor
Short term PC/AQAL	>100%	Moderate

7.3.39 For all other nature conservation sites, i.e. Local Wildlife Sites - LWS, the assessment needs to determine whether the installation will result in “significant pollution” i.e. where Critical Levels are exceeded. Therefore if the long and short term PC is less than 100% of the relevant standard, the impact is considered to be not significant.

Table 7.9. Effects Descriptors at LWS

Averaging Period	Percentage Change	Effect Descriptor
Annual mean PC/AQAL	<100%	Negligible
Short term PC/AQAL	<100%	Negligible

7.3.40 The assessment against Critical Loads has been carried out in accordance with AQTAG06 ‘Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air’ (Ref. 7-15). However, it should be noted that this does not provide definitive advice on interpreting the likely effects on different habitats of changes in air quality.

7.3.41 As with Critical Levels where process contributions of nitrogen and acid are less than 1% of the Critical Load, impacts can be considered to be insignificant. Should PCs be greater than 1% of the Critical Load then the potential to be significant is dependent upon the context, i.e. sensitivity of the habitat to acid/nitrogen or other factors such as buffering capacity of the local soils. The impact of point source emissions on ecological receptors with statutory designation, through deposition of nutrient nitrogen or acidity, has been evaluated using the Environment Agency ‘imperceptible’ criterion of 1% of the long term objective, as above.

7.3.42 Where emissions are not screened as having the potential to have an imperceptible (negligible) effect, the descriptive terms for the air quality effect outlined in Tables 7.6 - 7.9 have been applied.

7.4 Baseline Conditions

Sensitive Receptors

7.4.1 Receptors potentially affected by emissions from the construction and operation of the Proposed Development, including local residential and amenity receptors within 2km, have been identified through a desk study of local mapping.

7.4.2 It is assumed, for the purposes of assessment, that Site construction traffic would use the existing site entrance on Rosper Road, linking to the A160 (Humber Road) to the south.

7.4.3 Where several receptors are present in a locality (for example a conurbation or village), isopleth figures of pollutant dispersion from the operational Proposed Development have been examined to identify the receptors that would receive the highest point source contributions. The assessment of impact has been made at these receptors and is assumed to be representative of the impact at all receptors within the locality.

7.4.4 Ecological receptors potentially affected by emissions have been identified (see Chapter 10: Ecology and Nature Conservation of this ES); statutory designated sites up to 10km have been included in the assessment; and non-statutory designations (LWS) within 2km have been included in the assessment. Details of the sites and reasons for their designations are provided in Chapter 10: Ecology and Nature Conservation in this ES. The worst-case point source contributions at these receptors have been determined from the isopleth figures as described above.

7.4.5 The locations of the assessed sensitive receptors are shown in Figure 7.1 (Volume 2 of this ES).

Table 7.10. Receptors with Potential for Air Quality Impacts from the Proposed Development

Receptor ID	Receptor Name	Receptor Type[1]	Grid Reference	Distance from Site Boundary for Impacts from: Dust[2] (m)	Operation[3] (m)
R1	Hazel Dene	Residential	517330, 417311	>350	730
R2	Church Lane	Residential	514763, 417331	>350	1,840
R3	Station House	Residential	517333, 418345	>350	1,280
R4	Old Vicarage	Residential	514428, 418197	>350	2,350
R5	Manor Farm	Residential	514515, 417653	>350	2,110
R6	Westfield Farm	Residential	514708, 416785	>350	1,960
R7	Staple Road	Residential	515115, 416417	>350	1,730
R8	Humber Road	Residential	515516, 416120	>350	1,600
R9	East End Farm	Residential	515935, 415730	>350	1,710
R10	Immingham	Residential	517765, 415255	>350	2,350
R11	Station Road	Residential	517775, 418445	>350	1,640
E1	Humber Estuary	SAC, SPA, Ramsar	517600, 418700 to 519000, 417500	>350	1,650
E2	North Killingholme Haven Pits	SSSI	516851, 419535	>350	2,250

Receptor ID	Receptor Name	Receptor Type[1]	Grid Reference	Distance from Site Boundary for Impacts from: Dust[2] (m)	Operation[3] (m)
E3	Eastfield Railway	LWS	515313, 417108	>350	1,300
E4	Burkinshaws Covert	LWS	516432, 417874	>500	600
E5	Station Road Fields	LWS	516569, 417957	>500	660
E6	Rosper Road Pools	LWS	517224, 416937	>500	720

Notes:

1. SSSI = Site of Special Scientific Interest; SAC = Special Area of Conservation; SPA = Special Protection Area; LWS = Local Wildlife Site
2. Distance from Proposed Development construction site boundary or entrance.
3. Distance from Proposed Development operational boundary (for process emissions).

Existing Air Quality

7.4.6 Existing air quality conditions in the vicinity of the Site have been evaluated through a review of local authority air quality management reports, Defra published data and other sources. As described, the key pollutants of concern resulting from construction and operation of the Proposed Development are NO_x, NO_2, CO, PM_{10} and $PM_{2.5}$, therefore the assessment of baseline conditions considers these pollutants only.

Local Air Quality Management

7.4.7 Under the requirements of Part IV of the Environment Act (Ref 7-4), NLC have a duty to undertake the periodic review and assessment of local air quality within their administrative area. Over the course of the review and assessment process, NLC has declared two AQMAs (Scunthorpe and Low Santon, both for PM_{10}) within its administrative area, however these are both located more than 5km of the Site.

7.4.8 The adjacent North East Lincolnshire Council has also declared two AQMAs (Immingham (for PM_{10}) and Grimsby (for NO_2)). The Immingham AQMA was revoked in 2016. The Grimsby AQMA is located over 10km to the southeast of the Site. Given the distance of all the AQMAs from the Site, it is considered that the Proposed Development would not result in significant impacts at these locations.

7.4.9 The most recent Annual Management Report available from NLC (Ref 7-20) stated that during 2017 there were no recorded exceedances of the relevant air quality objectives for nitrogen dioxide, CO, PM_{10} or the $PM_{2.5}$ target. The review and assessment process has not identified any air quality issues in the vicinity of the Proposed Development Site, nor the air quality study area surrounding it.

7.4.10 Automatic monitoring for NO_2 is undertaken by NLC at four locations within the borough, of which two of the monitoring sites are within 2km of the Site. Typically annual mean concentrations of NO_2 at the automatic monitoring sites within the vicinity of the Site have shown a reduction in NO_2 concentrations since 2012. Summary monitoring data from 2011 - 2017 is presented in Table 7.11.

Table 7.11. NLC Automatic Monitoring Data for NO_2

Parameter	2011 ($\mu g/m^3$)	2012 ($\mu g/m^3$)	2013 ($\mu g/m^3$)	2014 ($\mu g/m^3$)	2015 ($\mu g/m^3$)	2016 ($\mu g/m^3$)	2017 ($\mu g/m^3$)	Data Capture 2016 (%)
CM9 Killingholme School (Industrial*)	21.4	21.1	22.4	22.1	20.4	17.0	17.0	99.8
CM10 Killingholme (Roadside*)	-	-	27.1	28.5	24.6	23.0	ND	92.0

Notes: * Denote the monitor type classification. ND = No data available.

7.4.11 NLC also operates a number of NO_2 diffusion tubes within the borough including background, roadside and kerbside locations. The closest tubes to the Site are located within South Killingholme. Summary monitoring data for 2016 is presented in Table 7.12.

Table 7.12. Annual Mean NO_2 Diffusion Tube Monitoring Data (2016)

Monitor ID & Location	Distance to Site (km)	NO_2 Concentration 2016 ($\mu g/m^3$)	Monitor type
DT13 Ulcerby Road, Killingholme	2.5	31	Roadside
DT14 Killingholme NO_x Analyser	2.3	31	Roadside
DT15 Humber Road, Chip Shop	1.7	21	Urban Background
DT16 Humber Road, LP 695	1.8	26	Roadside

7.4.12 Automatic monitoring for PM_{10} is undertaken at ten locations within the borough, although only one of these sites (CM9 Killingholme School (Industrial*)) is within 2km of the Proposed Development Site. There are no monitoring sites within the vicinity of the Site that monitor $PM_{2.5}$ or CO.

7.4.13 Typically annual mean concentrations of PM_{10} at the CM9 Killingholme School monitoring site have shown a reduction since 2012. Summary monitoring data from 2011 - 2017 is presented in Table 7.13.

Table 7.13. NLC Automatic Monitoring Data for PM_2 in the Vicinity of the Site

Parameter	2011 ($\mu g/m^3$)	2012 ($\mu g/m^3$)	2013 ($\mu g/m^3$)	2014 ($\mu g/m^3$)	2015 ($\mu g/m^3$)	2016 ($\mu g/m^3$)	2017 ($\mu g/m^3$)	Data Capture 2016 (%)
CM9 Killingholme School (Industrial*)	21.1	20.2	19.3	19.1	18.0	18.0	18.0	93.1

7.4.14 Background data has also been obtained from Defra published maps for the locations of likely maximum impact from point source emissions from the Proposed Development, and at identified sensitive receptor locations. Background mapping data for 2017 (based on 2015

background maps) is conservatively assumed to be representative of the construction (2019 peak construction) and opening (2020) baselines; as general trends are showing a reduction in both NO_2 and PM_{10} concentrations over time this is considered to be a conservative assumption. Background data assumed for the maximum impact location from the point source emissions is provided in Table 7.14 and indicates NO_2, CO, PM_{10} and $PM_{2.5}$ concentrations within the vicinity of the Proposed Development are consistently well below the NAQS annual mean objectives.

Table 7.14. Defra Background Air Quality Data (Annual Mean) – 2017 (1km^2 average)

Location	Pollutant (µg/m^3)	2017 – Current*
Maximum impact location, down-wind of Site (517500, 418500)	NO_2	16.91
	CO	113.88*
	PM_{10}	14.12
	$PM_{2.5}$	9.20
Killingholme School, automatic monitor (514500, 416500)	NO_2	12.78
	PM_{10}	15.15

Based on 2015 background-mapping except CO which is based on the 2001 background map, with the appropriate adjustment factors applied (Ref 7-21).

7.4.15 The Defra NO_2 and PM_{10} background mapping data for the Killingholme School location is lower than the automatic monitoring data in the same location for 2017.

7.4.16 The Defra background maps have been consulted for each human health receptor location, with NO_2 concentrations ranging from 12.6 – 17.1µg/m^3 and PM_{10} concentrations ranging from 12.7 – 15.8µg/m^3, therefore in order to carry out a conservative assessment, the concentrations measured during 2017 at the Killingholme School automatic monitoring station for both NO_2 and PM_{10} has been assumed to be representative of all human health receptors in the immediate vicinity of the Proposed Development.

7.4.17 The baseline NO_x pollutant concentrations at the identified statutory designation ecological receptors have been obtained from APIS (Ref 7-6) and are provided in Appendix 7A (ES Report Volume 3).

7.5 Development Design and Impact Avoidance

Construction Environmental Management Plan

7.5.1 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 the assessment process. The management of dust and particulates and application of adequate mitigation measures would be controlled through the CEMP. A framework CEMP is included as Appendix 4A of this ES.

7.5.2 It is also anticipated that the Considerate Constructors Scheme (CCS) would be adopted to assist in reducing potential pollution and nuisance from the Proposed Development.

Opening and Operational Impacts

Emission Limit Value (ELV) Compliance

7.5.3 The Proposed Development would be designed such that process emissions to air comply with the ELV requirements specified in the IED or MCPD, as appropriate for the capacity of the installed units. This would be regulated by the EA through the Environmental Permit required for the operation of the Proposed Development.

Stack Height

7.5.4 The final stack heights for the Proposed Development will be determined at the detailed design stage and will be optimised with consideration given to minimisation of ground-level air quality impacts, and the visual impacts of taller stacks. Dispersion modelling has been undertaken to determine the optimum stack height range through comparison of the maximum impacts at human health and ecological receptors. Further information on the determination of the stack heights is provided in Appendix 7A (Volume 3).

Decommissioning

7.5.5 Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a Decommissioning Environmental Management Plan (DEMP); no additional mitigation for decommissioning of the Proposed Development beyond such best practice is foreseen to be required 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.

7.6 Likely Impacts and Effects

Construction

Assessment of Construction Dust and NRMM Emissions

7.6.1 No residential or transient human health receptors, nor any ecological receptors, have been identified within the screening distance and therefore the effects of construction dust soiling, PM_{10} impacts, ecological impacts and emissions from NRMM, on these receptors, have been scoped out from further assessment. In addition, the LWS ecological receptors E4, E5 and E6, located less than 50m from the Rosper Road construction traffic route, are more than 500m from the site exit and therefore are beyond the screening distance for trackout effects.

7.6.2 The effects of emissions to air on the identified receptors from the construction site activities associated with the Proposed Development are considered to be not significant, based on the distances to the identified sensitive receptors.

Opening and Operation

Assessment of Operational Point Source Emissions

7.6.3 The impact of point source emissions at human health receptors has been determined from isopleth figures of pollutant dispersion and maximum model output at discrete receptor locations (Table 7.10). The maximum hourly, daily and annual mean predicted concentrations have been compared with the relevant AQALs, as summarised in Tables 7.15 - 7.18); the detailed concentrations at all identified receptor locations are provided in Appendix 7A (ES Volume 3). Isopleth figures showing the maximum predicted annual and short-term process contributions of NO_2 are provided in Figures 7.2 - 7.3 (ES Report Volume 2).

7.6.4 The results represent the output from the worst-case modelled scenario, which is 33 x 1.5MWe gas engines with 10m high stacks aligned north to south; variation in the predicted

results with alternative Rochdale Envelope scenarios is discussed in Appendix 7A (ES Volume 3).

7.6.5 The dispersion modelling includes a number of conservative assumptions in combination, including:

- Use of the worst-case year of meteorological data modelled;
- Maximum building sizes within the assessed Rochdale Envelope;
- Worst-case alignment of the stacks within the Proposed Power Plant Site;
- Lowest stack heights modelled within the range of stack heights considered for the gas engines;
- Worst-case gas-engine configuration within the assessed Rochdale Envelope, other configurations resulted in lower predicted impacts as shown in Appendix 7A (ES Report Volume 3);
- Maximum annual operation for the plant configuration assessed (1,200 hours in the case of these smaller engines, although higher running hours were applied to other engine configurations);
- Operation of the plant at MCPD emission limits, when annual average emissions will be below these; and,
- Conservative estimates of background concentrations at the receptor locations.

7.6.6 The following abbreviations are used in Tables 7.15-7.18:

- PC: this is the Process Contribution and represents the change caused by the Proposed Development;
- Headroom: this is the short term PC as a percentage of the available headroom between the baseline (ambient) concentration (AC) and the NAQS objective; and
- PEC: this is the Predicted Environmental Concentration and is PC plus baseline (ambient) concentration (AC). It is the concentration expected at a particular receptor once the effect of the Proposed Development is taken into account.

Human Health Impacts

Table 7.15. Maximum Short-term Predicted Concentration at the Worst-affected Human Receptor – H1 Hazel Dene

Pollutant	AQAL ($\mu g/m^3$)	PC ($\mu g/m^3$)	PC/ AQAL	Short-term AC ($\mu g/m^3$)	PC as % of headroom (PC/(AQAL-AC)	Effect descriptor
NO_x Hourly Mean as the 99.79th %ile	200	29.2	15%	34.0	18%	Minor
CO Hourly Mean (100th %ile)	30,000	392	1%	228	1%	Negligible
CO 8-hour Running Mean	10,000	352	4%	228	4%	Negligible

7.6.7 The maximum hourly mean predicted concentration of nitrogen dioxide from the Proposed Development at the worst affected residential receptor (R1, Hazel Dene) represents 15% of the hourly mean NAQS objective and therefore is considered to be minor, as defined by the IAQM and EA criteria.

7.6.8 Whilst not required to be specifically assessed under the IAQM guidance, the maximum hourly mean predicted concentration of nitrogen dioxide at any off-site location is predicted to be 18% of the available headroom and therefore well below the NAQS hourly mean objective. Therefore no exceedance of the short-term NAQS objectives is predicted from process contributions from the Proposed Development, and the effects can be considered to be not significant.

7.6.9 The maximum 8-hour and 1-hour mean process contributions of CO at identified receptors represent a negligible change, with worst-case PC of <4% of the 8-hour mean NAQS and 1% of the hourly mean EAL at all receptors.

Table 7.16. Maximum Long-term NO_2 Predicted Concentrations at the Worst-affected Human Receptor - H1 Hazel Dene

AQAL ($\mu g/m^3$)	Annual mean PC ($\mu g/m^3$)	PC /AQAL	Magnitude of change	Annual mean AC ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC / AQAL	Effect descriptor
40	0.40	1.0%	Very Low	17.0	17.4	44%	Negligible

7.6.10 The maximum long-term process contribution of nitrogen dioxide from any of the operational scenarios results in a very low magnitude of change in the annual mean concentration at the worst affected residential receptor (R1, Hazel Dene). The annual mean baseline concentration at all human health receptors is well below the NAQS objective, and with the Proposed Development, the maximum long-term predicted environmental concentration (PEC) is only 44% of the NAQS objective, therefore the effect of the Proposed Development emissions is described as negligible at all receptors (not significant).

Ecological Impacts

7.6.11 The impact of process contributions of point source emissions at the identified ecological receptors has been determined from isopleth figures of pollutant dispersion and maximum model output at the receptor locations. The NO_x process contribution has been compared with the Critical Levels at the worst-affected statutory designated ecological receptor, as shown in Tables 7.17 – 7.18.

Table 7.17. Maximum NO_x (24-hour) Process Contributions at Worst-affected Ecological Receptors

Receptor ID	AQAL ($\mu g/m^3$)	Daily mean NO_x PC ($\mu g/m^3$)	PC / AQAL	Effect descriptor
E1 (Humber Estuary SAC)	75	9.6	13%	Minor (<100% of CL at statutory site)
E4 (Burkinshaws Covert LWS)		35.1	47%	Negligible (<100% of CL at LWS)

7.6.12 The maximum daily mean NO_x at any statutory designated receptor occurs at E1 Humber Estuary and represents 13% of the Critical Level, and therefore is below the significance criterion (unacceptable if PC>100% of the Critical Level). Furthermore this represents a conservative maximum operation of 12-hours per day, every day of the year, which would be

more than the potential annual limit of 1,200 hours per year, and therefore the assessment represents the peak daily process contribution that could occur over a short-term period, rather than a longer-term average of the daily maximum.

7.6.13 The maximum daily mean PC of NO_x at the non-statutory local wildlife sites (LWS) in the site's vicinity, is predicted to be less than 100% of the Critical Level at the worst-affected receptor and therefore the PC to daily mean NO_x at non-statutory receptors is considered acceptable (not significant).

Table 7.18. Maximum Annual Mean NO_x Process Contributions at Worst-affected Ecological Receptors

Receptor ID	AQAL ($\mu g/m^3$)	PC ($\mu g/m^3$)	PC/AQAL ($\mu g/m^3$)	Change descriptor	Annual mean AC ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC/ AQAL	Effect descriptor
E1 (Humber Estuary SAC)	30	0.3	1.0%	Very Low	28.5	28.8	96%	Minor
E5 (Station Road Fields LWS)		1.2	4.1%	-	-	-	-	Negligible (<100% of CL at LWS)

7.6.14 The average annual mean PC of NO_x at the E1 Humber Estuary (assuming continuous maximum emissions factored for the total annual operating hours) represents 1% of the annual Critical Level and therefore would be considered to be negligible according to the EA's significance criteria. The process contribution at statutory designated receptors is considered to be minor adverse (not significant), largely due to the high background concentrations in the area.

7.6.15 The maximum process contribution of NO_x from any of the operational scenarios results in an imperceptible magnitude of change at the worst-affected non-statutory ecological receptor and is therefore considered acceptable (not significant).

7.6.16 In addition to the above assessment of the ground level concentration at the identified ecological receptors, an assessment of deposition impacts at the identified statutory designated receptors has also been undertaken and is presented in Appendix 7A, (ES Report Volume 3).

7.6.17 The worst-affected receptor (E1) is designated for species that may be sensitive to nutrient nitrogen deposition and acid deposition. The maximum process contribution of nutrient nitrogen deposition at the identified receptor is less than 1% of the Critical Load published for the most sensitive habitat type; this is considered to be insignificant.

7.6.18 The process contribution of sulphur deposition at the ecological receptor is expected to be negligible as the emissions of SO_2 from natural gas combustion are negligible; therefore only the process contribution of nitrogen kilo-equivalent deposition has been compared with the acidity Critical Load, and the maximum nitrogen deposition process contribution to acid deposition at the ecological receptor is less than <0.1% of the Critical Load published for the most sensitive habitat type; therefore the effect of nutrient nitrogen and acid deposition from the Proposed Development at this receptor is described as negligible (not significant).

Rochdale Envelope Parameters

7.6.19 The alternative design schemes included within this assessment under the Rochdale Envelope approach have been modelled and the design scheme resulting in the worst-case

predicted concentrations at receptors have been used in the assessment of effects significance; this means that the results presented in the this report are considered to be illustrative of several different design schemes and therefore the overall effect of the Proposed Development may be lower than that presented, as the preferred scheme to be taken forward may present lesser impacts on some receptors than presented in this assessment.

7.6.20 The maximum predicted concentrations of NO_2 at the worst affected human health and NO_x at ecological receptors associated with the alternative design schemes and layouts are shown in Table 7.18 as the percentage of reported values used in the effects significance assessment; so a reported result in Table 7.19 of 100% means that result is the same as was reported in the main assessment above, and therefore represents the worst-case; if a result is less than 100% then this means that the result is a lower impact than the worst-case presented. The range of maximum values predicted for the alternative layouts for each of design schemes A and B are shown; no single layout for either design scheme resulted in worst-case impacts at all receptors, therefore the reported results represent the worst-case from any of the modelled layouts. The full results of the model sensitivity carried out are provided in Appendix 7A (Volume 3) of this ES.

Table 7.19. Rochdale Envelope – Max Process Contributions at Worst Affected Receptors (as % of reported values)

	Human Health Receptors		Statutory Receptors	Ecological
Design Scheme	Long-term	Short-term	Long-term	Short-term
Indicative Layout A	30%	24%	34%	36%
Indicative Layout B	64-100%	91-100%	91 – 100%	77 – 100%

7.6.21 The above sensitivity analysis highlights that the scenario with 33 smaller gas engines (Indicative Layout B) result in the highest process contributions at sensitive receptors. The location and orientation of stacks relative to the units within the Site boundary made only limited difference to the maximum predicted concentrations at receptors. Application of the above sensitivity results to process contributions does not adversely alter the predicted effects significance assessment and therefore the reported receptor effects can be considered worst-case.

7.6.22 There is also potential for cumulative impacts from additional committed developments in the vicinity of the Proposed Development - these will be considered within Chapter 14: Cumulative and Combined Effects of the ES.

Decommissioning

7.6.23 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 based on the groundwork, traffic movements and level of site work required to decommission the Proposed Development being less than that required for its construction. Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a DEMP; no additional mitigation for decommissioning of the Proposed Development beyond such best practice is foreseen to be required at this stage.

7.7 Mitigation

7.7.1 As previously described in this chapter, the management of dust and particulates and application of adequate mitigation measures will be controlled through the CEMP, and through application of appropriate best practice mitigation. A framework CEMP is included as Appendix 4A of this ES.

7.7.2 The environmental effects from construction of the Proposed Development have been identified as not significant; therefore no additional mitigation has been identified as necessary for the construction phase of the Proposed Development.

7.7.3 The air quality assessment of operational impacts has assumed that the ELVs will be met for the operational plant, as required under the IED and/or MCPD and in accordance with use of BAT under the environmental permitting regime. The effects from operation of the Proposed Development have been identified as Not Significant through the selected minimum stack heights for the engine technologies under consideration; therefore no additional mitigation has been identified as necessary for the operational phase of the Proposed Development.

7.8 Residual Effects and Conclusions

7.8.1 The air quality assessment of construction impacts assumes that the measures outlined within the Development Design and Impact Avoidance section (Section 6.5) would be incorporated into the design of the Proposed Development, as they are standard best practice measures that are routinely applied across UK construction sites. No additional mitigation has been identified as necessary for the construction phase of the Proposed Development. For this reason, the residual effects would be as reported within Section 6.5 (i.e. not significant).

7.8.2 The air quality assessment of impacts at opening has assumed that the ELVs will be met for the operational plant as required under either MCPD or IED, as appropriate, and in accordance with use of BAT under the environmental permitting regime. No additional mitigation has been identified as necessary for the opening phase of the Proposed Development. For this reason, the residual effects would be as reported within Section 6.6.

7.8.3 Consistent with construction mitigation, it has been assumed that relevant best practice mitigation measures would be in place during any decommissioning works. No additional mitigation has been identified as necessary for the decommissioning phase of the Proposed Development.

7.9 Cumulative and Combined Effects

7.9.1 In accordance with the EIA Regulations, consideration has been given to the potential for cumulative impacts to arise. Other developments to be considered in the cumulative impact assessment have been agreed with North Lincolnshire Council.

7.9.2 Cumulative impacts are those that could arise from a number of development activities. The impact of the Proposed Development is considered in conjunction with the potential impacts from other projects or activities which are both reasonably foreseeable in terms of delivery (e.g. have planning permission) and are located within a realistic geographical scope, where environmental impacts could act together to create a more significant overall effect.

7.9.3 The combination of predicted environmental impacts resulting from a single development on any one receptor that may collectively cause a greater effect (such as the combined effects of noise and air quality/ dust impacts during construction on local residents), are referred to as combined effects. Combined effects are also assessed in Chapter 14 of this ES.

7.9.4 There are a number of developments that could potentially result in cumulative impacts with the Proposed Development, namely;

- The consented Killingholme Power Station development for a 14 gas reciprocating engine generators with electrical output of 23MWe (PA/2016/1240);
- The consented North Killingholme Power Project development of a 470MWe CCGT;
- Pending decision for the construction of a standing reserve power plant at Land South Side of Queens Road, Immingham comprising 12 gas reciprocating engine generators (DM/0802/16/FUL); and
- Pending decision for an Energy Recovery Facility at Land South of Queens Road, Immingham (Ref: DM/0026/18/FUL).

7.9.5 The Killingholme Power Station gas engines are located approximately 1.5km to the North of the Site, and comprise a similar development to that of the Proposed Development. The Killingholme Power Station gas engines are anticipated to run for a maximum of 1,500 hours per year, and therefore it is considered that it is unlikely that both sites will be operating simultaneously. It is therefore considered that the annual average impacts are more pertinent than the short term impacts for the purpose of the cumulative assessment.

7.9.6 Due to the prevailing wind coming from a south-westerly direction, and the locations of the two sites, the area of peak impact from both developments will not occur at the same location.

7.9.7 In terms of the Human Health impacts the Old Vicarage Receptor (R4) was also included in the Killingholme Power Station gas engines Air Quality Assessment (Ref 7-22). Predicted NO_2 concentrations at this receptor were 0.08µg/m^3, with impacts from the Proposed Development predicted to be 0.03µg/m^3. The cumulative concentration would therefore be 0.11µg/m^3, which represents 0.3% of the relevant AQS, and therefore would be considered to be imperceptible.

7.9.8 In terms of the Ecological impacts, the impacts from the Killingholme Power Station gas engines were predicted to be insignificant at all Ecological receptors, therefore it is considered that the cumulative impacts with the Proposed Development would not be significant.

7.9.9 The consented North Killingholme Power Project is located approximately 2km north of the Proposed Development Site and comprises a 470MWe CCGT. Again due to the location of this plant, the prevailing wind direction and the much higher stack, it is considered that cumulative impacts with the Proposed Development would be minimal. The Environmental Statement submitted for the North Killingholme Power Project (Ref 7-23) states that the maximum predicted annual average concentration of NO_2 is 0.2µg/m^3. This was predicted to occur approximately 1.5km to the northeast of the stack. Concentrations in the vicinity of the Proposed Development area of influence would be considerably lower and therefore it is again considered that the cumulative impact would be insignificant.

7.9.10 The two developments off Queens Road (Energy Recovery Centre and the 12 reciprocating engines), Immingham are approximately 5km from the Proposed Development site, and therefore it is considered that the cumulative impacts would be insignificant.

7.9.11 It should be noted that the in terms of the N-depositional impacts on the Humber Estuary receptor, the habitat type closest to the Proposed Development is saltmarsh, which is located approximately 1.5km from the Proposed Development. It is considered that the APIS critical load of a minimum figure of 20.0 kgN/ha/yr is not based on very relevant research[2] and is potentially excessively precautionary. The existing nitrogen deposition rate at the closest area of saltmarsh according to APIS is be 15.0 kgN/ha/yr, and the process contribution from the Proposed Development represents 0.2% of the lower end of the critical load at the worst case location. Given that the size of

[2] UK Air Pollution Information System website [accessed 8th May 2018]: http://www.apis.ac.uk/node/968

the other developments in the Site's vicinity are of a similar scale, and therefore are likely to have a similar level of impact at their worst case points, it is considered highly unlikely that the 'in combination' increase in nitrogen deposition would push the baseline above the minimum critical load. Also considering the locations of the other developments, and the prevailing wind direction, the worst case impacts for all the developments will occur at different locations and therefore the in combination impacts of the other developments would be lower at the point of worst case impact for the Proposed Development. Moreover, twice daily tidal inundation will bring much more nitrogen than would ever deposit from atmosphere, therefore the process of tidal inundation will have a much greater role influencing vegetation composition.

7.9.12 The most sensitive habitat designation for the Humber Estuary is sand dune, however, there is no sand dune within 10km of the Proposed Development and therefore this habitat is considered to be outside the zone of influence of the Proposed Development.

7.10 References

Ref 7-1 HM Government (2010). Air Quality Standards Regulations 2010.

Ref 7-2 European Commission (2008). European Ambient Air Quality Directive 2008.

Ref 7-3 European Commission (2010). Fourth Air Quality Daughter Directive 2010.

Ref 7-4 HM Government (1995). The Environment Act 1995.

Ref 7-5 Department for Environment, Food and Rural Affairs (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

Ref 7-6 Centre for Ecology and Hydrology and APIS (2016). http://www.apis.ac.uk

Ref 7-7 HM Government (2010). Environmental Permitting (England and Wales) Regulations 2010.

Ref 7-8 European Commission (2010) European Directive on Industrial Emissions 2010/75/EU.

Ref 7-9 European Commission (2015) European Directive on Medium Combustion Plant 2015/2193

Ref 7-10 Department for Environment, Food & Rural Affairs and Environment Agency (2016). Air emissions risk assessment for your environmental permit. 'https://www.gov.uk/government/collections/risk-assessments-for-specific-activities-environmental-permits [Date accessed 12/01/18]

Ref 7-11 European Commission (2017). Best Available Techniques (BAT) Reference Document for Large Combustion Plants LCP.

Ref 7-12 HM Government (2018). The Environmental Permitting (England and Wales) (Amendment) Regulations 2018.

Ref 7-13 North Lincolnshire Council Local Development Framework – Core Strategy (2011).

Ref 7-14 North Lincolnshire Council Local Development Framework – Development Plan Document (2016).

Ref 7-15 Department for Environment, Food and Rural Affairs (2016) Local Air Quality Management Technical Guidance (TG16), April 2016

Ref 7-16 Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) (2017) Land-Use Planning & Development Control: Planning For Air Quality.

Ref 7-17 Institute of Air Quality Management (2014) Guidance on the Assessment of Dust from Demolition and Construction.

Ref 7-18 British Standards Institute (1994) British Standard 6069-2:1994 Characterisation of Air Quality. Glossary.

Ref 7-19 Department for Environment, Food & Rural Affairs and Environment Agency (2014) AQTAG06 Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air.

Ref 7-20 North Lincolnshire Council (2017) Annual Screening Report 2017 (not ratified).

Ref 7-21 Defra Year Adjustment Factors available at: https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

Ref 7-22 Uniper Technologies. (2016). Air Quality Assessment for Standing Reserve Power Plant at Killingholme. Accessed at: http://www.planning.northlincs.gov.uk/api/Cached/PlanningWeb?ReqType=F&Refno=PA/2016/1240 on 26th April 2018.

Ref 7-23 C.GEN Killingholme Limited (2013). Environmental Statement Volume 1. Accessed at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010038/EN010038-000216-6.1%20Environmental%20Statement%20Volume%20I.pdf on 27th April 2018.

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Tables

8. Noise and Vibration

8.1 Introduction

8.1.1 This chapter of the Environmental Impact Assessment (EIA) Report addresses the potential effects of the Proposed Development on noise and vibration.

8.1.2 Impacts during the construction, operation and decommissioning phases of the Proposed Development are assessed. In particular, the chapter considers potential impacts on identified receptors in terms of:

- Noise and vibration during the site clearance and construction works associated with the Proposed Development;
- Changes in road traffic noise levels on the local road network during the construction phases; and
- Noise and vibration resulting from operation of the Proposed Development.

8.1.3 The operational road traffic noise impact assessment has been scoped out because the numbers of vehicles accessing the Proposed Development is not sufficient to require detailed assessment.

8.1.4 The noise and vibration resulting from decommissioning and demolition of the Proposed Development are considered comparable to those that would be experienced during the construction phase and are not assessed separately.

8.1.5 This chapter is supported by the Figure 8.1 (ES Volume 2) and Appendices 8A and 8B (ES Volume 3).

8.2 Legislation and Planning Policy Context

Legislative Background

Environmental Protection Act 1990

8.2.1 The Environmental Protection Act 1990 (EPA, Ref 8-1) Part 3 prescribes noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance as a statutory nuisance.

8.2.2 Local Authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they may serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It requires either simply the abatement of the nuisance or works to abate the nuisance to be carried out, or it prohibits or restricts the activity. Contravention of a notice without reasonable excuse is an offence.

8.2.3 In determining if a noise complaint amounts to a statutory nuisance the Local Authority can take account of various guidance documents and existing case law; no statutory noise limits exist. Demonstrating the use of 'Best Practicable Means' (BPM) to minimise noise levels is an accepted defence against a noise abatement notice.

Control of Pollution Act 1974

8.2.4 Sections 60 and 61 of the Control of Pollution Act 1974 (CoPA, Ref 8-2) provide the main legislation regarding demolition and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the local planning authority with instructions to cease work until specific conditions to reduce noise have been adopted.

8.2.5 Section 61 of the CoPA provides a means for applying for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.

8.2.6 CoPA requires that BPM (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to British Standard (BS) 5228 (British Standards Institute (BSI), (Ref 8-3 and 8-4) as BPM.

Environmental Permitting Regulations 2010

8.2.7 The Environmental Permitting Regulations 2010 (Ref 8-5) require the application of Best Available Techniques (BAT) to activities performed within installations regulated by the legislation, in order to manage the impact of these operations on the surrounding environment. This therefore applies to the operational period, not construction.

8.2.8 In terms of noise specifically, the selection of BAT will have to be considered and balanced with releases to different environmental media (air, land and water) and to give due consideration to issues such as usage of energy and raw materials. Noise, therefore, cannot be considered in isolation from other impacts on the environment.

8.2.9 The definition of pollution includes: "*emissions which may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment".* BAT is therefore likely to be similar, in practice, to the requirements of the Statutory Nuisance legislation which requires the use of BPM to prevent or minimise noise nuisance. In the case of noise, "*offence of any human senses"* may be judged by the likelihood of complaints. However, the lack of complaint should not necessarily imply the absence of a noise problem. In some cases it may be possible, and desirable, to reduce noise emissions still further at reasonable costs and this may therefore be BAT for noise emissions. Consequently, the aim of BAT should be to ensure that there is no reasonable cause for annoyance to persons beyond the installation boundary.

8.2.10 Guidance regarding Environmental Permitting and noise is available in the Environment Agency's document 'Horizontal Guidance for Noise Part 2 - Noise assessment and Control' (Ref 8-6. However, 'Horizontal Guidance for Noise Part 1 – Regulation and Permitting' (Ref 8-7), which provided useful guidance relating to noise limits from industrial installations in terms of absolute rating levels and rating levels relative to background noise levels (as defined in BS 4142:1997 (now superseded)) was withdrawn in February 2016. Therefore industry wide noise limits no longer apply.

Planning Policy Context

National Planning Policy

National Planning Policy Framework

8.2.11 The National Planning Policy Framework (NPPF) was published in March 2012 (Ref 8-8); paragraph 109 of the NPPF states that:

> *"The planning system should contribute to and enhance the natural and local environment by: …preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"*

8.2.12 Annex 2 of the NPPF defines 'Pollution' as;

> *"Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general*

amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light".

8.2.13 The planning system is required to contribute to and enhance the natural and local environment. Consequently, the aim is to prevent both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.

8.2.14 The NPPF states that planning policies and decisions should aim to:

- *"avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established [subject to the provisions of the Environmental Protect Act 1990 and other relevant law]; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason." (paragraph 123)"*

8.2.15 The NPPF may be considered by the Secretary of State to be important and relevant, and hence this assessment has had regard to its policies.

Noise Policy Statement for England

8.2.16 With regards to 'adverse effects' and 'significant adverse effects' the NPPF refers to the noise Policy Statement for England Explanatory Note (NPSE) (Ref 8-9).

8.2.17 The NPSE seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The NPSE applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

8.2.18 The statement sets out the long term vision of the government's noise policy, which is to:

"promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development".

8.2.19 This long term vision is supported by three aims:

- *"avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvements of health and quality of life."*

8.2.20 The long term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society.

8.2.21 The 'Explanatory Note' within the NPSE provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the concepts:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and

- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

8.2.22 The three aims can therefore be interpreted as follows:

- The first aim is to avoid noise levels above the SOAEL;
- The second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur; and
- The third aim seeks, where possible, to positively improve the health and quality of life through the pro-active management of noise whilst also taking account of the guiding principles of sustainable development. It is considered that the protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

8.2.23 The NPSE recognises that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that are applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and at different times of the day.

Planning Practice Guidance

8.2.24 In March 2014, DCLG released its Planning Practice Guidance (PPG) web-based resource to support the NPPF (Ref 8-10). The guidance advises that local planning authorities' should consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

8.2.25 This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). Full details of the PPG on effects are provided in Table 8.1 below.

8.2.26 Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts.

Table 8.1. Planning Practice Guidance

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum

Perception	Examples of outcomes	Increasing effect level	Action
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

8.2.27 The overarching National Policy Statement (NPS) for Energy (EN-1) (Ref 8-11) sets out national policy for energy infrastructure consented pursuant to the Planning Act 2008. Whilst not directly applicable to the Proposed Development; the NPS may be a consideration.

8.2.28 NPS EN-1 states that:

"The planning and pollution control systems are separate but complementary. The planning system controls the development and use of land in the public interest…Pollution control is concerned with preventing pollution through the use of measures to prohibit or limit the releases of substances to the environment from different sources to the lowest practicable level. It also ensures that ambient air and water quality meet standards that guard against impacts to the environment or human health.

In considering an application for development consent, the [Secretary of State] should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The IPC should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes…will be properly applied and enforced by the relevant regulator" (paragraphs 4.10.2-4.10.3)."

8.2.29 Section 5.11 of the NPS EN-1 refers to the Government's policy on noise within the Noise Policy Statement for England and sets out requirements for noise and vibration assessment for Nationally Significant Infrastructure Projects.

8.2.30 At paragraph 5.11.8, with regards decision making, NPS EN-1 states;

"The project should demonstrate good design through selection of the quietest cost-effective plant available; containment of noise within buildings wherever possible; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission."

8.2.31 Section 9.5 describes the impact avoidance measures identified relevant to the Proposed Development.

8.2.32 The NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2) (Ref 8-12) sets out policy specific to fossil fuel power stations. At paragraph 2.7.1, specific sources of noise identified that are relevant to the Proposed Development include *"the gas and steam turbines that operate continuously during normal operation"*. It reiterates at paragraph 2.7.5 the point made in NPS EN-1 that; *"the primary mitigation for noise from fossil fuel generating stations is through good design, including enclosure of plant and machinery in noise-*

reducing buildings wherever possible and to minimise the potential for operations to create noise" and goes on to state that; *"Noise from gas turbines should be mitigated by attenuation of exhausts to reduce any risk of low-frequency noise transmission."*

Local Planning Policy

8.2.33 North Lincolnshire Council (NLC) do not have a published policy or guidance document on noise. However direct contact was made with the Environmental Protection function of NLC and the assessment methodology and approach was agreed.

Other Guidance

British Standard 7445-1:2003 and 7445-2:1991

8.2.34 BS 7445 'Description and measurement of environmental noise' (Ref 8-13 and 8-14) defines parameters, procedures and instrumentation required for noise measurement and analysis.

British Standard 5228:2009+A1:2014

8.2.35 BS 5228-1 '(Ref 8-3) provides a 'best practice' guide for noise control, and includes Sound Power Level (Lw) data for individual plant as well as a calculation method for noise from construction activities. BS 5228-2 'Code of practice for noise and vibration control on construction and open sites. Vibration' (Ref 8-4) provides comparable 'best practice' for vibration control, including guidance on the human response to vibration.

British Standard 6472:2008

8.2.36 BS 6472-1 'Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting' (Ref 8-15) presents recommended frequency weighted vibration spectra (for continuous vibration) and vibration dose values (VDV) (for intermittent vibration) above which adverse comment is likely to occur in residential properties.

British Standard 7385:1993

8.2.37 BS 7385-2 'Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration' (Ref 8-16) presents guide values for transient and continuous vibration, above which there is a likelihood of cosmetic damage. The standard establishes the basic principles for carrying out vibration measurements and processing the data, with regard to evaluating vibration effects on buildings.

British Standard 4142:2014

8.2.38 BS 4142 'Methods for rating and assessing industrial and commercial sound' (Ref 8-17) can be used for assessing the effect of noise of an industrial nature, including mechanical services plant noise. The method compares the difference between 'rating level' of the industrial noise, with the 'background level' at the receptor position.

British Standard 8233:2014

8.2.39 BS 8233 'Guidance on sound insulation and noise reduction for buildings' (Ref 8-18) provides criteria for the assessment of internal noise levels for various uses including dwellings and commercial properties. It is noted that internal noise criteria are defined by a single set of criteria, replacing the 'Good' and 'Reasonable' categories in BS 8233:1999.

World Health Organization

8.2.40 The World Health Organisation's (WHO) 'Guidelines for Community Noise' (Ref 8-19) recommend external daytime and evening environmental noise limits, and internal night-time limits to avoid sleep disturbance.

8.2.41 The WHO 'Night Noise Guidelines for Europe' (Ref 8-20) recommend updated guidelines on night-time noise limits to avoid sleep disturbance.

Calculation of Road Traffic Noise

8.2.42 Department of Transport (DfT)/ Welsh Office Memorandum 'Calculation of Road Traffic Noise' (CRTN)' (Ref 8-21) describes procedures for traffic noise calculation, and is suitable for environmental assessments of schemes where road traffic noise may have an effect.

Design Manual for Road and Bridges

8.2.43 The Highways England 'Design Manual for Road and Bridges Volume 11 Section 3 Part 7 HD213/11 (Revision 1) Traffic Noise and Vibration' (DMRB) (Ref 8-22) provides guidance on the appropriate level of assessment to be used when assessing the noise and vibration effects arising from all road projects, including new construction, improvements and maintenance. The guidance can also be used for assessing changes in traffic noise levels as a result of non-road projects such as this.

ISO 9613-2:1996

8.2.44 ISO 9613-2:1996 'Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation' (Ref 8-23) specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources.

8.3 Assessment Methodology and Significance Criteria

Determining Baseline Conditions and Noise Sensitive Receptors

8.3.1 It was agreed in consultation with NLC that there is only one Noise Sensitive Receptor (NSR) with the potential to be significantly impacted by the operation of Proposed Development. This is given the following designation:

- Noise Sensitive Receptor 1 – Hazel Dene on Marsh Road, a residential property approximately 650 m east of the site of the Proposed Power Plant Site

8.3.2 The distance quoted above is taken from the approximate nearest boundary of the Site. This distance is used to determine the sound propagation attenuation during the assessment.

8.3.3 The existing Immingham CHP plant has been required to undertake regular (annual) noise monitoring at three locations around the site including Hazel Dene. Noise monitoring has been undertaken on behalf of VPI since 2005 and, as result, there is now a dataset of background and ambient sound levels at the receptor measured over a period of 13 years. These measurements have been made in a variety of wind directions and show that in similar conditions the background and ambient levels at each monitoring location have been fairly consistent over the monitoring period.

8.3.4 The third party monitoring reports on these surveys show that appropriate instrumentation and methodologies have been used. It is therefore considered that these results represent a robust and representative record of the background sound levels in the area. It was therefore agreed in consultation with NLC that this data would be used to derive the background sound levels for the assessment of noise from the Proposed Development.

8.3.5 Noise and vibration from construction have the potential to impact on non-residential receptors such as the buildings and structures associated with the existing CHP site and the adjacent Lindsey Oil Refinery.

Impact Assessment and Significance Criteria

8.3.6 Effects are classified based on the magnitude of the impact and the sensitivity or value of the affected receptor. The criteria for assigning the magnitude of impacts are outlined below for the various potential impacts during construction and operation, and these are followed by a scale of receptor sensitivity in Table 8.6 and overall classification of effects matrix in Table 8.7.

Assessment of Construction Noise Effects

8.3.7 At this stage in the design of the Proposed Development, before the appointment of a construction contractor, site-specific details on the construction activities, programme and number or type of construction plant are not yet available. A qualitative assessment of construction noise has been undertaken using the calculation methods set out in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' (Ref 8-3). When a contractor has been appointed a detailed construction noise assessment will be completed.

8.3.8 The calculation method provided in BS 5228 takes account of factors including the number and types of equipment operating, their associated Sound Power Levels (L_{WA}), their modes of operation (% on-times within the working period), the distance to NSRs, and the effects of any intervening ground cover or barrier/topographical screening. This allows prediction of the magnitude of impact.

8.3.9 BS 5228 contains a number of example methodologies for identifying significant construction noise effects based on fixed thresholds or noise level changes. Taking into account this guidance, the threshold values detailed in Table 8.2 below have been adopted in this chapter to define the SOAEL (the 'significant observed adverse effect level', as defined above) and the LOAEL (the 'lowest observable adverse effect level') for residential receptors.

Table 8.2. Construction Noise SOAEL and LOAEL for Residential Receptors

Time of Day	SOAEL LAeq,T dB (façade)	LOAEL LAeq,T dB (façade)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	75	65
Evenings (19:00 – 23:00 weekdays) and Weekends (13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	65	55
Night-time (23:00 – 07:00)	55	45

8.3.10 The criterion for the SOAEL at residential receptors corresponds to the threshold values for Category C in the BS 5228 example ABC method. Similarly, the criterion for the LOAEL corresponds to the threshold values for Category A in the BS 5228 example ABC method. In accordance with the NPPF and NPSE, it is important to consider receptors that exceed the LOAEL and ensure adverse effects are mitigated and minimised.

8.3.11 When considering exceedances of the SOAEL and LOAEL, other project-specific factors have been taken into account, such as the existing ambient noise levels, number of receptors affected and the frequency and duration of the impact.

8.3.12 Based upon the above, the magnitude of the impact of construction noise on residential receptors has been classified in accordance with the descriptors in Table 8.3.

Table 8.3. Construction Noise Magnitude of Impact Criteria for Residential Receptors

Magnitude of Impact	Daytime LAeq,T dB (façade)	Evening/Weekend LAeq,T dB (façade)	Night-time LAeq,T dB (façade)
High	> 80	> 70	> 60
Medium	>75-80	>65-70	>55-60
Low	>65-75	>55-65	>45-55
Very Low	≤ 65	≤ 55	≤ 45

Assessment of Daytime Construction Works Traffic on the Public Highway

8.3.13 The Proposed Development will affect traffic flows on existing roads in the area surrounding the Application Site during construction. The assessment considered the impact at the existing residential property located close to the site (NSR1).

8.3.14 Construction traffic noise is assessed by considering the increase in traffic flows during the construction works, following the guidance of CRTN (Ref 8-21) and DMRB (Ref 8-22).

8.3.15 Traffic data have been obtained for the year 2021 'with' and 'without' construction traffic during the peak construction period, in order to determine if any existing roads are predicted to be subject to a potentially significant change in 18-hour traffic flows. Basic Noise Level (BNL) calculations have been undertaken to predict the change in noise level between the 'with' and 'without' scenarios.

8.3.16 The criteria for the assessment of traffic noise changes arising from construction works have been taken from Table 3.1 of DMRB (Ref 8-22) and are provided in Table 8.4 below.

Table 8.4. Traffic Noise Criteria

Magnitude of Impact	Change In Traffic Noise Level $L_{A10,18H}$ DB
High	≥ 5
Medium	3 to <5
Low	1 to <3
Very low	<1

8.3.17 DMRB (Highways Agency, 2011) advises that an increase in road traffic flows of 25% (where the traffic speed and composition remain consistent) equates to an increase in road traffic noise of 1 dB L_{A10}. A doubling of in traffic flow would be required for an increase in 3 dB L_{A10}.

8.3.18 It is generally accepted that changes in noise levels of 1 dB or less are imperceptible, and changes of 1 to 3 dB are not widely perceptible. Consequently, at the selected road traffic noise receptors the magnitude of the predicted change in noise levels uses the scale shown in Table 8.4 above with respect to construction traffic. The criteria are based on the current guidance on short-term changes in traffic noise levels in DMRB. The SOAEL is set at a change in traffic noise of +3 dB L_{A10} and the LOAEL at +1 dB L_{A10}.

Assessment of Construction Vibration Effects

Effects on Humans – Annoyance

8.3.19 Vibration due to construction activities has the potential to result in adverse impacts at nearby NSRs. The transmission of ground-borne vibration is highly dependent on the nature

of the intervening ground between the source and receiver and the activities being undertaken. BS 5228-2: 2009+A1: 2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration' (BSI, 2014b) provides data on measured levels of vibration for various construction works, with particular emphasis on piling. Impacts are considered for both damage to buildings and annoyance to occupiers.

8.3.20 In the absence of specific information on likely construction activities and plant, a qualitative assessment based upon professional judgement has been undertaken at this stage. Given the distance to the nearest residential receptors (650 m), no significant vibration (medium or high magnitude impacts) is expected to result from the proposed construction (or decommissioning) and therefore further assessment is scoped out.

Effects on Buildings

8.3.21 In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. Consequently, if vibration levels are controlled to those relating to annoyance (*i.e.* 1.0 mm/s), then it is highly unlikely that buildings will be damaged by demolition and construction vibration levels.

8.3.22 In the absence of specific information on likely construction activities and plant, a qualitative assessment based upon professional judgement has been undertaken. Again, given the distance to residential receptors, no significant vibration is expected to result from the proposed construction activities on such receptors and therefore further assessment of the effects of vibration on residential buildings is scoped out. However, once piling methods are known the potential impact on the Lindsey Oil Refinery and the existing CHP plant will be assessed and managed.

Assessment of Operational Noise

8.3.23 The assessment of operational sound levels has been based upon calculations using emissions data available at this stage in the design process. The data has been taken from indicative plant equipment and manufacturer's data and sound power levels (L_{wA}) from similar power plant projects and manufacturer's data, indicative layout plans to determine the distance between the Proposed Development and the NSRs.

8.3.24 Based upon the above information, the potential noise impact at the identified NSR has been assessed using the guidance in BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound' (BSI, 2014a).

8.3.25 A key aspect of the BS 4142 assessment procedure is a comparison between the Background Sound Level in the vicinity of residential locations and the Rating Level of the sound source under consideration. The relevant parameters in this instance are as follows:

- *Background Sound Level* – $L_{A90,T}$ – defined in the Standard as the 'A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels';
- *Specific Sound Level* – L_s ($L_{Aeq,Tr}$) – the 'sound source at the assessment location over a given reference time interval, T_r;
- *Rating Level* – $L_{Ar,Tr}$ – the '*specific sound level* plus any adjustment made for the characteristic features of the sound';
- *Ambient sound level*, $L_{Aeq,T}$ dB - defined in the standard as 'the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far when present. The *ambient sound* comprises the residual sound and the *specific sound*'; and

- *Residual sound level, Lr = $L_{Aeq,T}$* –the *'Ambient Sound* remaining at the assessment location when the *Specific Sound* source is suppressed to such a degree that it does not contribute to the *Ambient Sound'*.

8.3.26 Whereas the previous version of BS 4142:1997 allowed for a single correction of +5 dB to be made to the Specific Noise Level if one or more of the distinguishable, impulsive or irregular features were considered to be present, BS 4142: 2014 allows for corrections to be applied based upon the presence or expected presence of the following:

- Tonality: up to +6 dB penalty;
- Impulsivity: up to +9 dB penalty (this can be summed with tonality penalty); and
- Other sound characteristics (neither tonal or impulsive but still distinctive): + 3 dB penalty.

8.3.27 Once any adjustments have been made, the *Background Sound Level* and the *Rating Level* are compared. The standard states that:

- "*Typically, the greater the difference, the greater the magnitude of impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.*
- *The lower the rating level is to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context*."

8.3.28 Importantly, as suggested above, BS 4142:2014 (BSI, 2014a) requires that the *Rating Level* of the noise source under assessment be considered in the context of the environment when defining the overall significance of the impact.

8.3.29 BS 4142:2014 (BSI, 2014) suggests that a one hour assessment period is considered during the day and a 15-minute assessment period at night.

8.3.30 Table 8.5 below illustrates the adopted magnitude of impact scale used in this assessment based upon the numerical level difference. For BS 4142 assessment purposes the SOAEL is set at a *Rating Level* above the *Background Sound Level* of +10 dB, and the LOAEL at +5 dB, although it should be remembered that the context assessment (including the absolute level of the sound under consideration) can vary the overall classification of effects. The table reflects the lack of hard boundaries within the assessment methodology of BS 4142 and the importance of context in the interpretation of its outputs.

Table 8.5. Magnitude of Impact for Industrial Noise including Building Services

Magnitude of Impact	Effect on Residential NSR	Rating Level – Background Sound Level (dB)
High	Major depending on context	+14/ ≥+15
Medium/High	Major depending on context	+12/+13
Medium	Moderate depending on context (SOAEL = +10)	+9/+10/+11
Low/Medium	Moderate/Minor depending on context	+7/+8
Low	Boundary of BS 4142 adverse impact but Minor depending on context (LOAEL = +5)	+4/+5/+6
Very Low/Low	Minor	+2/+3
Very low	Negligible	≤0/+1

Assessment of Operational Vibration

8.3.31 No causes of significant vibration associated with the Proposed Development are known and therefore further assessment of operational vibration is scoped out of this assessment.

Assessment of Operational Changes in Road Traffic Noise

8.3.32 Given the low levels of traffic that will be generated, assessment of operational road traffic has therefore been scoped out of further assessment.

Significance Criteria

8.3.33 Effects are classified based on the magnitude of the impact and the sensitivity or value of the affected receptor. The criteria for assigning the magnitude of impacts are outlined for the various potential impacts during construction, operation and decommissioning, and these are followed by a scale of receptor sensitivity in Table 8.6 and overall classification of effects matrix in Table 8.7.

Receptor Sensitivity

8.3.34 In accordance with the principles of Environmental Impact Assessment, the sensitivity of existing receptors to noise (or vibration) impacts during either construction or operational phases has been defined in Table 8.6 below.

Table 8.6. Sensitivity/ Value of Receptors

Sensitivity/ Value of Resource/ Receptor	Description	Examples of Receptor Usage
Very high	Receptors where noise or vibration will significantly affect the function of a receptor	Auditoria/studios Specialist medical/teaching centres, or laboratories with highly sensitive equipment
High	Receptors where people or operations are particularly susceptible to noise or vibration. Sensitive ecological receptors known to be vulnerable to the effects of noise or vibration.	Residential Quiet outdoor areas used for recreation Conference facilities Schools/educational facilities in the daytime Hospitals/residential care homes Libraries Ecologically sensitive areas for example Special Protection Areas (SPAs)
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance	Offices Restaurants/retail Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf)
Low	Receptors where distraction or disturbance of people from noise or vibration is minimal	Residences and other buildings not occupied during working hours Factories and working environments with existing high noise levels Sports grounds when spectator or noise is a normal part of the event

Significance of Effects

8.3.35 The following terminology has been used in the assessment to define effects:

- Adverse – detrimental or negative effects to an environmental resource or receptor;
- Neutral – effects to an environmental resource or receptor that are neither adverse nor beneficial; or
- Beneficial – advantageous or positive effect to an environmental resource or receptor.

8.3.36 The effect resulting from each individual potential impact type above is classified according to the magnitude of the impact and the sensitivity or value of the affected receptor using the matrix presented in Table 8.7 below, but where necessary also considering the context of the acoustic environment.

Table 8.7. Classification of effects

Sensitivity/ value of resource/ receptor	Magnitude of impact			
	High	Medium	Low	Very low
Very high	Major	Major	Moderate	Minor
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible

8.3.37 For the purposes of this assessment, negligible and minor effects are considered to be not significant, whereas moderate and major effects are considered to be significant.

Rochdale Envelope

8.3.38 As discussed in Chapter 2: Assessment Methodology of this ES, and in order to ensure a robust assessment of the likely significant environmental effects of the Proposed Development, this Assessment has been undertaken adopting the principles of the 'Rochdale Envelope'.

8.3.39 The noise and vibration assessment has been undertaken with reference to the Rochdale Envelope (i.e. the maximum parameters for the Proposed Development and in particular its main buildings and structures). It is considered that the potential variation in building locations and dimensions presented in Chapter 4: Proposed Development of this ES is unlikely to adversely affect the overall conclusions regarding the significance of residual noise effects. The, noise scenarios assessed in this chapter locate all of the sources on site at the minimum potential distance to the receptors with no allowance from screening by other on site structures. This represents the worst possible case as actual layout will involve sources distributed across the site some of which will be screened by others.

8.3.40 Whilst the scenarios modelled are based on the indicative layouts, Scenario 1 in particular differs from Indicative Layout A (as defined in Chapter 4: Proposed Development of this ES) in that fewer, larger engines are assumed (5x 9.5MW as opposed to 7x 7.5MW in Indicative Layout A). This is considered to be the worst case from the point of view of this assessment.

8.3.41 The qualitative construction noise assessment was based on the likely construction works for the Proposed Development.

Extent of Study Area

8.3.42 The extent of the study area has been defined to include the nearest receptor to the site, Hazel Dene to the eats of the site. All other sensitive receptors are located significantly further away with some much closer to existing background sound sources. To the north west, west, southwest and south of the site the land is in use by existing industrial facilities and there are no exposed sensitive receptors.

Sources of Information/ Data

8.3.43 The following sources of information that define the Proposed Development have been reviewed and form the basis of the assessment of likely significant effects of noise and vibration:

- Construction noise data referenced from BS 5228 (Ref 8-3);
- Chapter 4: Proposed Development of this ES including schedule of plant and Indicative layouts;

- Operational Sound Power Levels (LWA) provided by potential equipment suppliers
- Ordnance Survey mapping of the Site and surrounding area; and
- Aerial photography.

Consultation

8.3.44 Consultation undertaken during the preparation of this EIA Report Chapter is presented in Table 8.8 below.

Table 8.8. Consultation Summary Table

Consultee	Date (method of consultation)	Summary of consultee comments	Summary of response/ how comments have been addressed
Annie Ward Environmental Protection Officer NLC Church Square House Scunthorpe PO Box 42 DN15 6NL	27th -29th March 2018 (telecom and follow up email)	North Lincolnshire Council was contacted to discuss and agree the assessment methodology. The proposed methodology was: Comparison of the predicted plant sound levels with the background sound level using the method set out in BS4142:2014. Derivation of noise limits for the detailed design of the plant based on achieving noise levels below the Lowest Observed Adverse Effect Level (LOAEL). Use of a single assessment location (Hazel Dene) Use of data from the routine CHP site noise monitoring for determination of the representative background sound levels. Annie Ward confirmed her department's agreement with this approach by email	Procedure adopted

8.4 Baseline Conditions

Sound Survey Results

8.4.1 As agreed with NLC the baseline conditions have been taken from the routine noise monitoring undertaken for the Immingham CHP site.

8.4.2 The routine monitoring only occurs at night when the sources of ambient and background sound are at their lowest level. Therefore the assessment will be based on the night time background sound levels. During the day the background sound levels will be higher so the impact of the Proposed Development will be lower than predicted based on the night time levels

Representative Background Sound Levels

8.4.3 The full results of the routine site noise monitoring at Hazel Dene are given in Appendix 8A (ES Volume 3).

8.4.4 Section 8.1.1 of BS 4142 states that background sound level should be determined in *"weather conditions that are representative or comparable to the weather conditions when the specific sound occurs"*. The propagation of sound from outdoor sources is significantly influenced by the weather. In particular the propagation down wind of a source can be 10 to 15 dB greater than that upwind. The prediction methodology used to derive the specific

sound level for the generators (based on ISO 9613 (Ref 8-23)) assumes downwind conditions to the receptor. Therefore the predicted specific sound levels will only occur when the receptor is downwind of the source. Representative background sound levels must therefore be measured in similar conditions. Therefore, the data set was filtered so that only measurements sessions were the average wind direction was within a 120° arc (60°s each side) of the downwind condition were included for further analysis.

8.4.5 Section 8.1.4 of BS 4142 states that to obtain a representative value the data set should be analysed statistically and then a judgment made. It clearly states that the lowest measured level should not be taken as representative. Therefore, after filtering for wind direction as described above the remaining levels were analysed and a representative value based on lowest 10th percentile of values was selected.

Table 8 9. Summary of Representative Background and Ambient Sound Levels at Hazel Dene

Measurement Position	Representative baseline sound levels (night time)	
	Background sound level L_{AF90}	Ambient sound level LAeq
Location 1 – Hazel Dene	49	53

8.4.6 The monitoring report states that the ambient and background sound at Hazel Dene is dominated by existing industrial sources with additional contributions from distant roads and Motorways.

Future Baseline

8.4.7 In the absence of the Proposed Development, future baseline noise levels at the NSR will depend largely on traffic flows on surrounding road networks, and the future operations at other industrial and commercial premises.

8.5 Development Design and Impact Avoidance

Construction Noise

8.5.1 Details of the construction programme are not currently finalised but the following mitigations controls will be applied as appropriate.

8.5.2 Construction activities are to be undertaken typically during weekday daytime and Saturday mornings, although some works may take place outside of normal working hours provided they do not cause any noise disturbance. Measures to mitigate noise would be implemented during the construction phase of the Proposed Development in order to minimise impacts at the NSR, particularly with respect to any activities required outside of normal working hours. An Outline Construction Environmental Management Plan (CEMP) has been prepared (see Appendix 4A (ES Volume 3). The appointed contractor(s) would use this to produce a more detailed CEMP that would define the environmental control measures that will be applied during construction, including measures related to noise. The CEMP would include the impact avoidance measures as outlined in this section.

8.5.3 Mitigation measures for inclusion within the CEMP include, but are not limited to:

- Abiding by construction noise limits at the identified NSR and monitoring of baseline and ongoing noise levels during construction;
- Ensuring that all processes 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 where appropriate;

- Ensuring that modern plant is used, complying with the latest European noise emission requirements. Selection of inherently quiet plant where possible;
- Use of lower noise piling (such as rotary bored or hydraulic jacking) rather the driven piling techniques (if required), where possible, for works within the Application Site;
- Off-site pre-fabrication, where practical;
- All plant and equipment being used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use;
- Ensuring all staff are made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) (BSI, 2014a and b), which should form a prerequisite of their appointment;
- Loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials around the Site to be conducted in such a manner as to minimise noise generation;
- Consultation with 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.

8.5.4 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 will be to minimise noise disruption to local residents during the construction phase.

8.5.5 Consultation and communication with the local community throughout the construction period will also 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.

8.5.6 A detailed construction noise and vibration assessment will 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).

8.5.7 In addition, it is anticipated that the appointed contractor would be a member of the 'Considerate Constructors Scheme' which is an initiative open to all contractors undertaking building work.

Operational Noise

8.5.8 During the detailed design stage, the plant will be designed to meet the noise limits presented in this assessment. The potential significant noise effects will be mitigated by design, where possible and feasible.

8.5.9 Control of noise emission from the Proposed Development can be achieved in several ways, taking into account the numerous sound sources associated with it. As outlined previously, the predictions were based on application the following controls based on information provided by potential suppliers.

- Housing the engines and generators within acoustic enclosures, separate containers in the case of Indicative Layout A, and a single building in the case of Indicative Layout B;
- Ensuring adequate in-duct attenuation is specified for all air inlet and exhausts for the building (Indicative Layout B only);

- Fitting acoustic doors for all entrances and exits to the building (Indicative Layout B only);
- Selecting cooling equipment with appropriate sound emissions and air flow rates (Indicative Layout B only);
- Fitting appropriate in-line silencing to engine inlets and exhaust (all options).

8.5.10 As the detailed design progresses additional noise control benefit may be derived from screening of certain sources by other structures on the site.

8.5.11 The Proposed Development will 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 also proposed that operational noise would be controlled via a planning condition.

8.6 Likely Impacts and Effects

Construction Noise and Vibration

8.6.1 This section discusses the potential noise and vibration effects on sensitive receptors arising during the construction phase of the Proposed Development. As stated above there is no construction programme at this stage of the design but it is expected that noise generating activities will occur during:

- On-site Construction;
- Site Clearance;
- Piling and Foundation Works;
- Building and General Site Activities;
- Fit Out; and
- Landscaping

8.6.2 This section of the chapter gives a qualitative assessment of the potential for significant impacts due to the construction of the project.

8.6.3 Noise levels experienced by local receptors during construction works depend upon a number of variables, the most important of which are:

- The noise generated by plant or equipment used on site, generally expressed as Sound Power Levels (L_{wA}) or the vibration generated by the plant;
- The periods of use of the plant on site, known as its on-time;
- The distance between the noise/ vibration source and the receptor;
- The noise attenuation due to building absorption, ground absorption, air absorption and barrier effects;
- In some instances, the reflection of noise due to the presence of hard surfaces such as the sides of buildings; and
- The time of day or night the works are undertaken.

8.6.4 The residential NSR is some 650 m from the Site (closest point on the redline boundary). This is a significant distance which will result in high levels of noise reduction from site to NSR.

8.6.5 BS 5228 states that noise levels predicted at distances over 300 m should be treated with caution due to the increasing importance of meteorological effects. However the

meteorological effects will all tend to result in lower levels at the NSR than that those predicted and therefore this assessment is conservative.

8.6.6 It is intended that the majority of construction works will be undertaken during the period Monday to Friday 07:00 to 19:00 and Saturday 07:00 to 13:00, although it is likely that some construction activities will be required to be 24 hours at certain times. This is principally because certain construction activities that cannot be stopped, such as concrete pouring. No work will take place on Sundays or Bank holidays unless otherwise agreed in writing with NLC.

8.6.7 In the absence of a construction programme predictions have been made based on similar projects of the sound levels at the NSR which would be expected to result from the operation of a range of construction activities on the site. The results are presented in Table 8.10 below. Facade noise levels have been predicted to allow subsequent comparison with the Construction Noise SOAEL and LOAEL for residential properties as detailed in Table 8.2.

Table 8.10. Construction Noise Predictions for the Proposed Development (Daytime)

Typical Plant / Equipment	L_{WA} (dB) Reference from BS 5228	% on time (based on 12 hr day)	Predicted level at NSR
Compressors	108	50	38
Hand Held Pneumatic Breaker	111	50	41
Dump Truck (tipping fill)	107	50	37
Dump Truck (pass-by)	115	50	45
Wheeled Loader	108	50	38
Lorry (delivery and collection)	108	50	38
Water Pump (20 kW)	93	50	23
Pre-Cast Concrete Piling Hydraulic Hammer Rig	117	50	47
Hand-Held Welder (welding piles)	101	50	31
Generator for Welding	101	50	31
Dumper (idling)	91	50	21
Wheeled Backhoe Loader	95	50	25
Tracked Excavator	99	50	29
Concrete Mixer Truck	108	50	38
Truck Mounted Concrete Pump and Boom Arm	108	50	38
Poker Vibrator	106	50	36
Wheeled Mobile Telescopic Crane	106	50	36
Tower Crane	105	50	35
Lorry with Lifting Boom	105	50	35
Lifting Platform	95	50	25
Fork Lift Truck	103	50	33
Mini Tracked Excavator	102	50	32
Electric Core Drill (Drilling Concrete)	113	50	43
Concrete Floor Cutter	119	50	49
Hand-Held Circular Saw (Cutting Paving Slabs)	112	50	42
Roller	101	50	31

Typical Plant / Equipment	L_{WA} (dB) Reference from BS 5228	% on time (based on 12 hr day)	Predicted level at NSR
Diesel Generator for Site Cabins	94	50	24
Diesel Generator for Site Lighting	93	50	23
Road Sweeper	96	50	26
Angle Grinder	108	50	38
Hand-Held Cordless Nail Gun	101	50	31
Road Planer (road construction)	110	50	40
Vibratory Compactor (asphalt)	110	50	40
Asphalt Paver + Tipper Lorry	105	50	35
Electric Water Pump	96	50	26
Screen Stockpiler	115	50	45
Concrete Breaker mounted on backhoe	120	50	50
Tracked crusher	112	50	42

8.6.8 All of the predicted individual source levels are significantly below the LOAEL for daytime and evening operation and all but three are below the LOAEL for night time. While it is highly unlikely that all of these activities will take place simultaneously it is likely that several will take place at the same time including more than one of some source. However the margin by which the predicted levels fall below the LOAEL indicates that even in with many sources in combination the LOAEL is highly unlikely to be exceeded.

Construction Noise Effects

8.6.9 The effects of the predicted daytime construction noise levels (as presented in Table 8.10) have been compared against the absolute construction noise limit values in Table 8.2 and using the semantic scales in Table 8.3, 8.6 and 8.7. The significance of effects during the daytime period are summarised in Table 8.11 below.

Table 8.11. Daytime Construction Noise Effects without Mitigation

Location	Likely effect of construction activities
NSR1	Negligible

8.6.10 As outlined previously, 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 (such as during concrete pouring), although it would be expected that construction operations would be reduced during evening and night-time periods.

8.6.11 Where on-site works are to be conducted outside the core hours they will comply with any restrictions agreed with the planning authorities, in particular regarding control of noise and traffic.

8.6.12 SOAEL and LOAEL threshold values during non-weekday daytime, evening and night-time periods have been defined in Table 8.2. Construction activities taking place outside normal working hours will be planned, managed and mitigated appropriately, so as not to exceed the SOAEL threshold values and reduce levels towards the LOAEL (or less) where practical. Provided the SOAEL threshold values are not exceeded, construction activities outside of normal working hours would be considered as having a minor adverse effect or less (not significant). Potential measures to ensure that appropriate mitigation is in place during the works have already been discussed in Section 8.5.

Construction Traffic Noise

8.6.13 Due to the size of the Proposed Development, the distance of the NSR from Rosper Road, and the levels of traffic already using Rosper road it is anticipated that the impact and effect of construction traffic on NSR will be negligible.

8.6.14 As appropriate, the construction noise management measures listed within the Section 8.5 Development Design and Impact Avoidance section under construction noise, which will be reviewed as the project progresses and more details of the construction phase are known.

Construction Vibration

8.6.15 The level of impact at different receptors will be dependent upon a number of factors including distance between the works and receptors, ground conditions, the nature and method of works required close to receptors and the specific activities being undertaken at any given time.

8.6.16 There are no residential receptors in close enough proximity to the Proposed Development to be significantly affected by construction vibration. However, there is the potential for some vibration impacts upon buildings/ structures at the neighbouring Immingham CHP plant and Lindsey Oil Refinery. Whilst it is considered highly unlikely that most typical construction work would generate levels of vibration above which building damage would occur, there is the potential that vibration impacts could cause annoyance to occupants during certain construction activities if not properly managed through the CEMP.

8.6.17 Where impact or vibro piling, heavy earthworks, vibratory rollers or other significant vibration producing operations are proposed on the parts of the site closest to existing buildings, further consideration will be given to potential impacts, once the contractor is appointed and the construction methods requirements are developed.

Operational Noise

Operational Noise Criterion

8.6.18 Using the representative background sound level presented in Table 8.12 below and following the approach agreed with NLC's Environmental Protection officer, the acceptable rating Levels at the NSR are defined as being no more than +5 dB above background Sound Level as shown in Table 8.12.

Table 8.12. Operational Noise Criteria – (Representative Existing Background + 5 dB)

Receptor	NSR1
Night-time L_{AF90} dB (23:00-07:00 hrs)	54

Plant Configurations

8.6.19 Operational noise models for the two concept layouts have been produced as follows:

- Scenario 1 (based on Indicative Layout A): up to five reciprocating engines, of around 9.5 MWe output each, located within a single sound proofed building with external fin fan cooling radiators. The engine exhaust and air inlets would be fitted with attenuators/silencers; and,
- Scenario 2 (based on Indicative Layout B): up to 33 containerised reciprocating engines, of around 1.5 MWe output each. Each set will be housed in a separate acoustic enclosure with exhaust, inlet and cooling silencing fitted.

Assessment

8.6.20 The noise predictions have been based on information provided by potential suppliers to the project. This information has included sound power levels for the major noise sources and details of the performance of previously applied embedded noise mitigation measures. The

data is summarised in Appendix 8B which also lists the assumptions applied to the prediction methodology.

8.6.21 The key sound sources for both options are:

- The engine casing;
- The generator casing;
- Couplings;
- The engine exhaust;
- The engine combustion air inlet;
- Ventilation systems; and
- Cooling systems

8.6.22 The two options both incorporate embedded measures to control sound emissions from these sources including:

- Acoustic enclosures/buildings;
- Exhaust silencer;
- Combustion air inlet attenuators;
- Ventilation air attenuators; and
- Low noise fans

8.6.23 The operation of the plant would be driven by the dynamics of the energy market; as a result the plant could run for short or longer periods, at any time of day, up to the maximum allowed under its Environmental Permit.

8.6.24 In accordance with BS 4142:2014 (Ref 8-17) the daytime assessment considers a 1-hour period and the night-time assessment considers a 15-minute period. The plant would be expected to operate during periods of peak demand for relatively short periods, for example 2 to 3 hours and when in operation the sound produced by the plant will be constant in nature. As the plant may operate at any time of day or night and the expected duration of operation is longer than either the daytime or night time reference periods the predicted specific sound level will be the same for both day and night. Therefore the predicted impact would be the same if the plant were to operate for any duration longer than 1 hour during the day or 15 minutes during the night.

8.6.25 The predicted free-field operational specific sound levels at the NSR around the Application Site, for the two options, are presented in Table 8.13 below

Table 8.13. Predicted Operational Noise Levels

Receptor	Predicted operational specific sound level L_{Aeq} dB
	NSR1 – Hazel Dene
Scenario 1 - 5 x 9.5 MWe units in building	44
Scenario 2 - 33 x 1.4 MWe containerised units in open air	43

8.6.26 The night time BS 4142 assessment is presented in Table 8.14 for the two options. The magnitude of impact and effect classification has been included based upon the BS 4142 assessment outcomes, with reference to the semantic scales in Tables 8.5, 8.6 and 8.7.

8.6.27 A conservative BS4142 character correction of + 5 dB has been applied, on the assumption that the engine exhausts may include some residual tonal characteristics, although the

intension is for these potential features to be designed out of the Proposed Development during the detailed design phase by the selection of appropriate plant, building cladding louvres and silencers/attenuators. This is considered conservative in the context of the prevailing noise environment, which is dominated by existing industrial sources.

Table 8.14. Night-time BS 4142 Assessment – Options 1 and 2

Receptor	Option 1	Option 2
Specific Sound Level *Ls* ($L_{Aeq,Tr}$), dB	44	43
Acoustic feature correction, dB	+5	+5
Rating Level ($L_{Ar,Tr}$), dB	49	48
Representative *Background Sound Level* ($L_{A90,T}$), dB	49	49
Excess of *Rating Level* over *Background Sound Level* ($L_{Ar,Tr}$ - $L_{A90,T}$), dB	0	-1
Magnitude of impact (assigned from Table 8.5)	Very Low	Very Low
Classification of effect (assigned from Table 8.7)	Negligible	Negligible

8.6.28 The assessments for both options predict very low impacts and negligible effects at the NSR. This assessment is based upon night time background sound levels, the daytime background sound levels will be higher so the impacts and effects will be even lower. These predicted effects are below the LOAEL and the local authority agreed criterion for minor adverse (not significant) effects (+5 dB).

Decommissioning and Demolition

8.6.29 The potential impacts and effects would require further consideration at the decommissioning and demolition stage of the Proposed Development. The predicted noise effects of eventual decommissioning and demolition of the Proposed Development are considered to be comparable to – or less than – those assessed for construction activities. They would be managed through the use of a Demolition Environmental Management Plan in a similar way to the use of a CEMP as proposed during construction.

8.7 Mitigation and Enhancement Measures

Construction

8.7.1 As outlined in Section 8.6, the construction assessment will be reviewed once a contractor has been appointed for the works.

8.7.2 The preferred approach for controlling construction noise and vibration is to reduce levels at source where possible and practical. Sometimes a greater noise or vibration level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.

8.7.3 The list of noise control measures presented within Section 8.5 provides a detailed, but not exhaustive list of construction noise and vibration management measures that will be considered in the CEMP and are included in the outline CEMP includes as Appendix 4A of this ES.

8.7.4 Residual effects after mitigation are described in Section 8.9 below.

Operational Noise

8.7.5 Assessment of the Proposed Development, in particular the options derived from the Indicative Layouts described as part of the Rochdale Envelope has resulted in negligible noise and vibration effects predicted. The necessary noise controls will be built in to the detailed design as described in Section 8.5. As such no additional mitigation is required.

Cumulative Effects

8.7.6 There are no currently committed developments in the vicinity that are expected to present the potential for adverse cumulative noise and vibration impact when assessed in conjunction with the Proposed Development. Existing operations of neighbouring plant are part of the established current noise baseline.

8.8 Limitations or Difficulties

Construction

8.8.1 Detailed construction information is not yet available (because the contractor not yet been appointed) and therefore this assessment is purely qualitative based upon experience of similar projects. However the assessment is considered to be robust due to the nature of the area around the site and the scale of the construction which is expected to take place. However, absolute construction noise thresholds (limit values) have been provided in Table 8.2, and further assessment has been identified to ensure that appropriate mitigation is developed to achieve the values below the SOAEL values once the contractor is appointed. This and other mitigation measures detailed above, which are likely to be secured by planning condition if necessary, will help to ensure that construction noise and vibration is minimised.

Operation

8.8.2 As outlined previously, the operational noise is assessed against the background sound levels obtained during the surveys undertaken from 2005 to 2017 as part of the ongoing noise monitoring for the existing CHP plant. There are uncertainties involved with the use of this data as there would be with any background sound measurement; other sources of noise may have changed in the intervening period. However in view of the nature of the area these uncertainties are no greater than those which would be associated with a single occasion survey undertaken specifically for this assessment. The full set of third party noise monitoring reports have been examined and demonstrate that the measurements have been undertaken competently and result in a robust representative background sound level.

8.8.3 Lists of assumptions made during the noise modelling and assessment of the Proposed Development are as presented in Appendix 8B (ES Volume 3). It is considered that the assumptions made will have led to a conservative (‘worst case’) assessment.

8.9 Residual Effects and Conclusions

Table 8.15. Summary of Significant Effects

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
Construction	Noise effects during construction of the Proposed Development	Expected negligible at nearest residential NSR during daytime.	Further detailed assessment and CEMP once principal contractor appointed, particularly regarding working outside of daytime working hours	Negligible at nearest residential NSR
Operation- daytime	Operation of the generators	Negligible	NA	Negligible
Operation- night time	Operation of the generators	Negligible	NA	Negligible
Decommissioning and demolition	Noise effects during decommissioning of the Proposed Development	Expected negligible at nearest residential NSR during daytime.	Further detailed assessment and CEMP once principal contractor appointed, particularly regarding working outside of daytime working hours	Negligible at nearest residential NSR

Note: Lt = long term, Mt = medium term, St = short term, P = permanent, T = temporary, D = direct and In = indirect

8.10 References

Ref 8-1 HM Government Environmental Protection Act 1990.

Ref 8-2 HM Government Control of Pollution Act 1974.

Ref 8-3 British Standards Institute (2014) BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.

Ref 8-4 British Standards Institute (2014) BS 5228-2:2009+A1:2014 – 'Code of practice for Noise and Vibration control on construction and open sites. Part 2: Vibration.'

Ref 8-5 HM Government Environmental Permitting (England and Wales) Regulations 2010.

Ref 8-6 Environment Agency (2002) Integrated Pollution Prevention and Control (IPPC) H3 document 'Horizontal Guidance for Noise Part 2 - Noise assessment and Control'

Ref 8-7 Environment Agency (2002b) Integrated Pollution Prevention and Control (IPPC) H3 document Horizontal Guidance for Noise Part 1 – Regulation and Permitting.

Ref 8-8 Department for Communities and Local Government (2012) National Planning Policy Framework.

Ref 8-9 Department for Environment, Food & Rural Affairs (2010) Noise Policy Statement for England (NPSE).

Ref 8-10 Office of the Deputy Prime Minister (1994) Planning Policy Guidance (PPG) 24 - Planning and Noise.

Ref 8-11 Department of Energy and Climate Change (DECC, 2011) Overarching National Policy Statement (NPS) for Energy ('EN-1')

Ref 8-12 Department of Energy and Climate Change (DECC, 2011b) NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2)

Ref 8-13 British Standards Institute (2003) BS 7445-1 – Description and measurement of environmental noise. Guide to quantities and procedures.

Ref 8-14 British Standards Institute (1991) BS 7445-2 – Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use.

Ref 8-15 British Standards Institute (2008) BS 6472-1 – Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.

Ref 8-16 British Standards Institute (1993) BS 7385-2 – Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.

Ref 8-17 British Standards Institute (2014) BS 4142 – Methods for rating and assessing industrial and commercial sound.

Ref 8-18 British Standards Institute (2014) BS 8233 -Guidance on sound insulation and noise reduction for buildings.

Ref 8-19 World Health Organisation's (WHO, 1999) 'Guidelines for Community Noise'.

Ref 8-20 WHO (2009) 'Night Noise Guidelines for Europe'.

Ref 8-21 Department of Transport/ Welsh Office (1998) Calculation of Road Traffic Noise (CRTN).

Ref 8-22 Highways Agency (2011) Design Manual for Road and Bridges Volume 11 Section 3 Part 7 HD213/11 (Revision 1) Traffic Noise and Vibration.

Ref 8-23 International Standards Organisation (1996) ISO 9613-2 – Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation.

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Tables

9 Landscape and Visual Amenity

9.1 Introduction

9.1.1 This chapter of the Environmental Statement (ES) Report addresses the potential effects of the Proposed Development on landscape character (as a resource in its own right) and visual amenity.

9.1.2 This chapter is supported by Figures 9.1-9.12 (ES Volume 2) and Appendices 9A (ES Volume 3).

9.2 Legislative and Planning Policy Context

Legislative Background

9.2.1 The Landscape and Visual Impact Assessment (LVIA) takes account of the legislation relevant to landscape and visual issues, including the European Landscape Convention and Reference Documents (Ref 9-1).

Planning Policy Context

9.2.2 The Overarching National Policy Statement (NPS) for Energy EN-1 (Ref 9-2), includes a number of statements pertinent to the potential landscape (including Green Infrastructure (GI)) and visual impacts of energy infrastructure in general.

9.2.3 Section 5.9 of EN-1 sets out the requirements for assessing and mitigating landscape and visual impacts of proposed nationally significant energy infrastructure projects. The scope of the assessment should include construction phase effects as well as the effects of the completed facility and its operation and eventual decommissioning on landscape components, landscape character and views and visual amenity.

9.2.4 In terms of mitigation, EN-1 encourages the reduction in scale of the buildings taking into consideration function, appropriate siting, design including colours and materials, and landscaping schemes to mitigate adverse landscape and visual impacts.

9.2.5 The NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2) (Ref 9-3) includes the following relevant to potential landscape and visual impacts:

"*The* applicant *should include a landscape and visual impact assessment as part of the ES, as set out in Section 4.2 of EN-1*."

(paragraph 2.6.3)

"*The applicant should also consider the design of the plant, including the materials to be used, and the visual impact of the stack, as set out in Section 5.9 of EN-1 in the context of the local landscape*."'

(paragraph 2.6.4)

9.2.6 The NPS also includes the following paragraphs (pages 15 and 16) which relate to the decision making process:

"*It is not possible to eliminate the visual impacts associated with a fossil fuel generating station. Mitigation is therefore to reduce the visual intrusion of the buildings in the landscape and minimise impact on visual amenity as far as reasonably practicable*."

(paragraph 2.6.5)

"*For the reason given in paragraph 2.6.5 above if, having regard to the considerations in respect of other impacts set out in EN-1 and this NPS, the [the decision maker] is satisfied that the location is appropriate for the project, and that it has been designed sensitively (given the various siting, operational and other relevant constraints) to minimise harm to landscape and visual amenity, the visibility of a fossil fuel generating station should be given limited weight*."'

(paragraph 2.6.10)

National Planning Policy

9.2.7 The National Planning Policy Framework (NPPF) (Ref 9-4) requires local authorities' design policies to maximise renewable development whilst ensuring that adverse landscape and visual impacts are addressed satisfactorily.

Local Policy

9.2.8 The North Lincolnshire Local Plan was adopted in May 2003 and is being gradually replaced by the Local Development Framework. Policies within the adopted Core Strategy (Ref 9-9) that are relevant to this assessment are summarised below.

North Lincolnshire Core Strategy Adopted June 2011

9.2.9 Paragraph 11.10 states that '*The aim of the Core Strategy is to protect and enhance North Lincolnshire's natural heritage and world class landscapes and habitats by maintaining and creating a sensitive balance between urban and rural, built form and natural assets, and physical and cultural links between townscape and landscape. This will be incorporated in new areas and replacement of existing areas such as.... replacement land (mitigation and compensation) for loss of habitat and landscape to industry at the South Humber Bank.*'

9.2.10 Policy CS12 advises that the biodiversity and landscape character of the Humber Estuary should be protected and enhanced by harmonising the landscape with port related development activities. The policy states that the South Humber Gateway Conservation Mitigation Strategy Delivery Plan (SHGCMSDP) will identify *appropriate* areas of mitigation for the loss of offsite Special Protection Areas (SPA) and Ramsar water bird roosting and foraging habitat; ensure the protection of the Humber Estuary SPA, Special Area of Conservation (SAC) and Ramsar site; and develop new green infrastructure directly linked to the Green Infrastructure Strategy for North Lincolnshire. The policy also states the need for new development to harmonise with North Killingholme Haven Pits SSSI and Local Wildlife Sites such as Chase Hill Wood (a proposed Local Nature Reserve) Burkinshaws Covert, Halton Marsh Clay Pits and Rosper Road Pools.

9.2.11 Policy CS16 states that the council will protect, enhance and support a diverse and multi-functional network of landscape, greenspace and waterscape by not permitting development that would result in unacceptable conflict with the function(s) or characteristics of that area and requiring that development proposals improve the quality and quantity and address local deficiencies of accessible landscape, greenspace and waterscape. The policy also requires the protection of trees, hedgerows and historic landscape.

North Lincolnshire Local Plan 'Saved Policies'

Policy LC7 - Landscape Protection

9.2.12 Policy LC7 requires that special attention will be given to protecting the scenic quality and distinctive local character of the landscape within rural settlements or within the open countryside. The policy requires that proposals for development have regard for the conservation and enhancement of the landscape and its features and seek to maintain local variations in the landscape. It states that existing landscape features and habitats of landscape importance will be protected and enhanced and requires that proposals for development will have regard to the landscape assessment and guidelines and the

Countryside Design Summary (Ref 9-5) (Estell Warren Landscape Architects for North Lincolnshire Council, 1999), which are to be used as supplementary planning guidance. The Countryside Design Summary provides guidance on integrating industry with the landscape in section 13 and 15.

Policy LC12 - Protection of Trees, Woodland and Hedgerows

9.2.13 Policy LC12 requires proposals for development to ensure where possible, the retention of trees, woodland and hedgerows and states that particular regard will be given to the protection of these within the setting of settlements and providing amenity value within built up areas, alongside the protection of ancient woodlands and historic hedgerows. The policy requires that landscaping and tree and hedgerow planting schemes accompany applications for new development where it is appropriate to the development and its setting.

Policy LC20 - South Humber Bank - Landscape Initiative

9.2.14 Policy LC20 proposes that throughout the South Humber Bank Landscape Initiative area certain measures should be taken. These include provision of stepped-back security fences, fringed with shrubs and trees; establishment of mixed broad-leaf and conifer screening belts; maintenance of features such as woods and introduction of lakes, ponds and marshes; careful management of existing hedges to increase height; and new tree and hedge planting, carefully positioned for maximum effect.

9.3 Assessment Method and Significance Criteria

9.3.1 Baseline data has been gathered from a study of Ordnance Survey (OS) maps and aerial photographs, publicly available documents such as landscape character assessment documents from local authorities within the immediate area and national character mapping available from Natural England.

Consultation

9.3.2 Table 9.1 summarises the consultation responses of relevance to landscape and visual amenity, including those received from the Scoping Opinion and discussions with the local authorities for the agreement of proposed viewpoint locations for the site assessment.

Table 9.1. Consultation Summary

Consultee or organisation approached	Date and nature of consultation	Method	Summary of response
North Lincolnshire Council	Scoping Opinion January 2018 NLC considers that the Applicant should assess the landscape and visual effects of the Proposed Development in accordance with the Guidelines for Landscape and Visual Impact Assessment (Third Edition) (GLVIA3). Any departure from the methodology should be fully justified within the ES.	Scoping Opinion	See Section 9.2 Legislation, Planning Policy and Guidance. The landscape and visual impact assessment has been undertaken in accordance with principles within the Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) (Ref 9-6). Details of the landscape and visual impact assessment methodology are provided in Appendix 9A: Landscape and Visual Impact Assessment Methodology

Consultee or organisation approached	Date and nature of consultation	Method	Summary of response
			(ES Volume 3).
	15 February 2018, seeking agreement on selection of representative viewpoints to be used within the Landscape and Visual Impact Assessment chapter.	Email	Proposed viewpoints considered reasonable.

Sources of Information/Data

9.3.3 The landscape and visual impact assessment has been based on the following best practice guidance:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition (Landscape Institute and Institute of Environmental Management and Assessment , 2013) (Ref 9-6);
- Landscape Character Assessment; Guidance for England and Scotland (The Countryside Agency and Scottish Natural Heritage, 2002) (Ref 9-7);
- Advice Note 01/11 Photography and Photomontage in landscape and visual impact assessment (Landscape Institute, 2011) (Ref 9-8); and
- Technical Guidance Note 02/17 Visual representation of development proposals (31 March 2017) (Ref 9-9).

9.3.4 Baseline data has been gathered from a study of Ordnance Survey (OS) maps and aerial photographs, publicly available documents such as landscape character assessment documents from local authorities within the immediate area and national character mapping available from Natural England.

Assessment Methods

Landscape

9.3.5 In assessing the predicted effects from any likely impacts to the landscape as a result of the Proposed Development, the following criteria have been considered:

- Landscape character;
- Landscape quality;
- Landscape value;
- Landscape sensitivity;
- Magnitude of likely impacts that may affect the landscape; and
- Significance of landscape effects.

9.3.6 Landscape impacts are considered, including both the direct and indirect impacts of the Proposed Development upon landscape elements and features (or components), as well as the impact upon the general landscape character of the surrounding area.

9.3.7 The relationship between sensitivity and magnitude of impact allows an assessment of the significance of predicted landscape effects to be made.

9.3.8 The sensitivity of the landscape to change is the degree to which a particular Landscape Character Area (LCA) or feature can accommodate changes or new features without unacceptable detrimental effects to its essential characteristics.

9.3.9 The magnitude of a predicted landscape impact relates to the size, extent or degree of change likely to be experienced as a result of the Proposed Development (refer to Table

9.2). The magnitude takes into account whether there is a direct impact resulting in the loss of landscape components, or a change beyond the land take of the Proposed Development that might have an effect on the character of the area, and whether the impact is permanent or temporary.

9.3.10 Table 9.2 below provides a matrix used to describe this relationship, and to allow any predicted landscape effects to be categorised. Effects that are judged as being moderate or major are considered to be significant.

Visual

9.3.11 The assessment of effects likely to result from visual impacts is structured by receptor groups (residents, users of recreational spaces, business users and motorists). Individual receptors are identified through the definition of the Zone of Theoretical Visibility (ZTV), within which views of the development are likely to be possible. Individuals are subsequently categorised into receptor groups within different areas. The sensitivity of each receptor group is then evaluated as being high, medium, low or very low dependent upon their susceptibility to changes in views and visual amenity and the value attached to particular views (in accordance with the criteria set by the Landscape Institute and Institute of Environmental Management and Assessment in the Guidelines for Landscape and Visual Impact Assessment (Ref 9-6).

9.3.12 Views from each identified representative viewpoint as agreed with North Lincolnshire Council were photographed following current guidance. For each viewpoint a description of the view is recorded alongside the receptor types, location and direction of view.

9.3.13 Although the assessment considers all structures relating to the Proposed Development, the focus of the assessment within this chapter is the worst case scenario. To facilitate the reader's interpretation of the information, photomontages and wireframes (see Figures 9.10– 9.12) include examples of the two options under consideration, using the indicative layouts shown in Figures 4.1a to d (ES Volume 2).

9.3.14 The sensitivity of receptor is evaluated as being high, medium, low or very low dependent upon its susceptibility to changes in the view and visual amenity, and the value attached to the view.

9.3.15 The magnitude of impact is evaluated as being high, medium or low dependant on the magnitude of change in relation to the baseline view resulting from the Proposed Development.

9.3.16 The sensitivity of receptor and the magnitude of impact are combined to establish the likely visual effect the Proposed Development has on the baseline view, as shown in Table 9.1. Effects that are judged as being moderate or major are considered to be significant.

Study Area

9.3.17 The extent of the Study Area is determined by the potential visibility of the Proposed Development in the surrounding landscape and is proportionate to its size and scale and the nature of the surrounding landscape. Current guidance (Landscape Institute and IEMA (Ref 9-6)) states that the Study Area should include '*the full extent of the wider landscape around it which the proposed development may influence in a significant manner*'.

9.3.18 For the purposes of this assessment the Study Area has been defined by a combination of analysis of the ZTV and professional judgement of the likely extents of effects. Based upon the geographical extent of the Proposed Development, it is considered highly unlikely that significant landscape effects would be possible beyond 2km from the Proposed Development Site. A 2km Study Area boundary has been used in the consideration of landscape effects within this chapter.

9.3.19 Based upon the tallest element of the Proposed Development being the stack(s) (with a maximum height of 35m Above Ground Level (AGL) it is considered highly unlikely that

significant visual effects would be possible from further than 5km from the Proposed Development Site. A 5km Study Area boundary has been used in the consideration of landscape effects within this chapter.

Zone of Theoretical Visibility

9.3.20 A computer generated ZTV was produced for the 5km Study Area (see Figure 9.4 in ES Volume 2). 2m Digital Terrain Model (DTM) Lidar data from Gov.uk was used. Screening effects of vegetation, buildings or other structures are not taken into account with this model. Consequently, for the production of this ZTV, OS Vector Map District data and National Forest Inventory data has been incorporated into the DTM. Existing built structures outside of the Proposed Site were modelled at 7.5m in height and large areas of woodland were modelled at 15m in height to provide a more accurate ZTV than a bare-ground scenario (which does not take into account localised screening effects of vegetation and built form). Proposed stacks were modelled at 35m AGL and other proposed buildings within the site were modelled at 10m AGL.

9.3.21 In accordance with the Rochdale Envelope approach proposed for the Proposed Development (see Chapters 2 and 4 of this ES) two potential indicative layouts (termed Indicative Layout 'A' and Indicative Layout 'B') have been developed which illustrate the maximum extent of the Proposed Development in terms of its potential environmental impact. Layout A shows the maximum extent of larger gas engines housed within an engine hall, while Layout B shows the maximum number of smaller containerised engines that would be located outside, without an engine hall. Indicative Layout A with up to seven 35m AGL stacks was assessed as a worst-case scenario, this being considered more likely to result in significant visual effects than other Layouts. The ZTV identifies any point within 5km which has a view of any part of the modelled area.

9.3.22 Potential viewpoints and receptors were identified throughout this area. The potential receptors and their existing views are described in Table 9.4 and shown on Figures 9.5 to 9.9 (ES Volume 2).

Significance Criteria

9.3.23 Direct and indirect impacts upon landscape elements and features (or components), as well as impacts upon the general landscape character of the surrounding area resulting from construction of the Proposed Development are considered.

9.3.24 In line with GLVIA3 (Ref 9-6), significance of effects is assessed as resulting from the sensitivity of receptor (landscape or visual) and magnitude of impact.

9.3.25 Table 9.2 provides a matrix used to describe this relationship, and to allow any predicted landscape effects to be categorised. Effects that are judged as being moderate or major are considered to be significant.

Table 9.2. Classification of Effects

Sensitivity/importance of receptor	Magnitude of impact			
	High	Medium	Low	Very low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible

9.4 Baseline Conditions

Site Context

9.4.1 The location of the Site is illustrated on Figure 1.1 (ES Volume 2).

9.4.2 The landscape of the Site context comprises large scale industrial and dock related developments, scattered areas of residential and commercial development, small woodland blocks and arable farmland.

9.4.3 To the north-east of the Site a wedge of screening woodland comprising Chase Hill Wood and Burkinshaw's Covert extends alongside the west of Rosper Road. Beyond Rosper Road to the north-east of the site, the Humber Sea Terminal site occupies a large area with arable farmland further south. South-east of the site, Immingham Dock occupies a large part of the Study Area with unmanaged land nearer the Site.

9.4.4 The large industrial complexes of Lindsey Oil Refinery, Humber Refinery and Killingholme Power Stations lie to the north and north-west of the Site.

9.4.5 The north-west boundary of the Site abuts the Lindsey Oil Refinery main access road, the north-east boundary is defined by Rosper Road, whilst the south-east boundary abuts the existing VPI CHP power station and the south-west boundary passes through and area of unmanaged land.

9.4.6 Agricultural fields within the Site context are rectilinear and vary in size, tending to have large, well established hedgerows.

9.4.7 The Site comprises unmanaged land is characterised by rough grassland with sparse shrubs, and hardstanding providing car parking. There are no features of landscape importance.

Topography

9.4.8 The Site lies at approximately 4.0 to 6.0 m AOD. The wider landscape is predominantly flat and low lying, being between 4 and 15 m AOD, with the land rising slightly to the north-west. Localised areas of high ground rising to around 40 m AOD lie within open areas of farmland at the westerly extent of the Study Area.

Vegetation

9.4.9 Agricultural land occupies much of the remaining area and comprises arable crops, boundary hedgerows, hedgerow trees and moderately sized blocks of woodland.

9.4.10 Chapter 10 Ecology, of this ES contains a more full description of vegetation contained within the Site.

9.4.11 The wider agricultural landscape tends to consist of small to medium scale fields defined by well-established native hedgerows up to 4 m in height. Hedgerow trees are infrequent to the east with larger quantities near settlements at East Halton, North Killingholme and South Killingholme. Occasional woodland blocks are scattered through the landscape, the most significant of these being Burkinshaw's Covert and Chase Hill Wood, 0.4 km and 1.7 km to the north west of the Site respectively, as illustrated on Figure 9.1.

Roads, Public Rights of Way and Access

9.4.12 The A180 is the main transport corridor connecting Immingham and Grimsby to the wider transport network. It is located approximately 3.2 km to the south of the Site. A comprehensive network of B roads connecting small villages criss-cross the wider area.

9.4.13 This chapter considers impacts on users of Public Rights of Way (PRoW) These are generally located to the western and eastern boundaries of the study area. To the west, short footpaths radiate from South Killingholme including footpaths NKIL 85, SKIL 87A1, SKIL 85, SKIL 91B, SKIL 99, SKIL 87A2 and SKIL 89. Further PRoW radiate from North Killingholme including NKIL 84, NKIL 84A and bridleway NKIL 83.A long distance route, the Nev Cole way runs north to south along numerous PRoW between East Halton and Immingham. These are shown on Figure 9.3 (ES Volume 2).

9.4.14 To the east, NKIL 50 and KIL 50 run north to south along the coastline with SKIL 100 extending westwards along Marsh Lane to Rosper Road. SKIL 91A runs along the southern boundary of the existing VPI Power Station site.

Settlement and Land use

9.4.15 Immingham is the largest settlement in the area and lies outside the Study Area approximately 2.4 km to the south-east. The settlement pattern within the Study Area comprises small and medium sized villages including; East Halton which is located to the north-west, North Killingholme and South Killingholme to the west. Isolated properties and farmsteads are scattered throughout the Study Area.

Landscape Character

9.4.16 The following documents were reviewed in relation to the site and the surrounding area as summarised in Table 9.3. Please refer to the original documents for the complete landscape characterisation descriptions.

Table 9.3. Landscape Character Areas

Scale	Character Assessment	Character Area
National	Natural England (2014), NCA Profile 41: Humber Estuary (Ref 9-11)	NCA 41: Humber Estuary
	Natural England (2014), NCA Profile 42: Lincolnshire Coast and Marshes (Ref 9-12)	NCA 42: Lincolnshire Coast and Marshes
Regional	North Lincolnshire Landscape Character Assessment & Guidelines (1999), North Lincolnshire Council	Humber Estuary LCA
	North East Lincolnshire Landscape Character Assessment (2010), North East Lincolnshire Council	Humber Estuary LCA
Local	North Lincolnshire Council (1999), North Lincolnshire Landscape Character Assessment & Guidelines (Ref 9-13)	Industrial Landscape – South Humber Bank LLT
	North Lincolnshire Council (1999), North Lincolnshire Landscape Character Assessment & Guidelines (Ref 9-12=3)	Open Undulating Farmland – South Killingholme LLT
	North Lincolnshire Council (1999), North Lincolnshire Landscape Character Assessment & Guidelines (Ref 9-13)	Wooded Farmland – East Halton, North Killingholme LLT
	North East Lincolnshire Council (2010),North East Lincolnshire Council Landscape Character Assessment, Sensitivity and Capacity Study (Ref 9-14)	Humber Estuary - Industrial Landscape LCT

National Landscape Characterisation

Natural England National Character Areas (NCA)

9.4.17 The Study Area includes two NCAs: NCA 41 Humber Estuary and NCA 42: Lincolnshire Coast and Marshes. The relevant landscape character elements of the NCA documents are summarised below.

NCA 41: Humber Estuary

9.4.18 The Humber Estuary is an open, low-lying flat landscape influenced by the changing character of the river. The area is characterised by arable farming in large regular fields on the reclaimed, formerly inter-tidal landscape. Internationally valuable habitats are in strong contrast to the urban and industrial landscape surrounding Hull, including the Humber Bridge, a strong link between the north and south banks of the Humber Estuary.

NCA 42: Lincolnshire Coast and Marshes

9.4.19 The Lincolnshire Coast and Marshes lie south-east of Hull, this is an area of predominantly flat land, sparsely wooded with open views. The coastal strip has been developed during the 20th century as a tourist destination and larger settlements are located along the coast.

District/Regional Landscape Characterisation

9.4.20 The greater part of the Study Area lies within North Lincolnshire and characterised by the North Lincolnshire Landscape Character Assessment (NLLCA). A smaller part is located within North East Lincolnshire and is characterised within the North East Lincolnshire Landscape Character Assessment (NELLCA). Local Character Areas (LCA) within both assessments are described below.

North Lincolnshire Council Landscape Character Assessment

Humber Estuary LCA

9.4.21 This LCA covers a strip along the south bank of the estuary. This landscape is flat, expansive and low-lying, being characterised by arable fields, relatively sparse tree cover and urban and industrial complexes. Views of the Humber Estuary and north shore are limited due to the visual obstruction caused by the flood defence embankment. High ground to the south and east of Barton upon Humber rises up to approximately 50 m AOD, enabling long distance views to the north bank of the estuary.

North East Lincolnshire Council Landscape Character Assessment, Sensitivity and Capacity Study

Humber Estuary LCA

9.4.22 This is a simple landscape that is expansive, flat and low-lying in which agricultural, industrial and urban land uses and semi-natural habitat combine to provide local variety. Vibrancy is dependent on the dynamics of tide, changing weather, bird life and visible activity on the estuary which is largely obscured by flood alleviation schemes.

Local Landscape Characterisation

North Lincolnshire Landscape Character Assessment

9.4.23 The NLLCA subdivides LCA into Local Landscape Types (LLT). The Site is located within the Industrial Landscape – South Humber Bank (LLT), with the wider Study Area including: Open Undulating Farmland – South Killingholme and Wooded Farmland - East Halton, North Killingholme LLTs.

Industrial Landscape – South Humber Bank LLT

9.4.24 This area lies on the `South Bank' at the mouth of the Humber Estuary extending north from the North Lincolnshire boundary to Halton Marshes, lying east of South Killingholme. The Ulceby to Immingham railway bisects the area to the south. The key characteristics are described within the document as:

- *"Flat landscape gently undulating to the west;*
- *Land mainly developed for industry with pockets of flat reclaimed arable farmland plantation woodland and naturalised coastal habitats i.e. South Killingholme Haven;*
- *Large-scale massive structures, storage facilities, oil refineries, etc. give a sense of enclosure, limiting views. Elements combine to significantly degrade the surrounding rural landscape character;*
- *Lighthouses and concrete coastal defences prominent along the coast;*
- *Development has resulted in a relatively chaotic landscape lacking unity;*
- *Very strong vertical elements present in the form of chimneys, accentuated by rising steam;*
- *Urban elements such as fences and signs proliferate and cause clutter;*
- *industrial traffic such as large tankers and lorries are common and create noise; and*
- *`Green' elements are insignificant within the industrial landscape. Ornamental mitigation planting and amenity trees in grass verges are mostly out of scale with the industrial mass. A few overgrown hedges exist, possibly as small remnants of the previous landscape."*

Open Undulating Farmland – South Killingholme LLT

9.4.25 There are two areas of this LLT to the west of the Study Area (see Figure 9.2) These are characterised by:

- *"Gently undulating terrain dipping towards the Humber;*
- *South Killingholme nucleated on the A160 corridor with a few scattered farmsteads elsewhere;*
- *Some traditional farm buildings remain although large-scale sheds are common and intrusive;*
- *Large, intensive arable fields bounded by robust clipped hawthorn hedges although some discontinuous and degraded;*
- *Landscape is open and sometimes exposed due to the scarcity of woodland blocks. Trees are commonly grouped with farm buildings or occasionally as shelterbelts or present in hedgerows;*
- *Ditches are common and create strong linear features when associated with the roadside or field boundaries;*
- *The proliferation of urban elements such as fencing along field boundaries and signs are common; and*
- *Simple, peaceful landscape is interrupted by pylons, infrastructure and adjacent industry viewed in the distance."*

Wooded Farmland – East Halton, North Killingholme LLT

9.4.26 This lies to the west of the Study Area in the area around North Killingholme, and is characterised by the following:

- *"Gently undulating well-treed terrain with pockets of arable farmland and small pockets of pasture;*
- *Tightly nucleated villages with architectural styles creating attractive street-scenes. Church steeples are prominent features;*
- *Strong rural character with brick buildings the local vernacular, occasionally with white render and with pantile or slate roofs;*

- *Semi-natural woodland of well-matured, predominantly broadleaved species;*
- *Close ecological and historic associations with mature tree groups, historic sites, irregular small fields with 'ridge and furrow', mixed hedges and field ponds as a remnant ancient landscape within an intensively farmed setting;*
- *Peaceful, attractive and unified character, with internal diversity and localised enclosure; and*
- *Views of chimneys from the power station in the distance detract from the rural village scene and transmission lines bisect the area."*

North East Lincolnshire Council Landscape Character Assessment, Sensitivity and Capacity Study

9.4.27 The Study Area includes one Landscape Character Type (LCT) within the North East Lincolnshire section of the Humber Estuary.

Industrial Landscape LCT

9.4.28 This visually intrusive area stretches from the north-west of Grimsby up to and around Immingham. It is dominated by on-shore oil and gas refineries and other large scale industrial units and extends inland to the A180(T). The key characteristics are described within the document as:

- *Virtually flat landform emphasising large skies;*
- *Large scale industrial works (including Immingham power station) and docks;*
- *Medium to large scale open arable farmland;*
- *Open views sometimes interrupted by large scale built development;*
- *High and low voltage pylons criss-crossing the area have an urbanising effect;*
- *Network of busy roads including the main A180 transport route;*
- *Well established low cut native hedgerow field boundaries with hedgerow trees;*
- *Tall native hedgerows and mature trees along road corridor;*
- *Extensive network of field drainage dykes including several large named drains; and*
- *Immingham town, northern periphery of Grimsby, scattered farmsteads*

Representative Views

9.4.29 Locations within the ZTV where views of the Proposed Development would potentially be visible were identified through a desk based assessment and the use of 1:25,000 Ordnance Survey maps. These locations aimed to be representative of those views that would be available of the Proposed Development from key visual receptors.

9.4.30 The locations were visited to assess and record the potential views that receptors would have of the Proposed Development. Field surveys have been carried out by a Landscape Architect on 23rd February 2018.

9.4.31 The following viewpoints were identified during initial desk-based work and discounted following field work where it was found unlikely that views of the Proposed Development would be possible:

- PRoW EHAL 50 (Viewpoint A);
- Homestead Park /Church Lane (Viewpoint D); and
- Thornton Abbey and Gatehouse (Viewpoint H).

9.4.32 Table 9.4 provides a list of the viewpoints assessed in this chapter, and a description of the view that is currently available from that location. Figure 9.4 illustrates the locations of the viewpoints, while Figures 9.5 to 9.9 provide photographs for each viewpoint.

9.4.33 The viewpoints that have been taken forward for assessment purposes are the views considered as the most representative of those found within the Study Area (based on the degree of view of the Site, the receptors' sensitivity and the nature of the view). These representative viewpoints have been selected in agreement with North Lincolnshire Council.

Table 9.4. Viewpoints

Viewpoint reference	Latitude/ Longitude (WGS84)	Approximate distance to site (km)	Height (mAOD)	Receptor type
1	53°38.9833N, 0°13.1788W	1.6	30	Recreational users of PRoW NKIL 50.
2	53°38.4346N, 0°13.4362W	0.6	10.5	Recreational users of PRoW SKIL 100 and residential receptors on Marsh Lane.
3	53°37.9015N, 0°15.6024W	1.9	26.4	Residential receptors on Staple Road, South Killingholme.
4	53°38.3921N, 0°15.8932W	1.9	22.1	Residential receptors on Church Lane, North Killingholme.
5	53°40.0155N, 0°16.472W	3.8	25	Recreational users of PRoW EHAL 74 and residential receptors on Station Road.

Visibility in the Wider Landscape

9.4.34 Structures within the Lindsey Oil Refinery, Humber Refinery and Killingholme Power Station sites are visible within the majority of views within the Study Area due to the height of these industrial structures, the surrounding flat landform and low levels of tree cover. Views towards the Site from within settlements are generally restricted by built form or screening field boundary vegetation in adjacent agricultural land.

Visual Sensitivity

9.4.35 An evaluation of sensitivity has been undertaken based on a subjective assessment of the susceptibility to change of the receptor and the value of the view at agreed viewpoints as shown on Figure 9.4 (ES Volume 2).

9.4.36 The visual sensitivity for each of these viewpoints has been assessed in accordance with current guidance and is recorded in Table 9.5. Where there is a range of susceptibility or value of view then the highest criteria is used for the assessment of the sensitivity.

Table 9.5. Potential Viewpoints Visited

Viewpoint reference	Receptor type	Description	Susceptibility of receptor to specific change	Value of view	Receptor sensitivity

Viewpoint reference	Receptor type	Description	Susceptibility of receptor to specific change	Value of view	Receptor sensitivity
1	Recreational users of PRoW NKIL 50.	Wide, medium distance view in a south-west direction over arable farmland. The large scale industrial development at Humber Refinery, Lindsey Oil Refinery and VPI CHP power station are clearly visible within the middle distance. The topography is distinctively flat. Although localised mounding at the Philips 66 gas storage facility to the left of the view screens views further south. Intermittent native hedgerow and hedgerow trees partially obscure lower parts of the industrial structures extending across a large proportion of the view and extending above the horizon.	Medium	Low	Medium
2	Recreational users of PRoW SKIL 100 and residential receptors on Marsh Lane.	Wide view looking west over arable farmland. Topography is largely flat with large scale industrial development at the Humber Refinery, Lindsey Oil Refinery and VPI CHP power station in the near distance. Roadside hedgerow generally obscures low level buildings within the refineries from view for users of the PRoW. Intermittent gaps allow glimpses of the industrial structures extending across the view and above the horizon.	Medium	Low	Medium
3	Residential receptors on Staple Road, South Killingholme.	Medium wide view east over arable farmland and along Staple Road to Humber Refinery and Lindsey Oil Refinery in the near distance. Topography is flat with intervening roadside hedgerow effectively screening low level buildings and lower parts of structures from view. The refineries extend across the view with lower structures partially obscured by trees Stacks and taller structures are visually prominent. Trees along Staple Road effectively filter the view to the right.	Medium	Low	Medium
4	Residential receptors on Church Lane, North Killingholme.	Wide view east over arable farmland and along Church Lane to Humber Refinery and Lindsey Oil Refinery in the near distance. Topography is flat with intervening roadside hedgerow effectively screening lower parts of structures from view. The refineries	Medium	Low	Medium

Viewpoint reference	Receptor type	Description	Susceptibility of receptor to specific change	Value of view	Receptor sensitivity
		extend across the view with stacks and taller structures extending into the sky and dominating the view.			
5	Residential receptors on Station Road, East Halton / Recreational users of PRoW EHAL 74.	Wide view south over arable farmland. Topography is flat with intervening hedgerow and hedgerow trees in the middle distance partially obscuring the refineries in the far distance. Uppermost parts of structures with the refineries and VPI CHP power station are visible with pylons extending across the view.	Medium	Low	Medium

Future Baseline

9.4.37 In order to assess the potential impacts and effects of the Proposed Development, it is necessary to determine the environmental conditions that currently exist on site and in the surrounding area for comparison. These are known as the 'existing baseline conditions'. Existing baseline conditions are determined using the results of site surveys and investigations or desk-based data searches, or a combination of these, as appropriate.

9.4.38 For the purpose of this assessment, the future baseline has been set at 2020. The future baseline is a prediction of baseline conditions in the future but assuming the Proposed Development has not been, or is being, constructed.

9.4.39 In 2020, the future baseline conditions are assumed to be similar as described for the existing baseline. It is assumed that small amounts of development within existing settlement boundaries would have been constructed, but the general landscape character and features would remain in a similar condition as they are now.

9.5 Development Design and Impact Avoidance

9.5.1 Measures that have been integrated into the Proposed Development in order to avoid or reduce adverse environmental effects include refinement of the design and layout of the Proposed Development to minimise impacts on sensitive receptors. Refinements to the height, number, layout and orientation of proposed stacks have been considered, these being the most visually prominent element of the Proposed Development.

9.5.2 Supplementary planning guidance within the Countryside Design Summary (Ref 9-5) regarding industry and infrastructure developments within the Humber Estuary has informed design development. In particular, the following design principles within the Countryside Design Summary have considered:

- Whether the Proposed Development should be a landmark feature or should be obscured;
- How the built form of proposed structures relates to landscape character;
- How colour may be used to either integrate the Proposed Development with the landscape, reflect the character of the surrounding landscape or to relate to what the buildings will be seen against ;

- How the Proposed Development will relate to existing landscape or built features and its immediate setting in views from key locations;
- Whether provision of screening and/or reduction of massing where sensitive views are identified may be utilised; and
- How landscape mitigation may reflect and reinforce local character.

9.6 Likely Impacts and Effects

9.6.1 This section will identify the potential impacts resulting from the Proposed Development. The magnitude of impacts are defined with reference to the relevant baseline conditions (existing or future, as appropriate), and effects are determined in accordance with the identified methodology (Appendix 9A).

Landscape

Construction

9.6.2 The Proposed Development may affect landscape character. The removal of characteristic landscape elements, and introduction of uncharacteristic elements which contrast with the existing landscape character are likely to result in adverse effects while the creation of elements that re-establish characteristic features in order to achieve biodiversity/landscape objectives are likely to result in beneficial effects.

9.6.3 Construction activities undertaken as part of the Proposed Development would introduce mobile plant including piling rigs, heavy plant machinery and cranes. These construction activities would result in the loss of an area of grassland within the Site, alongside removal of vegetation present within. No other on-site or off-site landscape features would be impacted as a result of construction activities.

Table 9.6. Assessment of Landscape Effects - Construction

Landscape type	Sensitivity of receptor	Description of impact	Predicted magnitude of impact	Classification of Effect
NCA 41: Humber Estuary	Low	The Proposed Development would introduce construction activity to the NCA with resulting direct effects. Due to the large scale of the NCA in relation to the scale of the Proposed Development site, construction activities are likely to result in temporary small scale effects, with a negligible extent.	Very low	Negligible adverse (not significant)
NCA 42: Lincolnshire Coast and Marshes	Low	The Proposed Development would introduce construction activity to the NCA with resulting direct effects. Due to the large scale of the NCA in relation to the scale of the Proposed Development site, construction activities are likely to result in temporary small scale effects, with a negligible extent.	Very low	Negligible adverse (not significant)
Humber Estuary LCA	Low	Construction activities would introduce construction compounds and laydown areas, machinery and other related activities to the LCA. Sensitivity is assessed as low due to the localised influence of the existing power station and refineries on the condition and quality of the area. Effects due to construction activities are likely to be direct, temporary and small scale, with a negligible extent.	Low	Minor adverse (not significant)

Landscape type	Sensitivity of receptor	Description of impact	Predicted magnitude of impact	Classification of Effect
Industrial Landscape – South Humber Bank LLT	Low	Construction activities would introduce construction compounds and laydown areas, machinery and other related activities to the LLT. Sensitivity is assessed as low due to the localised influence of the existing power station and refineries on the condition and quality of the area. Effects due to construction activities are likely to be direct, temporary and small scale, with a negligible extent.	Low	Minor adverse (not significant)
Open Undulating Farmland – South Killingholme LLT	Low	Due to the location of the LLT, construction activities are unlikely to give rise to any direct effects on landscape character.	Very low	Negligible adverse (not significant)
Wooded Farmland – East Halton, North Killingholme LLT	Low	Due to the location of the LLT construction activities are unlikely to give rise to direct effects on landscape character.	Very low	Negligible adverse (not significant)

Operation

Table 9.7. Assessment of Landscape Effects – Operation

Landscape type	Sensitivity of receptor	Description of impact	Predicted magnitude of impact	Classification of Effect
NCA 41: Humber Estuary	Low	Operation of the Proposed Development would extend built form, similar in form and scale to that of the existing VPI Power Station Site. Due to the large scale of the NCA this is unlikely to give rise to any impacts on its overall character. Effects would be direct and reversible.	Very low	Negligible adverse (not significant)
NCA 42: Lincolnshire Coast and Marshes	Low	Operation of the Proposed Development would extend built form similar in form and scale to that at the existing VPI Power Station Site. Due to the large scale of the NCA this is unlikely to give rise to any impacts on its overall character. Effects would be direct and reversible.	Very low	Negligible adverse (not significant)
Humber Estuary LCA	Low	Operation of the Proposed Development would extend built structures similar in form and scale to those at the existing VPI Power Station Site. Due to the localised influence of the existing power station on the condition and quality of the wider LCA, effects would be indirect and reversible.	Low	Minor adverse (not significant)
Industrial Landscape – South Humber Bank LLT	Low	At operation the Proposed Development would increase levels of built structures similar in scale and form to existing structures within the LLT. These would expand the presence of features characteristic of the area. Effects on the LLT due to operation would be small scale,	Low	Minor adverse (not significant)

Landscape type	Sensitivity of receptor	Description of impact	Predicted magnitude of impact	Classification of Effect
		reversible and would have a low magnitude of impact on the LLT.		
Open Undulating Farmland – South Killingholme LLT	Low	Due to the location of the LLT construction activities are unlikely to give rise to direct effects on landscape character.	Very low	Negligible adverse (not significant)
Wooded Farmland – East Halton, North Killingholme LLT	Low	Due to the location of the LLT construction activities are unlikely to give rise to direct effects on landscape character.	Very low	Negligible adverse (not significant)

Decommissioning

Table 9.8. Assessment of Landscape Effects - Decommissioning

Landscape type	Sensitivity of receptor	Description of impact	Predicted magnitude of impact	Classification of Effect
NCA 41: Humber Estuary	Low	Due to the large scale of the NCA, effects due to decommissioning are anticipated as being similar to those assessed at construction.	Very low	Negligible beneficial (not significant)
NCA 42: Lincolnshire Coast and Marshes	Low	Due to the large scale of the NCA, effects due to decommissioning are anticipated as being similar to those assessed at construction.	Very low	Negligible beneficial (not significant)
Humber Estuary LCA	Low	Effects due to decommissioning are assessed as being similar to those at construction.	Low	Minor beneficial (not significant)
Industrial Landscape – South Humber Bank LLT	Low	Effects due to decommissioning are assessed as being similar to those at construction.	Low	Minor beneficial (not significant)
Open Undulating Farmland – South Killingholme LLT	Low	Effects due to decommissioning are assessed as being similar to those at construction.	Very low	Negligible beneficial (not significant)
Wooded Farmland – East Halton, North Killingholme LLT	Low	Effects due to decommissioning are assessed as being similar to those at construction.	Very low	Negligible beneficial (not significant)
The Site	Low	Effects due to decommissioning are anticipated as being	High	Minor beneficial

Landscape type	Sensitivity of receptor	Description of impact	Predicted magnitude of impact	Classification of Effect
		similar to those anticipated at construction.		(not significant)

9.6.4 Table 9. 9 provides a summary of the landscape effects during construction and operation.

Table 9.9. Summary of Landscape Effects

Receptor	Sensitivity of receptor	Construction		Operation	
		Magnitude of impact	Classification of effect	Magnitude of impact	Classification of effect
NCA 41: Humber Estuary	Low	Very low	Negligible adverse (not significant)	Very low	Negligible adverse (not significant)
NCA 42: Lincolnshire Coast and Marshes	Low	Very low	Negligible adverse (not significant)	Very low	Negligible adverse (not significant)
Humber Estuary LCA	Low	Low	Minor adverse (not significant)	Low	Minor adverse (not significant)
Industrial Landscape – South Humber Bank LLT	Low	Low	Minor adverse (not significant)	Low	Minor adverse (not significant)
Open Undulating Farmland – South Killingholme LLT	Low	Low	Negligible adverse (not significant	Very Low	Negligible adverse (not significant
Wooded Farmland – East Halton, North Killingholme LLT	Low	Low	Negligible adverse (not significant	Very Low	Negligible adverse (not significant

Visual Amenity

Construction

9.6.5 Changes in views may give rise to adverse or beneficial visual effects through obstruction in views, alteration of the components of the view and the opening up of new views by removal of screening. Potential visual effects arising from the construction activities may include:

- The introduction of stationary and moving pilling rigs, cranes and other high level construction machinery;
- The introduction of low level construction operations including heavy plant movements, welfare facilities, laydown and storage areas;
- Construction vehicles entering and leaving the Site; and
- The progressive construction of tall structures.

Operation

9.6.6 At this stage a worst-case scenario, including above ground cabling between the Proposed Development and the existing electrical infrastructure within the adjacent CHP power station and a maximum of seven stacks with a height of 35m AGL, has been assessed. Potential visual effects arising from opening of the Proposed Development may include the introduction of:

- A number of containerised gas engines with stack(s) and transformer(s) with associated switchgear and ancillary equipment, either individually housed or contained within one or more buildings;
- Above ground raw water tank, fire water storage tank, gas pipeline and electrical transmission infrastructure to the existing adjacent CHP plant site;
- Waste water treatment plant, small diesel generator set & tank to facilitate safe start up and shut down of the main generating sets;
- Associated ancillary equipment, facilities, buildings, pipelines, liquid fuel tanks, storage tanks and associated infrastructure, storm water attenuation system or similar, internal access roads and car parking, landscaping and fencing, construction laydown areas, auxiliary cooling equipment, and workshop, stores, welfare, electrical, control and administration buildings; and
- Other minor associated infrastructure and auxiliaries/services.

9.6.7 A series of photomontages and wireframes have been prepared (Figures 9.10 to 9.12 (ES Volume 2) which illustrate the likely visibility of the Proposed Development at three of the assessed viewpoints. These viewpoints were chosen as a range of representative views of the Proposed Development and illustrate the following scenario:

- Seven industrial gas turbines with individual chimney stacks

9.6.8 The visual effects of the Proposed Development at each representative viewpoint during these stages are described in detail in Table 9.10 below.

Table 9.10. Effects on Visual Amenity

Viewpoint	Development Phase	Sensitivity of receptor	Predicted magnitude of visual impact	Classification of Effect
1	Construction	Medium	Low	Minor adverse (not significant)
Description of impact	Medium distance views of construction operations would be visible in front and to the left of structures within the Humber Refinery and Lindsey Oil Refinery sites. Views of ground level construction operations would be limited due to intervening vegetation and structures. Construction of the proposed stacks would be visible in the context of existing structures within the refineries. These would still dominate views from this location due to their scale and massing in relation to the proposed construction operations, and visual presence above the horizon. Visual effects would be small scale, negligible in extent and temporary.			
	Operation	Medium	Low	Minor adverse (not significant)
Description of impact	Medium distance views of the Proposed Development at operation would be partially visible in front of Humber Refinery and Lindsey Oil Refinery. Views of low level buildings would be limited due to intervening vegetation and structures. Existing industrial structures within the refinery sites extend across a large proportion of the view. These dominate views from this location due to their scale and massing. Receptors at his location would observe a slight increase in the visual presence of industrial structures within the view resulting from construction of the Proposed Development. Completed stacks are likely to be visually assimilated into similar structures behind. Visual effects would be small in size, small in extent and reversible.			
2	Construction	Medium	Low	Minor adverse (not significant)

Description of impact	Short distance views of construction operations would be visible in the context of existing buildings within the CHP power station site, Humber Refinery and Lindsey Oil Refinery. Views of ground level construction operations would be limited by intervening roadside vegetation and the CHP power station. The Humber Refinery and Lindsey Oil Refinery would still dominate views from this location due to their height, massing and extent across the view. Visual effects would be small in size, small in extent and reversible.			
	Operation	Medium	Low	Minor adverse (not significant)
Description of impact	At operation, industrial structures would have a slightly extended presence within views from this viewpoint. The Proposed Development would be observed to the right of the existing VPI CHP power station and would extend the presence of industrial structures in the view. The Proposed Development is likely to be visually assimilated into the existing VPI CHP power station and refineries. Visual effects would be small in size, small in extent and reversible.			
3	Construction	Medium	Low	Minor adverse (not significant)
Description of impact	Short distance views of construction would be visible in the context of the refinery sites. Construction operations at height would be partially visible behind existing structures within the Humber Refinery site. Views of ground level construction operations would be obscured by intervening vegetation in the near distance and buildings within Humber Refinery. Stacks within the refineries would still dominate views from this location due to their scale and massing in relation to the proposed construction operations. Visual effects would be small in size, small in extent and reversible.			
	Operation	Medium	Low	Minor adverse (not significant)
Description of impact	Views of the operational development would be partially visible within the context of Humber Refinery and Lindsey Oil Refinery. Views of low level buildings would be obscured due to intervening vegetation and buildings in the near distance. The very tops of the proposed stacks are likely to be visually assimilated into Humber Refinery. The oil refineries would still dominate views from this location due to their larger scale in relation to the Proposed Development. Visual effects would be small in size, small in extent and reversible.			
4	Construction	Medium	Low	Minor adverse (not significant)
Description of impact	Short distance views of construction operations at height would be partially visible behind existing buildings within the refineries. Views of ground level construction operations would be obscured by intervening vegetation in the near distance and refinery structures beyond. Construction of the tops of the proposed stacks would be visible in the context of the oil refinery sites. Humber Refinery and Lindsey Oil Refinery would still dominate views from this location due to their scale and massing in relation to the proposed construction operations. Effects would be small scale, negligible in extent and temporary.			
	Operation	Medium	Low	Minor adverse (not significant)
Description of impact	Views of the operational development would be partially visible within the context of existing structures within the oil refinery sites. Views of low level buildings would be obscured by intervening vegetation and built form with the tops of the proposed stacks partially visible. Structures within the oil refineries being taller than those within the Proposed Development would still dominate views at this location. Effects would be small scale, negligible in extent and reversible.			
5	Construction	Medium	Low	Negligible adverse (not significant)
Description of impact	Long distance views of ground level construction operations would be limited by distance, intervening vegetation and built form within the refineries. Views of construction activities at height are likely to be filtered by intervening trees in the middle distance. The upper parts of the tallest structures proposed would be visible in the context of existing pylons and large scale structures to the right of the view within the oil refineries. Visual effects would be small in size, small in extent and reversible.			
	Operation	Medium	Very low	Negligible adverse (not significant)
Description of impact	The Proposed Development would be screened by intervening vegetation and only upper parts of the proposed stacks would be visible. These would be seen in the far distance, and within the context of existing large scale industrial structures and pylons visible extending across the view. Visual effects would be small in size, small in extent and reversible.			

9.6.9 Table 9.11 provides a summary of the effects on visual amenity during construction and operation.

Table 9.11. Summary of Visual Amenity Effects

Viewpoint reference	Receptor Sensitivity	Construction		Operation	
		Magnitude of visual impact	Classification of effect	Magnitude of visual impact	Classification of effect
1	Medium	Low	Minor adverse (not significant)	Low	Minor adverse (not significant)
2	Medium	Low	Minor adverse (not significant)	Low	Minor adverse (not significant)
3	Medium	Low	Minor adverse (not significant)	Low	Minor adverse (not significant)
4	Medium	Low	Minor adverse (not significant)	Low	Minor adverse (not significant)
5	Medium	Low	Negligible adverse (not significant)	Low	Negligible adverse (not significant)

Decommissioning

9.6.10 Changes in views may give rise to adverse or beneficial visual effects through obstruction in views, alteration of the components of the view and the opening up of new views by removal of screening. Potential visual effects arising during the decommissioning process may include:

- The introduction of stationary and moving cranes and other high level machinery;
- The introduction of low level operations including heavy plant movements, welfare facilities, and storage areas;
- Vehicles entering and leaving the site; and
- The progressive deconstruction of tall structures.

9.7 Mitigation

9.7.1 Section 2.65 of EN-2 (Ref 9-3) states that 'It is not possible to eliminate the visual impacts associated with a fossil fuel generating station. Mitigation is therefore to reduce the visual intrusion of the buildings in the landscape and minimise impact on visual amenity as far as reasonably practicable'.

9.7.2 The assessment has not identified significant visual effects for receptors at the viewpoints. As such, it is anticipated that standard construction practises already incorporated into the design would provide the best fit with the existing local landscape and minimise visual impact through appropriate choice of external finish and colour.

9.7.3 Enhancement in the form of tree planting to the periphery of the Site would assist in reducing the visibility of the Proposed Development from visual receptors to the east including those at viewpoint 1 and viewpoint 2, and users of Rosper Road.

9.8 Residual Effects and Conclusions

9.8.1 The assessment has not identified significant effects for landscape receptors or visual receptors at the viewpoints. As mitigation measures have not been proposed, effects identified within the assessment will remain as minor to negligible (not significant) residual effects.

9.9 Cumulative and Combined Effects

9.9.1 Cumulative impacts are those that could arise from a number of development activities. The impact of the Proposed Development will be considered in conjunction with the potential impacts from other projects or activities which are both reasonably foreseeable in terms of delivery (e.g. have planning permission) and are located within a realistic geographical scope, where environmental impacts could act together to create a more significant overall effect.

9.9.2 The combination of predicted environmental impacts resulting from a single development on any one receptor that may collectively cause a greater effect (such as the combined effects of noise and air quality/ dust impacts during construction on local residents), are referred to as combined effects. Combined effects are also assessed as part of this ES and reported in Chapter 14.

Cumulative Effects on Landscape Character

9.9.3 Cumulative effects on landscape character are assessed at identified landscape receptors within the 2km Study Area. Landscape receptors that have been assessed as having negligible effect have not been included in the assessment of cumulative effects, as it is considered unlikely that the addition of a negligible effect to the combined effect of other combinations of other development within the study area, would lead to a significant cumulative impact.

9.9.4 The major development considered is presented in Table 9.12 below, with details of its current status and comments regarding whether there is potential for a cumulative impact to occur.

Table 9.12. Refined Short List of Projects – Landscape and Visual Assessment

Name of development	Status	Description of development	Potential for cumulative impact
North Killingholme Power Project	DCO application (APP-058)	The development is a generating station intended to operate as either a CCGT power plant or IGCC power plant and comprises operations, fuel handling, cooling water and construction laydown areas. Constituent structures comprise an administration building, acid gas removal plant, biomass/limestone stores, flare stack, covered fuel storage, gasification island, power island, hybrid cooling towers, main E.S.S., raw water and waste water treatment plants, sulphur	**Construction** During construction, potential adverse landscape and visual impacts could arise from: Site clearance, Earthworks, movement of construction related traffic, construction activity, stockpiles, temporary hoardings and protective fencing, lighting and signage; and construction of the generating station, gasification plant and other ancillary buildings. **Operation** During operation, potential landscape and visual impacts could arise from: Increased amounts of large scale buildings and associated infrastructure with the maximum height of structures being up to 140mAOD; new hard and soft landscape elements associated with the project; occasional plumes from the hybrid cooling towers; operational traffic; and lighting, including aviation warning lights on the

Name of development	Status	Description of development	Potential for cumulative impact
		recovery buildings, warehouses and storage, and a conveyor section.	tallest proposed structures.

9.9.5 Due to the scale of NCA 41: Humber Estuary, NCA 42: Lincolnshire Coast and Marshes and Humber Estuary LCA, cumulative landscape effects on these areas are anticipated as being negligible and are not considered any further.

9.9.6 The Proposed Development and the cumulative development are both located within the South Humber Bank LLT and as such this LLT is assessed as likely to experience cumulative effects that are not negligible. The detailed landscape cumulative assessment is contained within Table 9.13 below.

Table 9.13. Cumulative Effects on Landscape

Landscape type	Receptor Sensitivity	Description of impact	Predicted magnitude of impact	Classification of effect
Industrial Landscape – South Humber Bank LLT	Low	Construction The cumulative development would introduce construction activity within the LLT on 27.5ha of land adjacent to the existing C.RO Ports Killingholme site (CPK) on land formerly occupied by a British Gas naptha/gas processing site. The land is currently covered in a variety of hardstanding (e.g. old building and tank foundations), small buildings, local gas pipelines, two large ponds and areas of rough grassland / scrub. A further 65.7ha of land comprising CPK would accommodate fuel handling, cooling water connection and construction laydown areas. Due to the existing industrial character of the LLT and the existing landscape elements within the cumulative development site, it is assessed that a low magnitude of impact would result from construction activities within the cumulative development. Impacts would be short term and temporary.	Low	Minor adverse (not significant)
	Low	Operation The cumulative development would introduce new built form including several tall structures: a flare stack (140mAOD), power island (85.2 mAOD), gasification island (70mAOD) and biomass/limestone stores (50mAOD high) into an already industrialised landscape. Areas of rough grassland and scrub would be removed to enable development; and existing hardstanding, buildings and pipelines would be replaced by landscape elements similar in character with new structures	Low	Minor adverse (not significant)

	being of a larger scale. Due to the existing industrial character of the LLT and the existing landscape elements within the cumulative development site, it is assessed that a low magnitude of impact would result from operation of the cumulative development. Impacts would be long term and reversible.

Cumulative Effects on Visual Amenity

9.9.7 Generally, cumulative effects on visual amenity for the viewpoints within the 5km Study Area are limited by the geographical relationship between the cumulative development at North Killingholme Power Project and the Proposed Development. The North Killingholme Power Project is anticipated to have little visual presence in views of the Proposed Development for visual receptors at located at the identified. As such these viewpoints have been scoped out of the cumulative visual assessment.

Cumulative Assessment Summary

9.9.8 South Humber LLT is predicted to receive minor adverse effects on landscape character that are not significant.

9.10 Summary

9.10.1 The Study Area is mostly located within one local landscape type, South Humber LLT and two regional LCAs. Within these, large scale industrial structures are considered by the relevant landscape character assessment to be visually prominent and as having influence on the local and regional landscape character.

9.10.2 The Proposed Development is assessed as likely to result in a low or very low impact on landscape character, due to the introduction of additional built form which is similar in form and scale to that within the adjacent refinery sites. This effect is assessed to be minor or negligible adverse and not significant.

9.10.3 The visual impact of the Proposed Development is considered in the context of existing large scale structures within the Lindsey Oil Refinery and Humber Refinery sites. These are visually prominent within the Study Area. Views towards the Proposed Development from settlements within the Study Area are generally restricted to locations along settlement edges due to the screening effect of built form and/ or boundary vegetation. Views from settlement edges and PRoW within the countryside tend to be open and wide with low level views of the Proposed Development screened by vegetation within the intervening countryside and large scale structures within the Lindsey Oil Refinery and Humber Refinery sites.

9.10.4 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 minor or negligible adverse effect that is not significant. As such, the need for mitigation measures has not been established.

9.10.5 From the majority of viewpoints, and in the context of the landscape character of the area, it would be viewed within an existing industrialised landscape and would be seen as an associated part of this, rather than a separate development.

9.11 References

Ref 9-1 Council of Europe, Cultural Heritage, Landscape and Spatial Planning Division and Directorate of Culture and Cultural and Natural (2008), *European Landscape Convention and Reference Documents*.

Ref 9-2 Department for Energy and Climate Change (2011b), *Overarching National Policy Statement for Energy EN-1*.

Ref 9-3 Department for Energy and Climate Change (2011b), *National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)*.

Ref 9-4 Department for Communities and Local Government (2012), *The National Planning Policy Framework*.

Ref 9-5 Estell Warren Landscape Architects for North Lincolnshire Council (1999), Countryside Design Summary

Ref 9-6 Landscape Institute and Institute of Environmental Management and Assessment (2013), *Guidelines for Landscape and Visual Impact Assessment Third Edition*.

Ref 9-7 Natural England (2014), *An Approach to Landscape Character Assessment*.

Ref 9-8 Landscape Institute (2011), *Advice Note 01/11 Photography and photomontage in landscape and visual impact assessment*.

Ref 9-9 Landscape Institute (2017) *Technical Guidance Note 02/17 Visual representation of development proposals.*

Ref 9-10 North Lincolnshire Council (2011), *Core Strategy Adopted*

Ref 9-11 Natural England (2013), *NCA Profile 41: Humber Estuary (NE344)*

Ref 9-12 Natural England (2013), *NCA Profile 42: Lincolnshire Coast and Marshes (NE521)*

Ref 9-13 North Lincolnshire Council (1999), *North Lincolnshire Landscape Character Assessment & Guidelines*

Ref 9-14 North East Lincolnshire Council (2010), *North East Lincolnshire Council Landscape Character Assessment, Sensitivity and Capacity Study*

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Tables

10 Ecology

10.1 Introduction

10.1.1 This chapter of the Environmental Statement (ES) addresses the potential effects of the Proposed Development on ecology features.

10.1.2 The ecological impact assessment considers;

- The present-day and future baseline conditions during construction and at opening;
- The effects of construction of the Proposed Development on habitats and species, with respect to construction traffic, construction dust and the Proposed Development footprint; and
- The effects of the operation of the Proposed Development on habitats and species.

10.1.3 The cumulative environmental effects associated with the Proposed Development and other committed developments in the vicinity are described in Chapter 14: Cumulative and Combined Effects of this ES.

10.1.4 Due to the timing of this application, it was not possible to complete all the necessary ecological surveys in advance of submission and so the ecology chapter is based on the information available up to the end of April 2018. Although a preliminary ecological appraisal has been carried out, several of the seasonal baseline surveys have not started or are ongoing. Details are given in the Limitations section below and Table 10.6.

10.1.5 Any evaluation of the importance of species or habitats is therefore provisional at present. The potential for impacts on ecological receptors has been identified, but the significance of effects cannot be fully assessed until the results of surveys are available. A revised version of this Ecology Chapter will be re-submitted in due course with additional information regarding the baseline ecology, assessment of impacts and significance of effects, mitigation and residual effects following the completion of the full suite of ecology surveys in 2018. A detailed programme of ecological surveys has been developed and those that are currently incomplete are summarised in Table 10.6 of this chapter.

10.1.6 This chapter is supported by the following technical appendices, located in ES Volume 3:

- Appendix 10A – Preliminary Ecological Assessment;
- Appendix 10B – HRA Signposting Report;
- Appendix 10C – Great Crested Newt Survey; and
- Appendix 10D – Wintering Bird Survey.

10.2 Legislative and Planning Policy Context

10.2.1 The ecological impact assessment (EcIA) presented in this chapter has been undertaken within the context of relevant planning policies, guidance documents and legislative instruments.

Legislative Background

10.2.2 The following legislation is considered relevant to the Proposed Development:

- Wildlife and Countryside Act (WCA) 1981 (as amended) (Ref 10-1);
- Countryside and Rights of Way (CRoW) Act 2000 (as amended) (Ref 10-2);

- Natural Environment and Rural Communities (NERC) Act 2006 (as amended) (Ref 10-3);
- The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) (Ref 10-4);
- Protection of Badgers Act 1992 (as amended) (Ref 10-5);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD) (Ref 10-6); and
- Animal Welfare Act 2006 (Ref 10-7).

Planning Policy Context

National Planning Policy

10.2.3 The overarching National Policy Statement (NPS) for Energy (EN-1) (Ref 10-8) sets out national policy for energy infrastructure. Those parts of the NPS relevant to biodiversity are detailed in Table 10.1, which includes cross references to where the issues have been ad dressed in the chapter.

Table 10.1. Summary of NPS Advice Relevant to Biodiversity

Summary of NPS	Consideration within the Chapter
Paragraph 5.3.3 states: *"Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity."*	Section 10.6
Paragraph 5.3.4 states: *"The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests."*	Sections 10.5 and 10.7
Paragraph 5.3.7 states: *"As a general principle, and subject to the specific policies below, development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives (as set out in Section 4.4 above); where significant harm cannot be avoided, then appropriate compensation measures should be sought."*	Sections 10.5 and 10.7
Paragraph 5.3.18 states*: "The applicant should include appropriate mitigation measures as an integral part of the proposed development. In particular, the applicant should demonstrate that:* • *during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works;* • *during construction and operation best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport access arrangements;* • *habitats will, where practicable, be restored after construction works have finished; and* • *opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals."*	Sections 10.5 and 10.7

National Planning Policy Framework

10.2.4 The UK Government has committed to halting the overall decline in biodiversity. Planning requirements in support of this are specified in the National Planning Policy Framework (NPPF) published on 27th March 2012 (Ref 10-9). The NPPF states:

> *"The planning system should contribute to and enhance the natural and local environment by: …preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"* (paragraph 109)

10.2.5 The NPPF states the commitment of the UK Government to minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity. It specifies the obligations that Local Authorities and the UK Government have regarding statutory designated sites and protected species under UK and international legislation, and how this is to be delivered in the planning system. Protected or notable habitats and species can be a material consideration in planning decisions and may therefore make some sites unsuitable for particular types of development, or if development is permitted, mitigation measures may be required to avoid or minimise impacts on certain habitats and species, or where impact is unavoidable, compensation may be required.

Local Development Plan Policy

10.2.6 Local planning policy relevant to ecology and nature conservation is set out in the North Lincolnshire Core Strategy (part of the North Lincolnshire Local Development Framework), which was adopted in June 2011 and sets out a long-term vision for managing growth and development in the area up to 2026. Policies CS5, CS16, CS17 relate to the protection of biodiversity resources, the maintenance of wildlife networks and green corridors, and ensuring ecological enhancement through good design (Ref 10-10).

10.2.7 The North Lincolnshire Core Strategy largely replaced the North Lincolnshire Local Plan, which was adopted in 2003. A new single Local Plan is in the process of being prepared by North Lincolnshire Council to replace the current North Lincolnshire Local Plan, the Core Strategy and the Housing and Employment Land Allocations Development Plan Documents (DPDs). The options are currently out to consultation, with the current timetable for the agreement and adoption of the new Local Plan by 2020. The consultation process has been supported by a Habitats Regulations Assessment document as part of the supporting evidence for the options appraisal stage (Ref 10-11).

Other Guidance

10.2.8 In July 2012, the UK Post-2010 Biodiversity Framework was published (Ref 10-12). This covers the period 2011 - 2020 and forms the UK Government's response to the UN Convention on Biological Diversity held in Nagoya in 2010. Following publication of the Framework, most of the strategic biodiversity work previously enacted under the UK Biodiversity Action Plan (Ref 10-13) was delegated to each of the four countries comprising the United Kingdom of Great Britain and Northern Ireland. The Framework shows how the work of the four UK countries joins up to achieve the international biodiversity targets agreed under the UN Convention, as well those required under the European Union biodiversity strategy.

10.2.9 In England, the strategic approach to be taken in biodiversity planning over the period 2010 to 2020 is set out in '*Biodiversity 2020, A strategy for England's wildlife and ecosystem services*' (Ref 10-14). These country strategies replace the UK Biodiversity Action Plan, with the associated lists of priority habitats and species carried over into the newly defined lists of habitats and species of principal importance for nature conservation in England contained within Section 41 of the NERC Act. This latter list encompasses 56 habitats and 943 species.

10.2.10 The Local Biodiversity Action Plan (LBAP) for Lincolnshire (Ref 10-15) is a nature conservation strategy identifying threats to habitats and species within the county and setting out the actions necessary to conserve them through a series of Habitat Action Plans (HAPs) and Species Action Plans (SAPs).

10.2.11 Standing advice has been published by Natural England and Defra to guide decision-makers on the determination of proposals with the potential to affect designated sites, species and habitats. The guidance sets out responsibilities and minimum requirements for survey and mitigation, including the need to engage with objectives for no net loss of biodiversity and provision of biodiversity net gain.

10.3 Assessment Methodology and Significance Criteria

Consultation

10.3.1 Consultation undertaken during the preparation of this ES chapter, including a summary of comments raised via the formal Scoping Opinion (Appendix 1B: Scoping Opinion in ES Volume 3) and in response to the formal consultation, is summarised in Table 10.2.

Table 10.2. Consultation Summary

Consultee or organisation approached	Date and nature of consultation	Summary of Response	How comments have been addressed in this Chapter
North Lincolnshire Council	Response to SORL [31.01.18]	The applicant should provide the information 'reasonably required' for a Habitats Regulations Assessment	Report to inform HRA screening provided as Appendix 10B (ES Volume 3).
		Landscape and visual impacts will also need to be considered	Landscape and visual impacts addressed in Chapter 9: Landscape and Visual Impacts (ES Volume 1)
		The applicant has made appropriate proposals for further ecological surveys to be carried out in 2018	-
		If permission is ultimately granted, there will be a need to secure biodiversity enhancements in accordance with the National Planning Policy Framework.	Ecological enhancements included in Section 10.7

Assessment Methodology

10.3.2 The EclA detailed in this chapter has been undertaken in accordance with best practice guidance issued by the Chartered Institute of Ecology and Environmental Management (CIEEM) (Ref 10-16). Full details of the approach applied are provided in Appendix 10A: Preliminary Ecological Assessment Methodology (ES Volume 3), with an abridged overview provided below. The aims of the ecological impact assessment are to:

- Identify relevant ecological features (i.e. designated sites, habitats, species or ecosystems) which may be impacted as a consequence of the Proposed Development;
- Provide a scientifically rigorous and transparent assessment of the likely ecological impacts and resultant effects of the Proposed Development, which may be beneficial (i.e. positive) or adverse (i.e. negative);
- Facilitate scientifically rigorous and transparent determination of the consequences of the Proposed Development in terms of national, regional and local policies relevant to

nature conservation and biodiversity, where the level of detail provided is proportionate to the scale of the development and the complexity of its potential impacts; and

- Set out the steps to be taken to adhere to legal requirements relating to the relevant ecological features concerned.

10.3.3 The principal steps involved in the CIEEM approach can be summarised as:

- Ecological features that are both present and might be affected by the Proposed Development are identified (both those likely to be present at the time works begin, and for the sake of comparison, those predicted to be present at a set time in the future) through a combination of targeted desk-based study and field survey work, to determine the relevant baseline conditions;
- The importance of the identified ecological features is evaluated to place their relative biodiversity and nature conservation value into geographic context, and this is used to define the relevant ecological features that need to be considered further within the EcIA process;
- The changes or perturbations predicted to result as a consequence of the Proposed Development (i.e. the potential impacts), and which could potentially affect relevant ecological features are identified and their nature described. Established best-practice, legislative requirements or other incorporated design measures to minimise or avoid impacts are also described and are taken into account;
- The likely effects (beneficial or adverse) on relevant ecological features are then assessed, and where possible quantified;
- Measures to avoid or reduce any predicted significant effects, if possible, are then developed in conjunction with other elements of the design (including mitigation for other environmental disciplines). If necessary, measures to compensate for effects on features of nature conservation importance are also included;
- Any residual effects of the Proposed Development are reported; and
- Scope for ecological enhancement is considered.

10.3.4 It is not necessary in the assessment to address all habitats and species with potential to occur in the zone of influence of a proposed development. Instead, the focus should be on those that are *'relevant*'. CIEEM guidance (Ref 10-16) makes it clear that there is no need to 'carry out detailed assessment of ecological features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable'. This does not mean that efforts should not be made to safeguard wider biodiversity and requirements for this have been considered. National policy documents emphasise the need to achieve no net loss of biodiversity and enhancement of biodiversity.

10.3.5 To support focussed EcIA, there is a need to determine the scale at which the ecological features identified through the desk studies and field surveys undertaken for the Proposed Development are of value. The value of each ecological feature has been defined with reference to the geographical level at which it matters, and the results of this assessment have been used to identify the relevant features requiring impact assessment. The frames of reference used for this assessment, based on CIEEM guidance (Ref 10-16), are:

- International (generally this is within a European context, reflecting the general availability of good data to allow cross-comparison);
- National (Great Britain, but considering the potential for certain ecological features to be more notable (of higher value) in an England context relative to Great Britain as a whole);
- Regional (Lincolnshire/ Humberside);
- County (North Lincolnshire);

- District (East Lindsey);
- Local (ecological features that do not meet criteria for valuation at a District or higher level, but that have sufficient value to merit retention or mitigation); and
- Negligible (common and widespread ecological features of such low priority that they do not require retention or mitigation at the relevant location to otherwise maintain a favourable nature conservation status).

10.3.6 All ecological features of Local value and above have been taken forward to impact assessment, and are the '*relevant ecological features*' for the purposes of impact assessment.

10.3.7 In line with the CIEEM guidelines, the terminology used within the EcIA draws a clear distinction between the terms *'impact'* and *'effect'*. For the purposes of the EcIA, these terms are defined as follows:

- Impact – actions resulting in changes to an ecological feature. For example, demolition activities leading to the removal of a building utilised as a bat roost; and
- Effect – outcome resulting from an impact, acting upon the conservation status or structure and function of an ecological feature. For example, killing/injury of bats and reducing the availability of breeding habitat as a result of the loss of a bat roost may lead to an adverse effect on the conservation status of the population concerned.

10.3.8 When describing potential impacts (and where relevant the resultant effects) consideration is given to the following characteristics likely to influence this:

- Beneficial/adverse (i.e. is the change likely to be in accordance with nature conservation objectives and policy?):
  - Beneficial (i.e. positive) - a change that improves the quality of the environment, or halts or slows an existing decline in quality (e.g. increasing the extent of a habitat of conservation value); or
  - Adverse (i.e. negative) - a change that reduces the quality of the environment (e.g. destruction of habitat or increased noise disturbance).
- Magnitude - the *'size'*, *'amount'* or *'intensity'* of an impact - this is described on a quantitative basis where possible;
- Spatial extent - the spatial or geographical area or distance over which the impact/effect occurs;
- Duration - the time over which an impact is expected to last, prior to recovery or replacement of the resource or feature. Consideration has been given to how this duration relates to relevant ecological characteristics such as a species' lifecycle. However, it is not always appropriate to report the duration of impacts in these terms. The duration of an effect may be longer than the duration of an activity or impact;
- Reversibility (i.e. is the impact temporary or permanent?). A temporary impact is one from which recovery is possible or for which effective mitigation is both possible and enforceable. A permanent effect is one from which recovery is either not possible, or cannot be achieved within a reasonable timescale (in the context of the feature being assessed); and
- Timing and frequency (i.e. consideration of the point at which the impact occurs in relation to critical life-stages or seasons).

Significance Criteria

10.3.9 For each ecological feature only those characteristics relevant to understanding the ecological effect and determining the significance are described. The determination of the

significance of effects has been made based on the predicted effect on the structure and function, or conservation status, of relevant ecological features, as follows:

- Not significant - no effect on structure and function, or conservation status; and
- Significant - structure and function, or conservation status is affected.

10.3.10 For significant effects (both adverse and beneficial) this is qualified with reference to the geographic scale at which the effect is significant (e.g. an adverse effect significant at a national level).

10.3.11 The CIEEM approach described in Appendix 10A: Preliminary Ecological Assessment (ES Volume 3) broadly accords with the EIA methodology described in Chapter 2: Assessment Methodology of this ES. However, the matrix has not been used to classify effects, as this deviates from CIEEM guidance. In order to provide consistency of terminology in the final assessment, the findings of the CIEEM assessment have been translated into the classification of effects scale used in other chapters of the ES as outlined in Table 10.3 below.

Table 10.3. Relating CIEEM Assessment Terms to those used in other ES Chapters

Effect classification terminology used in other ES chapters		Equivalent CIEEM assessment
Significant (beneficial)	Major beneficial	Beneficial effect on structure/function or conservation status at regional, national or international level.
	Moderate beneficial	Beneficial effect on structure/function or conservation status at District or County level.
Non-significant	Minor beneficial	Beneficial effect on structure/function or conservation status at Site or Local level.
Non-significant	Neutral	No effect on structure/function or conservation status.
Non-significant	Minor adverse	Adverse effect on structure/function or conservation status at Site or Local level.
Significant (adverse)	Moderate adverse	Adverse effect on structure/function or conservation status at District or County level.
	Major adverse	Adverse effect on structure/function or conservation status at Regional, National or International level.

Extent of Study Area

10.3.12 The study areas used in this assessment were defined with reference to the likely zone of influence over which the Proposed Development may have potential to result in significant effects on relevant ecological features.

10.3.13 It is important to recognise that the potential zone of influence of the Proposed Development may vary over time (e.g. the construction zone of influence may differ from the operational zone of influence) and/or depending on the individual sensitivities of different ecological features.

10.3.14 This was taken into account when defining study areas and these are sufficient to address the potential worst case zone of influence of the Proposed Development on the relevant ecological features concerned.

10.3.15 The extent of the study areas applied during the desk study and field surveys are detailed within Table 10.4 and Table 10.5 below, and in Figure 2 of Appendix 10A.

Sources of Information

10.3.16 The ecological baseline has been determined through a combination of desk study and field survey, as summarised below.

Desk Study

10.3.17 A desk study was carried out to identify nature conservation designations and protected and notable habitats and species potentially relevant to the Proposed Development. The desk study was carried out using the data sources detailed in Table 10.4 and is reported in detail in the Preliminary Ecological Appraisal (PEA) report in Appendix 10A (ES Volume 3).

10.3.18 Protected and notable habitats and species include those listed under Schedules 1, 5 and 8 of the WCA (Ref 10-1), Schedules 2 and 4 of The Habitats Regulations (Ref 10-4), and species and habitats of principal importance for nature conservation in England listed under Section 41 (S41) of the NERC Act (Ref 10-3). Other notable habitats and species have also been considered and assessed on a case by case basis (e.g. those included in national Red Data Books and Lists and within the LBAP (Ref 10-15), but not protected by legislation). This is consistent with the requirements of relevant planning policy.

Table 10.4. Desk Study Area and Data Sources

Ecological Feature	Study Area[1]	Data Sources	Date Accessed
International statutory nature conservation designations (e.g. Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site)	10km	Multi-Agency Geographic Information for the Countryside (MAGIC) website	November 2017
National statutory nature conservation designations (e.g. Site of Special Scientific Interest (SSSI))	2km	MAGIC website Natural England website	November 2017
Local non-statutory nature conservation designations (e.g. Local Wildlife Sites (LWS))	1km	Greater Lincolnshire Nature Partnership	November 2017
Protected and notable habitats and species	1km	Greater Lincolnshire Nature Partnership	November 2017
Ponds	500m	1:25,000 Ordnance Survey maps Aerial photographs (Google Earth) MAGIC website	November 2017
Wintering birds	Fields to the east of Rosper Road	Able Marine Energy Park Development Consent Order – Environmental Statement (2012) Able UK Marsh Lane Car Storage Area – Ecological Survey reports (Planning ref: PA/2017/2141)	April 2018
Wintering birds	North Killingholme mudflats	British Trust for Ornithology (BTO) Wetland Birds Survey (WeBS) for Sector J	April 2018

Field Surveys

10.3.19 The scope of habitat and protected species survey work considered necessary to inform the EcIA is summarised in Table 10.5. This was determined through a PEA of the Site, as detailed within Appendix 10A: Preliminary Ecological Appraisal (ES Volume 3), which also includes the rationale applied when scoping out surveys for certain species or species groups.

10.3.20 The Phase 1 Habitat survey area encompassed all habitats within the Proposed Development boundary (referred to as 'the Site'), as well as land adjacent to the Site within the applicant's control. This included the substantial area of brownfield land between the Site and Rosper Road. This was because at the time at which the Phase 1 Habitat survey was undertaken, the location of the Proposed Development within the land under the applicant's control was not defined. This has meant that much of the baseline survey

[1] See Figure 2 in Appendix 10A: Preliminary Ecological Appraisal

information collected and presented within the PEA is outside the Site boundary, and is not directly relevant to the Proposed Development. This is clarified in the relevant baseline sections of this Chapter.

10.3.21 The southern section of the Site lies within the existing VPI Immingham CHP plant to facilitate the gas and electricity connections to the Proposed Development. These areas are entirely within the operational area of the VPI Immingham CHP plant and comprise only hardstanding and industrial infrastructure. Consequently, no ecology surveys were undertaken in these areas.

10.3.22 In addition to the surveys undertaken by AECOM, an initial walkover of the Site was undertaken in January 2017 by SLR Consulting on behalf of VPI Immingham (Ref 10-19), and SLR subsequently commissioned three months of wintering bird surveys undertaken by Graham Catley (Ref 10-20). As with the Phase 1 Habitat survey, the wintering bird survey area encompassed habitat within the Site boundary and the brownfield land between the Site and Rosper Road i.e. the land within the applicant's control.

10.3.23 Where surveys are due to be completed in the spring/ summer 2018 season (but which could not be completed in advance of the planning application submission) this is clarified in the baseline sections and in Table 10.5. A revised ES Ecology Chapter supported by all of the completed technical appendices will be issued to North Lincolnshire Council prior to the determination of the application.

Table 10.5. Scope and methods of ecological field survey work

Ecological Survey	Study Area[2]	Survey Method	Survey Period	Completed to date?
Site walkover and preliminary appraisal	Habitats within and adjacent to the Site boundary	Preliminary appraisal undertaken in accordance with CIEEM 2016 (Ref 10-16).	January 2017	✓
Wintering bird survey	Habitats within and adjacent to the Site boundary.	Monthly walked transect surveys between January and March 2017	January – March 2017	✓
Phase 1 Habitat survey	Habitats within the Site boundary and within 50m of the Site.	All habitats mapped in accordance with JNCC, 2010 (Ref 10-21)	September 2017 and March – May 2018.	✓
Badger survey	Suitable habitat for badger within 100m of the Site, where accessible.	Search of study area for badger field signs including setts, footprints and latrines.	September 2017	✓
Great crested newt survey	Ponds within 250m of the Site.	Habitat Suitability Index (HSI) appraisals of ponds in accordance with Oldham et al. 2000 (Ref 10-22). eDNA sampling undertaken in accordance with DEFRA guidance (Ref 10-23)	April 2018	✓
Reptile survey	Suitable habitat for reptiles within and adjacent to the Site.	Seven visits in suitable weather conditions using artificial refugia in accordance with standard guidance (Ref 10-24)	April – July 2018	×
Breeding bird survey	Suitable habitat for breeding birds within and adjacent to the Site.	Five walked transects covering all suitable potential nesting habitats based on standard guidance (Ref 10-25).	April – July 2018	×
Terrestrial invertebrate survey	All habitat within and adjacent to the Site boundary.	Three visits using various methodologies based on standard guidance (Ref 10-	May – July 2018	×

[2] See Figure 3 in Appendix 10A: Preliminary Ecological Appraisal

Ecological Survey	Study Area[2]	Survey Method	Survey Period	Completed to date?
		26).		
Botanical Survey	Habitat within and adjacent to the Site boundary	One visit in suitable weather conditions	May/ June 2018	×

10.3.24 The following ecology surveys were scoped out on the basis of habitat unsuitability following completion of the PEA (further justification is provided in the PEA in Appendix 10A):

- Further wintering bird surveys of the Site (SPA/ Ramsar species) - based on the habitat and topographical context of the Site, it is highly unlikely that the site would have a specific value for passage and wintering birds associated with the Humber Estuary SPA/ Ramsar. This was confirmed by the wintering bird surveys carried out on the Site in 2017 (Appendix 10D, Volume 3); the only waterfowl species that were recorded were snipe (*Gallinago gallinago*) and woodcock (*Scolopax rusticola*), which do not form part of the SPA/ Ramsar assemblage;
- Wintering bird surveys outside the Site (SPA/ Ramsar species) – fields to the east of Rosper Road have been recorded to support wintering bird species including those for which the SPA/ Ramsar is designated and may therefore be considered to be 'functionally linked' to the SPA/ Ramsar. No specific surveys of these fields were undertaken for the assessment, given that they are separated from the site by Rosper Road, and mitigation for loss of fields throughout the North Killingholme area has been agreed with the adoption of the South Humber Strategic Mitigation Strategy. However, desk study data from a planning application on adjacent plots was used, along with monitoring survey data from the fields obtained from the British Trust for Ornithology's annual Wetland Birds Survey (WeBS);
- Bats (roosting) - there is no habitat suitable for roosting bats within or adjacent to the Site boundary;
- Bats (foraging/ commuting) - habitats within the Site boundary are sub-optimal habitat for foraging/ commuting bats, due to its close proximity to the existing VPI Immingham CHP Plant and the expected high levels of nocturnal light emissions in the local area that may deter foraging bats. The habitat on site is also relatively isolated from other suitable bat foraging habitats by the surrounding industrial sites, which includes the VPI CHP Plant to the south, and Lindsey Oil Refinery to the west and north; and
- White-clawed crayfish (*Austropotamobius pallipes*) – the desk study indicated that this species was not present in the county, and the adjacent field drainage ditch does not provide any suitable habitat for crayfish.

10.3.25 Surveys for the following species will be undertaken prior to construction to determine the requirement for specific construction mitigation:

- Water vole (*Arvicola amphibius*) – the adjacent drainage ditch had been identified as being potentially suitable for this species at the PEA stage. However, the majority of the ditch and its banks will not be directly impacted by the Proposed Development because the gas/ electricity connection to the VPI Immingham CHP plant will be via an overbridge pipe-rack. Impacts on water vole associated with the construction of the drainage outfall are minor and temporary in nature, and will be managed through an appropriate mitigation strategy (either Precautionary Working Method Statement or Natural England licence) if water vole is confirmed as present; and
- Otter (*Lutra lutra*) – the presence of this species on the adjacent ditch is likely to be on a highly occasional and transitory basis only, and therefore the risk of disturbance to the species if present on passage would be negligible. There is no suitable habitat for otter holts or couches (lying-up sites) and therefore there is no risk of the drainage outfall pipe affecting breeding or resting otter. Impacts on otter associated with the

construction of the drainage outfall are minor and temporary in nature, and will be managed through appropriate PWMS if otter is confirmed as present.

Rochdale Envelope

10.3.26 For the purposes of the ecological impact assessment it is assumed that the majority of the Site would be cleared, no matter what the final sizing and layout of the structures is. The Rochdale Envelope parameters (i.e. the maximum parameters for the Proposed Development and in particular its main structures, see Chapter 4: Proposed Development of this ES for further information) therefore do not alter the parameters of the assessment of construction (or decommissioning) impacts on ecology, as they are by definition worst-case.

10.3.27 For the assessment of air quality impacts during operation (and thereby the effects reported on ecological receptors in this chapter), the worst-case configuration of engines, stack heights and stack locations has been assessed. The assessment of operational impacts presented in this chapter is therefore also based upon a worst-case scenario for Rochdale Envelope parameters.

10.3.28 Given the above, no further discussion of the Rochdale Envelope parameters is provided in this chapter.

Limitations

10.3.29 The Phase 1 Habitat survey was undertaken outside the optimal seasonal period for undertaking botanical surveys, and therefore some species may not have been readily identifiable. This gap will be addressed through the undertaking of further botanical surveys in spring/ summer 2018 to establish a detailed botanical baseline for the Site for evaluation against Local Wildlife Site selection criteria. However, for the purposes of scoping up further protected species surveys the Phase 1 Habitat survey is considered sufficiently robust because a scoping survey is not seasonally restricted.

10.3.30 The reptile surveys were extended beyond the Site boundary to include the brownfield land between the Site boundary and Rosper Road. Access restrictions for the placement of artificial refuges meant that reptile mats were not placed in areas within the operational LOR boundary. However, adjacent habitats were surveyed, and this is therefore not considered to represent a limitation to the effectiveness of the survey because the habitats were contiguous with those within the Site boundary.

10.4 Baseline Conditions

Existing Baseline

10.4.1 The ecological baseline relevant to the Proposed Development is summarised below. Further details of the findings of desk and field based studies, including evaluation of the relative nature conservation value of identified ecological features, are provided in Appendices 10A, 10C and 10D (ES Volume 3).

10.4.2 Further surveys for breeding birds, terrestrial invertebrates and reptiles are in the process of being undertaken throughout spring and summer 2018. A detailed botanical survey to facilitate screening of the brownfield OMH habitat against LWS selection criteria will be undertaken in late May/ early June 2018 when botanical species will be flowering.

Statutory International Nature Conservation Designations within 10km

10.4.3 The Humber Estuary is approximately 1.4 km north-east of the Site. The Estuary is designated as a Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site because of its estuarine and intertidal habitats that support internationally important populations of wintering birds (especially geese, ducks and waders) during the

migration periods and in winter. In summer, the Humber Estuary supports important breeding populations of bittern (*Botaurus stellaris*), marsh harrier (*Circus aeruginosus*), avocet (*Recurvirostra avosetta*) and little tern (*Sterna albifrons*). The marine species sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and grey seal (*Halichoerus grypus*) are also designated features of the SAC.

10.4.4 There are no other international nature conservation designations within a 10km radius of the Site, which is the worst-case zone of influence defined in Table 10.4. This search radius is sufficient to identify all designations relevant to the assessment of potential air quality impacts.

10.4.5 A signposting report to inform Habitats Regulations Assessment (HRA) screening of the Proposed Development is presented as Appendix 10B (ES Volume 3).

Statutory National Nature Conservation Designations within 2km

10.4.6 The Humber Estuary is also designated as a Site of Special Scientific Interest (SSSI), the boundary of which largely overlaps with the SPA, SAC and Ramsar designated site boundaries.

10.4.7 The North Killinghome Haven Pits SSSI, an important high tide roost for wading birds feeding in the Estuary, is approximately 2 km north of the Site.

Non-statutory Nature Conservation Designations within 1km

10.4.8 Three non-statutory designations (Local Wildlife Sites (LWSs)) are located within 1 km of the Site, as listed below. These are all of County nature conservation value:

- Burkinshaw's Covert LWS – 0.4 km north, comprises woodland and seasonally wet areas;
- Station Road Field LWS – 0.4 km north, predominantly grassland site with some botanical interest and a small area of wetland that supports farmland birds. Ponds on Site supported a GCN population in 2006; and
- Rosper Road Pools LWS – 0.6km south, an artificial flood relief reservoir (now largely overgrown with reeds) previously supporting breeding, wintering and migrant birds and water vole.

Habitats

10.4.9 The habitats associated with the Site are summarised below. Full results of the Phase 1 Habitat survey, including a Phase 1 habitat map, are provided in the PEA report (Appendix 10A, ES Volume 3). A detailed botanical species list will be provided once further survey work has been completed at the appropriate time of year.

10.4.10 The Site is set in a landscape dominated by the industrial areas of Lindsey Oil Refinery (LOR) and VPI Immingham CHP Plant, which are to the west and south of the Site respectively. Rosper Road lies to the east of the Site, beyond which are arable and improved grassland fields between the road and the Humber Estuary. The semi-natural habitat surrounding the Site is bisected by a series of man-made drains.

10.4.11 The majority of the Site was dominated by bare ground currently used as overspill car parking/ temporary storage area for the Lindsey Oil Refinery. The area was covered with crushed rubble substrate that had been installed to provide a hard standing platform for parking/ storage. This area is evaluated to have negligible ecological value and is not considered further.

10.4.12 The remainder of the Site was dominated by a mosaic of semi-improved neutral grassland and dense scrub that had colonised the previously disturbed ground used for the storage of material cleared from the relatively recently constructed LOR car park that lies to the immediate north of the Site. Consequently the habitat is undulating with vegetated mounds of rubble/ spoil. The grassland was typified by a rank unmanaged grass dominated sward

with locally abundant tufted hair-grass (*Deschampsia caespitosa*) indicating where ground is drainage impeded during the winter. The grassland was species poor and forb species included locally frequent teasel (*Dipsacus fullonum*), colt's-foot and creeping thistle (*Cirsium arvense*), with occasional fleabane (*Pulicaria dysenterica*) and rare wild carrot (*Daucus carota*).

10.4.13 Scattered willow (*Salix* spp.) and bramble (*Rubus fruticosus* agg.) dominated scrub was also present, mainly associated with the tall herb areas. A substantial area of bramble scrub had been previously cleared in the southern part of the Site, resulting in a large area of bare ground.

10.4.14 A man-made drainage ditch runs west to east in the central part of the Site, and drains surface water run-off from the temporary parking/ storage area to the north. The ditch was approximately 0.5m wide with a moderate flow, and was heavily silted. The ditch did not support any marginal or aquatic vegetation and is likely to dry out in the summer months.

10.4.15 There was one area of standing water within the Site boundary (Pond 6). This waterbody has developed in a shallow archaeological trial trench (50m x 2m) that was excavated as part of previous ground investigations on the land. The pond supported no aquatic or marginal vegetation and was turbid.

10.4.16 There were five other waterbodies (ponds) within 250m of the Site. Ponds 1 and 2 are seasonal ponded areas adjacent to Rosper Road, in the brownfield land to the east of the Site. These ponds supported vegetation that indicated they held water for much of the year, although seasonal drying (or a reduction in extent) in the summer months cannot be ruled out. Pond 1 supported a high emergent cover of common spike rush (*Eleocharis* sp.) with frequent bulrush (*Typha latifolia*) and rare grey club-rush (*Schoenoplectus tabernaemontani*) whereas Pond 2 was dominated by bulrush. Following a site visit in February 2018, it appeared that the separate 'ponds' identified in early autumn and reported in the PEA combine to form a large area of shallow ponded water throughout the winter and early spring months, covering most of the eastern part of the this area where drainage is impeded.

10.4.17 Pond 4 is a seasonal ponded area that has developed on an area of impeded drainage in the central portion of the brownfield land between the Site and Rosper Road. Pond 5 has developed in a second abandoned archaeological trial trench in this area, immediately east of the Site. These pools supported no aquatic or marginal vegetation, and are likely to regularly dry out in the summer months. A large drainage lagoon is present to the west of the Site (Pond 3). This is part of the LOR process facility, and as such has been scoped out of further surveys.

10.4.18 A substantial drainage ditch runs along the southern edge of the Site, and drains surface water from within the LOR. An outfall into the ditch from the LOR is present in the south-western corner of the Site. A surface water drainage ditch is also present alongside Rosper Road along the eastern boundary of the Site, but was found to be entirely dry at the time of the survey and does not appear to regularly hold water.

10.4.19 The habitat assemblage within the Site is considered to represent an example of the Open Mosaic Habitats (OMH) on Previously Developed Land priority habitat type. OMH is not a discrete habitat that can be mapped for the purposes of Phase 1 Habitat survey, but instead is a matrix derived from a variety of different habitat types and associated habitat and land-use features and characteristics, and edaphic conditions.

10.4.20 The OMH on site will be surveyed in late May/ early June 2018 when the majority of the botanical species present will be flowering, and will be screened against the LWS selection criteria.

Protected and Notable Species

10.4.21 No protected, rare or notable plant species were identified within the Site during Phase 1 Habitat surveys. No invasive, non-native plant species were identified within or directly adjacent to the Site.

10.4.22 The following protected and notable faunal species have been identified either as present in association with the Site, or potentially within the zone of influence of the Proposed Development:

- Wintering birds (on Site and in adjacent habitats);
- Breeding birds;
- Great crested newt;
- Reptiles;
- Otter;
- Water vole;
- Badger; and
- Terrestrial invertebrates.

Wintering Birds (Site)

10.4.23 Baseline information on wintering birds is presented in Appendix 10D in ES Volume 3.

10.4.24 The wintering bird survey of the Site and the brownfield land between the Site and Rosper Road recorded only common wintering passerine species. The only waterfowl species that were recorded were snipe (*Gallinago gallinago*) and woodcock (*Scolopax rusticola*), which do not form part of the Humber Estuary SPA/ Ramsar assemblage.

10.4.25 The undulating topography and tall vegetation within the Site boundary means that it is unsuitable to support aggregations of feeding and roosting/ loafing waders at high tide because there is insufficient 'scanning distance'. Flocks of waders and wildfowl prefer open and shorter-swarded habitat over which they can easily identify and thus escape from predators such as foxes and birds of prey. Similarly the small area of bare ground (temporary parking/ storage area) in the northern part of the Site is too enclosed by industrial buildings/ fences/ LOR infrastructure to be suitable for high tide feeding, roosting and loafing waders and wildfowl.

10.4.26 The Site is evaluated to be of negligible ecological value to wintering birds, and this ecology feature is not considered further in this assessment.

Wintering Birds (Rosper Road Fields)

10.4.27 The Proposed Development has the potential to have noise and visual impacts beyond the immediate Site boundary during construction, operation and decommissioning. The fields on the east side of Rosper Road to the Site (between Rosper Road and the Humber Estuary) have been subject to previous surveys to record wintering and passage waterbirds, because they provide high tide feeding, roosting and loafing habitat for waterbirds that are part of the Humber Estuary SPA/ Ramsar assemblage. These fields can therefore be considered to be 'functionally linked' to the SPA/ Ramsar[3] and within the potential zone of influence of the Proposed Development.

10.4.28 No specific surveys of the Rosper Road fields have been undertaken by AECOM to inform this assessment. This is because there are a large amount of wintering bird data for the fields from previous surveys including those undertaken as part of the DCO application for the consented Able Marine Energy Park (AMEP), and annual counts undertaken as part of the BTO WeBS. More recently, a wintering bird desk study exercise was completed by SLR

[3] Field reference numbers used in this assessment adopt the Humber EDC numbering system for consistency

Consulting as part of a planning application for a car storage area off Marsh Lane for Able UK (Ref 10-28; Planning Ref: PA/2017/2141).

10.4.29 The fields immediately east of the Proposed Development are within the boundary of the consented AMEP DCO. These fields have been found to numbers of feeding curlew in excess of 1% of the five year peak mean Humber Estuary population (this being the threshold for indicating higher value areas around the Estuary), but suitability is influenced by horse grazing and agricultural activities (Ref 10-28). Compensation for the loss of these fields was agreed with North Lincolnshire Council and Natural England to be provided at North Killingholme Marshes ('AMEP Mitigation Area A'), in fields east of Rosper Road to the south and east of the Proposed Development. This forms part of the South Humber Gateway (SHG) mitigation strategy that has been adopted in the Local Plan, which will deliver 80 ha of wet grassland (in four 20 ha blocks) with 150 m surrounding 'buffers' to facilitate HRA compliant development on coastal fields in the South Humber Gateway region.

10.4.30 The proposed Marsh Lane car storage area (Planning Ref: PA/2017/2141) would occupy fields to the south-east of the Site (on the eastern side of Rosper Road), which are currently within the consented AMEP Mitigation Area A. These fields were consented for the creation and management of wet grassland primarily for curlew, to be delivered as compensation for the AMEP development. Since the AMEP DCO was made, an application has been submitted by Able UK to North Lincolnshire Council to relocate Mitigation Area A to the 'Halton Marshes Wet Grassland Scheme (HMWGS)' on the north side of the AMEP development at East Halton Skitter. The HMWGS would deliver a single, larger area of wet grassland (with appropriate buffers) to compensate for the loss of high tide functional habitat in the Rosper Road fields resulting from the AMEP and Able Logistics Park (ALP) consented developments.

10.4.31 Given that the loss of these fields will be compensated for through consented developments (AMEP and ALP) by the delivery of either AMEP Mitigation Area A or HMWGS, it is not considered necessary to assess any potential indirect impact pathways through noise/ visual disturbance to these areas during construction of the Proposed Development. Any temporary displacement of birds from these fields during the construction of the Proposed Development needs to be considered in the context of consented development for the AMEP/ ALP schemes, otherwise there is a risk of double-counting impacts on any waterbirds utilising them. This source-receptor pathway has therefore been scoped out of the ecological impact assessment.

Wintering Birds (North Killingholme mudflats)

10.4.32 WeBS data obtained for the nearest count sector of the Humber Estuary SPA/ Ramsar site (Sector J) indicated that the mudflats at North Killingholme supported internationally important aggregates of black-tailed godwit (*Limosa limosa*), with numbers typically peaking in August/ September on autumn passage, and in November for the wintering period. The nearest part of the intertidal mudflats on which this species feeds is approximately 1.3 km north-east of the Site. The black-tailed godwit flocks typically roost at high tide in the North Killingholme Haven Pits SSSI, which is approximately 1.9 km north of the Site.

10.4.33 The wintering bird assemblage of North Killingholme is therefore evaluated as being of International nature conservation value.

Breeding Birds

10.4.34 Breeding bird surveys are ongoing on the Site, and the results will be provided in an updated version of the ES. However, given the nature of the habitats on the Site, it is reasonable to expect that it will not support a particularly diverse or important assemblage of breeding species. On this basis, an initial evaluation of negligible nature conservation value has been assigned to the breeding bird assemblage and this ecology feature has not been taken forward for ecological impact assessment.

Great Crested Newt

10.4.35 Further details on the GCN survey and pond habitat suitability appraisal are provided in Appendix 10C: Great Crested Newt Survey (ES Volume 3). The pond locations are shown in Figure 3 in Appendix 10A: Preliminary Ecological Appraisal

10.4.36 GCN surveys undertaken for the consented AMEP development recorded a medium sized GCN population in two ponds in a field off Station Road ('Pond 12' at TA 167 181 and 'Pond 13' at TA 168 182) (Ref 10-27). These ponds were 0.6 km and 0.7 km north of the Site respectively. A GCN mitigation licence was obtained for the AMEP development (Natural England licence number: 2014-1559-EPS-MIT), which included for the capture and translocation of GCN to a new receptor area comprising six new ponds at 'Mitigation Area B'. This is a small triangular portion of land off Rosper Road adjacent to Chase Hill Wood, approximately 1.5 km north of the Site. The original GCN ponds have been subsequently lost to the AMEP development, translocation of GCN completed and the compensation habitat delivered at Mitigation Area B. However, this information indicated that populations of GCN are known in the wider local area.

10.4.37 One waterbody is present within the Site boundary (Pond 6), and five waterbodies were identified within 250m of the Site boundary (Ponds 1, 2, 3, 4 and 5). Of these, Ponds 1 and 2 were subject to an environmental DNA (eDNA) survey in spring 2016 by SLR for the Marsh Lane car storage application (Ref 10-28), which returned a negative result for GCN[4]. Ponds 4, 5 and 6 were subject to eDNA sampling in April 2018, and samples were also taken from Ponds 1 and 2 to update the 2016 survey. The results are given in Table 10-6 below.

10.4.38 Pond 3 is a square water storage lagoon, which is linked to the process facility of the LOR (it is a settling pond for contaminated run-off), and as such is contaminated and thus unsuitable for GCN. This pond was therefore scoped out of further surveys for GCN and was not subject to sampling

Table 10.6. GCN eDNA Survey Results

Pond Reference	Pond Type	Grid Reference	Distance from Site	HSI Score	eDNA Sampling Result
1	Flooded part of site	TA 167 175	40m south	Excellent	Negative
2	Flooded part of site	TA 168 174	70m south	Good	Negative
3	LOR process lagoon	TA 164 173	40m west	Not surveyed	
4	Flooded part of the site	TA 166 174	10 m south	Average	Negative
5	Flooded archaeology trial trench	TA 166 174	40m south	Below average	Negative
6	Flooded archaeology trial trench	TA 165 173	Within Site boundary	Poor	Negative

10.4.39 The eDNA samples were taken by a licensed AECOM ecologist on 16th April 2018, and all samples returned a negative result for GCN. No further consideration is therefore given to GCN in this assessment.

[4] N.B. Only one waterbody (P3) is referred to in the SLR report; however the nature of the wetland means that it is difficult to distinguish between specific 'ponds' because the whole area holds standing water.

Reptiles

10.4.40 Reptile surveys are ongoing within the Site and will be reported in an updated revised version of the ES when completed. The habitats within the Site boundary have been appraised as being of potential suitability for grass snake (*Natrix natrix*) and common lizard (*Zootoca vivipara*).

Otter

10.4.41 The surface water drainage ditch to the south of the Site was heavily shaded, and provides poor quality foraging habitat for otter. Given that this species is known to be present in the wider area and Humber Estuary, its occasional presence on passage cannot be ruled out, although the ditch is poorly connected to the wider ditch network and Humber Estuary due to extensive culverting. Passage otter is evaluated as being of negligible nature conservation value, and is not considered further in this assessment.

Water Vole

10.4.42 The surface water drainage ditch to the south of the Site was heavily shaded, supports virtually no aquatic or marginal plant species and provides poor quality habitat for water vole. However, given that this species is known to be present on ditches in the wider local area, it may be present on occasion although the ditch is poorly connected to the wider ditch network due to extensive culverting. Water vole is evaluated as being of Local nature conservation value.

Terrestrial Invertebrates

10.4.43 Terrestrial invertebrate surveys are ongoing within the Site and will be reported in an updated revised version of the ES when completed.

Brown Hare

10.4.44 No brown hares (*Lepus europaeus*) have been observed on the Site during the course of other ecological surveys. The arable habitats on the east side of Rosper Road do provide suitable habitat for this species, although there are no records of the species in ecology survey reports for the AMEP development (consented) or the Able UK car storage area off Marsh Lane (currently in consultation phase). The habitat within the Site boundary provides limited opportunities for brown hare breeding, with much of the site being marshy/ wet due to impeded grassland. The Site is also relatively isolated within the surrounding industrial area including LOR to the west and the VPI Immingham CHP plant to the south. On this basis, it is reasonable to assume that brown hare is not resident within the Site boundary, and it is not considered further in this assessment.

Badger

10.4.45 No evidence of badger (*Meles meles*) was identified within the Site boundary. The Site is entirely surrounded by industrial areas associated with the Lindsey Oil Refinery to the north and west, and the VPI Immingham CHP plant to the south, as well as Rosper Road to the east. It is therefore highly unlikely that the species forages on the Site. This species is assumed to be absent from the Site and is therefore not considered further in this assessment.

Summary of Baseline

10.4.46 A summary of the baseline ecology conditions at the Site is provided in Table 10.7 below. As discussed in the methods section, all ecology features valued at local level or above have been taken forward for impact assessment.

Table 10.7. Summary of Baseline Ecology Features

Ecology Feature	Nature Conservation Value	Justification	Taken forward for Assessment?
Humber Estuary SAC/ SPA/ Ramsar/ SSSI	International	Site supports qualifying features under the relevant EC Directives that are of international importance.	Yes – potential for direct and indirect effects on habitats and qualifying features
Burkinshaw's Covert LWS	County	Site meets the criteria for habitats/ features of county importance.	Yes – potential for direct effects on habitats
Station Road Field LWS	County	Site meets the criteria for habitats/ features of county importance.	Yes – potential for direct effects on habitats
Rosper Road Pools LWS	County	Site meets the criteria for habitats/ features of county importance.	Yes – potential for direct effects on habitats
Open Mosaic Habitats on Previously Developed Land (OMH)	Local/ District	Further surveys will be undertaken in late May/ early June to establish a detailed species list and to screen the habitats against the Lincolnshire LWS selection criteria to assist with the evaluation of the Site's nature conservation value.	Yes – habitats will be lost to Proposed Development
Ponds	Negligible	The ephemeral waterbodies are seasonal in nature and do not support any protected species of amphibians. They dry out in the summer months, and are in the process of natural succession to permanently dry grassland habitats.	No
Wintering birds	Negligible	Habitats on site are unsuitable for important aggregations of wintering/ passage birds including those that are the qualifying features of the Humber Estuary SPA/ Ramsar wintering assemblage.	No
Breeding birds	Negligible	Although surveys are yet to be complete, it is considered unlikely that the habitats present on the site will support anything other than common and widespread breeding bird species.	No
Otter	Local	May be present on an occasional and transitory basis in the surface water drainage ditch to the south, but this is not well connected to the surrounding ditch network (and Estuary) due to culverting.	No
Water vole	Local	May be present on drainage ditch.	Yes – potential for direct and indirect effects on habitats
Reptiles	To be confirmed	Surveys ongoing throughout spring 2018 and will be reported in an updated version of the ES.	To be confirmed
Notable invertebrates	To be confirmed	Surveys ongoing throughout spring 2018 and will be reported in an updated version of the ES.	To be confirmed
Brown hare	Absent	-	-
Badger	Absent	-	-

Future Baseline

No Development (2019/Q2 2020)

10.4.47 It is reasonable to assume that over this timeframe the open rank grassland areas will have naturally shifted to a more scrub dominant habitat as the willow continues to establish. The

swamp/ ephemeral pooled areas would be expected to become drier as a result of the accumulation and establishment of emergent/ aquatic plants and the subsequent natural succession of the wetland habitats to grassland. However, over the short timescales considered as part of the future baseline, it is reasonable to conclude that there would not be any substantive changes in the extent of standing water on the Site.

10.4.48 The succession of the barer ground to grassland would likely reduce the mosaic nature of the Site, and would lead to a corresponding decline in the ecological value of the open mosaic habitat as is the transitory nature of previously disturbed 'brownfield sites'. However, again over this short timeframe no material changes in the habitat would be expected.

10.5 Development Design and Impact Avoidance

10.5.1 The design process for the Proposed Development has included consideration of ecological constraints and has incorporated, where possible, measures to reduce the potential for adverse ecological effects, in accordance with the 'mitigation hierarchy' and relevant planning policy. The measures identified and adopted include those that are inherent to the design of the Proposed Development, and those that can realistically be expected to be applied as part of construction environmental best practice, or as a result of legislative requirements.

10.5.2 The development design and impact avoidance measures have been, or would be, adopted during the construction, operation and decommissioning phases of the Proposed Development. These are set out below.

Construction

10.5.3 The construction phase of the Proposed Development will comply with industry good practice and environmental protection legislation during construction in relation to prevention of surface and ground water pollution, fugitive dust management and noise prevention or amelioration. In support of this, the construction contractor would prepare and implement a Construction Environmental Management Plan (CEMP) detailing all requirements for environmental protection and legal compliance.

10.5.4 The Proposed Development will not result in any direct impacts on the drainage ditch to the south of the Site that will provide the connection to the VPI CHP site to the south. This may include an section of above ground pipeline to pass over the existing services, drainage ditch and roadway bordering the Site.

10.5.5 To ensure legislative compliance in relation to nesting birds, all clearance of suitable vegetation during site preparation would be undertaken outside the breeding season (typically March-August inclusive for most species), where possible. In situations where this is not possible, an ecologist would check the working area for nests before works commence. If nests were discovered, appropriate mitigation would be implemented to ensure that they are not disturbed or destroyed before any works can commence in that area. This would include imposing exclusion zones between the works and nest(s) and suspending vegetation clearance works within the area until any young had fledged.

10.5.6 Precautionary measures would be implemented to prevent trapping wildlife in construction excavations, in order to ensure compliance with animal welfare legislation. Any excavations deeper than 1m would be covered overnight, or where this is not practicable, a means of escape would be fitted (e.g. battered soil slope or scaffold plank), to allow animals (e.g. otter) to vacate excavations should they fall in.

10.5.7 Construction temporary lighting would be arranged so that glare is minimised outside the construction site. Measures to minimise the impact of lighting will be detailed in the CEMP.

10.5.8 The drainage network for the Proposed Development will likely require the construction of an outfall pipe (and associated headwall structure) into the drainage ditch to the south of the Proposed Development. A precautionary pre-construction survey of the ditch for water vole and otter will therefore be undertaken at least 3 months prior to the commencement of works to determine whether specific mitigation for this species is required. In the event that water vole presence is confirmed, mitigation will include displacement of the species from the small area to be affected under a Precautionary Working Method Statement (PWMS) or specific licence from Natural England, whichever approach is deemed necessary for compliance with the legislative protection afforded to this species.

Operation

10.5.9 Lighting impacts beyond the Site boundary would be minimised as far as possible, for example by directing lighting away from adjacent habitats, in accordance with the lighting design for the scheme.

10.5.10 Air impacts on designated sites will be minimised through the use of appropriate stack heights to aid dispersion of pollutants and emissions monitoring to demonstrate continued compliance with emission limit values set by the Environment Agency.

10.5.11 Surface water discharge would be attenuated to green-field run-off rates and therefore there would be no changes in the flow rate within the adjacent drainage ditch. There is therefore no potential for adverse operational effects on the ditch habitats and the species it may support (otter and water vole).

Decommissioning

10.5.12 Further site surveys would be undertaken in advance of decommissioning works, to determine the status of protected species and to evaluate the habitats present that may be impacted. Relevant avoidance and mitigation measures would be specified and implemented with reference to the findings of the above surveys.

10.5.13 The following measures, would be implemented as appropriate:

- Survey findings and associated mitigation requirements would be discussed and agreed with stakeholders as required prior to the start of works;
- Relevant stand-off working distances would be identified by the project ecologist and implemented to avoid effects, where practicable;
- All necessary protected species licences would be obtained to derogate unavoidable impacts on relevant protected species. Mitigation and monitoring would be implemented in accordance with the requirements of the relevant licences;
- Works would be planned to avoid key risk periods (seasons) where appropriate and practicable; and
- Relevant works would be undertaken under the supervision of an Ecological Clerk of Works to deliver compliance with relevant legislation and approved mitigation.

10.6 Likely Impacts and Effects

Construction

10.6.1 This section describes the impacts and potential effects during the construction phase of the Proposed Development on relevant ecological features in the absence of any mitigation, over and above that which is inherent to the design (as described in Section 10.5).

10.6.2 To enable a focussed impact assessment, screening was undertaken of potential impacts of the construction phase that are likely to result in adverse or beneficial effects on relevant ecological features and that require further impact assessment. The relevant impacts are taken forward in the more detailed impact assessment that follows. Those impacts that are considered unlikely to result in effects are scoped out and not considered further.

10.6.3 The following broad categories of impact and their potential effects on ecological features were used for the purposes of the screening exercise:

- Habitat loss - clearance or damage of habitat to facilitate construction, resulting in temporary or permanent reduction in habitat extent and potential direct and indirect effects on associated species; and
- Disturbance - increased levels of disturbance (noise, vibration, lighting), potentially resulting in adverse effects on protected and notable species.

10.6.4 The following potential source-receptor pathways have been screened out of the impact assessment in respect of the Humber Estuary designated site:

- Noise/ visual disturbance to qualifying breeding bird species (bittern, marsh harrier, avocet and little tern) - there is no suitable habitat for the qualifying species of breeding birds within the potential zone of influence of noise and visual disturbance arising from the construction of the Proposed Development. There is therefore no pathway by which these features could be affected by the Proposed Development; and
- Air quality impacts on intertidal and subtidal habitats – intertidal habitats are not susceptible to the effects of changes in air quality arising from construction (through dust deposition and smothering of habitats) because of their regular tidal inundation. Subtidal habitats have similarly been scoped out.

10.6.5 Impacts during the construction period that have potential to result in significant effects on relevant ecological features, and which were screened into the impact assessment are considered further below:

- Potential effects on Humber Estuary SAC/ SPA/ Ramsar/ SSSI (potential changes in air quality, noise and visual disturbance and surface water pollution);
- Potential effects on North Killingholme Haven Pits SSSI (potential noise and visual disturbance);
- Potential effects on Local Wildlife Sites (potential changes in air quality);
- Loss of open mosaic habitat;
- Potential effects on reptiles (loss of habitat);
- Potential effects on otter (loss/ damage to habitat, noise and visual disturbance); and
- Potential effects on water vole (loss/ damage to habitat, noise and visual disturbance).

Potential Effects on Humber Estuary SAC/ SPA/ Ramsar/ SSSI

Fugitive Dust Emissions Resulting in Smothering of Habitats

10.6.6 For designated habitats above mean high water, or terrestrial habitats, given the distance between the Proposed Development and the Humber Estuary SAC/ SPA/ Ramsar/ SSSI, and taking into account the implementation of best practice during construction to minimise fugitive dust emissions, it is concluded that the Proposed Development would not impact upon them through this pathway.

Noise and Visual Disturbance to Qualifying Wintering Bird Assemblage

10.6.7 The nature and scale of the Proposed Development is similar to the surrounding industrial areas, which includes the operational Lindsey Oil Refinery and VPI Immingham CHP plant. It is therefore reasonable to assume that any SPA/ Ramsar waterbirds roosting/ loafing/

foraging in fields on the east side of Rosper Road are habituated to the industrial nature of the surrounding area such that they would not be adversely affected, for example; construction work of a similar scale is currently ongoing at VPI Immingham's CHP plant, which lies immediately to the south of the Site.

10.6.8 Noise and visual disturbance associated with the construction of the Proposed Development is therefore assessed as giving rise to a neutral effect on the qualifying wintering bird assemblage of the Humber Estuary SPA/ Ramsar.

Surface Water Pollution to Habitats Supporting Marine Species

10.6.9 Potential pollution (with sediment or contaminants) arising from surface water run-off from within the Site during construction will be controlled through the adoption of best practice construction methods to meet environmental requirements. Impacts to the adjacent drainage ditch as part of the surface water drainage network for the Proposed Development will be similarly controlled. These measures will be detailed in the CEMP.

10.6.10 It is reasonable to conclude that, with these measures in place, there is no surface water pathway by which the Proposed Development could impact on the Humber Estuary SAC/ SPA/ Ramsar/ SSSI designated habitats, and the ecology features they support (sea lamprey, river lamprey and grey seal).

Potential Effects on North Killingholme Haven Pits SSSI

Noise and Visual Disturbance to Wintering Bird Assemblage

10.6.11 Given the distance between the Proposed Development and SSSI, and the intervening industrial areas (including the car storage areas at Able's Humber Port), it is reasonable to assume that noise and visual disturbance arising from the construction of the Site would not affect the wintering bird assemblage.

Potential Effects on Local Wildlife Sites

10.6.12 There is no potential for adverse effects to the three LWSs identified within the potential zone of influence of the Proposed Development; Burkinshaw's Covert, Station Road Field and Rosper Road Pools. Embedded mitigation for the construction phase will ensure that there is no potential for dust smothering to vegetation as a result of fugitive dust emissions. Similarly, there is no potential for light spillage onto the woodland habitat to the north associated with Burkinshaw's Covert LWS, which may support nocturnal foraging species such as owls and badgers, given that it is 0.4 km from the Site boundary.

10.6.13 There is no hydrological connectivity between the Site and Rosper Road Pools LWS, which lies on the opposite side of Rosper Road to the Site. There are therefore no pathways by which the water quality or hydrological regime of the LWS could be affected by the construction of the Proposed Development.

Loss of OMH

10.6.14 Construction of the Proposed Development would result in the permanent and irreversible loss of approximately 1.3 ha of OMH.

10.6.15 A detailed evaluation of this habitat has not been undertaken to date because further botanical survey work is necessary to gather detailed baseline information for screening against the county LWS selection criteria for OMH (and thus to establish whether the habitat meets the criteria for being of Local, District or County nature conservation value).

Potential Effects on Reptiles

10.6.16 In the event that populations of reptiles are identified within the Site boundary, it will be necessary to adopt appropriate mitigation to minimise the risk of killing/ injury of reptiles during site clearance works for legislative compliance.

10.6.17 In the absence of mitigation, there is a risk of killing/ injury of reptiles and loss of habitat potentially resulting in a local contraction in range and population size. This would be assessed to result in a minor adverse effect on reptiles, significant at the Site level only.

Potential Effects on Otter

Loss/ Damage to Habitat

10.6.18 There will be direct impacts on the ditch running along the southern boundary of the Site that may be used on occasion by foraging and passage otter, as a result of the construction of a drainage outfall as part of the surface water drainage network for the Proposed Development. The exact location of the outfall is yet to be determined, but regardless the impacts on the ditch banks would be expected to be negligible in magnitude and affect only a short stretch of the ditch (c. 2–3 m). There is no suitable habitat for otter holts or couches (lying-up sites) and therefore there is no risk of the drainage outfall pipe affecting breeding or resting otter.

Noise and Visual Disturbance

10.6.19 There is the potential for noise/ visual disturbance during the construction phase. However, given the industrial nature of the surrounding land use which includes an operational VPI CHP plant and the LOR, it is reasonable to assume that otters foraging on ditches in this area would be habituated to current operational activity. It is assessed that construction noise would give rise to neutral effects on foraging/ passage otter.

10.6.20 Embedded mitigation to control surface water run-off during construction will ensure that there is negligible potential for any pollution to habitats that may be used by foraging/ passage otter.

Potential Effects on Water Vole

Loss/ Damage to Habitat

10.6.21 There will be direct impacts on the ditch running along the southern boundary of the Site that may support water vole, as a result of the construction of a drainage outfall as part of the surface water drainage network for the Proposed Development. The exact location of the outfall is yet to be determined, but regardless the impacts on the ditch banks would be expected to be negligible in magnitude and affect only a short stretch of the ditch (c. 2 – 3 m). Any minor habitat losses associated with the ditch would not reasonably be expected to adversely affect water vole given the embedded mitigation proposed in the event that the species is present. The effect is therefore assessed as neutral and not significant.

Noise and Visual Disturbance

10.6.22 There is the potential for noise/ visual disturbance during the construction phase. However, given the industrial nature of the surrounding land use which includes an operational VPI CHP plant and the Lindsey Oil Refinery, it is reasonable to assume that water voles resident on ditches in this area would be habituated to current operational activity. It is assessed that construction noise would give rise to neutral effects on water voles.

Operation

10.6.23 This section describes the impacts and potential effects during the operational phase of the Proposed Development on relevant ecological features, in the absence of any mitigation over and above that which is inherent to the design (as described in Section 10.5).

10.6.24 Potential impacts during the operational phase that could result in effects on ecological features are as follows:

- Air quality impacts - air pollution from stack emissions, potentially leading to adverse effects on sensitive habitats, through increased nitrogen and acid deposition; and

- Disturbance impacts - increased levels of disturbance (noise, vibration, artificial lighting), potentially resulting in adverse effects on ecological features.

10.6.25 The following potential source-receptor pathways have been scoped out of the impact assessment in respect of the Humber Estuary designated site:

- Noise/ visual disturbance to qualifying breeding bird species (bittern, marsh harrier, avocet and little tern) - there is no suitable habitat for the qualifying species of breeding birds within the potential zone of influence of noise and visual disturbance arising from the operation of the Proposed Development. There is therefore no pathway by which these features could be affected by the Proposed Development.
- Air quality impacts on intertidal and subtidal habitats – intertidal habitats are not susceptible to the effects of changes in air quality (e.g. deposition of nitrogen) because of their regular tidal inundation. Subtidal habitats have similarly been scoped out.

Potential Effects on Humber Estuary SAC/ SPA/ Ramsar/ SSSI

Air Quality Impacts on Habitats

10.6.26 An air quality impact assessment has been undertaken and is presented in Chapter 7: Air Quality (ES Volume 1). The proposed stack heights assessed have been based on the standard offerings under consideration, and are considered to be the lowest stack heights that would be applied to the plant (10m), and therefore would result in the worst case impacts. If higher stack heights are employed in the final design, these will improve the dispersion of emissions and therefore reduce the impacts over those presented in this assessment.

10.6.27 The Power Station is not designed to operate continuously, but to run intermittently to provide power for periods of peak electricity demand. It is therefore not possible to specify which hours of the year the plant will operate. The method by which this is taken into account in the dispersion modelling is dependent on the metric being assessed i.e. annual, daily, 8-hour or hourly mean concentrations.

10.6.28 There are two measures of particular relevance in when considering the potential for significant effects on habitats to result from changes in air quality arising from the Proposed Development. The first is the concentration of oxides of nitrogen (known as NO_x) in the atmosphere. The main importance is as a source of nitrogen (N), which is then deposited on adjacent habitats either directly (known as dry deposition, including directly onto the plants themselves) or washed out in rainfall (known as wet deposition). The deposited nitrogen can then have a range of effects, primarily growth stimulation or inhibition, but also biochemical and physiological effects such as changes to chlorophyll content. NOx may also have some effects which are un-related to its role in total nitrogen intake (such as the acidity of the gas potentially affecting lipid biosynthesis) but the evidence for these effects is limited and they do not appear to occur until high annual concentrations of NOx are reached.

10.6.29 The guideline atmospheric concentration of NO_x advocated by Government for the protection of vegetation is 30 micrograms per cubic metre (μgm^{-3}), known as the Critical Level (Ref 10-29). This is driven by the role of NOx in N deposition and in particular in growth stimulation and inhibition. If the total NOx concentration in a given area is below the critical level, it is unlikely that N deposition will be an issue, unless there are other sources of nitrogen (e.g. ammonia). If it is above the critical level then local N deposition from NOx could be an issue and should be investigated.

10.6.30 The second important metric is a direct determination of the rate of the resulting N deposition, which is habitat specific because different habitats have varying tolerance to nitrogen. For many habitats there are measurable effects in the form of published dose-response relationships for N deposition, which do not exist for NO_x. Unlike NO_x, the N deposition rate below which current evidence suggests that effects should not arise is different for each habitat. The rate (known as the Critical Load) is provided on the UK Air Pollution Information System website (www.apis.ac.uk) and is expressed as a quantity

(kilograms) of nitrogen over a given area (hectare) per year (kg N/ha/yr). More recently, there has also been research compiled that investigates N dose-response relationships in a range of habitats (Ref 10-29).

10.6.31 For completeness, rates of acid deposition were also calculated. Acid deposition derives from both sulphur and nitrogen. It is expressed in terms of kiloequivalents (keq) per hectare per year. The thresholds against which acid deposition is assessed are referred to as the Critical Load Function.

10.6.32 The air quality impact assessment has concluded that the process contribution resulting from the maximum annual mean NOx emissions from the stack is no greater than 1% of the critical level for the Humber Estuary SAC/ SPA/ Ramsar. This does not therefore exceed the threshold at which an adverse effect on the designated habitats (and therefore the species they support) would be reasonably expected to occur. It is therefore assessed that NOx emissions from the Proposed Development will result in a neutral effect on the Humber Estuary SPA/ SAC/ Ramsar/ SSSI that is not significant.

10.6.33 The air quality impact assessment has concluded that the annual N deposition rate (kg N/Ha/year) would be substantially below 1% of the critical load, and therefore well below the screening threshold at which adverse effects on habitats would be reasonably be expected to occur. It is therefore assessed that N deposition resulting from the Proposed Development will result in a neutral effect on the Humber Estuary SPA/ SAC/ Ramsar/ SSSI that is not significant.

10.6.34 For acid deposition (keq/Ha/year), similarly the air quality impact assessment identified that there would be no significant effects on the identified designated habitat types in the Humber Estuary (acid grassland, calcareous grassland and dwarf shrub heath).

Surface Water Pollution to Habitats Supporting Marine Species

10.6.35 Potential pollution (sediment or contaminants) arising from surface water run-off from within the Site during operation will be controlled through the drainage design. This is set out in Chapter 13: Surface Water, Flood Risk and Drainage (ES Volume 1).

10.6.36 There is therefore no surface water pathway by which the Proposed Development could impact on the Humber Estuary SAC/ SPA/ Ramsar/ SSSI designated habitats, and the ecology features they support (sea lamprey, river lamprey and grey seal).

Noise and Visual Disturbance to Qualifying Wintering Bird Assemblage

10.6.37 The nature and scale of the Proposed Development is similar to the surrounding industrial areas, which includes the operational Lindsey Oil Refinery and VPI CHP plant. It is therefore reasonable to assume that any SPA/ Ramsar waterbirds roosting/ loafing/ foraging in fields on the east side of Rosper Road are habituated to the industrial nature (and its associated noise and visual impact from chimney stacks, pipe racks, buildings etc.) of the surrounding area such that they would not be adversely affected. Noise and visual disturbance associated with the operation of the Proposed Development is therefore assessed as giving rise to a neutral effect on the qualifying wintering bird assemblage of the Humber Estuary SPA/ Ramsar.

Potential Effects on North Killingholme Haven Pits SSSI

Noise and Visual Disturbance to Wintering Bird Assemblage

10.6.38 Given the distance between the Proposed Development and SSSI, and the intervening industrial areas (including the car storage areas at Able's Humber Port), it is reasonable to assume that noise and visual disturbance arising from the operation of the Site would not affect the wintering bird assemblage.

Air Quality Impacts on Habitats

10.6.39 The air quality impact assessment has concluded that the process contribution resulting from the maximum annual mean NOx emissions from the stack is less than 1% of the critical level for North Killingholme Haven Pits SSSI. Similarly, the annual N deposition rate is substantially below the 1% of the critical load. The emissions therefore do not exceed the threshold at which an adverse effect on the SSSI designated habitats (and therefore the species they support) would be reasonably expected to occur. The habitats are not susceptible to acid deposition and therefore no assessment of this metric was undertaken.

10.6.40 It is assessed that NOx emissions and N deposition to the SSSI arising from the Proposed Development will result in a neutral effect on the North Killingholme Haven Pits SSSI, which is not significant.

Potential Effects on Local Wildlife Sites

10.6.41 The air quality impact assessment has considered potential air quality impacts arising from acid and nitrogen deposition from the stacks on the non-statutory sites identified within 1 km of the Site, although there are no baseline data for these sites as there are for the statutory designated sites. Various assumptions on the habitat types have therefore been made to inform the modelling process.

10.6.42 The closest LWS to the Proposed Development is Burkinshaw's Covert LWS is approximately 0.4 km north of the Site. The air quality impact assessment has concluded that even at the closest LWS receptor, the Proposed Development gives rise to a maximum of 2.4% of the annual mean critical level for atmospheric NO_x. This is assessed as an imperceptible change in the PEC and therefore the effect on the LWS habitats is assessed as neutral and not significant. For all other LWSs, the magnitude of change in atmospheric NO_x emissions is significantly lower and thus also assessed as resulting in a neutral effect on LWS habitats.

10.6.43 For N and acid deposition, no critical loads are defined for the LWS habitat types, and therefore no assessment of these metrics has been possible.

Potential Effects on Otter

10.6.44 There will be no direct impacts to the ditch running along the southern boundary of the Site that may be used on occasion by foraging and passage otter.

10.6.45 There is the potential for noise/ visual disturbance during the operational phase. However, given the industrial nature of the surrounding land use which includes an operational CHP plant and the Lindsey Oil Refinery, it is reasonable to assume that otters foraging on ditches in this area would be habituated to current operational activity. It is assessed that operational noise would give rise to neutral effects on foraging/ passage otter.

10.6.46 Embedded mitigation in the drainage design to control surface water run-off during operation will ensure that there is negligible potential for any pollution to habitats that may be used by foraging/ passage otter.

Potential Effects on Water Vole

10.6.47 There will be no direct impacts to the ditch running along the southern boundary of the Site that may support water vole.

10.6.48 There is the potential for noise/ visual disturbance during the operational phase. However, given the industrial nature of the surrounding land use which includes an operational CHP plant and the Lindsey Oil Refinery, it is reasonable to assume that water voles resident on ditches in this area would be habituated to current operational activity. It is assessed that operational noise would give rise to neutral effects on water voles.

10.6.49 Embedded mitigation in the drainage design to control surface water run-off during operation will ensure that there is negligible potential for any pollution to habitats that may be used by foraging/ passage water vole.

Decommissioning

10.6.50 Impacts associated with the decommissioning phase of the Proposed Development are likely to be of a similar nature to those associated with the construction phase and as a result the potential effects on ecological features are not anticipated to differ significantly from those predicted at construction. The extent of habitat loss that is likely to be required during decommissioning is likely to be much less than at construction, and the resulting effects on ecological features are therefore likely to be reduced. As described in Section 10.5, appropriate pre-works surveys and mitigation or impact avoidance measures will be implemented for the decommissioning phase as necessary.

10.7 Mitigation and Enhancement Measures

10.7.1 Should species of reptiles be identified within the Site boundary, a minor adverse effect on reptile populations at the Site is predicted during the construction phase. If reptiles are identified on Site, a Precautionary Working Method Statement (PWMS) would be prepared for the construction phase to avoid the killing/ injury of reptiles during initial site clearance works. This will involve a fenced capture and translocation of reptiles away from the working area (including permanent and temporary works).

10.7.2 Should the pre-construction survey for water vole identify the presence of this species, either a PWMS would be prepared or Natural England licence obtained, whichever is considered necessary to achieve legislative compliance in respect of this species. Given the limited impacts of the construction of the outfall and headwall in terms of magnitude and duration, it is reasonable to expect that mitigation can be implemented through a non-licensed PWMS rather than triggering the requirement for a Natural England licence, but this would be reviewed following the survey. Mitigation will involve the displacement of water voles from the affected section of bank, and micro-siting of the outfall to minimise impacts on existing burrows.

10.7.3 Mitigation for the loss of OMH habitat on the Site will be delivered through the creation and management of pockets of this habitat type in undeveloped areas of the Site. The management of these areas will maintain the brownfield habitat type, and will prevent the natural succession of the habitat to grassland as would otherwise occur on the OMH habitat currently present on Site. The remainder of the OMH habitat to the west of the Site will be retained.

10.7.4 In addition, the following habitat enhancements are proposed to meet the requirements of no net loss of biodiversity in the NPPF:

- Creation of log pile refuges in undeveloped parts of the Site (in the southern parts of the Site close to the ditch corridor) to create ecological niches for reptiles, amphibians and terrestrial invertebrates.
- Installation of bird nest boxes on buildings.
- Planting of native species of trees and berry-bearing shrubs to provide nesting opportunities for breeding birds, and sources of food for overwintering and passage birds.
- Creation of species-rich wildflower grassland on undeveloped areas of the Site.

10.7.5 A Biodiversity Enhancement and Management Plan (BEMP) will be prepared and agreed with the local planning authority prior to the commencement of works. The BEMP will include details on:

- Protected species mitigation;
- The location and planting specifications for habitat enhancements;
- The location and construction specifications for log pile refuges and bird nest boxes;
- Long-term management of the habitats; and
- Any post-construction protected species monitoring (if required); and
- Timetables and responsibilities for undertaking the above tasks.

10.8 Limitation or Difficulties

10.8.1 The completion of the EcIA has been limited by the availability of baseline ecology data due to the seasonal constraints associated with the undertaking of some protected species surveys. This was due to the timescale for the submission of the planning application for the Proposed Development. Further survey work will be completed throughout spring and summer 2018 and the results of these surveys will be published in a revised ES ecology chapter. However, it is not considered that the results of the surveys would result in material changes to the ecological impact assessment as presented in this EcIA.

10.9 Residual Effects and Conclusions

10.9.1 If reptiles are present, the implementation of appropriate mitigation through PWMS will ensure that there are no significant residual effects on this species.

10.9.2 No significant effects on other ecology features have been identified.

10.10 References

Ref 10-1 HM Government (1981) *Wildlife and Countryside Act 1981 (as amended).*

Ref 10-2 HM Government (2000) *Countryside and Rights of Way Act 2000 (as amended).*

Ref 10-3 HM Government (2006) *Natural Environment and Rural Communities Act 2006 (as amended).*

Ref 10-4 HM Government (2017) *The Conservation of Habitats and Species Regulations 2017.*

Ref 10-5 HM Government (1992) *Protection of Badgers Act 1992 (as amended).*

Ref 10-6 HM Government (2003) *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003.*

Ref 10-7 HM Government (2006) *Animal Welfare Act 2006.*

Ref 10-8 Department for Energy and Climate Change (2011) *National Policy Statement for Energy (EN-1).*

Ref 10-9 Department for Communities and Local Government (2012) *National Planning Policy Framework.*

Ref 10-10 North Lincolnshire Council (2011) *North Lincolnshire Local Development Framework - Core Strategy Adopted June 2011.*

Ref 10-11 JBA Consulting (2018) *North Lincolnshire Local Plan Issues & Options – Habitats Regulations Assessment Screening Report January 2018.* Prepared on behalf of North Lincolnshire Council by JBA Consulting, Doncaster.

Ref 10-12 Joint Nature Conservation Committee and Defra (2012) *UK Post-2010 Biodiversity Framework.*

Ref 10-13 Joint Nature Conservation Committee (1994) *UK Biodiversity Action Plan.*

Ref 10-14 Department for Environment, Food and Rural Affairs (2011) *Biodiversity 2020, A Strategy for England's Wildlife and Ecosystem Services.*

Ref 10-15 Lincolnshire Biodiversity Partnership (2011). *Lincolnshire Biodiversity Action Plan*.

Ref 10-16 CIEEM (2016) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, second Edition*. Chartered Institute of Ecology and Environmental Management, Winchester.

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Ref 10-19 SLR Consulting Ltd (2017) VPI Immingham Site Walkover – Phase 3 Consultancy Services. Prepared on behalf of VPI Immingham Ltd by SLR Consulting Ltd.

Ref 10-20 Catley, G. P. (2017) *Winter bird survey of designated land at North Killingholme January – March 2017*. Report prepared for VPI Immingham LLP.

Ref 10-21 Joint Nature Conservation Committee (JNCC) (2010) *Handbook for Phase 1 habitat survey – a technique for environmental audit*. JNCC, Peterborough

Ref 10-22 Oldham, R.S., Keeble, J., Awan, M.J.S. & Jeffcote, M. (2000) *Evaluating the suitability of habitat for the Great Crested Newt* (Triturus cristatus). Herpetological Journal 10 (4), 143 – 155.

Ref 10-23 Briggs, J., Ewald, N., Valentini, A., Gaboriaund, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. & Dunn, F. (2014) *Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt* (Triturus cristatus) *environmental DNA*. Freshwater Habitats Trust, Oxford

Ref 10-24 Froglife (1999) *Froglife Advice Sheet 10: reptile survey*. Froglife, Halesworth.

Ref 10-25 Marchant, J.H. (1983). *British Trust for Ornithology (BTO) Common Birds Census Instructions*. BTO, Tring.

Ref 10-26 Drake, C. M., Lott, D. A., Alexander, K. N. A., and Webb, J. (2007). Surveying terrestrial and freshwater invertebrates for conservation evaluation. Natural England Research

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Tables

11. Cultural Heritage

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) addresses the potential effects of the construction, operation and decommissioning of the proposed VPI-Immingham Energy Park 'A' (the Proposed Development) on cultural heritage.

11.1.2 The location, type and significance of cultural heritage assets and their setting is identified and the chapter reports on the predicted impacts of the Proposed Development on this resource and the likely significance of effect.

11.1.3 Heritage assets are defined within the National Planning Policy Framework (NPPF, Ref 11-1) as "A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest" (NPPF, Annex 2, Glossary). Heritage assets include those that are designated under legislation (such as listed buildings and scheduled monuments) as well as those that are non-designated. Non-designated heritage assets are assets that are considered to have a degree of local interest or significance usually recognised by Local Planning Authorities (LPA) either by their inclusion within the local Historic Environment Record (HER) or by local listing.

11.1.4 A study area for both designated and non-designated heritage assets has been identified, the resources within the area have been defined and the assessments of significance and setting are made with reference to both national and local plan policy, as well as Historic England guidance.

11.1.5 This Chapter is supported by Figures 11.1 and 11.2 (ES Volume 2) and Appendices 11A,B and C (ES Volume 3).

11.2 Legislation and Planning Policy Context

11.2.1 Relevant legislation considered as part of this cultural heritage assessment comprises the following:

- Ancient Monuments and Archaeological Areas Act 1979 (Ref 11-2);
- Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref 11-3); and
- Section 12 of the NPPF.

Legislation

The Ancient Monuments and Archaeological Areas Act 1979

11.2.2 The Act imposes a requirement for Scheduled Monument Consent for any works of demolition, repair, and alteration that might affect a Scheduled Monument. For non-designated archaeological assets, protection is afforded through the development management process as established both by the Town and Country Planning Act 1990 (Ref 11-4) and the NPPF.

The Planning (Listed Buildings and Conservation Areas) Act 1990

11.2.3 The Act sets out the principal statutory provisions which must be considered in the determination of any application affecting either listed buildings or conservation areas.

11.2.4 Section 66 of the Act states that in considering whether to grant planning permission for development which affects a listed building or its setting, the local planning authority or, as the case may be, the Secretary of State shall have special regard to the desirability of

preserving the building or its setting or any features of special architectural or historic interest which it possesses. By virtue of Section 1(5) of the Act a listed building includes any object or structure within its curtilage.

11.2.5 Recent case law makes it clear that the duty imposed in the Act means that in considering whether to grant permission for development that may cause harm (substantial or less than substantial) to a designated asset (listed building or conservation area) or its setting, the decision maker should give considerable importance and weight to the desirability of avoiding that harm. There is still a requirement for a planning balance, but it must be informed by the need to give that weight to the desirability of preserving the asset and its setting.

National Planning Policy

The National Planning Policy Framework

11.2.6 The NPPF establishes a set of core land-use planning principles that should underpin both plan-making and decision-taking. The conservation of heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations, is one of these core planning principles (paragraph 17). Section 12 of the NPPF sets out a series of policies that are a material consideration to be taken into account in development management decisions in relation to the heritage consent regimes established in the Ancient Monuments and Archaeological Areas Act 1979 and the Planning (Listed Buildings and Conservation Areas) Act 1990.

11.2.7 The NPPF sets out the importance of being able to assess the significance of heritage assets that may be affected by a development proposal. Significance is defined in Annex 2 as the value of an asset because of its heritage interest. This interest may be archaeological, architectural, artistic or historic and can extend to its setting. The setting of a heritage asset is defined in Annex 2 as "*the surroundings in which a heritage asset is experienced*". In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the asset's importance and no more than is sufficient to understand the potential impact of the proposal on their significance (paragraph 128). Similarly there is a requirement on local planning authorities to identify and assess the particular significance of any heritage asset that may be affected by a proposal; and that they should take this assessment into account when considering the impact of a proposal on a heritage asset (paragraph 129).

11.2.8 In determining planning applications, local planning authorities should take account of the following three points:

- The desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
- The positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
- The desirability of new development making a positive contribution to local character and distinctiveness (paragraph 131).

11.2.9 Paragraphs 132 to 134 of the NPPF introduce the concept that heritage assets can be harmed or lost through alteration or destruction or development within their setting. This harm ranges from less than substantial through to substantial. With regard to designated assets, paragraph 132 states that the more important the asset, the greater the weight should be on its conservation. Distinction is drawn between those assets of exceptional interest (e.g. grade I and grade II* listed buildings), and those of special interest (e.g. grade II listed buildings). Any harm or loss of heritage significance requires clear and convincing justification, and substantial harm or loss should be wholly exceptional with regard to those assets of greatest interest.

11.2.10 In instances where development would cause substantial harm to or total loss of significance of a designated asset consent should be refused unless that harm or loss is 'necessary to achieve substantial public benefits that outweigh that harm or loss' (para 133). In instances where development would cause less than substantial harm to the significance of a designated asset the harm should be weighed against the public benefits of the proposal including its optimum viable use (paragraph 134). In relation to non-designated assets a balanced judgment is required taking into account the scale of harm or loss and the significance of the asset (paragraph 135).

11.2.11 Guidance on the application of heritage policy within the NPPF is provided by on-line Planning Practice Guidance (Ref 11-5) and best practice advice is provided by a series of Historic England Advice notes (Ref 11-6 & 11-7).

Local Plan Policy

11.2.12 The North Lincolnshire Local Plan (Ref 11-8) has eight saved policies relating to heritage. Three cover conservation areas, three cover listed buildings and two relate to archaeology. These are as follows:

- HE2 – Developments occurring within Conservation Areas;
- HE3 – Demolition in Conservation Areas;
- HE4 – Development standards in Conservation Areas;
- HE5 – Developments affecting listed buildings;
- HE6 – Demolition of listed buildings;
- HE7 – Advertisements and listed buildings;
- HE8 – Ancient Monuments; and
- HE9 – Archaeological Evaluation.

Policy Guidance

11.2.13 The Planning Practice Guidance (PPG) is a government produced interactive on-line document that provides further advice and guidance that expands the policy outlined in the NPPF. It expands on terms such as 'significance' and its importance in decision making. The PPG clarifies that being able to properly assess the nature, extent and the importance of the significance of the heritage asset and the contribution of its setting, is very important to understanding the potential impact and acceptability of development proposals (Paragraph: 009).

11.2.14 The PPG states that in relation to setting a thorough assessment of the impact on setting needs to take in to account, and be proportionate to, the significance of the heritage asset under consideration and the degree to which proposed changes enhance or detract from that significance and the ability to appreciate it (Paragraph: 013).

11.2.15 The PPG usefully discusses how to assess if there is substantial harm. It states that what matters in assessing if a proposal causes substantial harm is the impact on the significance of the asset. It is the degree of harm to the asset's significance rather than the scale of the development that is to be assessed (Paragraph: 017). Generally harm to heritage assets can be avoided or minimised if proposals are based on a clear understanding of the heritage asset and its setting (Paragraph: 019).

11.2.16 The NPPF indicates that the degree of harm should be considered alongside any public benefits that can be delivered by development. The PPG states that these benefits should flow from the proposed development and should be of a nature and scale to be of benefit to the public and not just a private benefit and would include securing the optimum viable use of an asset in support of its long term conservation (Paragraph: 020).

Historic England Good Practice Advice Notes

11.2.17 Historic England have published a series of Good Practice Advice (GPA) of which those of most relevance to this appraisal are GPA2 Managing Significance in Decision-taking (March 2015) and GPA3 The Setting of Heritage Assets (December 2017).

11.2.18 GPA2 emphasises the importance of having a knowledge and understanding of the significance of heritage assets likely to be affected by the development and that the 'first step for all applicants is to understand the significance of any affected heritage asset and, if relevant the contribution of its setting to its significance' (paragraph 4). Early knowledge of this information is also useful to a local planning authority in pre-application engagement with an applicant and ultimately in decision making (paragraph 7).

11.2.19 GPA3 provides advice on the setting of heritage assets. Paragraph 8 sets out the extent of setting and that it cannot be definitively and permanently described as surroundings change over time. Historic England state that setting does not have a boundary and that setting is often expressed by reference to views, comprising the visual impression of an asset obtained from a variety of viewpoints. Paragraph 9 explains that setting is not an asset or a designation, rather its importance is in what it contributes to the significance of an asset and its appreciation is not dependent upon public access.

11.2.20 The relationship between setting and significance is set out in a series of bullets in GPA3 that cover change, the appreciation of setting and the setting of buried assets. Setting and significance are not dependent upon public access. Designed settings such as those associated with a historic park can be extensive and project beyond the core elements of the asset. Development within the setting of an asset can be beneficial; it can also be harmful and therefore needs careful assessment.

11.2.21 Historic England advocates a stepped approach to assessment:

- Stage 1: identify which heritage assets and their settings are affected;
- Stage 2: Assess the degree to which these settings and views make a contribution to the significance of the heritage asset or allow significance to be appreciated;
- Stage 3: Assess the effects of the proposed development, whether beneficial or harmful, on the significance or on the ability to appreciate it;
- Stage 4: Explore ways to maximise enhancement and avoid or minimise harm; and
- Stage 5: Make and document the decision and monitor outcome.

11.3 Assessment Methodology and Significance Criteria

11.3.1 This section of the assessment presents the following:

- Consultation with external parties;
- Identification of the information sources that have been consulted throughout preparation this chapter;
- The methodology behind the baseline assessment including the definition of an appropriate study area; and
- The methodology and terminology used in the assessment of effects.

Consultation

11.3.2 Consultation undertaken during the preparation of this ES chapter, including a summary of comments raised via the formal Scoping Opinion (Appendix 1B: Scoping Opinion in ES Volume 3) and in response to the formal consultation, is summarised in Table 11.1 below.

Table 11.1. Consultation Summary Table

Consultee or organisation approached	Date and nature of consultation	Summary of Response	How comments have been addressed in this Chapter
North Lincolnshire Council	Response to Scoping Report]	The cultural assessment will comprise desk-based research and a walkover survey.	The desk-based research is presented in section 9.4 above. A walkover survey was not undertaken due to disturbed nature of the Proposed Development's ground surface and a walkover survey was not considered beneficial. However, the site was visited by an archaeologist during monitoring of geotechnical investigation.
		Further archaeological field evaluation may be required prior to determination of any planning permission.	Geotechnical investigation was archaeologically monitored, following consultation with the North Lincolnshire Historic Environment Officer. The site had previously been subject to geophysical survey and evaluation excavation.
		The three listed lighthouses on the south Humber bank: These lighthouses are prominent in the landscape and have intervisibility with the application site…and the impact needs assessing to the methodology described in section 5.3 of the scoping report.	These lighthouses have been assessed in Section 9.6.

Data Sources

11.3.3 The following sources of information that define the Proposed Development have been reviewed and form the basis of the assessment of likely significant effects on Heritage:

- A search of the National Heritage List for England was undertaken to identify all designated heritage assets, including Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and Registered Battlefields;
- North Lincolnshire Historic Environment Record (HER) data;
- Information on locally listed buildings and conservation areas was obtained from North East Lincolnshire Council;

- North Lincolnshire Central Library, Scunthorpe to analyse historic mapping as well as local historical sources;
- Review and summery of previous work/reports; and
- The results of archaeological monitoring of geotechnical investigations.

11.3.4 Due to the disturbed nature of the Proposed Development ground surface, and archaeological walkover survey was not considered necessary. However, the site was visited by an archaeologist during the monitoring of the geotechnical work.

Methodology for Determining the Heritage Baseline

11.3.5 The objective of this assessment is to identify the significance of effects on cultural heritage assets likely to arise from the Proposed Development, and to identify the location, type and importance of constraints.

11.3.6 As the setting of heritage assets are not a fixed distance, two study areas have been defined which surround the boundary of the site. A study area of 3km has been created to identify all known designated heritage assets within the site or close to it. A smaller, 1km study area was used to identify any non-designated assets. This reflects the reduced significance of the assets and the likelihood of their significance to be affected over greater distances.

11.3.7 Assess the presence/absence, condition and significance of any built heritage features within the site or close to it.

Significance Criteria

11.3.8 The significance (heritage value) of a heritage asset is derived from its heritage interest which may be archaeological, architectural, artistic or historic (NPPF Annex 2, Glossary). The significance of a place is defined by the sum of its heritage values. Taking these criteria into account, each identified heritage asset can be assigned a level of significance (heritage value) in accordance with a three-point scale as set in Table 11.2 below.

Table 11.2. Criteria for Determining the Significance (heritage value) of Heritage Assets

Significance (heritage value)	Criteria
High	Assets of inscribed international importance, such as World Heritage Sites, Grade I and II* listed buildings, Grade I and II* registered historic parks and gardens, Registered battlefields, Scheduled monuments, Non-designated archaeological assets of schedulable quality and importance.
Medium	Grade II listed buildings, Grade II listed registered historic parks and gardens, Conservation Areas, Locally listed buildings included within a conservation area Non-designated heritage assets of a regional resource value.
Low	Non-designated heritage assets of a local resource value as identified through consultation, Locally listed buildings Non-designated heritage assets whose heritage values are compromised by poor preservation or damaged so that too little remains to justify inclusion into a higher grade

11.3.9 Having identified the significance (heritage value) of the heritage asset, the next stage in the assessment is to identify the level and degree of impact to an asset arising from the development. Impacts may arise during construction or operation and can be temporary or permanent. Impacts can occur to the physical fabric of the asset or affect its setting.

11.3.10 When professional judgement is considered, some sites may not fit into the specified category in this table. Each heritage asset is assessed on an individual basis and takes into account regional variations and individual qualities of sites.

11.3.11 The level and degree of impact (impact rating) is assigned with reference to a four-point scale as set out in Table 11.3 below. In respect of cultural heritage an assessment of the level and degree of impact is made in consideration of any scheme design mitigation (embedded mitigation).

Table 11.3. Criteria for Determining the Magnitude of Impact on Heritage Assets

Magnitude of Impact	Description of Impact
High	Change such that the significance of the asset is totally altered or destroyed. Comprehensive change to setting affecting significance, resulting in a serious loss in our ability to understand and appreciate the asset.
Medium	Change such that the significance of the asset is affected. Noticeably different change to setting affecting significance, resulting in erosion in our ability to understand and appreciate the asset.
Low	Change such that the significance of the asset is slightly affected. Slight change to setting affecting significance resulting in a change in our ability to understand and appreciate the asset.
Minimal	Changes to the asset that hardly affect significance. Minimal change to the setting of an asset that have little effect on significance resulting in no real change in our ability to understand and appreciate the asset.

11.3.12 An assessment of the level of significant effect, having taken into consideration any embedded mitigation, is determined by cross-referencing between the significance (heritage value) of the asset (Table 11.2) and the magnitude of impact (Table 11.3). The resultant level of significant effect (Table 11.4 below) can be negligible, adverse or beneficial.

Table 11.4. Criteria for Determining the Significance of Effect

Significance (heritage value)	Magnitude of impact			
	High	Medium	Low	Minimal
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Negligible

11.3.13 The ES reports on the significance of effect in accordance with EIA regulations. Effects of major or moderate significance are considered to be significant. Within the NPPF, impacts affecting the significance of heritage assets are considered in terms of harm and there is a requirement to determine whether the level of harm amounts to 'substantial harm' or 'less than substantial harm'. There is no direct correlation between the significance of effect as reported in this ES and the level of harm caused to heritage significance. A major significant effect on a heritage asset would, however, more often be the basis by which to determine that the level of harm to the significance of the asset would be substantial. A moderate significant effect is unlikely to meet the test of substantial harm and would therefore more often be the basis by which to determine that the level of harm to the significance of the

asset would be less than substantial. In all cases determining the level of harm to the significance of the asset arising from development impact is one of professional judgement.

11.3.14 An assessment of the predicted significance of effect is made both prior to the implementation of mitigation and after the implementation of mitigation to identify residual effects. This first highlights where mitigation may be appropriate and then demonstrates the effectiveness of mitigation and provides the framework for the assessment of significance which takes mitigation measures into consideration.

11.4 Baseline Conditions

Topography and geology

11.4.1 The British Geological Survey (BGS) 1:50,000 solid and drift geology map indicates that the site is underlain by Devensian aged glacial till, overlying Upper Cretaceous aged chalk of the Burnham Chalk Formation. (Ref 11-9, 11-10) This is in general agreement with local historic boreholes accessed through the BGS, and reflected the geology encountered during the Phase 2 ground investigation (See Chapter 12: Ground Conditions and Hydrogeology of this ES).

11.4.2 The soils within the study area are split east west, with the west side of the site covered with slowly permeable, slightly acid, loamy and clayey soils, while the east side by the Humber consists of loamy and clayey coastal flats with naturally high groundwater (Ref 11-11, 11-12).

Heritage Overview

11.4.3 There are 58 heritage assets recorded from the North Lincolnshire Historic Environment Record within the 1km study area. Within the 3km study area, there are 15 listed buildings and three scheduled monuments. There are no World Heritage Sites, registered parks and gardens, registered battlefields or Conservation Areas recorded in the study area.

11.4.4 The bracketed numbers in the text are listed in the gazetteers in Appendices 11A and 11B (ES Volume 3) and shown on Figures 11.1 and 11.2 (ES Volume 2).

Early Prehistoric (to 800BC)

11.4.5 There are 11 assets of prehistoric date, dating from the Palaeolithic (to 10,000BC) to the Bronze Age (2,500 – 800BC), recorded within the study area. The earliest recorded asset was Mesolithic (10,000 – 4,000BC) organic remains recorded from peat deposits identified from a borehole (22851). They dated to the mid-5th millennium BC, and subsequent pollen analysis revealed various plant and tree species. Six of the assets consist of individual finds and scatters of flint, including scrapers, cores and flakes (19726; 19727; 19803; 21544; 22737), as well as a fragment of a Neolithic (4,000 – 2,500BC) polished stone axe (22487). In addition to these, features have been recorded, including a pit (21571), and ditches with charcoal evidence (21553; 21554) all discovered during archaeological evaluation. A further linear feature and enclosure was recorded from cropmarks (1614).

11.4.6 The area around the Humber has been the subject of investigation into the prehistoric environment due to periods of glaciation during the Palaeolithic which saw sea levels fall and Britain become attached to mainland Europe. Organic remains from the Humber have been recorded, and these date to the Palaeolithic and Mesolithic. Evidence includes seeds and small shells, which have suggested the land was previously under marshy conditions.

11.4.7 Three early/middle Bronze Age planked boats, dated to between 2,020BC and 1,680BC, have also been discovered on the north bank of the Humber at Ferriby. The boats were made of oak planks tied together with yew withies and measured 16m long. This demonstrates the exploitation of the waterways as far back as the prehistoric period.

Iron Age/ Roman (800BC – AD410)

11.4.8 The Iron Age (800BC – AD43) has been combined with the Roman (AD43- 410) period for this baseline as there are a number of assets dated to these two periods. Three assets are dated exclusively to the Iron Age and comprise ditches and sub-rectangular features recorded as cropmarks (20124), and ditches found to contain Iron Age pottery (20422; 22428). Evaluation in the site boundary of the Proposed Development, and to the north, was undertaken in 2006 by Archaeological Project Services (Ref 11-13). This suggested the area was used for agricultural purposes during the Iron Age, as environmental samples recorded a lack of occupational debris (APS, 2006).

11.4.9 The area around the site has significant evidence of Iron Age/ Roman industry. There are five assets dated to the late Iron Age and Roman, three of which are settlements. The first is located on the site of the Conoco CHP plant, and contained evidence of an early Iron Age settlement and a late Iron Age/ Roman settlement (19771). Finds comprised 2nd to 4th century AD pottery and evidence of iron and salt production were identified through archaeological evaluation, with remains of briquetage fragments and ceramic trays located. The second settlement (21567) is recorded to the north of Station Road and approximately 1.2km north of the Conoco CHP plant. The settlement was recorded through geophysical survey and a number of ditches and enclosures were identified as well as possible hearths or kilns. A third settlement (21556), located to the north of Humber Road and south-east of the previous two sites with evidence of salt making and iron smelting near the settlement. Two additional assets include cropmarks of a rectilinear enclosure and a small L-shaped feature (20078), which has been at least partially destroyed by the oil refinery at South Killingholme, and ditches identified through archaeological trial trenching with evidence of both Iron Age and early Roman pottery (21569).

11.4.10 There are six assets of Roman date recorded in the study area, four of which are finds of greyware pottery sherds (1630; 19806; 19807; 20423). There are also two records of ditches. The first comprised evidence of a possible enclosure with early Roman pottery recorded (21568) and the other, to the north of Marsh Lane (22743), with 4th century AD pottery, both recorded through archaeological trial trenching.

11.4.11 There is evidence of the Roman influence throughout the county of Lincolnshire, with numerous settlements and roads identified. Ermine Street, which ran from London to York, crossed north south through Lincolnshire to Winteringham on the Humber, located to the north west of the Proposed Development, where a ferry crossing to Brough on the north bank was located. One smaller road, High Street, was located closer to the Proposed Development and ran from Horncastle to South Ferriby, in a general north-west to south-east direction. There was thought to be another ferry crossing at South Ferriby, further highlighting the significance of the river throughout the period and how it was used (Ref 11-14).

Early Medieval – Medieval (AD410 – 1500)

11.4.12 The place-names of Immingham and Killingholme have Anglo-Saxon origins. Killingholme was referred to in the Domesday Survey 1086 as 'Cheluinggeholm' and was in the Wapentake of Yarborough. Killingholme and nearby Immingham date back to at least the latter part of the early medieval period as they were in the control of lords prior to the Norman Conquest – Alwin in Immingham and Fulcric in Killingholme, both recorded in the Domesday Book, 1086. (Ref 11-15) Immingham was controlled by William of Percy, and consisted of a population of 39 with eight plough lands. Killingholme in comparison was much smaller, the lord was recorded as Norman of Arcy and contained three freemen and two plough lands. Larger settlements have also been recorded in the vicinity of the site at Goxhill, Barton upon Humber and South Ferriby in the Domesday Book, all located to the north west of the proposed development site. The populations range from 70 and 91 households at South Ferriby and Goxhill, to 196 households in Barton upon Humber.

11.4.13 There are no assets of early medieval (AD410-1066) date recorded within the study area, and four of medieval (AD1066-1500) date. There are two areas of ridge and furrow recorded

(20998; 20104). The first of these was aligned north-east to south-west and the other was aligned north to south; both were identified through geophysical survey. Within the study area is also a hedgerow (20121), recorded on enclosure maps, which formed the historic boundary between North and South Killingholme. A ditch (20424), measuring 1m wide and 0.15m deep, containing a Toynton ware pottery sherd has also been identified to the west of Rosper Road.

11.4.14 There are three scheduled monuments recorded outside of the 1km study area, but within the 3km study area. These consist of three moated sites. These sites would have had contained high status domestic dwellings from the 11th and 12th centuries and would have resulted in the land being managed as a feudal system. The first is at Manor Farm (1008044) and is located approximately 1.9km west north-west from the western edge of the Proposed Development. The site includes two moats, a smaller one located in the north-west corner of the larger. The larger moat measures c.240m east to west and 180m north to south. The northern arm of the moat remains water-filled and is 10m wide and at least 2m deep. The smaller moat island measure 50m square, with the moat 10m wide by 2m deep. In the centre of the island of the larger moat is Manor Farm. This is thought to have originally been used as a high status domestic dwelling.

11.4.15 The second site is at Baysgarth Farm, located approximately 2.5km north-west of the Proposed Development. The site includes a large sub-rectangular moated site, with a central island measuring 150m by 80m and a moat 10m wide by 2m deep; a second smaller moated enclosure, the island of which measures 60m by 50m; and other associated earthworks.

11.4.16 The third scheduled monument is North Garth moated site (1007815), located approximately 2.2km north-west of the Proposed Development. The site includes a series of dry ditches enclosing a main moated site and associated enclosures. The island of the main site measures 40m by 20m, enclosed by a 6m wide and 1-1.5m deep moat.

Post-Medieval (AD1500 – 1900)

11.4.17 There are 11 archaeological assets of post-medieval date recorded within the study area. These exclude the listed buildings discussed above. There are two historically important hedgerows in North and South Killingholme (20569; 20570), thought to pre date 1840, and a cropmark representing a previous field boundary (21101) which was shown on 1887 OS map. The remaining eight assets are sites of 19th century farmsteads (21324; 24999; 25000; 25012; 25013; 25014; 25015; 26105) that were recorded on the 1887 OS map. Most of the farmsteads comprise a regular courtyard with associated outbuildings, and are now demolished.

11.4.18 The area of, and around, the Proposed Development was dominated by agricultural fields during this period with farmsteads dispersed across the landscape, which is recorded on the historical mapping. Between the fields were open areas of pasture which were considered to be too wet to farm. Fields were enclosed around the area following the Enclosure Act of 1776 and the wet land was drained and split into smaller fields for farming (Ref 11-16).

11.4.19 The villages of North and South Killingholme are recorded as a small number of buildings around a central road on the 1887 OS map. The tithe apportionments for the land within the study area, recorded in 1841 (Immingham tithe apportionment), reveal that the majority of the land was made up of arable farmland, divided into allotments, and marshes, much of which was owned by Lord Yarborough during the later post-medieval period and into the 20th century. In addition to farming, brickworks and boat building were notable industries, with various boatyards and brickyards along the Humber. Brickyards were constructed across the area from Burton Stather to Killingholme in the 19th century, and supplied bricks for London and West Yorkshire (Ref 11-17).

11.4.20 Three lighthouses were constructed on the edge of the Humber River in the mid-19th century. Killingholme North Low Lighthouse, Killingholme High Lighthouse and Killingholme South Low Lighthouse were built to provide navigation for ships sailing along the river.

11.4.21 During the 19th century, the area surrounding the development site was rural and undeveloped. Rectilinear field patterns are evident and typical of enclosure within the 19th century. The area contains isolated farms, the 1886 OS map shows Cawber Farm on East Middle Mere Road to the west of the development site, Marsh Farm to the east and a property called Woodlands to the north-west. There are long straight roads which link the nucleated settlements and ditches which are indicative of marshland, the historic map shows Killingworth Marshes to the east of the development site.

Modern (AD1900 – present)

11.4.22 The area around the development site remained largely undeveloped until the early 20th century, including Immingham which had remained as a village until this point, with the historic core of the village clustered around the Church of St. Andrew. The Humber Commercial Railway and Dock Act 1901 saw the construction of Immingham Docks which resulted in the construction of the deep water port of Immingham in 1913. The dock consisted of a 45 acre dock basin and chosen as it was a deep water port, as opposed to the shallower entrances at sites such as Grimsby. The dock also contained a number of associated structures, including offices, railways comprising a dock railway, three light railways and an electric railway, and 170 miles of sidings.

11.4.23 Further development in the area at this time was funded by the Great Central Railway Company and included the construction of the railway lines of Goxhill and Immingham Line to the east and the Uloeby and Immingham Line to the south. Killinghome Station was created on the Goxhill and Immingham line. These railway lines provided routes for transporting goods and dock workers. The 1929 OS map shows the new railway lines and new buildings appearing along Rosper Road. New buildings included the Mission Room and Killingholme School located to the south-east of the development site.

11.4.24 Killingholme was also the site of a Royal Navy Air services station, opened in 1914, which used a timber slipway for launching sea planes into the river during the First World War (Ref 11-18). During World War I and World War II, Immingham Docks were used as a base for submarines and ships. Additional structures were built around the docks for this new use and included an anchorage site, observation positon and air raid shelter.

11.4.25 The area continued to be used for the chemical and petroleum industries following the wars and gradually developed and expanded. The OS maps from the 1960s show the oil refinery developing with a depot and raised circular features to the east of the development site and towards the lighthouses. The 1974 OS map shows the Killingholme Oil Refinery to the west of Rosper Road and the construction of a new railway line from the Uloeby and Immingham line to the south. The development of the oil refinery resulted in the demolition of Cawber Farm to the west and East Middle Mere Road was built over. Development of large and tall structures, such as tanks and flare stacks, which are highly visible in the flat landscape, were first constructed at this time. Immingham power station, comprising the area around the Proposed Development, was opened in 2004 and covers a significant proportion of the study area, with the town of Immingham located to the south-east and North and South Killingholme to the west of the site.

11.4.26 There are 12 assets of modern date recorded within the study area. These mostly consist of assets recorded from OS mapping, including the site of a mission room (22497), a day school and school house (22489), Myrtle Villas House (22499), and a chapel (26104). There are also four assets associated with the railways, the Humber Commercial Railway (21326), built in 1912, and the Barton and Immingham Light Railway (21959), built 1910-1911, Killingholme railway station (22569), opened in 1910, and the former station master's house (22570), built post-1945.

11.4.27 To the west of the development site is the former RAF North Killingholme as well as the Killingholme Power Stations and Philips 66 oil refinery.

11.4.28 The area is still characterised by the rural landscape and elements of the planned enclosure of the 19th century has survived. The Oil Refinery and Immingham Docks have been built to respect the orientation and rectilinear form of the underlying pattern of enclosure and roads have been built to follow the lines of the old field boundaries.

11.4.29 There are also two assets relating to the Second World War, the site of a barrage balloon anchorage (21225), of which two shelters and the main and secondary anchorages survive, and aircraft obstructions (21322), recorded on wartime aerial photography in a T-shaped arrangement. Further assets include the site of a row of approximately 16 terraced houses (21323), and a survey trench (20103) identified as a linear feature during geophysical survey.

Unknown

11.4.30 There are six assets of unknown date recorded within the study area. There is a linear feature and series of circular and sub-circular features (4635) recorded as cropmarks. Further sites which yielded no archaeological evidence when evaluated included an ovoid enclosure (20789), an L-shaped magnetic anomaly (21315) and magnetic anomalies to the south of Station Road (21570). Also recorded is a system of creeks, which were thought to represent a former shoreline from the deposits found (20141) and a small square enclosure (21321) identified through cropmarks, although this has now been obscured by the southern edge of the Immingham CHP plant.

Previous Archaeological Work

Archaeological Evaluation on Land at Rosper Road North Killingholme North Lincolnshire (2006)

11.4.31 Archaeological Project Services undertook an archaeological evaluation in the area of the proposed development, with a programme of trial trenching. The subsequent report (Ref 11-13) summarises the features identified as part of an Iron Age field system truncated by later field boundaries and drains of mostly modern date. The Proposed Development site is included within the southern end of the area subjected to trial trenching and encompassed eleven of the excavated trenches, with parts of a further four within the boundary. A number of the trenches within the Proposed Development were devoid of archaeological features (TR27, TR29, TR31, TR38-TR40).

11.4.32 Trenches 13, 17, 30 and 61, all of which are located within the Site, contained modern linear features identified as land drains or small field boundaries. Modern ceramic building material was recovered from the fill of the linear in TR30 and 20th century material in TR13. TR61 also contained a shallow NW-SE aligned ditch with a single sherd of late medieval pottery in its fill. This feature was truncated by a land drain and identified as a possible precursor to the modern system of land drainage or a small field boundary. Trench 54 contained a small north-south aligned linear feature that did not contain any finds. It was identified as a small drain or field boundary.

11.4.33 Trench 28, in the south-east part of the Site, contained a large linear ditch, aligned NW-SE, with an irregular profile. A second ditch was identified as a recut of the first. The largest number of pottery sherds recovered during this evaluation came from these two ditches. The report suggests this was due to their proximity to the identified Iron Age settlement to the south of the area. The sherds were of early or middle Iron Age date. Trench 55 was excavated to establish the trajectory of these ditches, both of which continued on their alignments.

11.4.34 The report concluded that; "*The investigations revealed evidence of Iron Age cultivation of the area. This evidence was concentrated towards the north-west and was probably the remains of a field drainage system.*"

Results of Archaeological Monitoring of Geotechnical Investigation

11.4.35 A programme of Geotechnical Investigation (GI) had been undertaken at the site. The trial pits and borehole starter pits were all subject to archaeological monitoring (AOC 2018). This report is provided in Appendix 11C. No archaeological features or deposits were identified.

Archaeological Potential

11.4.36 There are four recorded archaeological assets located within the Proposed Development boundary. These are a ditch containing medieval pottery (A19), and cropmark ditches and sub-circular features, one of which was dated to the Iron Age (A15).

11.4.37 Table 11.5 below summarises the current visibility of archaeological sites within the study area and the predicted likelihood of further discovery. Further details of the reasoning for these predictions can be found below.

Table 11.5. Predictability of Sites

Period	Visibility	Presence/Absence	Likelihood of further discovery
Early Prehistoric	Limited – Revealed by field investigation and artefacts	Present – Limited	Low
Iron Age/ Roman	Limited - Revealed by field investigation, aerial photographs, geophysical survey and artefacts.	Present – Frequent	Medium
Early Medieval	Poor – No assets identified	Absent	Low
Medieval	Fair – Revealed through geophysical survey, and excavation. Some cartographic evidence.	Present – Limited	Low
Post-Medieval	Far – Revealed through aerial photography, with fair cartographic coverage	Present –Limited	Low

11.4.38 Evidence of the early prehistoric period is mostly limited to find spots and scatters, consisting of scrapers, cores, flakes, and a fragment of a Neolithic polished stone axe. Although there is evidence of river exploitation in the wider area of North Lincolnshire during the early prehistoric period, the evaluations within the study area have not revealed any evidence. Therefore the potential for early prehistoric activity is considered to be low.

11.4.39 Much of the evidence within the study area is dated to between the Iron Age and Roman period. This evidence consists of three settlement sites with evidence of industry, finds of pottery, and features such as ditches and enclosures. The existence of Iron Age/Romano-British settlements in the study area, along with the frequency of assets, indicate that there was significant use of the area at this time, and therefore the potential for Iron Age and Roman activity is considered to be medium.

11.4.40 The evidence of the medieval period is limited to remains of ridge and furrow, hedgerows and a ditch containing a pottery sherd. While there is evidence in the wider area, including three scheduled moated sites, the lack of evidence during previous evaluations from this period within the study area leads to the conclusion that the potential for medieval activity is low.

11.4.41 The majority of evidence of the post-medieval period is confined to cartographic sources. Many of the structures of this period that were located in the vicinity of the Proposed Development, consisting of farms, have been demolished. Given the lack of remains and the distance of any post-medieval assets recorded on maps from the Proposed Development, it is thought that the activity of this period is low.

Designated Assets

11.4.42 There are a total of 15 designated heritage assets within the 3km study area. There are three scheduled monuments, discussed in paragraphs 9.4.15 to 9.4.17 above. There are also three Grade I, one Grade II*, and 11 Grade II listed buildings. Appendix 11B discusses those assets identified within the study area, their setting and significance.

11.4.43 A selection exercise was carried out on all of the identified listed buildings. This established the significance of the assets, including their setting. On the basis of this selection exercise, only those listed buildings located to the east of the proposed development site are assessed further. It was determined that the development would not result in any impacts on the remaining assets either as a result of their screened setting or the effect of the existing oil refinery. These buildings are not assessed any further. Those assets which have the potential to be impacted by the development are discussed below. All assets are discussed within Appendix 11A.

Killingholme South Low Lighthouse (1215093), Killingholme North Low Lighthouse (1103707) and Killingholme High Lighthouse (1103706)

11.4.44 Killingholme South Low Lighthouse is a Grade II listed building. It was constructed in 1836 and is 4 storeys in height. It is built of brick which has been rendered and coloured, increasing its visibility. The top floor has a projecting balcony with domed roof above. The windows face towards the estuary. The former lightkeeper's cottage was located at the base of the lighthouse, but only the chimney survives, rises to the height of the dome.

11.4.45 Killingholme North Low Lighthouse is a Grade II listed building was built in 1851 by William Foale. It comprises a lighthouse and adjoining lighthouse keeper's cottage. This is the most northern lighthouse within the group of three lighthouses and is the only one that still has the lightkeeper's cottage. It is 4 storeys, constructed from brick, rendered and whitewashed. The lighthouse has a splayed tower and roof with ribbed dome and scalloped eaves. The adjacent house is to the south and of two storeys in whitewashed brick.

11.4.46 Killingholme High Lighthouses is a Grade II listed building, it was originally built in 1831 but was reconstructed in 1876 after the original lighthouse was struck by lightning. It is built of brick and render and is 6 storeys in height (approximately 30 metres tall). It has a projecting balcony to the top floor with iron railings. The roof is a ribbed dome with scalloped eaves.

11.4.47 The original function of the lighthouses was to direct boats using the Humber estuary. As such they are a significant landmark feature. All are of independent architectural and historic interest; however, their significance is increased when viewed as a group. With the exception of Killington North Low Lighthouse, the structures are still used as navigational aids, alongside their counterparts to the north of the estuary; therefore, their setting is intrinsically linked to the waterway. Their visibility from inland is secondary and limited due to industrial developments, including the existing oil refinery.

11.5 Development Design and Impact Avoidance

11.5.1 No design or other measures have been taken into account in the design of the Proposed Development to avoid or reduce adverse effects.

11.6 Likely Impacts and Effects

11.6.1 This section identifies the potential impacts resulting from the Proposed Development based on the identified methodology presented above.

Effects During Construction

11.6.2 Construction impacts include those impacts associated with construction activities, such as ground breaking, moving machinery, noise and construction traffic. Construction works at the site could also result in impacts on the settings of heritage assets including scheduled monuments and listed buildings.

11.6.3 There are three previously recorded assets which could be impacted by the Proposed Development.

Ditch (A19)

11.6.4 Ditch (A19) is thought to be medieval in date due to a sherd of 13th – 15th Toynton ware pottery recovered from it. The ditch is of very limited archaeological and historic significance for the information it contains regarding the land management of the area in the medieval period. The significance (heritage value) ascribed to this asset is low. It will be destroyed by the development, resulting in a magnitude of impact of high. This results in a significance of effect of moderate adverse prior to mitigation.

Hedgerows (A21)

11.6.5 The second asset within the Proposed Development boundary is the line of historically important hedgerows (A21). There are no hedgerows surviving within the Proposed Development here, and as this part of the Proposed Development is only required for site access, no further below ground impact will be required. The area in the vicinity of this asset will be used only for site access and no further effects are anticipated.

Circular and Linear Cropmark Features (A15)

11.6.6 The circular and linear cropmark features (A15) are no longer extant, and any remains will have been removed during the construction of the extant car park area, and no further below ground impact will be required. The area in the vicinity of this asset will be used only for site access and no further effects are anticipated.

Unrecorded Remains

11.6.7 There is potential for previously unrecorded remains to be located within the Proposed Development. Any such remains are most likely to be of Iron Age or Roman date, and would most likely represent agricultural activity on the peripheral of the settlement activity which surrounds the site. If any such remains are located, they would likely be of no more than low significance (heritage value) and contain limited archaeological significance. The development will have significant physical effect on any unrecorded buried remains, resulting in a high magnitude of impact, resulting in a moderate adverse significance of effect before mitigation.

Designated Assets

11.6.8 There will be no physical impact upon any designated heritage assets during construction.

11.6.9 The three listed lighthouses, Killingholme North Low Lighthouse (1103707), Killingholme South Low Lighthouse (1215093) and Killingholme High Lighthouse (1103706) are Grade II listed buildings. They were built to serve as navigational aids along the Humber. Their presence reinforces the historic importance of the Humber as a transport route. The setting of the structures is defined by their relationship with each other and their visual connection with the estuary. They are considered to be of medium sensitivity due to their designation as Grade II listed buildings.

11.6.10 The lighthouses are located approximately 1.25km to the east of the existing oil refinery and the proposed development site for a new power station. The proposed development of the power station will result in the erection of tall structures. There are existing large and tall structures at the oil refinery and are already significant vertical elements within a predominantly flat landscape. The existing industrial uses in this area create a strong industrial character which can be viewed on the skyline at a great distance.

11.6.11 While the development will be visible from the lighthouses, it will be seen within the existing views of the oil refinery. The visual envelope affected will not increase. Key views of the lighthouses are from the estuary where they act as navigational aids. The development will be visible within these views, including new tall elements. While this will affect views, it should be seen in the context of existing impacts from the operational refinery. Again, the visual envelope will not be extended and the lighthouses will remain in the forefront of any view. The impact on the significance of the assets is, therefore, considered to be low resulting in a minor adverse effect.

Effects During Operation

11.6.12 It is not anticipated that the operation and maintenance of the development will result in any operational impacts on the heritage resource described above beyond those already experienced as part of the working oil refinery.

11.7 Mitigation

11.7.1 It is considered that the likely adverse effects arising from the construction of the Proposed Development can be mitigated by a programme of archaeological work, consisting of a strip, map and record within the areas of ground disturbance within the Proposed Development boundary.

11.7.2 Consideration has been given to further evaluation excavation but, as the site and its surrounds have been subject to a programme of evaluation excavation, the nature of the underlying archaeological resource, should it survive, is understood. As described above, it is anticipated that any previously unrecorded remains would be of Iron Age or Roman date, and would most likely represent agricultural activity on the peripheral of the settlement activity which surrounds the site. This would allow all remains to be recorded in line with paragraph 141 of NPPF.

11.7.3 Any archaeological remains identified during the strip, map and record will be excavated and recorded in line with a Written Scheme of Investigation to be agreed with the North Lincolnshire Historic Environment Officer. A report detailing the results of the strip, map and record will also be produced. All works should also be in line with guidance from the CIfA (Ref 11-19, 11-20).

11.8 Residual Effects and Conclusions

11.8.1 The archaeological strip, map and record of any previously unrecorded remains will allow the archaeological deposits to be preserved by record. This would reduce the magnitude of impact on asset A19, as well as any previously unrecorded remains, to be reduced from high to medium. This will result in an effect of minor adverse significance.

11.8.2 No mitigation is proposed for listed lighthouses; therefore, the effect on the Killingholme North Low Lighthouse (1103707), Killingholme South Low Lighthouse (1215093) and Killingholme High Lighthouse (1103706) remains minor adverse.

11.9 Cumulative and Combined Effects

11.9.1 Cumulative impacts are those that could arise from a number of development activities. The impact of the Proposed Development has been considered in conjunction with the potential impacts from other projects or activities which are both reasonably foreseeable in terms of delivery (e.g. have planning permission) and are located within a realistic geographical scope, where environmental impacts could act together to create a more significant overall effect.

Cumulative Effects during Construction/Demolition

11.9.2 There is one development located to the north-east and south-east of the Proposed Development. This will result in the creation of new areas of car parking which will necessitate the raising of the ground (PA/2017/2141). Therefore, any archaeological remains will be preserved in situ and will remain unaffected. Therefore, there are no cumulative effects on archaeology. The low lying-nature of this development also means that there are no effects on the setting of any heritage assets, and there are no cumulative effects on the listed light houses.

Cumulative Effects during Operation

11.9.3 No cumulative effects during operation are anticipated.

11.10 Conclusion

11.10.1 This cultural heritage assessment collected data from within a 1km study are around the Proposed Development. The assessment collated date from the North Lincolnshire HER, the National Heritage List England, the North Lincolnshire Central Library, and the results of archaeological work.

11.10.2 A total of 58 assets have been recorded within the 1km study area, with 15 listed buildings and three scheduled monuments recorded within the 3km study area. There are three sites recorded within the Proposed Development boundary. These comprise a medieval ditch, the line of a historically important hedgerow and a cropmark of probable Iron Age date.

11.10.3 There is potential for previously unrecorded assets to be located within the Proposed Development, particularly of Iron Age to Roman-British date.

11.10.4 There is the potential for physical effects on the site of the medieval ditch. This will result in a minor adverse significance of effect with mitigation in place. There will also be a minor adverse effect on the listed lighthouses.

11.10.5 It is recommended that archaeological strip, map and record is carried out during intrusive ground works within the Proposed Development boundary.

11.11 References

Ref 11-1 Department of Communities and Local Government (2012) National Planning Policy Framework. DCLG, London

Ref 11-2 HM Government (1979) Ancient Monuments and Archaeological Areas Act 1979

Ref 11-3 HM Government (2002) Planning (Listed Buildings and Conservation Areas) Act 1990

Ref 11-4 HM Government (2005) Town and Country Planning Act 1990

Ref 11-5 Department for Communities and Local Government (2014 and subsequent updates) *Planning Policy Guidance (PPG)* https://www.gov.uk/government/collections/planning-practice-guidance

Ref 11-6 Historic England (2015) H*istoric Environment Good Practice Advice in Planning Note 2. Managing Significance in Decision Taking in the Historic Environment* English Heritage, Swindon.

Ref 11-7 Historic England (2017) *Historic Environment Good Practice Advice in Planning Note 3. The Setting of Heritage Assets* 2nd Edition Historic England, Swindon.

Ref 11-8 North Lincolnshire Council (2003) *North Lincolnshire Local Plan, adopted May 2003*

Ref 11-9 British geological Society, Geology of Britain Viewer. Available at http://mapapps.bgs.ac.uk/geologyofbritain/home.html accessed April 2018.

Ref 11-10 Kent, P. (1980) *British Regional Geology: Eastern England from the Tees to the Wash* Institute of Geological Sciences, HMSO (2nd Edn), London

Ref 11-11 Soilscape viewer (Cranfield University, 2018), Available at: www.landis.org.uk/soilscapes accessed April 2018

Ref 11-12 Soil Survey of England and Wales (1983) Map Sheet 1: England and Wales, 1:250,000 Harpenden

Ref 11-13 Archaeological Project Services (2006) Archaeological Evaluation on Land at Rosper Road North KIllingholme North Lincolnshire Unpublished report

Ref 11-14 Margary, I. D. (1973) *Roman Roads in Britain,* London, John Baker.

Ref 11-15 Cameron, K. (1991) The Place Names of Lincolnshire, Part 2, English Place Name Society, Vol. LXIV, LXV, Irthlingborough

Ref 11-16 Russell, E. & R.C. (1982) Landscape Changes in South Humberside. The Enclosure of Thirty-Seven Parishes Beverley

Ref 11-17 Wright, N. R. (1982) Lincolnshire Towns and Industry 1700-1914: History of Lincolnshire XI. Lincoln, History of Lincolnshire Committee.

Ref 11-18 Wright, N. (1989) “Heavy and Manufacturing Industry” in D.R Mills (ed.) Twentieth Century Lincolnshire: History of Lincolnshire XII. Lincoln, History of Lincolnshire Committee.

Ref 11-19 Chartered Institute for Archaeologists (2014) Code of Conduct CIfA: Reading.

Ref 11-20 Chartered Institute for Archaeologists (2017) Standard and Guidance for Historic Environment Desk-Based Assessment CIfA: Reading.

Table of Contents

Tables

12. Ground Conditions and Hydrogeology

12.1 Introduction

12.1.1 This chapter of the Environmental Statement (ES) addresses the potential effects of the Proposed Development on ground conditions and hydrogeology.

12.1.2 This chapter describes the existing geological and hydrogeological conditions at the Proposed Development Site (the Site), and assesses the likely nature and existing sources of contamination which may be present. In addition, an assessment of the likely ground conditions to be encountered has been undertaken, based on a review of existing site investigations conducted at the Site. Having established baseline conditions, an assessment is made of the potential impacts to the existing geological and hydrogeological conditions from the Proposed Development and likely mitigation measures.

12.1.3 This chapter is supported by Figure 12.1 (ES Volume 2) and by Appendix 12A: Phase 1 Geo-Environmental Site Assessment (ES Volume 3).

12.2 Legislative and Planning Policy Context

12.2.1 Redevelopment of brownfield land which forms part of the Site must take into account the regulatory context of the work, provide information that is appropriate for development, and be in accordance with UK good practice. An environmental assessment of the condition of the Site must not only consider the potential receptors of human health and controlled waters, but also include a review of the relevant legislation and planning policy that applies to the Site and its immediate environs.

European Legislation

Water Framework Directive (WFD)

12.2.2 The European Union (EU) Water Framework Directive (WFD) (2000/60/EC) (Ref 12-1) is one of the key European Directives setting the context for the hydrogeological assessment included within this chapter. The purpose of the WFD is to establish a framework for the protection and improvement of groundwater, and inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters.

12.2.3 The WFD requires the UK to classify the current condition of key waterbodies (giving a 'status' or 'potential') and to set objectives to either maintain the condition, or improve it where a waterbody is failing minimum targets. Any activities or developments that could cause deterioration within a nearby waterbody, or prevent the future ability of a waterbody to reach its target status, must be mitigated so as to reduce the potential for harm and allow the aims of the WFD to be realised.

Industrial Emissions Directive (IED)

12.2.4 The Industrial Emissions Directive (IED) (2010/75/EU) (Ref 12-2) was adopted on November 24 2010, and came into force in January 2011. The IED resulted in revisions to the existing Environmental Permitting Regulations (EPR) including the requirement to establish a baseline report for all regulated sites storing and handling hazardous materials as required in Article 22 of the IED. This process is outlined in the European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions (2014/C136/03) (Ref 12-3).

12.2.5 This guidance presented a seven-stage approach to generating a 'baseline report' which presents the condition of the land under the site for 'relevant hazardous substances' present at the Site. Following completion of a desktop assessment, collation of a targeted set of baseline site condition data for the Site may be needed to meet this requirement, including collection of samples of soil and groundwater and their analysis.

12.2.6 Article 16 of the IED requires monitoring of groundwater and soil condition to be carried out every 5 and 10 years respectively, with the scale and scope of this monitoring determined based on the findings of the baseline report.

Groundwater Daughter Directive (GDD)

12.2.7 The Groundwater Daughter Directive (GDD) (2006/118/EC) (Ref 12-4) was adopted in November 2006, and sets out the approach to protect groundwater against pollution and deterioration in response to Article 17 of the WFD. The transposition of the GDD into law in England and Wales is achieved through the Groundwater Regulations (2009) (Ref 12-5), implemented in England and Wales though the Environmental Permitting Regulations (2010) (Ref 12-6) and two Directions to the Environment Agency from the Secretary of State (SoS) and National Assembly for Wales. The first Direction sets out the principles for classifying groundwater and surface water bodies and the second Direction sets out water quality standards and groundwater threshold values.

7th Environment Action Programme (EAP)

12.2.8 The 7th EAP (Decision No. 1386/2013/EU) (Ref 12-7) entered into force in January 2014, and is guided by the following long term vision:

"In 2050, we live well, within the planet's ecological limits. Our prosperity and healthy environment stem from an innovative, circular economy where nothing is wasted and where natural resources are managed sustainably, and biodiversity is protected, valued and restored in ways that enhance our society's resilience. Our low-carbon growth has long been decoupled from resource use, setting the pace for a safe and sustainable global society." (Annex, Paragraph 1)

12.2.9 The 7th EAP is based around three priority areas requiring more action. These are to:

- Protect nature and strengthen ecological resilience;
- Boost resource-efficient, low-carbon growth; and
- Reduce threats to human health and wellbeing linked to pollution, chemical substances, and the impacts of climate change.

12.2.10 In relation to geology, hydrogeology and ground conditions, the first priority area identifies further action on soil protection and sustainable use of land, while the third area covers challenges to human health including air and water pollution, excessive noise and toxic chemicals.

National Legislation

12.2.11 There are three key statutes dealing with the risks posed to human health and the environment associated with historic land contamination, namely:

- Part IIA of the Environmental Protection Act, 1990 (the 'Contaminated Land' regime) (Ref 12-8);

- The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 (Ref 12-9); and
- The Town and Country Planning Act 1990 (Ref 12-10).

12.2.12 In the UK, Part IIA of the Environmental Protection Act, as introduced by Section 57 of the Environment Act 1995 (Ref 12-11), makes provision for identifying 'contaminated land', the circumstances in which remediation is required and who is responsible for that remediation. Under Part IIA, 'contaminated land' in respect of which remediation may be required is:

"Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substance in, on or under the land, that -

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being or is likely to be caused."*

12.2.13 Under the Water Resources Act, 'controlled waters' are defined as including both surface waters and groundwater. Once a site is determined as 'contaminated land' then remediation is required to render significant pollutant linkages (i.e. the source-pathway-receptor relationships that are associated with significant harm and/or pollution of Controlled Waters) insignificant, subject to a test of reasonableness.

12.2.14 A number of specific regulations have been enacted to implement the statutory European and national legislation into UK law. These regulations include:

- The Anti-Pollution Works Regulations 1999 (Ref 12-12);
- The Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref 12-13);
- The Environmental Damage Regulations 2015 (Ref 12-14); and
- The Environmental Permitting (England and Wales) Regulations 2010 (Ref 12-6), which control discharge of water to surface water and groundwater.

12.2.15 A review of the national, regional and local planning policy pertaining to local ground conditions and contaminated land follows.

Planning Policy Context

National Planning Policy Framework

12.2.16 The National Planning Policy Framework (NPPF) was published in March 2012 (Department for Communities and Local Government (DCLG), 2012) (Ref 12-15) and details the Government's planning policies for England and how these are to be applied. It is a material consideration in planning decisions made by local planning authorities. It states:

"The planning system should contribute to and enhance the natural and local environment by: …preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"
(paragraph 109)

12.2.17 The NPPF identifies land contamination as a material consideration in the planning process, stating:

> *"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, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner."* (paragraph 120)

12.2.18 Further, the NPPF states that planning policies and decisions should ensure that:

> *"The site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation";*
>
> *"After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990"; and*
>
> *"Adequate site investigation information, prepared by a competent person, is presented."* (paragraph 121).

Local Development Plan Policy

12.2.19 The North East Lincolnshire Council Local Plan 2013-2023 (Ref 12-16), is currently subject to a statutory waiting period prior to adoption and is due to be adopted in May 2018. The new Local Plan divides the Borough into 5 spatial zones and the proposed development lies within the 'Estuary' zone. In regards of the Estuary zone, the new Local Plan states:

> *"…the Estuary Zone is an area of both ecological and industrial importance, giving rise to some particularly complex environmental planning issues and challenges. It includes the nationally important port and town of Immingham and accommodates a major concentration of port-related and energy-related industry and commerce: these and the estuary itself are the main influences on the character, appearance and form of this part of the Borough"* (paragraph 5.4)

12.2.20 The Local Plan Strategic Objective SO6 has been adopted to "*Ensure that the development needs of the Borough are met in a way that safeguards and enhances the quality of the built, historic and natural environment. Direct development to locations of least environmental value and proactively manage development to deliver net gains in biodiversity overall. Encourage the use of brownfield land*."

National Policy Statements

12.2.21 The Overarching National Policy Statement (NPS) for Energy (EN-1) Section 4.10 (Pollution control and other environmental regulatory regimes) (Ref 12-17) details that issues relating to discharges or emissions from a proposed project which may affect air quality, land quality and the marine environment, or which include noise and vibration may be subject to separate regulation under the pollution control framework or other consenting and licensing regimes. Before consenting any potentially polluting developments:

"The *relevant pollution control authority is satisfied that potential releases can be adequately regulated under the pollution control framework"; and*

"The effects of existing sources of pollution in and around the site are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable, particularly in relation to statutory environmental quality limits" (Paragraph 4.10.7)

12.2.22 Section 5.3 of EN-1 (Biodiversity and geological conservation) states:

"*Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity."* (Paragraph 5.3.3)

12.2.23 Section 5.10 of EN-1 (Land use including open space, green infrastructure & Green Belt) states:

"Applicants should also identify any effects and seek to minimise impacts on soil quality taking into account any mitigation measures proposed. For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination." (Paragraph 5.10.8)

12.2.24 Section 5.15 of EN-1 (Water Quality and resources) states:

"Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent. The ES should in particular describe:

- *The existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges;*
- *Existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Catchment Abstraction Management Strategies);*
- *Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics; and*
- *Any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive and source protection zones (SPZs) around potable groundwater abstractions."*

  (paragraph 5.15.3)

12.2.25 NPS EN-2 (Ref 12-18) on Fossil Fuel Electricity Generating Infrastructure (EN-2) states that where a project is likely to have '*effects on water quality or resources, the applicant for development consent should undertake an assessment which should particularly demonstrate that appropriate measures will be put in place to avoid or minimise adverse impacts of abstraction and discharge of cooling water. The applicant for development consent should demonstrate measures to minimise adverse impacts on water quality and resources*'. (paragraph 2.10.2)

Other Relevant Legislation, Policy, Standards and Guidance

12.2.26 The Building Act 1984 (Ref 12-19) is supported by the Building Regulations 2000 (Ref 12-20), which contain detailed information regarding the preparation of a site for redevelopment and resistance to contaminants.

12.2.27 The Environment Agency provides general guidance on the management of land contamination in document 'GPLC1 - Guiding Principles for Land Contamination' (Ref 12-21). The Environment Agency also acts as a statutory consultee for developments requiring an EIA. The Environment Agency's primary concern in the management of contaminated land through the planning regime is in respect of the protection of the water environment.

12.2.28 Model Procedures for the Management of Contaminated Land, Contaminated Land Report 11 (referred to in this ES as 'CLR11') (Ref 12-22) outlines the approach for the evaluation of contamination in line with UK Government legislation, Environment Agency and National House-Building Council (NHBC) requirements.

12.2.29 The procedures recommend the application of a risk based approach with the first tier assessment being a Phase 1 Desk Top Report to identify previous and current site uses, geological setting and historical contamination records. The approach to further investigation is then based on the risk established by virtue of the Phase 1 Report. If a site has no historical or current evidence of contaminative uses, the scope of further investigation can be less than sites with a long standing history of potentially contaminative uses.

12.3 Assessment Method and Significance Criteria

Consultation

12.3.1 An initial consultation, part of the scoping opinion, has been undertaken and those responses pertinent to the assessment of geology, ground conditions and hydrogeology are summarised in Table 12.1:

Table 12.1. Consultation Summary Table

Consultee organisation approached	Date (method)	Summary of consultee comments	Summary of response
North East Lincolnshire Council	Jan 31, 2018 (Scoping Opinion)	'The submitted scoping report identifies that contaminated land will be considered via a Phase 1 Report and that liaison will take place with NLC and the EA regards the findings of this report. The council's Environmental Health Officer is supportive of this approach and has no further comments to make at this stage. Further to the above, the EA has confirmed that they have no concerns with the scope of the assessment outlined in Section 5.8 of the scoping report with regards to risks posed to controlled waters from contamination at the site.'	N/A

Methodology for Assessing Baseline Conditions

12.3.2 Baseline information has been obtained in order to assess the likelihood of finding contamination and its potential nature and extent. Baseline conditions have been identified from documentary research of the site history, geology, hydrogeology and hydrology, and review of a commercially available regulatory database. The assessment has involved a review of the Groundsure Reports for the Proposed Development (appended to the Phase 1 Geo-Environmental Site Assessment, Appendix 12A), as well as publically available BGS mapping (Ref 12-23) and the Environment Agency website (Ref 12-24).

12.3.3 This information has then been used to formulate a Conceptual Site Model (CSM) to allow an assessment of potential environmental risks. The above information has been collated, in order to characterise the baseline conditions of the Site. In addition, the initial findings of a ground investigation undertaken in April 2018 have been used to rationalise the environmental risks, Potential receptors were then identified and their relative sensitivity evaluated as described within Table 12.1.

12.3.4 The criteria used to determine the sensitivity of receptors and the magnitude of impacts has been developed by technical specialists and has been applied to similar land development proposals. Where appropriate, for the purpose of this assessment, risk likelihood has been interpreted as being equal to the impact rating (e.g. low likelihood/ low impact).

Sensitivity/Importance of Receptors

12.3.5 Using information gathered during the desk-based study, the presence and relative sensitivity of receptors at risk from potential land contamination and risks to geological/ geomorphologic features have been evaluated by consideration of the following factors:

- Surrounding land uses, based on mapping, site visits and consideration of the occupants of adjacent sites;
- Proposed end-use, based on the nature of the Proposed Development;
- Type of construction operations that would be necessary as part of the Proposed Development;
- Surrounding sites of nature conservation importance;
- Underlying groundwater;
- Surrounding sites and/or areas of geological/geomorphologic importance; and
- Geology, hydrogeology and hydrology of the Proposed Development and its surrounding area.

12.3.6 The sensitivity of receptors or geological features that could be affected by the Proposed Development is described qualitatively in Table 12.2.

Table 12.2. Descriptive Scale for Sensitivity of Receptors

Qualitative description	Receptor sensitivity		
	Low	Medium	High
End users (operational workers/visitors)	'Hard' end use (e.g. industrial, car parking)	Landscaping or open space	Residential, allotments and play areas

Qualitative description	Receptor sensitivity		
	Low	Medium	High
Surrounding land uses	Industrial area	Open space or commercial area	Residential area
Construction workers	Minimal disturbance of ground	Limited earthworks	Extensive earthworks and demolition of buildings
Ecological sites	No sites of significant ecological value close by	Locally designated ecological sites	Nationally or internationally designated ecological sites, including Sites of Special Scientific Interest (SSSIs), Local and National Nature Reserves, Special Protection Areas.
Built environment	Not applicable	Buildings, including services and foundations	Nationally or internationally designated sites of historic value or other sensitivity
Geology / geomorphology	Areas of superficial geology or geomorphologic features with no special significance	Other areas of potential mineral resources Exposed geological features of local importance or educational value	Nationally or internationally designated geological sites Local Geological Sites SSSIs Mineral reserve allocated on Local Minerals Plan
Groundwater	Non aquifer Low quality resource No abstractions within 1km	Secondary Aquifer Abstraction point within 1km SPZ within 1km of the Site	Principal Aquifer High quality resource Abstraction point within 250m SPZ on-site

12.3.7 The Site was then considered in detail with respect to the proposed construction, operational and decommissioning periods, and any ground contamination or soil quality related impacts considered likely to result are described herein and, where possible, quantified.

Prediction of Potential Impacts

12.3.8 The potential impacts (or risks) associated with contaminated land have generally been assessed by means of a hazard-pathway-receptor model (the Pollutant Linkage), where the following definitions apply:

- Hazard: source of contamination;
- Receptor: the entity that is vulnerable to harm from the hazard; and
- Pathway: the means by which the hazard can come into contact with the receptor.

12.3.9 This assessment considers the impacts of:

- Construction
  - Use of land within the Site for temporary laydown areas etc.;

- Earthworks;
- Raising site levels with placement of suitable structural fill (if required);
- Dust generation;
- Dewatering (if required);
- Piling operations (if required);
- Pollution prevention measures; and
- Waste generation;

- Operation
  - Use of reciprocating gas engines with stack(s) and transformer(s) with associated switchgear and ancillary equipment, either individually housed or contained within one or more buildings;
  - Small diesel generator for 'black-start' capability;
  - One or more liquid fuel tanks (diesel or fuel distillate for black-start capability);
  - Pump house (for firewater);
  - Electrical transformers; and
  - Roadways, internal access roads and car parking.

Contamination Sources (Hazards)

12.3.10 Potential sources of land contamination can be described qualitatively according to the categories shown in Table 12.3. This is a qualitative judgement, but has been developed in line with an accepted methodology for Phase 1 desk studies and Part IIA contamination studies (Ref 12-22). While contamination testing of soils and groundwater was undertaken as part of the April 2018 ground investigation, the full results were not available at the time of preparation of this chapter.

Table 12.3. Descriptive Scale for Land Contamination Potential

Qualitative description of source (hazard)	Previous land use
Low	Greenfield site, or previous or on-going activities with low potential to cause contamination (e.g. residential, retail or offices), or site investigation data indicating no significant contamination.
Medium	Previous or on-going activities with some potential to cause moderate contamination (e.g. railways, collieries, scrap yards), or site investigation data indicating limited contamination.
High	Previous or on-going activity on or near to site with high potential to cause land contamination (e.g. gasworks, chemical works, landfills), or site investigation data including widespread or severe contamination.

12.3.11 If a hazard has been identified and potentially sensitive receptors are present, then the potential impacts associated with the Proposed Development can be predicted by considering the pathways by which the hazard may affect the receptors. Table 12.4 indicates the most likely potential impacts that may occur in relation to the Proposed Development for different categories of receptor.

Table 12.4. Summary of the most likely sources of potential land contamination impacts that may affect sensitive receptors

Receptor:	End users (operational workers / residents / visitors)	Surrounding land uses (including offsite residential areas)	Construction workers	Sensitive water resources	Ecological sites	Built environment
Potential impact from land contamination	Direct or indirect ingestion of contaminated soil (operation)	Inhalation or deposition of wind-borne dust (construction)	Direct or indirect ingestion of contaminated soil (construction)	Existing and/ or new pollutant pathways (construction and/or operation)	Phytotoxic impacts on plants (operation)	Chemical attack of buried concrete structures (operation)
	Concentration of flammable or asphyxiating in-ground gases in enclosed spaces (operation)	Migration of contamination in sub-surface strata (including gases) (construction and/or operation)	Concentration of flammable or asphyxiating gases in confined spaces (construction)	Generation of liquid and/ or mobile contaminants (operation)	Toxic impacts on fauna (operation and/or construction)	Concentration of flammable/ explosive gases in confined spaces (operation)
	Inhalation of harmful in-ground vapours/ dusts indoors and outdoors (operation)	N/A	Inhalation of asbestos during building demolition (construction)	N/A	Indirect impacts via contamination of water resources (operation and/or construction)	Permeation of water supply pipelines (operation)

12.3.12 The potential impacts are assessed based on the existing land use at the Site and predicted construction, operation and decommissioning of the Proposed Development.

12.3.13 The magnitude of a potential impact is described, wherever possible, by using the terms defined in Table 12.5.

Table 12.5: Descriptive Scale for the Impacts of Land Contamination

Magnitude of impact	Examples of typical impacts
High	Loss of exposed designated geological feature Very high risk of exposure of a sensitive receptor to potentially harmful levels of contamination via a confirmed pathway
Medium	Quarrying of rock for imported fill, or substantial changes due to cuttings Proven source – pathway – receptor pollutant linkage identified with elevated level of contamination recorded/ or potential to be present

Magnitude of impact	Examples of typical impacts
Low	Superficial disturbance to geology; changes in geomorphology Identified source – pathway – receptor pollutant linkage identified but contamination likely to be low risk
Very low	Changes to made ground deposits No source – pathway – receptor pollutant linkage identified

Significance of Effects

12.3.14 For each of the potential impacts identified, an assessment has been made of the likely significance of effects.

12.3.15 Where geological receptors are present, then their importance (sensitivity) has been determined (see Table 12.2) and the potential impact of the Proposed Development qualitatively predicted (see Table 12.5).

12.3.16 Effects are classified based on the identified sensitivity/importance of the receptor and the predicted magnitude of the impact, using the standard assessment matrix set out in Table 12.6, in conjunction with professional judgement of site-specific factors that may be of relevance.

Table 12.6. Matrix to Determine the Significance of an Effect (Prior to Mitigation)

Magnitude of impact	Sensitivity/importance of receptor			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very low	Minor	Negligible	Negligible	Negligible

12.3.17 This chapter considers that major or moderate effects are significant, in accordance with standard EIA practice.

12.3.18 If potentially significant effects are identified, measures are proposed to mitigate the risks from the hazards. However, industry best practices would be applied whether there is the potential for significant effects, or not. The assessment is undertaken on the assumption that best practice would be implemented during construction, operation and decommissioning. The generic categories of mitigation are outlined in Table 12.7.

Table 12.7: Generic Categories of Mitigation

Category of mitigation	Description of mitigation measures
Remedial works	Remedial work may be required to allow the development to proceed. The scope and nature of any remedial work is likely to be highly dependent on the results of investigations and subsequent risk assessments.
Design changes	Significant effects can be reduced by changes in design (e.g. protective measures to prevent build-up of flammable gases), or modification of layouts to ensure that sensitive end uses are sited away from likely areas of contamination. Relocation of built features away from geologically important features. Consideration of the construction method proposed for underground structures to minimise potential impacts on groundwater.
Protective measures during construction	Many of the potentially significant effects on the construction workforce can be mitigated by the use of appropriate protective equipment, such as gloves and respiratory protection, and effective dust suppression techniques.
Environmental management	Environmental management may be required to prevent construction work and future operations from giving rise to land contamination.

Extent of Study Area

12.3.19 The Site encompasses the land required for the construction, operation and decommissioning of the Proposed Development (refer to Chapter 3: Description of the Site).

12.3.20 The current site layout is shown on the plans provided in Figure 3.1 (ES Volume 2). The site occupies a total area of approximately 3.1 ha. The northern section of the site is currently used as a contractors' car park at the Lindsey Oil Refinery (LOR), whilst the southern section comprises an undeveloped area of shrubbery/grassland. The site is bounded to the east by a building housing a canteen, the LOR employee car park and an area of undeveloped land and to the south by the current VPI Immingham CHP plant. Immingham Port is located approximately 1.75km to the South East and the River Humber is located approximately 1.4km to the east. Elevation of the site is ~5m above ordnance datum (AOD).

12.3.21 The land use immediately surrounding the Power Plant Site was assessed and is summarised below:

- North: Undeveloped land proposed as Construction Laydown area for the Proposed Development (see below), currently used for LOR contractors vehicle parking;
- East: Undeveloped land with Rosper Road beyond. Multiple stockpiles of an unknown material are present within this undeveloped area;
- West: Vegetated land, access trackways and ponds associated with the drainage system for LOR. Beyond is a private railway line and LOR itself. A single tower (pylon) associated with a high voltage transmission line is present approximately 20m from the Site boundary.
- South: Pipework and services related to the operation of Humber oil refinery, LOR and other facilities, a vegetated drainage ditch and access trackway and the CHP plant operated by the Applicant.

12.3.22 The study area comprises the Proposed Development boundary (referred to as 'the Site'), and up to a 2km zone of influence. It should be noted that the Phase 1 Geo-Environmental Site Assessment (ESA) (Appendix 12A in ES Volume 3) considered the Power Plant Site within a larger site (5 Ha) including undeveloped land between the Power Plant site and Rosper Road and a strip of the existing LOR employee car park. A copy of Phase 1 ESA and Groundsure® Report are presented in Appendix 12A (ES Volume 3).

Desk Study

12.3.23 A Phase 1 Assessment referred to above was conducted to determine the baseline ground conditions and potentially contaminative land uses. As part of this assessment, Groundsure® Reports for the Proposed Development were commissioned from Groundsure Limited.

12.3.24 The reports summarise environmental information available in the public domain from a variety of sources. Information is included on authorisations, permits, discharge consents, water abstractions, groundwater, surface water, ecological sensitivities, licensed waste management and disposal facilities, consented trade effluent discharges, records of unlicensed landfills in the search area, trade directory entries of potentially contaminating activities, Control of Major Accident Hazards (COMAH) registered sites, radon risk, coal (and other) mining and natural subsidence risk, and sensitive land uses (nature reserves, protected areas, sensitive habitats). It is noted that the Groundsure database is updated periodically and therefore it may not document recent developments/ registrations in the Site area or activities which have not been declared.

Phase 2 Intrusive Investigation

12.3.25 Following the Phase 1 ESA, an intrusive Phase 2 ground investigation was undertaken on an area including the Power Plant Site in April 2018. The investigation comprised six deep boreholes into bedrock, eight window samples to a depth of approximately 5m, ten trial pits, and three trial trenches. Soil samples were collected and submitted for chemical and geotechnical analysis

12.3.26 The baseline conditions have been updated to reflect the initial findings of the ground investigation, where available.

12.3.27 It is envisaged that the ground investigation will be able to provide additional information on the following:

- The depth, nature and properties of infilled and made ground deposits underlying the Site;
- The presence and extent of possible perched water within the fill;
- The composition and nature of material in the mounds and stockpiled material present on the Site; and
- The presence and composition of deeper groundwater within the underlying Principal Aquifer believed to be present within underlying bedrock.

12.4 Baseline Conditions

Existing Baseline

12.4.1 This section describes the Site at present (without the Proposed Development) and the sensitivity of the receiving environment to change.

Designated Sites

12.4.2 The Site is located within a Nitrate Vulnerable Zone.

12.4.3 The Humber Estuary, located approximately 1.3km to the East of the site, is designated as a Site of Special Scientific Interest (SSSI), a Special Area of Conservation (SAC), a Special Protection Area (SPA) and a 'Ramsar' site. A second SSSI, North Killinghome Haven Pits, is located approximately 1.9km to the North.

12.4.4 No other environmentally sensitive sites (including Special Protection Areas, Special Areas of Conservation, Ramsar sites, National and Local Nature Reserves, or Regionally Important Geological Sites) have been identified within 2km of the Site.

Existing and Previous Land Use

12.4.5 Table 12.8 details the history of the site, based on available OS historical mapping (Appendix 12A: Phase I Geo-Environmental Site Assessment in ES Volume 3).

Table 12.8. Summary of Site History

Year	On Site	Offsite
1886-1887	Marsh land; Rosper Road present; East Middle Mere Road present;	Cawber Farm – north east (450m); Marsh Farm – south east (750m);
1906-1910	No significant change;	No significant change;
1930-1947	No significant change;	Goxhill and Immingham Line/ Killingholme Station present – east (850m); School present – south (650m); Ulceby-Immingham railway line present (100m south west);
1951	Drainage system in place;	Municipal buildings present – south east (500m); Railway depot present – east (850m);
1968	No significant change;	No significant change;
1974	Railway sidings present (west);	Vast industrial expansion inc. oil refinery west and east of site;
1983	No significant change;	No significant change;
2002	Pipe line on southern border of site;	Expansion of road system to south

Year	On Site	Offsite
		(A180/A160/A1173) (750m);
2010	No significant change;	Immingham West Fire Station approximately 750m south of site (date built is unknown);
2014	Car park now present.	New road system throughout oil refinery, directly west of site.

Source: Phase I Geo-Environmental Site Assessment, AECOM 2017

Geology

12.4.6 The British Geological Survey (BGS) 1:50,000 solid and drift geology map indicates that the site is underlain by Devensian aged glacial till, overlying Upper Cretaceous aged chalk of the Burnham Chalk Formation. This is in general agreement with local historic boreholes accessed through the BGS, and reflected the geology encountered during the Phase 2 ground investigation.

Superficial Geology – Made Ground

12.4.7 During the Phase 2 ground investigation, Made Ground was present across the northern and eastern part of the Power Plant site, at the following exploratory holes (BH01, BH02, TP01, TP02, TP05, TP06, and WS01-05 predominantly located in the area used as a general laydown area for LOR (see Figure 12.1 ES Volume 2).

12.4.8 The typical thickness of made ground encountered was approximately 1m, with a minimum of 0.3m in TP05 and a maximum thickness of 1.4m in WS01.

12.4.9 Made ground deposits typically comprised brown through to black slightly sandy gravelly clay, with gravel of slag, sandstone, mudstone and chalk. Hydrocarbon odours were noted at a number of locations including Bh01, BH02, TP01, TP02, WS01, and WS02.

12.4.10 Preliminary drillers logs for the boreholes, trial pits / trenches and window samples are presented in Appendix 12B in ES Volume 3.

Superficial Geology – Natural Deposits

12.4.11 Superficial deposits encountered on site comprised glacial deposits, comprising glacial till and occasional horizons of glacial sands and gravels.

12.4.12 Deposits encountered typically comprised clay, described as stiff, becoming very stiff with increasing depth.

12.4.13 The full depth of superficial deposits was proven in BH1, where bedrock was encountered at 27.5m.

Solid Geology

12.4.14 Published geological maps and memoirs indicate that the site is underlain by the Burnham Chalk Formation of the Upper Cretaceous period. Local historic boreholes indicate that the upper surface of the Chalk is typically located between approximately 18m and 20m below ground level (bgl). The upper 10m to 20m of the bedrock is frequently described as “soft

chalk", overlying "hard chalk and flints", indicating that the upper part of the Chalk is extensively weathered.

12.4.15 Chalk bedrock was encountered on the Power Plant Site in BH1 at a depth of 27m, while bedrock was not identified in BH2, which was drilled to 22.3m bgl.

12.4.16 The depth to bedrock in boreholes) drilled on land east of the site ranged from 26.5m in BH03 to 21.5m in BH06.

Hydrogeology

12.4.17 The EA aquifer classifications for the identified superficial deposits and bedrock underlying the Site are summarised in Table 12.9 below;

Table 12.9. Summary of EA Aquifer Classifications within Underlying Geology

Formation	EA Aquifer Designation	Definition
Superficial Geology		
Glacial Deposits	Secondary A (Undifferentiated) Aquifer	Defined by the EA as *'an aquifer where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'*.
Solid Geology		
Burnham Chalk Formation	Principal Aquifer	Defined by the EA as *'layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.'*

Source: BGS

Radon

12.4.18 Public Health England's interactive Radon map indicates that the site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

Potential Pollutant Linkages

12.4.19 In order for an area of potential contamination within the confines of the Site to pose a significant level of risk to or as a result of the Proposed Development or the wider environment, a potential source and sensitive target or receptor has to be identified, together with a plausible and effective pathway by which the receptor may be exposed to any given hazard.

12.4.20 Based upon the available information, potential future sources of contamination within the Site associated with the Proposed Development include:

- Contamination associated with made ground within areas of potentially infilled land and stockpiles;
- Impacted shallow groundwater below site;
- Bulk fuel storage tanks associated with proposed 'Black Start' capability; and
- Historical agricultural land use (e.g. use of pesticides, heavy equipment).

12.4.21 Based upon the available information, potential sources of contamination outside the Site (typically within 500m, unless otherwise specified) include:

- Activities relating to the adjacent Total site's existing operation as a refinery;
- Activities relating to the adjacent existing VPI power generation activities; and
- Railway lines and former railway sidings.

Potential Contaminants of Concern

12.4.22 Potential compounds of concern associated with the identified potential sources of contamination may include, but are not limited to:

- Hydrocarbons e.g. diesel, lubricating oils, petrol;
- Polychlorinated Biphenyls (PCBs);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Other organics e.g. alcohols, PCBs, MTBE, TAME, solvents, aliphatic and aromatic compounds;
- Metals including (but not limited to) arsenic, zinc, lead, copper, manganese and cadmium;
- Asbestos;
- Ground gases including carbon dioxide, methane and hydrogen sulphide; and
- Mineral acids, alkalis, cyanides, sulphur and sulphide.

Potential Receptors

12.4.23 Based upon the available information, the following are considered to be potential receptors:

- Human Health:
  - On site construction workers;
  - Future employees at the new development; and
  - Off-site workers e.g. Lindsey Oil refinery;
- Controlled Waters:
  - Surface waters including the River Humber (RAMSAR site) and nearby drains;
  - Shallow groundwater within the superficial deposits (Secondary A Aquifer); and,
  - Groundwater within the bedrock (Principal Aquifer);
- Infrastructure:
  - Underground services e.g. buried pipes; and,
  - Proposed future on site buildings;

- Ecology:
  - Flora & Fauna.

Potential Pathways

12.4.24 Based upon the available information, the following are considered potential pathways:

- Human Health:
  - Direct dermal contact with substances in shallow soil and/or groundwater during potential groundworks;
  - Inhalation of substances from the partitioning of vapours from soil and / or shallow groundwater; and
  - Accidental ingestion and/or inhalation of substances in soil/dust and/or shallow groundwater during potential groundworks;
- Controlled Waters:
  - Lateral and vertical migration within the made ground and superficial deposits (Secondary A Aquifer), e.g. leaching from made ground vertically into shallow soil layers, including into deeper groundwater; and
  - Lateral overland flow, including via drains, to nearby surface waters;
- Infrastructure:
  - Migration of ground gases and accumulation in confined spaces (e.g. basements, service ducts); and
  - Piling foundations or drilled boreholes;
- Ecology:
  - Plant uptake and subsequent ingestion by fauna.

Future Baseline

12.4.25 In the event that the Proposed Development does not proceed, no significant changes to the existing baseline assumed for the Proposed Development are anticipated.

12.5 Development Design and Impact Avoidance

12.5.1 The appointed contractor(s) would (in due course) be required to produce a Construction Environmental Management Plan (CEMP) that would provide details of proposed environmental control measures, including measures related to the protection of land quality. The CEMP would include the impact avoidance measures as outlined in this section.

Construction

12.5.2 During construction of the Proposed Development, the contractor(s) would be required to minimise adverse land contamination effects on sensitive receptors by implementing good operational practices (e.g. employing suitable surface water drainage control).

12.5.3 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 (Ref 12-

25). Such measures would include suitable Personal Protective Equipment (PPE), hygiene facilities and the implementation of dust control where considered necessary.

12.5.4 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.

12.5.5 The final levels of the Proposed Development platform may require removal of some of the existing made ground present on the Site, and the placement of suitable geotechnical fill on the softer ground encountered in the southwest of the Power Plant Site. Should the removal of stockpiled material be required, a separate consent would be sought from the Local Authority which would include a characterisation of the material to determine suitability for re-use.

12.5.6 The potential sources of oils and fuels on site include plant, machinery, electrical installations and above-ground storage tanks. All plant and machinery would be checked regularly and, where possible, the use of drip trays would be employed, should vehicles be parked on unsurfaced areas of the Site. An emergency spillage action plan would be produced and provisions made to contain any leak/spill. Diesel storage tanks and related fuel delivery infrastructure associated with the 'black-start' capability should be fit for purpose and contained with an adequately and effectively bunded area, and comply with EA Oil Storage Regulations for Business (Ref 12-26).

12.5.7 Given the historical deposition of unknown wastes upon the site and adjacent land use as a refinery, 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 contaminated land 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 mobilised 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;
- The contractor(s) would be required to place arisings and temporary stockpiles away from watercourses and drainage systems, whilst surface water would be directed away from stockpiles to prevent erosion;
- The risk to surface water and groundwater from run-off from any contaminated stockpiles during construction works would be further reduced by implementing suitable measures to minimise rainwater infiltration and/or capture runoff and leachates, through use of bunding and/ or temporary drainage systems. These mitigation measures would

be designed in line with current good practice, follow appropriate guidelines and all relevant licences including discharge consents;

- Any waters removed from excavations by dewatering would be discharged appropriately, subject to the relevant licences being obtained; and
- The contractor(s) would implement a dust suppression/management system in order to control the potential risk from airborne contamination migrating off-site to adjacent sites.

12.5.8 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, for example water supply pipes would be designed in accordance with current good practice and applicable guidance to ensure pipes are protected from potential impacts associated with any contamination.

12.5.9 Piling design and construction works would be completed following preparation of a piling risk assessment, completed in accordance with the Environment Agency's 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention' (Ref 12-27). A piling and penetrative foundation design method statement would be submitted for approval by the local planning authority prior to relevant works commencing.

12.5.10 An initial (Phase 2) intrusive ground investigation is being undertaken to inform the preliminary design of foundations and to further characterise the ground structure (composition of made ground and infilled ground, bed rock depth, perched water, deeper groundwater and existing surface water quality). The investigation includes collection of soil and groundwater samples for analysis of potential contaminants, and completion of gas and groundwater monitoring.

12.5.11 Following completion of the investigation, and any other site specific site investigations which may be required, the need for any mitigation measures additional to the impact avoidance measures as presented above would be defined and presented in the final CEMP to be prepared by the appointed contractor.

Operation

12.5.12 It is anticipated that chemical testing results from soil and groundwater samples collected in the site investigation will inform the Site Condition Report required by the Environment Agency to inform the Environmental Permit Application. Dependent on the findings of the site investigation, it may be necessary to update the existing CSM for the site.

12.5.13 Liquid fuel storage areas and transformer building areas would be appropriately bunded to ensure that, in the event of any spillage, the materials are safely contained. Most significant impacts to soil and groundwater can be avoided with good housekeeping and management practices adopted and adhered to. However, cumulative emissions of oil based materials from road vehicles are more difficult to manage. Oil/water separators would be installed as appropriate within the drainage system to reduce the likelihood of oil-based materials impacting on the environment.

12.5.14 Under the Industrial Emission Directive, transposed into UK law in The Environmental Permitting (England and Wales) (Amendment) Regulations 2013 (Ref 12-28), operation of the Proposed Development will require an Environmental Permit which may contain conditions relating to routine environmental (including groundwater) monitoring during the lifetime of the Permit to confirm that operation of the Proposed Development is not adversely affecting groundwater quality beneath the Site.

Decommissioning

12.5.15 During decommissioning, the contractor(s) would be required to minimise adverse land contamination effects on sensitive receptors by implementing good operational practices (e.g. the use of PPE, such as dust masks if necessary, and suitable surface water drainage control).

12.5.16 During any earthworks operations (for example to reprofile the Site following demolition of buildings and structures, to create a platform for future development), 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. This would be controlled under a Material Management Plan as defined in the CIRIA Definition of Waste.

12.5.17 The contractor(s) would be required to implement pollution control measures to deal with any contaminated land encountered during the site activities. These measures would include the following:

- Should any potentially contaminated ground, including isolated 'hotspots' of contamination, be encountered during demolition works, 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 mobilised and contaminating other soils/ water during the development of the site, demolition workers would be briefed as to the possibility of the presence of such materials;
- In the event that contamination is identified during site works, appropriate remediation measures would be undertaken to protect workers, future site users, water resources, structures and services;
- The contractor(s) would be required to place arisings and temporary stockpiles away from watercourses and drainage systems, whilst surface water would be directed away from stockpiles to prevent erosion;
- The risk to surface water and groundwater from run-off from any contaminated stockpiles during demolition works would be further reduced by implementing suitable measures including sealing stockpiles to prevent rainwater infiltration. Alternatively bunding and/or temporary drainage systems would be put in place, designed in line with current good practice, following appropriate guidelines and obtaining all relevant licences including discharge consents;
- Any fuels or chemicals used during demolition phase would be stored in bunded areas with an impermeable base in accordance with Environment Agency regulations, thereby limiting the potential for migration of contaminants into groundwater following leaks/ spillages;
- Any waters resulting from dewatering would be discharged appropriately, subject to the relevant licences / permits being obtained; and
- The contractor(s) would implement a dust suppression/management system in order to control the potential risk from airborne contamination migrating off site to adjacent sites.

12.5.18 Measures that have been integrated into the Proposed Development in order to avoid or reduce adverse environmental effects will be described. Such measures may include refinement of the design and layout of the Proposed Development to minimise impacts on

sensitive receptors, implementation of Construction and Operational Environmental Management Plans, and adherence of relevant legislation, guidance and best practice.

12.6 Likely Impacts and Effects

Construction Impacts

12.6.1 Potential impacts during the construction phase(are anticipated to include the following:

- The discovery of soils exhibiting visual and olfactory evidence of contamination during groundworks and the potential disturbance of residual soil contamination through construction activities such as excavations for foundations;
- The discovery of impacted groundwater/surface water recovered during dewatering which may not be suitable for discharge to ground without treatment;
- Foundation methods and construction activities that may open and/or modify potential pollutant linkages;
- Re-profiling of the Site including the possible introduction of new fill materials and the removal of unsuitable or excessive materials;
- Runoff from contaminated material exposed and/or stockpiled during Site construction works;
- Contamination arising from spillages associated with vehicles and construction materials;
- Airborne contamination arising from potentially contaminated dust;
- Removal of any waste materials and/or contaminated soil; and
- Introduction of contaminated materials during infilling activities.

Operation Impacts

12.6.2 Potential impacts during the operational phase are anticipated to include the following:

- Leaks, spills and contamination from storage of chemicals, fuels and wastes on site affecting site users and groundwater; and
- Presence of gases, vapours and groundwater in the ground affecting site users and buildings.

Decommissioning Impacts

12.6.3 Potential impacts during the decommissioning phase are anticipated to include the following:

- Generation of wastes during decommissioning of existing chemical tanks, pipework, and associated infrastructure;
- Generation of crushed concrete and other demolition materials;
- The discovery of soils exhibiting visual and olfactory evidence of contamination during demolition and the potential disturbance of residual soil contamination through demolition activities such as the removal of Site drainage;
- Demolition activities that may open and/or modify potential pollutant linkages, including the disturbance of sediments;
- Re-profiling of the Site including the removal of unsuitable materials;

- Runoff from contaminated material exposed and/ or stockpiled during site demolition works;
- Contamination arising from spillages associated with vehicles and demolition materials;
- Airborne contamination arising from potentially contaminated dust;
- Removal of any waste materials and/or contaminated soil; and
- Introduction of contaminated materials during infilling activities.

Effects

12.6.4 This section presents the effects arising from the potential impacts identified above. The magnitude of impacts are defined with reference to the relevant baseline conditions (existing or future, as appropriate), and effects are determined in accordance with the identified methodology.

Table 12.10. Summary of Impacts and Effects

Description of impact	Mitigating factors	Sensitivity of resource/ receptor	Magnitude of impact	Classification of effect
Construction				
Impact to construction workers from contaminated soils, sediments and groundwater/ surface water encountered during construction	PPE requirements and engineering controls to be determined following groundwater monitoring as part of the future site investigation. Depth to groundwater to be considered during detailed design and measures are to be incorporated into the final CEMP in order to control exposure.	Medium	Low	Minor adverse (not significant)
Impact to groundwater from runoff and/ or leachates from stockpiled materials during construction	Thickness of made ground/ fill anticipated to be high. Mitigation measures to be adopted including collection of runoff and/ or covering of stockpiles.	Medium	Low	Minor adverse (not significant)
Impact to groundwater through creation of new or exacerbation of existing pathways during construction	Potential for residual sources of contamination likely to be moderate. Additional mitigation (e.g. piling risk assessment) would further reduce hazard.	Medium	Low	Minor adverse (not significant)

Description of impact	Mitigating factors	Sensitivity of resource/ receptor	Magnitude of impact	Classification of effect
Impacts to flora, fauna and agricultural land from contaminated soils encountered during construction	Potentially contaminated soils will be stockpiled in locations and upon land which is unlikely to result in impact on flora, fauna and agricultural land. Where possible, contaminated soils will be remediated in situ.	Medium	Low	Minor adverse (not significant)
Impact to workers, offsite residents and land from potentially contaminated dusts generated during construction	Adoption of suitable mitigation measures to minimise dust generation (e.g. damping down of materials).	Medium	Low	Minor adverse (not significant)
Risks to underlying groundwater potential contamination in imported fill placed at the site.	If required, imported fill to be suitable for use, and subject to testing and visual inspection prior to acceptance at the Site.	Medium	Low	Minor adverse (not significant)
Operation				
Impact to groundwater from spills, leachates and runoff during site operation	All fuel and chemical storage areas to be bunded. Design of surface water drainage to include oil-water separator and sediment traps.	Medium	Low	Minor adverse (not significant)
Impacts to buildings and site workers from gases, vapours and groundwater during operation	Risks to be minimised through completion of site investigation and adoption of design measures and engineering controls to minimise risks.	Low	Low	Negligible adverse (not significant)
Decommissioning				
Accidental release of contaminants to controlled waters during decommissioning and demolition activities	Risks to be minimised through appropriate methods and controls adopted as part of any planned decommissioning and demolition activities	Medium	Low	Minor adverse (not significant)
Placement of potentially contaminated demolition materials on the site during and following demolition	Any residual material remaining on site following decommissioning and demolition to be subject to an appropriate risk assessment to confirm absence of risks to the environment.	Low	Low	Negligible adverse (not significant)

12.6.5 It is concluded that, with the implementation of the impact avoidance measures and best practice guidance defined within Section 12.5, potential effects upon the identified sensitive receptors as a result of the impacts identified are with minor adverse or negligible (not significant).

12.7 Mitigation

12.7.1 As no significant effects have been identified, no additional mitigation measures are required in order to further reduce the potential impacts and effects from the ground conditions on the Proposed Development. Notwithstanding, following completion of a ground investigation in due course, it will be possible to refine the need for any additional design and impact avoidance measures beyond detailed in Section 12.5.

12.8 Residual Effects and Conclusions

12.8.1 Given that no significant effects have been identified and therefore no additional mitigation is required, it is considered that there will be no impacts with more than a minor adverse impact present (non-significant effect) on the Proposed Development from ground conditions.

12.9 Cumulative and Combined Effects

12.9.1 There are no currently committed developments in the vicinity that are expected to present the potential for adverse cumulative ground conditions and hydrogeology impact when assessed in conjunction with the Proposed Development.

12.10 Summary

12.10.1 Based on the information as detailed herein, the construction, operation and decommissioning activities associated with the Proposed Development would have the potential to generate a number of land contamination related adverse effects on identified receptors if appropriate impacts avoidance measures (as detailed in Section 12.5) are not implemented. However, as it can be assumed that the impact avoidance measures detailed in Section 12.5 would be employed and any further mitigation measures identified following an appropriately designed ground investigation would be implemented, effects related to potential geological, hydrogeological and contamination related impacts associated with the Proposed Development during the construction, operation and decommissioning periods are likely to be negligible or minor adverse (not significant).

12.11 References

Ref 12-1 European Commission (2000) Water Framework Directive (2000/60/EC).

Ref 12-2 European Parliament and Council of the European Union (2010) *Directive 2010/75/EU on industrial emissions (integrated pollution and control).*

Ref 12-3 European Commission (2014) *European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions.*

Ref 12-4 European Parliament and Council of the European Union (2006) *Directive 2006/118/EC on the protection of groundwater against pollution and deterioration (Daughter to 2000/60/EC).*

Ref 12-5 HM Government (2009) *The Groundwater (England and Wales) Regulations 2009*.

Ref 12-6 HM Government (2010) *Environmental Protection, England and Wales The Environmental Permitting (England and Wales) Regulations 2010*.

Ref 12-7 European Parliament and Council of the European Union (2013) *Decision 1386/2013/EU on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet'*.

Ref 12-8 Her Majesty's Stationary Office (1990) *The Environmental Protection Act 1990.*

Ref 12-9 Her Majesty's Stationary Office (2009) *The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009.*

Ref 12-10 Her Majesty's Stationary Office (1990) *The Town and Country Planning Act 1990.*

Ref 12-11 Her Majesty's Stationary Office (1995) *The Environment Act 1995.*

Ref 12-12 Her Majesty's Stationary Office (1999) Water Resources (England and Wales) The Anti-Pollution Works Regulations 1999.

Ref 12-13 Her Majesty's Stationary Office (2001) *The Control of Pollution (Oil Storage) (England) Regulations 2001.*

Ref 12-14 Her Majesty's Stationary Office (2015) *The Environmental Damage (Prevention and Remediation) (England) Regulations 2015.*

Ref 12-15 Department for Communities and Local Government (2012) *National Planning Policy Framework.*

Ref 12-16 North East Lincolnshire Council (2018) *Local Plan North East Lincolnshire*

Ref 12-17 Department of Energy and Climate Change (2011) *Overarching National Policy Statement for Energy (EN-1)*.

Ref 12-18 Department of Energy and Climate Change (2011) *National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)*. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47855/1939-nps-for-fossil-fuel-en2.pdf

Ref 12-19 Her Majesty's Stationary Office (1984) *The Building Act 1984.*

Ref 12-20 Her Majesty's Stationary Office (2000) *The Building Regulations 2000.*

Ref 12-21 Environment Agency (2010) *GPLC1 - Guiding Principles for Land Contamination.*

Ref 12-22 Department of the Environment, Food and Rural Affairs (2004) *Model Procedures for the Management of Contaminated Land, Contaminated Land Report 11.*

Ref 12-23 British Geological Survey (2017) (www.bgs.co.uk) accessed July 2017.

Ref 12-24 Environment Agency (2017) (https://www.gov.uk/government/organisations/environment-agency) accessed July 2017.

Ref 12-25 Her Majesty's Stationary Office (2002) *Control of Substances Hazardous to Health Regulations.*

Ref 12-26 Environment Agency (2018) Oil storage regulations for business https://www.gov.uk/guidance/storing-oil-at-a-home-or-business, accessed April 2018.

Ref 12-27 Environment Agency (2001) *Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention*, National Groundwater & Contaminated Land Centre report NC/99/73.

Ref 12-28 Her Majesty's Stationary Office (2013) *The Environmental Permitting (England and Wales) (Amendment) Regulations 2013.*

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Tables

13 Surface Water, Flood Risk and Drainage

13.1 Introduction

13.1.1 This chapter of the Environmental Statement (ES) addresses the potential effects of the construction, operation (including maintenance) and decommissioning of the proposed VPI-Immingham Energy Park 'A' (the Proposed Development) on surface water, flood risk and drainage. The assessment considers:

- The present-day baseline conditions during construction;
- The effects of construction of the Proposed Development on water resources, flood risk and drainage;
- The effects of operation of the Proposed Development on water resources, flood risk and drainage; and
- The effects of decommissioning the Proposed Development, where possible, on water resources, flood risk and drainage.

13.1.2 The assessment of cumulative effects on water resources, flood risk and drainage associated with the Proposed Development and other committed developments in the vicinity are described in Chapter 14: Cumulative and Combined Effects of this ES.

13.1.3 This chapter is supported by a Flood Risk Assessment (FRA) including an Outline Drainage Strategy (Appendix 13A: Flood Risk Assessment (ES Volume 3). The FRA details the existing levels of flood risk associated with the Site and the surrounding area, quantifies the volume of surface water on the Site and requiring management, identifies the impacts that the Proposed Development would have upon these aspects, and suggests potential mitigation measures to reduce the impact and manage the flood risk.

13.1.4 The Outline Drainage Strategy for the Proposed Development (see Appendix 13A: Flood Risk Assessment (ES Volume 3)) provides guidance and information with regards to the effective and safe drainage of surface water for the Site. The final drainage design would be completed during the detailed design stage.

13.1.5 It should be noted that some of the potential impacts and effects relating to the hydrogeology underlying the Proposed Development are also addressed within Chapter 12: Ground Conditions and Hydrogeology, due to the considerable overlap between the two subject areas.

13.2 Legislative and Planning Policy Context

Legislative Background

European Legislation

13.2.1 The European Union (EU) Water Framework Directive (WFD) (2000/60/EC) (Ref 13-1) is the primary European Directive setting the context for the requirements of this chapter. The purpose of the Directive is to establish a framework for the protection and improvement of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater.

13.2.2 The Directive requires the UK to classify the current condition of key waterbodies (giving a *'status'* or *'potential'*) and to set objectives to either maintain the condition, or improve it where a waterbody is failing minimum targets. Any activities or developments that could

cause deterioration within a nearby waterbody, or prevent the future ability of a waterbody to reach its target status, must be mitigated so as to reduce the potential for harm and allow the aims of the WFD to be realised.

National Legislation

13.2.3 The Water Resources Act 1991 (as amended) (Ref 13-2) sets out the relevant regulatory controls that provide protection to waterbodies and water resources (from abstraction pressures and pollution).

13.2.4 Other relevant national legislation which set out requirements related to control and protection of water resources and flood risk management includes:

- The Flood and Water Management Act 2010 (FWMA) (Ref 13-3) – see paragraph 13.2.6 and paragraph 13.2.7;
- The Water Act 2003 (Ref 13-4) and 2014 (Ref 13-5) governing the control of water abstraction, discharge to water bodies, water impoundment, conservation and drought provision;
- The Environment Act 1995 (Ref 13-6) which established the Environment Agency and its statutory role in water resource protection;
- The Environmental Protection Act 1990 (Ref 13-7) which provides for integrated pollution control; and
- The Land Drainage Act 1991 (Ref 13-8) which provides for drainage management related to non-main rivers.

13.2.5 A number of specific regulations have been enacted to implement the statutory European and national legislation into UK law - these regulations include:

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Ref 13-9). These Regulations are important to the assessment within this chapter as they set the WFD environment quality standards that need to be met and maintained in UK waterbodies;
- The Water Environment (WFD) Regulations 2015 (Ref 13-10);
- The Water Framework Directive (Standards and Classification) Directions 2015 (Ref 13-11);
- The Anti-Pollution Works Regulations 1999 (Ref 13-12);
- The Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref 13-13);
- The Groundwater Regulations (England and Wales) 2009 (Ref 13-14);
- The Environmental Damage Regulations 2009 (Ref 13-15);
- The Flood Risk Regulations 2009 (Ref 13-16);
- The Water Resources Act (Amendment) (England and Wales) Regulations 2009 (Ref 13-17);
- The Environmental Permitting (England and Wales) Regulations 2010 (Ref 13-18), which control discharge of water to surface water and groundwater; and
- The Water Supply (Water Quality) Regulations 2010 (Ref 13-19).

13.2.6 The FWMA, enacted by Government in 2010 in response to The Pitt Review (Ref 13-20) designated unitary authorities, such as North Lincolnshire Council (NLC), as Lead Local Flood Authorities (LLFAs). As a LLFA, NLC has responsibilities to lead and co-ordinate local flood risk management. Local flood risk is defined as the risk of flooding from surface water runoff, groundwater and ditches and watercourses (collectively known as ordinary watercourses).

13.2.7 The FWMA also formalises the flood risk management roles and responsibilities for other organisations including the Environment Agency, water companies and highways authorities establishing them as Risk Management Authorities (RMAs). The responsibility to lead and co-ordinate the management of tidal and fluvial flood risk remains that of the Environment Agency.

Planning Policy Context

National Planning Policy

13.2.8 The National Planning Policy Framework (NPPF) (Ref 13-21) outlines the Government's economic, environmental and social planning policies for England. The NPPF is a succinct planning document, which sets out the government's vision of sustainable development, intended to be interpreted and applied locally to meet local aspirations. The NPPF supersedes and replaces a number of planning policy documents that are applicable to the water environment including Planning Policy Statement 25 (PPS25): Development and Flood Risk (Ref 13-22) and PPS23: Planning and Pollution Control (Ref 13-23).

13.2.9 The NPPF sets-out 12 planning principles as guidance for local councils for the creation of their local plan; the following principles are directly applicable to the water environment:

> *"10. Meeting the challenge of climate change, flooding and coastal change – support the transition to a low carbon future in a changing climate taking full account of (inter alia) flood risk and coastal change; and*
>
> *11. Conserving and enhancing the natural environment – development should minimise pollution and other adverse effects on the local and natural environment and should plan positively for the creation, protection, enhancement and management of networks of biodiversity and green infrastructure".*

13.2.10 On 6th March 2014 the National Planning Practice Guidance (NPPG) web-based resource was launched (Ref 13-24) which includes greater emphasis on issuing more robust guidance with regards to flood risk. The purpose of the new online national planning guidance is to give simplicity and clarity to the planning system.

13.2.11 The NPPG contains guidance in relation to water supply, wastewater and water quality, and flood risk management. It also provides advice and information on how planning can and should protect water quality; ensure the delivery of adequate water and wastewater infrastructure for new development and ensure development is protected from flood risk, and does not increase flood risk elsewhere.

13.2.12 The Non-statutory Technical Standards for Sustainable Drainage Systems (Ref 13-25) was published in March 2015 and is the current guidance for the design, maintenance and operation of Sustainable Drainage Systems (SuDS). The standards set out the following:

- Peak runoff rates should be as close as is reasonably practicable to the greenfield rate, but should never exceed the pre-development runoff rate;
- The drainage system should be designed so that flooding does not occur on any part of a development site for a 1 in 30 year rainfall event, and that no flooding of a building (including basement) would occur during a 1 in 100 year rainfall event; and
- Pumping should only be used when it is not reasonably practicable to discharge by gravity.

13.2.13 The Proposed Development will also be considered by the Environment Agency in terms of the Land Drainage Act 1991 and the Water Resources Act 1991. Consent from the Environment Agency will be required for any proposed discharges to controlled waters.

13.2.14 The East Inshore and East Offshore Marine Plans (Ref 13-26) are guidance documents for developers to ensure the sustainable development of the marine area and protection of the marine ecosystem. These plans have been published in line with the Marine Policy Statement (Ref 13-27) and NPPF.

13.2.15 The East Inshore Marine Plan area includes the coastline stretching from Flamborough Head to Felixstowe, extending out to the seaward limit of the territorial sea (approximately 12 nautical miles). It also includes:

- Any area submerged at mean high water spring tide;
- The waters of any estuary, river or channel, so far as the tide flows at mean high water spring tide; and
- Waters in any area which is closed (permanently or intermittently) by a lock or other artificial means against the regular action of the tide, but into and from which seawater is caused or permitted to flow (continuously or from time to time).

13.2.16 This includes the tidal limits for the Humber Estuary, which incorporates areas of NLC.

13.2.17 The East Inshore Marine Plan states *"A clean and healthy marine environment, including healthy beaches and good water quality, are important to tourism and recreation"*. Relevant district wide policies include:

- Policy TR1: Proposals for development should demonstrate that during construction and operation, in order of preference:
  - *a) They will not adversely impact tourism and recreation activities;*
  - *b) How, if there are adverse impacts on tourism and recreation activities, they will minimise them;*
  - *c) How, if the adverse impacts cannot be minimised, they will be mitigated; and*
  - *d) The case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.*
- Policy TR2: Proposals that require static objects in the East Inshore Marine Plan areas, should demonstrate, in order of preference:
  - *a) That they will not adversely impact on recreational boating routes;*
  - *b) How, if there are adverse impacts on recreational boating routes, they will minimise them;*
  - *c) How, if the adverse impacts cannot be minimised, they will be mitigated; and*
  - *d) The case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.*

13.2.18 In addition, the following policy in relation to climate change is also applicable:

- Policy CC1: Proposals should take account of:
  - *How they may be impacted upon by, and respond to, climate change over their lifetime;*
  - *How they may impact upon any climate change adaptation measures elsewhere during their lifetime; and*
  - *Where detrimental impacts on climate change adaptation measures are identified, evidence should be provided as to how the proposal will reduce such impacts.*

13.2.19 No works are required within the river or to flood defences within the East Inshore Marine Plan area in proximity to the Site therefore no Deemed Marine Licence is required.

Local Planning Policy

13.2.20 The Core Strategy (Ref 13-28) was adopted by NLC in June 2011. This Core Strategy sets-out the long term spatial planning framework for the development of North Lincolnshire up to 2026 by providing strategic policies and guidance to deliver the vision for the area including the scale and distribution of development, the provision of infrastructure to support it and the protection of the natural and built environment.

13.2.21 Policies within the NLC Core Strategy relevant to flood risk and surface water management include:

- **Policy CS2: Delivering More Sustainable Development** - A 'sequential approach' will also be applied to ensure that development is, where possible, directed to those areas that have the lowest probability of flooding, taking account the vulnerability of the type of development proposed, its contribution to creating sustainable communities and achieving the sustainable development objectives of the plan. Where development does take place in the floodplain, mitigation measures should be applied to ensure that the development is safe;
- **Policy CS12: South Humber Bank Strategic Employment Site (SHBSES)** - Development will be assisted by a drainage programme. The outcome will be to include surface water and sewage management solutions to accommodate development of the SHBSES without harming the natural environment. Safeguard and improve the flood defences of the SHBSES from tidal flooding through partnership working with the Environment Agency and its Humber Flood Risk Management Strategy, North Lincolnshire and North East Lincolnshire Councils, Yorkshire Forward, landowners and industry. This will include managing the predicted effects of climate change in harmony with the development of port related activities by managing and minimising the risk of flooding;
- **Policy CS18: Sustainable Resource Use and Climate Change** - Requiring the use of Sustainable Urban Drainage Systems (SuDS) where practicable and supporting the necessary improvement of flood defences and surface water infrastructure required against the actions of climate change, and preventing development in high flood risk areas wherever practicable and possible; and
- **Policy CS19: Flood Risk** - The council will support development proposals that avoid areas of current or future flood risk, and which do not increase the risk of flooding elsewhere. This will involve a risk based sequential approach to determine the suitability of land for development that uses the principle of locating development, where possible, on land that has a lower flood risk, and relates land use to its vulnerability to flood. Development in areas of high flood risk will only be permitted where it meets the requirements of the Exception Test and, in addition, development will be required, wherever practicable, to incorporate SuDS to manage surface water drainage.

Internal Drainage Board (IDB) Byelaws

13.2.22 Internal Drainage Boards (IDBs) are responsible for managing water levels in the watercourses designated to each IDB and work in partnership with other authorities to actively manage and reduce the risk of flooding within the Board's district. They have permissive powers under the Land Drainage Act 1991 (as amended by the 1994 Act) (Ref 13-8) to undertake maintenance on any watercourse within their district other than 'Main Rivers' and to supervise all matters relating to the drainage of land within their districts. Permissive powers means that IDBs are permitted to undertake works on ordinary watercourses but the responsibility remains with the riparian owner[1] as the IDBs are not

[1] The responsibility for managing and maintaining ordinary watercourses falls to riparian owners who typically own land on either bank and therefore are deemed to own the land to the centre of the watercourse. NYCC, as the LLFA, has permissive powers to manage the risk of flooding arising from the watercourses through engagement with riparian owners and enforcing maintenance responsibilities in accordance with the Land Drainage Act 1991, http://www.legislation.gov.uk/ukpga/1991/59/contents

obligated. IDBs can undertake works on watercourses outside their drainage district in order to benefit the district. IDBs may make byelaws, approved by the relevant Minister, for securing the efficient working of the drainage systems.

13.2.23 North East Lindsey (NEL) IDB operates in the study area for the Proposed Development. Any developer working in the NELIDB area should review the following byelaws[2] (Ref 13-29):

- Byelaw 3: Control of introduction of water and increase in flow or volume of water;
- Byelaw 4: Control of sluices etc.;
- Byelaw 6: Diversion or stopping up of watercourses;
- Byelaw 7: Detrimental Substances not to be Put Into Watercourses;
- Byelaw 10: No obstructions within 7m of the edge of the watercourse;
- Byelaw 15: Banks not to be Used for Storage;
- Byelaw 16: Not to Dredge or Raise Gravel, Sand etc;
- Byelaw 17: Fences, excavations, pipes etc.; and
- Byelaw 18: Interference with Sluices.

Other Guidance

Environment Agency Pollution Prevention Guidance Notes

13.2.24 The Environment Agency Pollution Prevention Guidance (PPG) Notes provide advice on statutory responsibilities and good environmental practice. A review plan for the PPGs is currently underway, replacing them with a replacement guidance series, Guidance for Pollution Prevention (GPPs). The GPPs provide environmental good practice guidance for the whole UK and environmental regulatory guidance directly to Northern Ireland, Scotland and Wales only. The following are therefore considered pertinent to the Proposed Development:-

- PPGN 1 – General Guide to the Prevention of Pollution (Ref 13-30) provides an introduction to pollution prevention and the pollution prevention guidance notes;
- GPPN 2 – Above Ground Oil Storage Tanks (Ref 13-31) provides guidance to those responsible for the storage of oil on construction sites, including guidance on location, bunding, protection and operation of oil stored in addition to maintenance and dealing with spills;
- PPGN 3 – Use and Design of Oil Separators in Surface Water Drainage Systems (Ref 13-32) provides guidance on when oil separators are appropriate and what size and type of separator are required;
- GPPN 5 – Works and Maintenance in, or near watercourses (Ref 13-33) provides guidance on how to prevent pollution and comply with environmental law when planning works near, in or over ponds, lakes, ditches, streams, rivers and other watercourses. It gives information about planning the works, managing silt, concrete and cement, oils and chemicals, maintaining structures over watercourses, waste management and responding to pollution incidents;
- PPGN 6 – Working at Construction or Demolition Sites (Ref 13-34) repeats much of what PPGN5 presents but concentrates specifically on the situations likely to occur at demolition and construction sites;

[2] http://northeastlindsey-idb.org.uk/wp-content/uploads/2017/06/NORTH-EAST-LINDSEY.pdf

- PPGN 7 – Refuelling Activities (Ref 13-35), provides information on the correct delivery, storage and dispensing of fuel to help reduce the risk of pollution;
- GPPN 8 – Safe storage and disposal of used oils (Ref 13-36);
- PPGN 13 – Vehicle Washing and cleaning (Ref 13-37);
- PPGN 18 – Managing firewater major spillages (Ref 13-38); and
- GPPN 21 – Pollution Incident Response Planning (Ref 13-39) contains advice for those developing site specific pollution incident response plans to help prevent and mitigate damage to the environment caused by accidents such as spillage and fire.

Construction Industry Research and Information Association (CIRIA) Guidance

13.2.25 The CIRIA guidance of relevance to the Proposed Development includes:

- Guidance C532 - Control of Water Pollution from Construction Sites (Ref 13-40) brings together the Environment Agency guidance but goes into greater detail with regard to sources of water on construction sites, pollutants and pathways. In addition, it provides guidance on planning for the type and location of suitable control measures; and
- Guidance C753 - The SuDS Manual (Ref 13-41) provides best practice guidance on the planning, design, construction, operation and maintenance of SuDS to facilitate their effective implementation within developments.

13.3 Assessment Methodology and Significance Criteria

Consultation

13.3.1 The consultation undertaken with statutory consultees to inform this chapter, including a summary of comments raised through the formal Scoping Opinion (Appendix 1B (ES Volume 2)) and in response to the formal Stage 1 consultation is summarised in Table 13.1 below.

Table 13.1. Consultation Summary

Consultee or organisation approached	Date and nature of consultation	Summary of Response	How comments have been addressed in this Chapter
Environment Agency	Scoping Opinion (January 2018)	Overall we agree that the scope of the report in respect of surface water has been appropriately addressed. During the construction stage, the Scoping Report highlights issues with sedimentation impacts into adjacent land drains and potential leakage of construction materials into watercourses. We have the following recommendations for the developer to consider: • Include settling tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake; • Incorporate the use of SuDs techniques, interceptors and separators, as required; and • Areas at risk of spillage can be bunded and carefully sited to minimise the risk of	Mitigation for the Proposed Development for both the construction and operation phases are outlined in Section 13.5 – Development Design and Impact Avoidance.

Consultee or organisation approached	Date and nature of consultation	Summary of Response	How comments have been addressed in this Chapter
		hazardous substances entering local watercourses.	
		The Water Framework Directive (WFD) River Basin Management Plans require that the watercourses continue to show improvements in overall quality in line with the quality standards specified in these documents. Under WFD, developers will need to ensure that deterioration in water body status is prevented both during and after construction.	Section 13.6 Likely Impacts and Effects includes an assessment of water quality against WFD objectives, where required.
		We are satisfied the scope of the report regarding flood risk has been appropriately addressed. A Flood Risk Assessment (FRA) is required which should include an assessment of how flood risk will be managed now and over the lifetime of the development. This analysis needs to include assessment of the consequences should a breach of the tidal flood defences occur. It should also be demonstrated that the development will not increase flood risk elsewhere.	Flood risk from all potential sources has been assessed within the supporting FRA - Appendix 13A (ES Volume 2) which also details relevant mitigation.

Assessment Methods

13.3.2 There is no formal standard methodology for assessing the magnitude of impacts and significance of effects of a development on the water environment. Each water receptor is evaluated, and the effects of the project assessed, according to their individual characteristics. A methodology for assessing the significance of any effect has, therefore, been developed by consultants in the water industry and is commonly adopted by water EIA practitioners for projects throughout the UK, based on the most relevant legislation and Government guidance. The methodology developed is considered to be appropriate for the types of impact that are predicted to arise from the proposed Development, and for assessing the resulting effects.

13.3.3 The assessment criteria used in this chapter are based on the web-based DETR (Department of the Environment, Transport and the Regions) document 'Transport Analysis Guidance' (known as WebTAG) Unit 3.3.11 (Ref 13-42). This methodology provides an appraisal framework for taking the outputs of the environmental impact process and analysing the key information of relevance to the water environment. Although this guidance is intended for transport studies, it is commonly used for water resources impact assessment for other types of infrastructure, and is considered suitable for application to other development schemes (including the Proposed Development) in the absence of other suitable guidance.

13.3.4 For the purpose of this assessment, a number of modifications to the WebTAG criteria have been made to address relevant legislation (notably the WFD). These modifications are based on other more recent guidance, where appropriate (e.g. The Design Manual for Roads and Bridges (DMRB) (Ref 13-43), or draw upon the professional judgement and experience of the chapter authors.

Significance Criteria

13.3.5 The WebTAG methodology takes into account the importance of receptors and the magnitude of predicted impacts on the water environment. Importance is based on the value of the feature or resource (see Table 13.2), whilst the magnitude of a potential impact is estimated based on the degree of impact and is independent of the importance of the feature (see Table 13.3).

13.3.6 The basic approach to assessing the impacts of the Proposed Development on water receptors is to consider how sensitive the receptors may be to changes in surface water conditions, including flows and water quality. The indicators used in making a professional judgement on the importance of a water feature under consideration include quality, scale, rarity and substitutability where:

- Quality is a measure of the physical condition of the attribute;
- Scale requires consideration of the geographical scale at which the attribute matters to both policy makers and stakeholders, at all levels;
- Rarity requires consideration of whether the water feature is commonplace or scarce, at the scale at which it matters; and
- Substitutability requires consideration of whether water attributes are replaceable over a given time frame.

Table 13.2. Importance of Water Feature or Resource (modified from WebTAG Unit 3.3.11)

Importance	Criteria	Examples
Very high	Attribute with a high quality and rarity, regional or national scale and limited potential for substitution.	**Water resources**: Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0m^3/s Source Protection Zone (SPZ) 1 within a Principal Aquifer **Water abstraction**: >1,000m^3/day **Receptors to flood risk**: essential infrastructure or highly vulnerable development*
High	Attribute with a high quality and rarity, local scale and limited potential for substitution or attribute with a medium quality and rarity, regional or national scale and limited potential for substitution.	**Water resources**: Watercourse having a WFD classification as shown in a RBMP, and Q95 < 1.0m^3/s Principal Aquifer (not within SPZ 1) [Cyprinid or Salmonid fishery] **Water abstraction**: 500-1,000m^3/day **Receptors to flood risk**: more vulnerable development*
Medium	Attribute with a medium quality and rarity, local scale and limited potential for substitution or attribute with a low quality and rarity, regional or national scale and limited potential for substitution.	**Water resources**: Watercourse detailed in the Digital River Network** but not having a WFD classification as shown in a RBMP; Secondary Aquifer **Water abstraction**: 50-499m^3/day Receptors to flood risk: less vulnerable development*
Low	Attribute with a low quality and rarity, local scale and limited potential for substitution.	**Water resources**: Surface water sewer, agricultural drainage ditch; non-aquifer **Water abstraction**: <50m^3/day **Receptors to flood risk**: water compatible development*

* As defined in Table 2 of the Flood Risk section of the PPG (Ref. 13-24)

** Digital River Network is a dataset that comprises river centrelines which has been digitised from OS 1:50,000 mapping. It consists of rivers; canals; surface pipes (man-made channels for transporting water such as aqueducts and leats); and miscellaneous channels (including estuary and lake centrelines and some underground channels).

13.3.7 Professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor and in many instances, it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance, to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, just because a watercourse may currently be below Good Ecological Status (GES), this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the Water Resources Act 1991 (as amended) and future WFD targets also need to be considered.

Magnitude of Impacts

13.3.8 For an impact on water quality to exist, it is necessary for a pollution linkage to be identified. Specifically this requires:

- A source of pollution (for the purposes of this assessment, defined as the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment);
- A receptor that is sensitive to that pollution; and
- A pathway by which the two are linked (i.e. completing a Source-Pathway-Receptor model).

13.3.9 This model identifies the potential sources or 'causes' of impact before describing their nature and quantifying them where possible, as well as identifying and evaluating the receptors (water resources) that could potentially be affected. However, the presence of a potential impact source and a potential receptor does not always infer an impact; there must also be a clear mechanism or 'pathway' via which the source can affect the receptor. For example, spillage of a contaminant on an area of hard standing within a development site would not necessarily reduce the quality of an adjacent watercourse, unless there is a pathway whereby it can travel to the watercourse (such as a surface water drain within the hard standing area).

13.3.10 The first stage in applying the Source-Pathway-Receptor model is to identify the causes or 'sources' of potential impact from a development. The impact sources have been identified through a review of the details of the Proposed Development, including the size and nature of the development, potential construction methodologies and timescales. This has been undertaken in the context of local conditions relative to water resources near the Proposed Development site, such as topography, geology, climatic conditions and potential sources of contamination.

13.3.11 The next step in the model is to undertake a review of the potential receptors, that is, the water resources themselves that have the potential to be affected. The identification of potential water resource receptors has been undertaken through the review of baseline data.

13.3.12 The last stage of the model is, therefore, to determine if there is a viable exposure pathway or a 'mechanism' linking the source to the receptor.

13.3.13 Impacts may be adverse or beneficial, depending on the circumstances. They are quantified where practicable and the degree or magnitude of impact is assessed on a qualitative scale, to facilitate comparison with impacts on other environmental receptors. The four-point scale used is described in Table 13-3 below.

Table 13.3. Magnitude of Potential Impacts

Magnitude	Impact	Description
High	Adverse: loss of an attribute	Decrease in surface water ecological or chemical WFD status or

Magnitude	Impact	Description
	and/or quality and integrity of an attribute	groundwater qualitative or quantitative WFD status. Change in flood risk to receptor from low or medium to high risk.
	Beneficial: creation of new attribute or major improvement in quality of an attribute	Increase in productivity or size of fishery; increase in surface water ecological or chemical WFD status; increase in groundwater quantitative or qualitative WFD status. Change in flood risk to receptor from high to low.
Medium	Adverse: loss of part of an attribute or decrease in integrity of an attribute	Measurable decrease in surface water ecological or chemical quality, or flow; reversible change in the yield or quality of an aquifer; such that existing users are affected, but not changing any WFD status. Change in flood risk to receptor from low to medium.
	Beneficial: moderate improvement in quality of an attribute	Measurable increase in surface water quality or in the yield or quality of aquifer benefiting existing users but not changing any WFD status. Change in flood risk to receptor from medium to low.
Low	Adverse: some measurable change to the integrity of an attribute	Measurable decrease in surface water ecological or chemical quality, or flow; decrease in yield or quality of aquifer; not affecting existing users or changing any WFD status. Change in flood risk to receptor from no risk to low risk.
	Beneficial: measurable increase, or reduced risk of negative effect to an attribute	Measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer not affecting existing users or changing any WFD status. Change in flood risk to receptor from low risk to no risk.
Very low	No change to integrity of attribute	Negligible change discharges to watercourse or changes to an aquifer which lead to no change in the attribute's integrity.

13.3.14 In the context of the Proposed Development, short-term effects are considered to be those associated with the construction and decommissioning phases and which cease when construction or decommissioning works are completed; long-term effects are those associated with the completed, operational Proposed Development and which last for the duration of the operational phase. Effects may also be permanent (irreversible) or temporary (reversible) and direct or indirect.

13.3.15 Effects on areas on the scale of the NLC (or similar scale, across local authority boundaries) are considered to be at a regional level, whilst effects that cover different parts of the country, or England as a whole, are considered being at a national level. Smaller scale effects (to the Site or neighbouring sites) are considered to be at a local level.

Significance of Effects

13.3.16 The significance of a potential effect is derived by considering both the importance of the feature and the magnitude of the impact, using a matrix as illustrated in Table 13-4.

13.3.17 The following significance categories have been used for both potential and residual effects:

- Neutral: effects to a water resource receptor that are neither advantageous or detrimental;
- Beneficial: a beneficial/positive effect on the quality of a water resource receptor; or
- Adverse: a detrimental/negative effect on the quality of a water resources receptor.

13.3.18 When an effect is considered to be beneficial or adverse, the following levels of significance are stated, as shown in Table 13-4:

- Negligible: imperceptible effects to a water resources receptor;

- Minor: a limited, very short or highly localised effect on a water resource of high or medium importance, or a wide extent or long duration effect on a water resource of low quality/importance. A minor effect would not prevent compliance with legislation, water quality standards or policy;
- Moderate: a local scale medium magnitude of change on a water resource of high quality; or a large (reversible) effect on a water resource of medium quality/importance. A moderate effect would not affect the long-term status of a waterbody under the WFD; and
- Major: a magnitude of change on a water resource of high quality/importance resulting in a deterioration of waterbody status; preventing WFD objectives or compliance with other legislation being met.

Table 13.4. Classification of Effects

Magnitude of impact	Sensitivity/importance of receptor			
	Very High	High	Medium	Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very low	Minor	Negligible	Negligible	Negligible

13.3.19 In applying this methodology, if a major adverse or moderate adverse effect were to be identified, then mitigation measures would be developed to reduce or mitigate this effect. For the purposes of this assessment, effects are only considered to be significant if they are major or moderate.

Rochdale Envelope

13.3.20 As discussed in Chapter 2: Assessment Methodology of this ES, and in order to ensure a robust assessment of the likely significant environmental effects of the Proposed Development, this Assessment has been undertaken adopting the principles of the 'Rochdale Envelope'.

13.3.21 The FRA (Appendix 13A ES Volume 3) considers the maximum building dimensions shown in the indicative layouts (Figure 4.1a and Figure 4.1b in ES Volume 2) to determine the anticipated surface water runoff from the Site.

13.4 Baseline Conditions

Spatial Scope of Assessment

13.4.1 The Site encompasses the land required for the construction and operation of the Proposed Development and associated connections. The Site occupies a total area of approximately 3.2 ha. The northern area of the Site is currently occupied by an existing access road and compacted permeable ground. The southern half of the Site is covered in shrubbery/grassland and contains various stockpiles of unknown origin.

13.4.2 This assessment considers water bodies that are hydrologically connected with the Site and where impacts from the proposed Site may have an effect, based on available data. The assessment considers watercourses within an area spanning from immediately upstream of the Site, to as far downstream as a potential impact may influence the quality or quantity of the watercourse.

13.4.3 The main watercourses with the potential to be in hydraulic conductivity in the vicinity of the Site are: local land drains (located within and directly adjacent to the Site boundary), wider NELIDB watercourses (Watercourse 9 and 9A), the wider land drainage network and the Humber Estuary. The locations of the watercourses are presented as Figure 13.1 Watercourse Location (ES Volume 2).

Sources of Information/Data

13.4.4 A desk-based study has been undertaken to identify the existing surface water conditions within the defined study area.

13.4.5 In order to identify and characterise the surface water receptors considered as part of this assessment, available data on surface water quality and quantity within the vicinity of the Site have been obtained.

13.4.6 A number of sources of information and websites have been consulted, including:

- Ordnance Survey maps;
- Multi-Agency Geographical Information for the Countryside (MAGIC) website (Ref 13-44);
- Environment Agency website (Ref 13-45);
- Humber River Basin Management Plan (RBMP) (Ref 13-46);
- Groundsure Report (included within Appendix 12A: Phase I Geoenvironmental Site Assessment (ES Volume 3));
- The Environment Agency was consulted and provided data on water, uses of groundwater, surface water features (potable water sources, fisheries, consented discharges etc.), groundwater quality and RBMP status and objectives;
- NLC Strategic Flood Risk Assessment (Ref 13-47);
- NLC Preliminary Flood Risk Assessment (Ref 13-48); and
- A walkover of the study area by ecologists and land contamination specialists (undertaken in September 2017) to identify, locate and describe water resource receptors. Further information is outlined in Chapter 10: Ecology and Chapter 12: Ground Conditions and Hydrogeology.

Existing Baseline

Topography

13.4.7 A review of topographic survey data shows that ground levels across the Site range from 6.67m above Ordnance Datum (AOD) in the north east to 3.9m AOD in the south east. Ground levels, in general, decrease from the northern site boundary towards the south and south east.

13.4.8 The ground elevation within the proposed construction laydown area, to the north of the central drainage ditch, is generally flat with ground levels between 6.67m and 5.86m AOD.

13.4.9 To the south of the central drainage ditch ground elevations are generally between 5.89m AOD, to the south west corner, and 3.9m AOD to the south east. Ground levels directly adjacent to the drainage ditch are generally between 5.3m and 5m AOD.

13.4.10 Spot levels on OS mapping show ground levels at the junction of Rosper Road and Station Road, to the north of the Site, are approximately 6m AOD whilst at the junction of Rosper Road and Marsh Lane, to the south east of the Site ground levels are approximately 4m AOD.

13.4.11 Ground levels are shown to increase from east to west in the general area.

Drainage

13.4.12 The existing access road located within the red line boundary, which will be used as a permanent access road to the Proposed Development and the adjacent car parks (outside the red line boundary) comprise areas of hardstanding that are positively drained. Surface water from the access road and car parks is discharged to a local drainage ditch to the north of the Site.

13.4.13 The remaining Site area (Power Plant Site and Construction Laydown Area) comprises predominantly undeveloped land that drains via natural processes of evaporation, overland flow and infiltration to ground.

13.4.14 Localised areas of standing water within the Site boundary and within brownfield land to the east of the Power Plant Site suggests that drainage is impeded by ground conditions.

13.4.15 It is considered that surface water from the Site ultimately drains to the drainage ditches within the central area of the Site and surrounding drainage ditches to the south and east.

Surface Waterbodies

13.4.16 The following notable watercourses have been identified in close proximity to the Site and are summarised in Table 13-5 below.

Table 13.5. Identified Watercourses

Name of Watercourse	Location	Assessment Grouping
Drainage Ditch	Located within the Site boundary between the Power Plant Site and the Construction Laydown Area.	Drainage ditch within the Site
Local Land Drain	Running parallel with and directly adjacent to the southern Site boundary.	Land drains adjacent to the Site
Local Land Drain	Running parallel with and directly adjacent to the eastern Site boundary and Rosper Road.	
Local Land Drain	Running parallel with and directly adjacent to the northern Site boundary.	
Local Land Drain	Running parallel with and directly adjacent to the western Site boundary.	
Watercourse 9 and 9A (a North East Lindsey IDB drain)	Approximately 50m to the south east of the Site to the east of Rosper Road	NELIDB Watercourses
Series of land drains	Approximately 50m to the west of the Site	Wider land drainage network
Series of land drains	Approximately 120m to the north of the Site	
Humber Estuary (Humber Lower)	Approximately 1.4km to the east of the Site.	Humber Lower
Water Storage Lagoon)	Approximately 50m to the west of the Site.	Other Water Features
Settling Lagoons	Approximately 90m to the south west of the Site.	
Rosper Road Pools	Approximately 740m to the south east of the Site	Rosper Road Pools

Drainage Ditch Within the Site

13.4.17 A small drainage ditch, running from north east to south west, is located in the central area of the Site between the Power Plant Site and the Construction Laydown Area. The ditch is stopped up and has no hydrological connection to local land drains in the surrounding area. Although located within the Site, it is likely that this ditch will be infilled during the construction phase. Any land drainage function provided by the drainage ditch will be replaced by a formal drainage system within the Power Plant Site. This surface water feature is therefore not considered further as part of this assessment.

Local Land Drains Adjacent to the Site

13.4.18 Land drains are located adjacent to the Site boundaries to the north, east, south and west.

13.4.19 The land drain located adjacent to the northern Site boundary runs from west to east parallel with the access road towards Rosper Road. The drain is stopped up and has no hydrological connection to local land drains in the surrounding area. The drain receives surface water from the access road and car park surface water drainage system. Surface water is stored within the ditch and drains via infiltration and evaporation. Although the drain is not connected to the surrounding land drainage system, there is a direct hydrological connection with the Site via runoff from the access road.

13.4.20 To the east of the Site, a small land drain flows south from the vicinity of the access road junction with Rosper Road. The ditch was found to be entirely dry at the time of the ecological survey and does not appear to regularly hold water. It is assumed that a confluence is formed with Watercourse 9A to the south. As the drain is located in close proximity to the access road junction with Rosper Road it is considered that there is a direct hydrological connection to the ditch, albeit this may be seasonal, via surface water runoff/ drainage.

13.4.21 The land drain to the south flows generally east from the Settling Lagoons, located 90m south west of the Site, towards Rosper Road and it is assumed a confluence is formed with Watercourse 9A adjacent to the highway. An outfall into the ditch from the LOR is present in the south-western corner of the Site. It is also likely that the ditch receives greenfield runoff from the Power Plant Site and therefore has a direct hydrological connection with the Proposed Development.

13.4.22 A small land drain located approximately 20m from the western Site boundary flows from north to south and passes beneath access road and tracks to the west of the Site via culverted sections The drain eventually flows from east to west away from the Site. As ground levels increase in elevation from the Site towards the west it is unlikely there are any preferential drainage pathways from the Site to this ditch..

13.4.23 The Site has direct, hydrological connectivity with the land drainage ditches to the north, east and south of the Site. Based on observations during site walkovers, these drains contain low volumes of slow-moving water and are densely vegetated. Given the local topography, it is considered that there is no direct hydrological connection from the Site to the land drainage ditch to the west of the Site. This land drainage is therefore not considered further in this assessment.

NELIDB Watercourses

13.4.24 Two land drains, known as Watercourse 9A and Watercourse 9, are located approximately 50m to the south east of the Site. Watercourse 9A is located to the west of Rosper Road and flows south running parallel with the road and the eastern boundary of the existing power station site.

13.4.25 Watercourse 9 is located to the west of Rosper Road and flows south parallel with the road. The watercourse continues to flow south towards Humber Road where it turns generally

east flowing to the north of the Port of Immingham. The watercourse discharges to the Humber Estuary via sluice gates at South Killingholme Haven.

13.4.26 It is considered that the NELIDB watercourses have an indirect hydrological connectivity with the Site via the land drains located directly adjacent to the eastern and southern Site boundary.

Wider Land Drainage Network

13.4.27 A series of land drains are located to the north and west of the Site and form part of the wider land drainage network in the area.

13.4.28 Based on aerial mapping and discussions with the client it is considered that the Site is not hydrologically connected to this wider drainage network and therefore these water features are not considered further in this assessment.

Humber Lower

13.4.29 The Humber Estuary is split into three waterbodies by the Environment Agency (Ref 13-46). These are the Upper Humber (Trent Falls to the Faxfleet Ness), the Middle Humber (Faxfleet Ness to Goxhill Haven), and the Lower Humber (Goxhill Haven to Spurn Point). The Site is located in proximity to the Lower Humber.

13.4.30 The Humber Estuary has a large tidal range (7.2 m), due to its position within the North Sea basin, producing a mean spring tidal range of 5.7 m at Spurn. The tidal range is amplified as it propagates up the Estuary; being 7.4 m at Salt End, and 6.9 m at Hessle (being 45 km inland). It is because of these large tidal ranges that the Humber is classified as a macro-tidal Estuary (Ref 13-49).

13.4.31 The Estuary has high suspended sediment content, derived from the eroding boulder clay cliffs along the Holderness coast, but also from riverine sediments (Ref 13-49). Within the vicinity of the proposed Site, the Humber Estuary is not classified for bathing water quality. The nearest bathing water monitoring point is at Cleethorpes, which achieved 'higher' bathing water quality standards in 2012, and has consistently reached 'higher' bathing water quality since 2002 with the exception of 2007 (when ‘minimum’ bathing water quality was recorded) (Ref 13-46).

13.4.32 It is considered that the Humber Lower has an indirect hydrological connectivity with the Site via Watercourse 9 and 9A.

Other Water Features

13.4.33 There are two surface water features, a water storage lagoon, and settling lagoons, located beyond the Site boundary to the west and south west.

13.4.34 The water storage lagoon is located within the Lindsey Oil Refinery Site boundary and was inaccessible at the time of the ecological walkover survey (September 2017). Based on aerial photography, it is assumed this surface water feature comprises an artificial structure.

13.4.35 The water storage lagoon receives water from a piped drainage system that drains surface water from the built development located to the north of the Proposed Development. The piped drainage passes below ground to the west of the Site boundary, running north to south, to the water storage lagoon.

13.4.36 The settling lagoons are artificial structures containing stagnant water and are part of the industrial processes within the oil refinery, and as such are likely to be periodically emptied and/ or maintained. The settlement lagoons receive pass forward flow from the water storage lagoon and a further drainage connection enters the settling lagoons from the west. Water from the settling lagoons discharges directly into the land drainage ditch that runs from west to east along the southern Site boundary.

13.4.37 There is no direct hydrological connection from the Proposed Development to either the water storage lagoon or settling lagoons therefore these features are not considered further in this assessment.

Rosper Road Pools

13.4.38 Rosper Road Pools, an Artificial Flood Relief Reservoir, are located to the south east of the Power Plant Site, to the east of Rosper Road. This surface water feature has an indirect hydrological connectivity with the Site via Watercourse 9 and 9A.

Surface Water Quality

13.4.39 The classification of waterbodies is reported in the 2015 cycle of the River Basin Management Plans (RBMP). The Humber RBMP (Ref 13-46) assesses the pressures facing the water environment in the Humber river basin district and lists actions to address them. The Humber RBMP is in the second iteration of a series of six-year planning cycles and will be updated in 2021.

13.4.40 Some surface water bodies are designated as 'artificial' or 'heavily modified'. This is because they may have been created or modified for a particular use such as water supply, flood protection, navigation or urban infrastructure.

13.4.41 According to the Humber RBMP, by definition, artificial and heavily modified waterbodies are not able to achieve natural conditions. Instead the classification and objectives for these waterbodies, and the biology they represent, are measured against 'ecological potential' rather than status. For an artificial or heavily modified waterbody to achieve good ecological potential, the chemistry must be good. Chemical status is assessed by compliance with the environmental standards for chemicals that are listed in the Priority Substances Directive 2008/105/EC, which is a 'daughter' directive of the WFD (Ref 13-50). Chemical status is recorded as either 'good' or 'fail', in terms of whether the chemical status is compliant with environmental standards.

13.4.42 In addition, any modifications to the structural or physical nature of the waterbody that harm biology must only be those essential for its valid use. All other such modifications must have been altered or managed to reduce or remove their adverse impact, so that there is the potential for biology to be as close as possible to that of a similar natural waterbody. Often though, the biology will still be impacted and biological status of the waterbody may be less than good (Ref 13-46). The ecological status takes into account physio-chemical elements, biological elements, specific pollutants and hydromorphology.

Local Land Drains Adjacent to the Site

13.4.43 The local land drains located directly adjacent and in close proximity to the Site are not classified under the WFD and no water quality information is provided within the Humber RBMP. The Environment Agency and the NELIDB does not currently hold any water quality data for any of these local land drains.

13.4.44 Given that the surface water features are not detailed in the Digital River Network and do not have a WFD classification as shown in the RBMP (Table 13-2), these features are considered to be water resource receptors of low importance with respect to water quality.

NELIDB Watercourses

13.4.45 The NELIDB watercourses (Watercourse 9A and 9) are not classified under the WFD and no water quality information is provided within the Humber RBMP. The Environment Agency and the NELIDB does not currently hold any water quality data for any of the NELIDB watercourses.

13.4.46 Given that the watercourses are detailed in the Digital River Network but do not have a WFD classification as shown in a RBMP (Table 13-2), the NELIDB watercourses and their

associated tributaries are considered to be water resource receptors of medium importance with respect to water quality.

Humber Lower

13.4.47 The stretch of the Humber Estuary nearest to the Site (defined in the WFD as 'GB530402609201 – Humber Lower') is classified as a transitional water and a heavily modified watercourse due to flood protection and navigation modifications.

13.4.48 The Humber RBMP Cycle 2 (2016) classifies the Humber Lower water body as currently being at moderate ecological potential, with a fail chemical status. As such, the current overall potential is moderate, with an objective of maintaining moderate overall potential by 2027.

13.4.49 The reasons cited for the continued failure of the water body to meet its WFD objectives include disproportionate cost and technical infeasibility.

13.4.50 A number of mitigation measures relating to port activities are already 'in place' within the Humber Lower water body, these include:

- Manage disturbance;
- Site selection (dredged material disposal), e.g. to avoid sensitive areas;
- Sediment management;
- Reduce sediment resuspension;
- Reduce impact of dredging; and
- Prepare a dredging/ disposal strategy.

13.4.51 Based on Table 13-2, the Humber Lower is considered to be a water resource receptor of very high importance with respect to water quality.

Rosper Road Pools

13.4.52 The Rosper Road Pools are not classified under the WFD and no water quality information is provided within the Humber RBMP.

13.4.53 The Rosper Road Pools are detailed in the Digital River Network but do not have a WFD classification as shown in the RBMP (Table 13-2), the Pools are therefore considered to be a water resource receptor of medium importance with respect to water quality.

Surface Water Abstractions

13.4.54 Information from the Groundsure Report (included within Appendix 13A: Phase I Geoenvironmental Site Assessment (ES Volume 3)) indicates there are no surface water abstractions for potable water within a 2km radius of the Site. The impact of the Proposed Development on water supply from the identified watercourses is therefore not considered further in this assessment.

Discharges to Surface Water

13.4.55 Information from the Groundsure Report indicates there are four Licensed Discharge Consent records within a 0.5km radius of the Site. Of these, all but one licence are listed as 'revoked'. The active consent for the Lindsey Oil Refinery is for sewage discharge to the local land drain to the north east of the Site.

Point Source Pollutants

13.4.56 Pollution incidents are classified by the Environment Agency on the degree of Environment Agency manpower deployed (i.e. large, small) and likely environmental impact with regard to air, water and land. Incidents are classified as category 1 (major), 2 (significant), 3 (minor) or 4 (insignificant).

13.4.57 There have been no Category 1 (major), one category 2 (significant) and one Category 4 (minor) incidents within 500 m of the Proposed Development in the last 16 years that had the potential to affect water quality.

13.4.58 The principal pollution incident for water quality occurred in December 2004 and is noted as Oils and Fuel – Crude Oil.

13.4.59 None of the recorded incidents are considered serious enough to have affected current baseline water quality, either temporarily, or in the long-term; either due to the historical nature of the incident or the classified category. Therefore they are not taken into account when describing the baseline conditions for the Proposed Development.

Non-Point Source Pollutants

13.4.60 Within the study area, urban, industrial and commercial and agricultural runoff may enter the identified watercourses and may affect the status of such watercourses.

Designations and Biodiversity

13.4.61 The Humber Lower contains a number of sites designated at the national, European and international levels for nature conservation importance. The Estuary is a Site of Special Scientific Interest (SSSI), a Special Protection Area (SPA), a Special Area of Conservation (SAC) and a Ramsar site.

13.4.62 As well as these designations under the Habitats and Birds Directives, the Lower Humber is also designated under the Bathing Water Directive, Freshwater Fish Directive, Nitrates Directive, Shellfish Water Directive and the Urban Waste Water Treatment Directive (Ref 13-46).

13.4.63 The Humber Estuary is a designated fishery and is used by migrating freshwater species to reach upstream spawning grounds. The Estuary also has ecological classification under the WFD and, therefore, is considered to be a water resource of very high importance with regard to biodiversity.

13.4.64 There are four non-statutory nature conservation designations within 1km of the Site as listed below:

- Eastfield Road Railway Embankment Local Wildlife Site (LWS), located 1km west of the Site;
- Burkinshaw's Covert LWS, located 0.4km north of the Site;
- Station Road Field LWS, located 0.4km north of the Site; and
- Rosper Road Pools LWS, located 0.7km south of the Site.

13.4.65 Further details of the LWS are summarised in Chapter 10: Ecology.

13.4.66 With the exception of the Humber Lower, all the identified watercourses/surface water features within the study area have no ecological classification under the WFD.

13.4.67 A site walkover undertaken as part of the preliminary ecological appraisal (as outlined in Chapter 10: Ecology) identifies the study area as having potential for great crested newts, water vole, brown hare and ground nesting birds. Given this information, the local land drains adjacent to the Site and the NELIDB watercourses are considered to be of medium importance with regard to biodiversity.

13.4.68 The Rosper Road Pools LWS has an indirect hydrological connection with the Proposed Development and supports many breeding, wintering and migrant birds, associated with both wetland and scrubby habitat. Water vole was recorded at the LWS in 2002, and the fauna as a whole is likely to be rich. The Rosper Road Pools (Other Water Features) is therefore considered to be a water resource of high importance with regard to biodiversity.

Recreation

13.4.69 The Humber Estuary has a number of recreational functions, including for sailing, bird and seal watching and a number of footpaths and bridleways exist adjacent to the banks of the Estuary. Given this information, it is considered that the Humber Lower is a water resource of high importance with regard to recreation.

13.4.70 There is no public access to either the land drains adjacent to the Site, therefore, these water resources are considered to be of low importance with regard to recreation.

13.4.71 As access is possible along the NELIDB watercourses therefore these water resources are considered to be of medium importance with regard to recreation.

13.4.72 The Rosper Road Pools is managed for its ornithological interest and its main recreational function is for birdwatching. The Rosper Road Pools (Other Water Features) are therefore considered a water resource of high importance with regard to recreation.

Flood Risk

13.4.73 The importance of receptors in the context of flood risk relates to the NPPF vulnerability classification for land uses potentially affected by any changes in flood risk as a result of the Proposed Development. Potential receptors could therefore be occupiers or users of the Proposed Development itself, as well as users or occupiers of land outside of the Site boundary that could be affected by changes to flood risk resulting from the Proposed Development. The receptor importance is therefore defined independently of the sources of flood risk.

13.4.74 The NPPF considers the vulnerability of different forms of development to flooding and classifies proposed uses accordingly. The Proposed Development is considered as 'Essential Infrastructure' in the NPPF vulnerability classification and as such it is assigned as a receptor of very high importance. The vulnerability and hence importance of receptors elsewhere has been defined where flood risk impacts have the potential to occur.

13.4.75 A FRA has been undertaken to ascertain if the Site is at risk of flooding or if the Proposed Development of the Site would cause an increase in the off-site flood risk (see Appendix 13A: Flood Risk Assessment (ES Volume 3)). The FRA has been prepared in accordance with the NPPF and supporting PPG. For further information on flood risk, the FRA should be consulted, although the section below provides a summary of flood risk for the Site:

- The predominant source of flood risk on the Site is associated with tidal flooding from the Humber Estuary located approximately 1.4km to the east of the Site;
- The southern (Power Plant Site) and north eastern (Permanent Access and part of the Construction laydown area) area of the Site is located in Flood Zone 3 (high risk) and Flood Zone 2 (medium risk). The area to the north and north west of the Site (construction laydown area) is located in Flood Zone 1 (low risk).
- The Site is located in area that benefits from flood defences offering a standard of protection up to, and including, a 0.5% (1 in 200 year) storm event, based on the Still Water Tidal Water Levels;
- The risk of flooding from fluvial, groundwater, surface water, artificial watercourses and drainage infrastructure sources is assessed as low;
- There remains a low residual risk of flooding to the Site from overtopping or a breach of the flood defences and from failure or exceedance of the surface water drainage system.

13.4.76 The FRA (Appendix 13A, ES Volume 3) serves to demonstrate that the Proposed Development would remain safe during its lifetime and would not increase flood risk elsewhere and is, therefore, considered to be acceptable in flood risk terms.

Summary of Baseline Conditions and Importance of Existing Resource

13.4.77 Only surface watercourses in close proximity (hydraulic connectivity) to the Site and with the significant potential to be affected by the Proposed Development have been considered further within this impact assessment.

13.4.78 Table 13-6 below provides a summary of the importance of the waterbodies in the vicinity of the Proposed Development.

Table 13.6. Importance of Identified Surface Water Feature/receptor

Water Resource	Attributes	Importance
Local Land Drains adjacent to the Site	Water quality	Low
	Recreation/other uses	Low
	Biodiversity	Medium
NELIDB Watercourses	Water quality	Medium
	Recreation/other uses	Medium
	Biodiversity	Medium
Humber Lower	Water quality	Very High
	Recreation/other uses	High
	Biodiversity	Very High
Rosper Road Pools	Water quality	Medium
	Recreation/other uses	High
	Biodiversity	High

13.5 Development Design and Impact Avoidance

13.5.1 The Proposed Development has the potential to impact on the surface waterbodies in the vicinity of the Site through both quality and quantity changes (though quantitative changes are only considered here in relation to the any general changes to the quantity of a waterbody as a resource).

13.5.2 The surface waterbodies as described above have been assessed for the likelihood of actual effects occurring as a result of the Proposed Development.

Impact Avoidance

13.5.3 The following impact avoidance measures would either be incorporated into the design or are standard construction and operational practices. These measures have therefore been taken into account during the impact assessment in Section 13.6. Any need for additional mitigation measures as identified as a result of the impact assessment are described (where necessary) in Section 13.7.

Construction

13.5.4 For the purposes of this assessment, it is assumed that the measures set out below would be required of any contractors undertaking construction work in relation to the Proposed Development.

13.5.5 As a general measure to protect surface water from a range of potentially dangerous activities associated with construction of this type, best practice will be implemented through a Construction Environmental Management Plan (CEMP) and contractors undertaking works within the Site will comply with relevant guidance during construction, including, but not limited to, the Environment Agency GPPNs and PPGNs, and IDB byelaws. A framework

CEMP is provided in Appendix 4A (ES Volume 3) which includes the measures set out in this section.

13.5.6 Piling design and construction works would be completed following preparation of a piling risk assessment, completed in accordance with the Environment Agency's '*Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention*' (Ref 13-51). A piling and penetrative foundation design method statement would be submitted to and approved by the local planning authority, and if required, the Environment Agency and NELIDB, prior to relevant works commencing.

Staff Awareness/Training

13.5.7 The contractor(s) would ensure that Proposed Development construction personnel are fully aware of the potential impact to water resources associated with the proposed construction works and procedures to be followed in the event of an accidental pollution event occurring. This would be included in the site induction and training, with an emphasis on procedures and guidance to reduce the risk of water pollution.

Pollution Plans

13.5.8 Plans to deal with accidental pollution will be drawn up and agreed with the Environment Agency and NELIDB, prior to construction commencing and any necessary equipment (*e.g.* spillage kits) shall be held on site and all site personnel will be trained in their use. The Environment Agency and the NEL IDB will be informed immediately in the unlikely event of a suspected pollution incident.

Storage of Materials

13.5.9 The CEMP would incorporate measures set out in the Environment Agency GPPN and PPGN documents listed above. Examples of such measures include:

- Placing arisings and temporary stockpiles outside of the Flood Zone 3 flood extent and away from drainage systems, and directing surface water away from stockpiles to prevent erosion. If areas located within Flood Zone 2 are to be utilised for the storage of construction materials, then a permit will be obtained from the EA;
- Containment measures would be implemented, including drip trays, bunding or double-skinned tanks of fuels and oils; all chemicals would be stored in accordance with their Control of Substances Hazardous to Health (COSHH) guidelines (Ref 13-52), whilst spill kits would be provided in areas of fuel/oil storage;
- An Emergency Spillage Plan would be produced, which site staff would have read and understood;
- The mixing and handling of materials would be undertaken in designated areas and away from surface water drains;
- Plant and machinery would be kept away from surface water bodies wherever possible and would have drip trays installed beneath oil tanks/engines/gearboxes and hydraulics, which would be checked and emptied regularly. Refuelling and delivery areas would be located away from surface water drains; and
- Exposed ground and stockpiles would be protected as appropriate and practicable to prevent windblown migration of potential contaminants. Water suppression would be used if there is a risk of fugitive dust emissions (see also Chapter 7: Air Quality and Greenhouse Gas Emissions of this ES).

Discharge/Disposal of Site Runoff/Material

13.5.10 Plans for the discharge and/or disposal of potentially contaminated water would be agreed in advance with the Environment Agency, NLC and NELIDB where appropriate, and permits obtained as required.

13.5.11 All foul water from any site compound (including temporary toilets) would be either tankered away to an appropriate disposal facility by a licensed waste disposal contractor or treated on site in a septic tank. Any potentially contaminated water would be tested, and if it is not of a suitable quality, agreed disposal procedures would be followed. Construction drainage details would be developed in consultation with the Environment Agency.

13.5.12 As would be detailed in the CEMP, if any suspected contaminated material is discovered during the works, it would be tested and dealt with appropriately. Pre-construction sediment contamination testing would be undertaken prior to works commencing. If material is considered to be contaminated, it would be disposed of to a licensed facility (also see Chapter 12: Ground Conditions and Hydrogeology).

13.5.13 Any waters removed from excavations by dewatering would be discharged appropriately, subject to the relevant licenses being obtained.

13.5.14 Foundations and services would be designed and constructed to prevent the creation of pathways for the migration of contaminants and would be constructed of materials that are suitable for the ground conditions and designed use. For example, water supply pipes would be designed in accordance with current good practice and applicable guidance to ensure pipes are protected from potential impacts associated with contamination.

13.5.15 No discharges from any self-contained wheel wash and localised wheel wash would be permitted to discharge into any surface water system.

Temporary Drainage and Settlement

13.5.16 Temporary drainage facilities would be provided during the construction phase, where necessary, to ensure controlled discharge of surface water runoff.

13.5.17 It would be a contractual requirement of the contractor to ensure that runoff from the Site does not cause pollution or flooding. Measures that would be considered for implementation for temporary drainage through the construction design and/or CEMP include:

- Installation of measures such as swales, silt fences and appropriately sized settlement tanks/ponds to reduce sediment load;
- Cut-off ditches or geotextile silt-fences, installed around excavations, exposed ground and stockpiles to prevent uncontrolled release of sediments from the Proposed Development;
- Site access points would be regularly cleaned to prevent build-up of dust and mud:
- A valve would be installed to isolate the settlement tank/ponds in the event of a polluted discharge;
- Oil interceptors to be installed (notably the outflow from the settlement pond/tank) to reduce the potential risk for contamination of groundwater and surface water; and
- All potentially polluted waters (including washdown areas, stockpiles and other areas of risk for water pollution) to have separate drainage and to be tankered away from the Site.

13.5.18 In addition, if monitoring demonstrates unsatisfactory levels of solids or other pollutants, measures would be implemented (e.g. changes to site drainage and settlement facilities and/or use of flocculants) to control suspended solids or other polluted discharge to watercourses.

Wastewater Generation

13.5.19 A septic tank is likely to be used for treatment of sanitary or domestic wastewater from offices/administration/welfare facilities. This septic tank would be emptied as required and tankered off site to a waste water treatment plant.

Flood Risk

13.5.20 Construction works undertaken adjacent to, beneath and within watercourses would comply with relevant guidance during construction, including the Environment Agency PPGs and the requirements of the NELIDB byelaws, particularly Byelaws 3, 6, 10 and 17.

13.5.21 The CEMP would incorporate measures aimed at preventing an increase in flood risk during the construction works. Examples of measures that would be implemented in the Proposed Development areas in Flood Zones 2 and 3 include:

- Topsoil and other construction materials would be stored outside of the 1 in 100 year floodplain extent. If areas located within Flood Zone 2 are to be utilised for the storage of construction materials, then a permit will be obtained from the EA;
- Connectivity would be maintained between the floodplain and the River Humber, with no changes in ground levels within the floodplain as far as practicable;
- The construction laydown area site office and supervisor would be notified of any potential flood occurring by use of the Floodline Warnings Direct service; and
- The Contractor would be required to produce a Flood Risk Management Action Plan/Method Statement which would provide details of the response to an impending flood and include:
  - *A 24 hour availability 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 areas.*

Operation

13.5.22 The operational phase of the Proposed Development would require storage, transport, handling and use of minor volumes of potentially polluting substances (e.g. diesel). Throughout its lifetime, the facility would be regulated by the EA through an Environmental Permit, which would include conditions relating to handling, storage and use of diesel and other chemicals, including emergency procedures in line with the use of Best Available Techniques (BAT). These measures would be in place to prevent pollution during plant operation in accordance with the permit.

13.5.23 A number of the impact avoidance measures employed during the construction phase would remain for the operation phases of the Proposed Development (where relevant), and would be implemented through the Site operator's Environmental Management System (EMS), for example:

- Plans to deal with accidental pollution and any necessary equipment (e.g. spillage kits) would be held on Site and all site personnel would be trained in their use, for example the plan would incorporate details on how to appropriately deal with accidental spillages to ensure they are not drained to any surface water system;
- Containment measures would be implemented, including bunding or double-skinned tanks for fuels and oils; all chemicals would be stored in accordance with their COSHH guidelines; and

- Interceptors would be incorporated into the drainage system to prevent material entering the surface water drainage system or local waterbodies.

Contaminated Fire Water

13.5.24 In the event of a fire, the surface water drainage system would be closed to prevent contaminated water being released through surface water drains. Fire water would be contained on Site and either disposed off-site in accordance with waste management legislation (if contaminated) or treated and discharged to surface water in accordance with the Environmental Permit, if the water quality is acceptable for surface water discharge (and subject to agreement with the Environment Agency and/or the NELIDB). This strategy would prevent pollution of surface and groundwater waterbodies.

Site Drainage

13.5.25 A Conceptual Drainage Strategy outlining how surface water would be managed post-development has been produced and is presented in Appendix 13A: Flood Risk Assessment (ES Volume 3).

13.5.26 The Conceptual Drainage Strategy for the Site comprises a predominantly below ground drainage system with a new outfall discharge to the drainage ditch located directly adjacent to the southern boundary of the Power Plant Site, subject to confirmation that sufficient capacity is available and receiving discharge consent from the NELIDB.

13.5.27 The Floods and Water Management Act 2010 (Ref 13-3) places responsibility on local planning authorities, supported by the Environment Agency, to ensure new developments are unlikely to increase overall risk of flooding and requires SuDS criteria to be incorporated into the design. Post-development runoff volumes and rates should therefore be approximate to pre-development equivalent values ('Greenfield runoff').

13.5.28 SuDs standards (Ref 13-25) require that the first choice of surface water disposal should be to discharge to infiltration systems. SuDs systems/units shall also contribute to improving the water quality and sediment control. Attenuation would be achieved by limiting discharge through an appropriate flow attenuation device.

13.5.29 Surface water run-off from the Proposed Development would be restricted to the existing greenfield run-off rate of 4.2 l/s using a flow control device fixed within a manhole near to the system outfall.

13.5.30 For outline design purposes the critical storm duration of the design return period storm event (1.0% AEP) has been used to size surface water drainage from the Proposed Development. This ensures that ponding of the site due to exceedance of the drainage network flow capacity is unlikely to occur during the design life of the development.

13.5.31 Based on available geological information it is believed to be unlikely that infiltration based drainage solutions will be viable for the Site therefore attenuation storage will likely be provided using below ground attenuation tanks and oversized pipes. The Site requires an attenuation volume of between approximately 623 m^3 and 842 m^3. This volume will accommodate surface water runoff for a 1% AEP storm event with a 40% allowance for climate change.

13.5.32 The details set out in the Conceptual Drainage Strategy (Appendix 13A: Flood Risk Assessment (ES Volume 3)) represent an high level outline drainage design and would be developed through detailed design and in response to requirements identified through the detailed design process.

13.5.33 In addition, the following measures are included in the outline drainage strategy:

- Provision for a segregated surface water management system to serve the gas engines, liquid fuel delivery area and transformer compound and prevent oil contamination from reaching the surface water drainage system;

- Any leakages of lube oil from the engines to drain to a local 'blind' bund (i.e. unconnected to site drainage network) for periodic removal off-site;
- Liquid fuel tanks will be appropriately bunded (e.g. containerised emergency diesel generator with double skin leak protection);
- Rainwater collected within bunds shall be removed using automated oil-sensitive pumps (Bund Water Control Units) (BWCU);
- Pumped drainage accumulated from all BWCUs shall be collected and pass through a Class 1 Full Retention Oil Separator prior to discharge into the surface water drainage system;
- Periodic maintenance, including de-silting and emptying of collected oil, will be undertaken in order to maintain the intended function of interceptors;
- A class 1 separator would be installed to enable discharge of storm water runoff from the fuel delivery area to the surface water drainage network; and
- Transformers and other high risk plant to be fitted with fire water sprinklers and located within a contained compound area with integral or external sumps with sufficient volume to capture spent fire-fighting water prior to removal to suitable waste water treatment facility via road tanker.

Flood Risk

13.5.34 The Applicant would subscribe to the Environment Agency's Flood Alert Service in the area.

13.5.35 As a precaution, flood resilience measures would be incorporated into the Proposed Development design to minimise the amount of damage and reduce the recovery time in the unlikely case of the Site becoming inundated. During construction the opportunity would be taken to adopt flood resilient design techniques for the Proposed Development. The following resilient measures have been identified as possible options for inclusion at the Site, subject to final design:

- If technically feasible, critical equipment will be raised above the expected 0.5% climate change scenario flood depth of 5.93 mAOD (for the year 2083); and
- Flood sensitive equipment will be raised a minimum of 600 mm above ground/ floor level;
- Adequate containment of storage areas to ensure material does not wash away and cause pollution;
- Flood proofing including the use of flood resistant building materials, use of water resistant coatings, use of galvanised and stainless steel fixings and raising electrical sockets and switches;
- Inclusion into the existing Power Station's emergency response procedures including the recommendation of at least one Flood Warden for the Proposed Power Plant Site;
- Implementation of a Surface Water Management Strategy; and
- Oil interceptors would be based on guidance within PPGN3 (Ref 13-32) and are likely to be Class 1 Full Retention systems.

13.5.36 Further details are included within the FRA presented as Appendix 13A (ES Volume 3).

Decommissioning

13.5.37 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 would be prepared to identify required measures to prevent pollution during this phase of the Proposed Development, based on the detailed decommissioning plan.

13.5.38 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.

13.6 Likely Impacts and Effects

Construction

13.6.1 The surface watercourses described above (land drains adjacent to the Site, NELIDB Watercourses, Humber Lower Other Water Features and the Rosper Road Pools) have been assessed for the likelihood of actual effects occurring as a result of the construction phase of the Proposed Development (taking into account the mitigation measures as detailed in Section 13.5).

Contaminated Runoff Surface Water Entering Watercourses and Spillage of Pollutants

13.6.2 During construction, there is an elevated risk of leakage or accidental spillage of construction materials and potential pollutants used on Site, migrating to nearby surface watercourses. Washout facilities (washing of tools, plant and equipment), storage and use of various liquids and soluble solids, unstable exposed soils, excavated materials, stored aggregates, contaminated road surfaces, and fuel storage and handling all have the potential to result in pollution of water resources. Inappropriate disposal of waste materials associated with the construction phase also has the potential to enter surface water.

13.6.3 The Humber Lower is turbid in this area, as such, baseline sediment concentrations are high in the watercourse, and localised impacts are likely to be trivial and of short duration.

13.6.4 With the measures set out in Section 13.5 (including the implementation of a CEMP), the likelihood of such an event occurring is low. Taking this into account, and based on the information available to date, the anticipated potential effects on different water attributes are described below.

Local Land Drains Adjacent to the Site

13.6.5 Potential contamination impacts and effects on the local land drains adjacent to the Site are assessed below:

- Water quality and WFD status (low importance):
  - *Possible short- term, but highly localised and temporary change in water quality, assuming a very worst-case scenario. The potential impact is evaluated to be of medium magnitude, and whilst effects might be experienced in the localised area, no effect on the quality of the watercourse would be experienced with the implementation of the impact avoidance measures;*
  - *The significance of this effect is therefore considered to be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*
- Recreation (low importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity such as walking etc., but given the localised nature, such an impact is evaluated to be of low magnitude as a worst-case scenario;*

- *The resulting effect would be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*

- Biodiversity (medium importance):
  - *There is the possibility of a short- term, highly localised effect on water quality that could potentially have a temporary and localised ecological impact, however the impact and effect would be constrained to the area immediately adjacent to the Site (newts, invertebrates etc. being affected from the changes to water quality) and the impact is evaluated to be of medium magnitude due to limited levels of dilution; and*
  - *The significance of this effect is therefore considered to be minor adverse (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented).*

NELIDB Watercourses

13.6.6 Potential contamination impacts and effects on the NELIDB watercourses are assessed below:

- Water quality and WFD status (medium importance):
  - *Given the distance from the Site and indirect nature of the impact, a possible short-term, but highly localised and temporary change in water quality, assuming a very worst-case scenario. The potential impact is evaluated to be of low magnitude, and whilst effects might be experienced in the localised area, no effect on the quality of the watercourse would be experienced with the implementation of the impact avoidance measures;*
  - *The significance of this effect is therefore considered to be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*
- Recreation (medium importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity such as walking etc., but given the localised nature, such an impact is evaluated to be of low magnitude as a worst-case scenario;*
  - *The resulting effect would be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*
- Biodiversity (medium importance):
  - *There is the possibility of a short-term, highly localised effect on water quality that could potentially have a temporary and localised ecological impact, however the impact and effect would be constrained to the area immediately downstream of the Site (newts, invertebrates etc. being affected from the changes to water quality) and the impact is evaluated to be of low magnitude due to the indirect nature of the impact and levels of dilution in the watercourse; and*
  - *The significance of this effect is therefore considered to be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented).*

Humber Lower

13.6.7 Potential contamination impacts and effects on the Humber Lower are assessed below:

- Water quality and WFD status (very high importance):
  - *Given the distance from the Site and indirect nature of the impact, a possibility of a short-term, highly localised and temporary change in water quality, assuming a worst-case scenario (this conclusion is reached having consideration to the*

dilution potential of the estuary and its current quality). The potential impact is evaluated to be of very low magnitude, and whilst effects might be experienced in the localised area, no effect on the quality of the river and WFD status would be experienced with the implementation of the impact avoidance measures described in Section 13.5 above; and

- *The significance of this effect is therefore considered to be minor adverse (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented).*

- Recreation (high importance):
  - *There is the possibility of a short-term, localised temporary impact on recreational activity such as walking in the unlikely event of a pollution incident, but given the localised nature, such an impact is evaluated to be of very low magnitude as a worst-case scenario; and*
  - *The resulting effect would be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*
- Biodiversity (very high importance):
  - *There is the possibility of a highly localised effect on water quality that could potentially have a short-term, temporary and localised ecological impact, however the impact and effect would be constrained to a localised area (species of International and National Value etc. being affected from the changes to water quality) and would not affect the structure or function of the Lower Humber at this location or more widely. The impact is evaluated to be of very low magnitude due to high level of dilution;*
  - *The significance of this effect is therefore considered to be minor adverse (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented); and*
  - *The predicted effect on river habitats of International and National Value are therefore not significant.*

Rosper Road Pools

13.6.8 Potential contamination impacts and effects on the Rosper Road Pools are assessed below:

- Water quality (medium importance):
  - *Given the distance from the Site and indirect nature of the impact, a possible highly localised and temporary change in water quality, assuming a very worst-case scenario, impact of very low magnitude;*
  - *The significance of this effect is therefore considered to be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*
- Recreation (high importance):
  - *There exists the potential for a localised temporary impact on recreational activity, an impact of very low magnitude as a worst-case scenario;*
  - *The resulting significance of this effect would be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*
- Biodiversity (high importance):
  - *Possible localised and temporary ecological impact resulting from the effect on water quality, impact of very low magnitude;*

- *The significance of this effect is therefore considered to be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented); and*
- *The predicted effects on water habitats of Local Value (Rosper Road Pools LWS) are therefore not significant.*

Surface Water – Suspended Sediments in Site Runoff/Re-suspension of Sediments in Watercourses

13.6.9 The movement and storage of construction and waste materials to and from the Site, and from other construction activities, has the potential to give rise to suspended solids that could become entrained in surface water run-off from the Site following rainfall. This creates a potential risk of increased sediment loads being discharged into the nearby surface water. High sediment input has the potential to affect waterbodies by increasing turbidity, reducing dissolved oxygen (DO) levels and reducing light penetration. There could also be toxic effects caused by inorganic and organic compounds associated with re-suspended sediment. Indirect effects could include impacts on invertebrates and fish communities, and destruction of feeding areas, refuges and both breeding and spawning grounds.

13.6.10 Water in the Humber Lower is turbid with suspended sediment and in proximity to the proposed works currently has mitigation measures set under the WFD with regards to the strategic management of sediment, a reduction in the impact of dredging, sediment re-suspension and manage disturbance.

13.6.11 With the measures set out in Section 13.5, including the implementation of a CEMP, the likelihood of this occurring would be very low. Taking this into account, the following effects on different attributes are described below.

Local Land Drains Adjacent to the Site

13.6.12 Potential impacts and effects on local land drains within and adjacent to the Site from suspended sediments are assessed below:

- Water quality and WFD status (low importance):
  - *Possible short-term, localised and temporary changes in water quality, the potential impact is evaluated to be of medium magnitude given the limited levels of dilution in the watercourse, no effect on water quality would be experienced;*
  - *The resulting effect would be negligible (not significant);*
- Recreation (low importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of low magnitude as a worst-case scenario;*
  - *The resulting effect would be negligible (not significant).*
- Biodiversity (medium importance):
  - *It is possible that the local land drains could experience a short-term, localised and temporary impact with the potential to affect ecology (newts, invertebrates etc., resulting from a change in water quality). Considering a worst-case scenario, this impact is evaluated to result in an impact of low magnitude in the localised area immediately adjacent to the Site; and*
  - *The resulting effect would be negligible (not significant).*

NELIDB Watercourses

13.6.13 Potential impacts and effects on NELIDB watercourses from suspended sediments are assessed below:

- Water quality and WFD status (medium importance):
  - *Possible short-term, localised and temporary changes in water quality, the potential impact is evaluated to be of very low magnitude due to the indirect nature of the impact and levels of dilution in the watercourse, no effect on water quality would be experienced;*
  - *The significance of this effect is therefore considered to be negligible (not significant) (but unlikely to occur);*
- Recreation (medium importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of very low magnitude as a worst-case scenario;*
  - *The resulting effect would be negligible (not significant);*
- Biodiversity (medium importance):
  - *It is possible that the NELIDB watercourses could experience a short-term localised and temporary impact with the potential to affect ecology (newts, invertebrates etc., resulting from a change in water quality). Considering a worst-case scenario, this impact is evaluated to result in an impact of low magnitude in the localised area in proximity to the Site; and*
  - *The significance of this effect is therefore considered to be negligible (not significant) (but unlikely to occur).*

Humber Lower

13.6.14 Potential impacts and effects on the Humber Lower from suspended sediments are assessed below:

- Water quality and WFD status (very high importance):
  - *Possible short-term, localised and temporary changes in water quality, the potential impact is evaluated to be of very low magnitude given the distance from the Site and level of dilution in the estuary, no effect on water quality and WFD status would be experienced;*
  - *The significance of this effect is therefore considered to be minor adverse (not significant), but unlikely to occur based on the impact avoidance measures to be implemented;*
- Recreation (high importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of very low magnitude as a worst-case scenario;*
  - *The significance of this effect is therefore considered to be negligible adverse (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*
- Biodiversity (very high importance):
  - *It is possible that the Humber Lower could experience a short-term, localised and temporary impact with the potential to affect ecology (fish, invertebrates etc., resulting from a change in water quality). However the impact and effect would be constrained to the area in proximity to the Site (species of International and*

National Value etc. being affected from the changes to water quality) and would not affect the structure or function of the Lower Humber at this location or more widely. The impact is evaluated to be of very low magnitude due to high level of dilution in the estuary;

- *The significance of this effect is therefore considered to be minor adverse (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented); and*
- *The predicted effect on river habitats of International and National Value are therefore not significant.*

Rosper Road Pools

13.6.15 Potential impacts and effects on the Rosper Road Pools from suspended sediments are assessed below:

- Water quality (medium importance):
  - *Given the distance from the Site and indirect nature of the impact , a possible highly localised, short-term and temporary change in water quality, assuming a very worst-case scenario, impact of very low magnitude;*
  - *The significance of this effect is therefore considered to be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*
- Recreation (high importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, an impact of very low magnitude as a worst-case scenario;*
  - *The significance of this effect is therefore considered to be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented);*
- Biodiversity (high importance):
  - *Given the distance from the Site and indirect nature of the impact, a possible localised, short-term and temporary ecological impact resulting from the effect on water quality, impact of low magnitude;*
  - *The significance of this effect is therefore considered to be negligible (not significant) (and unlikely to occur based on the impact avoidance measures to be implemented); and*
  - *The predicted effects on water habitats of Local Value (Rosper Road Pools LWS) are therefore not significant.*

Disturbance of Contaminated Materials

13.6.16 Contaminated material exposed or disturbed during the construction works has the potential to affect surface water or groundwater (as discussed in Chapter 12: Ground Conditions and Hydrogeology). As described, there is not a significant risk of impact from contaminated material on surface water receptors after the implementation of defined impact avoidance measures. Therefore, the significance of this effect is assessed as negligible. Details are provided in Chapter 12: Ground Conditions and Hydrogeology, which should be referred to for further information.

Operation

13.6.17 Once the Proposed Development is open and operational, it is considered that the majority of the identified watercourses assessed during the construction phase would not be affected by the Proposed Development.

13.6.18 The Proposed Development would utilise the land drainage ditch immediately adjacent to the southern Site boundary in terms of surface water drainage, via a new drainage connection, subject to agreement from NELIDB.

Surface Water – Leakage from the Drainage System

13.6.19 A high level conceptual drainage strategy has been developed for the Proposed Development, as detailed in Appendix 13A: Flood Risk Assessment (ES Volume 2).

13.6.20 There is minimal contaminated wastewater generated from the Proposed Development during operation. Any uncontaminated surface water would be discharged directly to the land drainage ditch immediately adjacent to the southern Site boundary via attenuation storage. Surface water would drain from the Site at a restricted greenfield rate of 4.2 l/s with excess runoff above this rate stored in an underground attenuation tank and oversized pipes located within the Site boundary. Whilst pollution prevention features would be included in the design as set-out in Section 13.5, there always remains the potential for leakage from the system to occur (albeit the risk is very low).

13.6.21 The effects of any accidental pollution from site containment systems on different attributes of the identified watercourses are detailed below.

Local Land Drains Adjacent to the Site

13.6.22 Potential impacts and effects on the local land drains adjacent to the Site from any leakage from the drainage system are assessed below:

- Water quality and WFD status (low importance):
  - *If a leak occurred in the site containment system, considering the importance of the attribute, the potential impact would be short-term, localised, temporary and of low magnitude;*
  - *The resulting effect would be negligible (not significant);*
- Recreation (low importance):
  - *There exists the potential for a localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of low magnitude as a worst-case scenario;*
  - *The resulting effect would be negligible (not significant).*
- Biodiversity (medium importance):
  - *It is possible that the local land drains could experience a short-term, localised and temporary impact with the potential to affect ecology (newts, invertebrates etc., resulting from a change in water quality). Considering a worst-case scenario, this impact is evaluated to result in an impact of low magnitude in the localised area immediately adjacent to the Site; and*
  - *The resulting effect would be negligible (not significant).*

NELIDB Watercourses

13.6.23 Potential impacts and effects on the NELIDB watercourses from any leakage from the drainage system are assessed below:

- Water quality and WFD status (medium importance):
  - *If a leak occurred in the site containment system, considering the importance of the attribute, the potential impact would be short-term, localised, temporary and of very low magnitude;*
  - *The significance of this effect is therefore considered to be negligible (not significant);*

- Recreation (medium importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of very low magnitude as a worst-case scenario;*
  - *The resulting effect would be negligible (not significant);*
- Biodiversity (medium importance):
  - *It is possible that NELIDB watercourses could experience a short-term, localised and temporary impact with the potential to affect ecology (invertebrates etc., resulting from a change in water quality). Considering a worst-case scenario, this impact is evaluated to result in an impact of very low magnitude in the area local to the Site; and*
  - *The resulting effect would be negligible (not significant).*

Humber Lower

13.6.24 Potential impacts and effects on the Humber Lower from any leakage from the drainage system are assessed below:

- Water quality and WFD status (very high importance):
  - *If a leak occurred in the site containment system, considering the importance of the attribute, the potential impact on the watercourse would be short-term, localised, temporary and of very low magnitude;*
  - *No effect on water quality and WFD status would be experienced, the significance of this effect is therefore considered to be minor adverse (not significant).*
- Recreation (high importance):
  - *There exists the potential for a short-term localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of very low magnitude as a worst-case scenario.*
  - *The resulting effect on recreation would be negligible (not significant).*
- Biodiversity (very high importance):
  - *It is possible that the Humber Lower could experience a short-term, localised and temporary impact with the potential to affect ecology (species of International and National Value etc. being affected from the changes to water quality). Considering a worst-case scenario, this impact is evaluated to result in an impact of very low magnitude.*
  - *No effect on biodiversity and WFD status would be experienced, the significance of this effect is therefore considered to be minor adverse (not significant).*
  - *The predicted effect on river habitats of International and National Value are therefore not significant.*

Rosper Road Pools

13.6.25 Potential impacts and effects on the Rosper Road Pools from any leakage from the drainage system are assessed below:

- Water quality and WFD status (medium importance):
  - *If a leak occurred in the site containment system, considering the importance of the attribute, the potential impact would be short-term, localised, temporary and of very low magnitude;*
  - *No effect on water quality would be experienced, the significance of this effect is therefore considered to be negligible (not significant);*

- Recreation (high importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of very low magnitude as a worst-case scenario;*
  - *No effect on recreation would be experienced, the significance of this effect is therefore considered to be negligible (not significant).*
- Biodiversity (high importance):
  - *It is possible that the other water features could experience a short-term, localised and temporary impact with the potential to affect ecology (birds etc., resulting from a change in water quality). Considering a worst-case scenario, this impact is evaluated to result in an impact of very low magnitude in the localised area;*
  - *No effect on biodiversity would be experienced, the significance of this effect is therefore considered to be negligible (not significant); and*
  - *The predicted effect on water habitats of Local Value (Rosper Road Pools LWS) is therefore not significant.*

Surface Water – Contamination of Site Runoff

13.6.26 The impacts associated with contamination of surface water (with sediments, fuels etc.) are considered to be the same as those assessed in relation to leakage from the drainage system, as any potentially polluting substances would be stored inside buildings as set out below. Implementation of the measures as described in Section 13.5 would ensure the risk of contamination of site runoff would be low.

13.6.27 Pollution from runoff of contaminated surface water from the Proposed Development entering a watercourse would cause little change to the Humber Lower given the indirect nature of the impact and due to the level of dilution in the waterbody.

Land Drains adjacent to the Site

13.6.28 Potential impacts and effects on the local land drains adjacent to the Site from runoff of contaminated surface water are assessed below:

- Water quality and WFD status (low importance):
  - *Any contaminated run off is likely to infiltrate into the surface layers or pond on the surface, allowing clean up, prior to reaching the watercourses. If, however, a spillage of pollutant did reach the local land drains within and adjacent to the Site, the potential impact would be short-term, localised and temporary, and evaluated to be of low magnitude;*
  - *No effect on water quality would be experienced, the significance of this effect is therefore considered to be negligible (not significant) (but is unlikely to occur based on impact avoidance measures to be implemented);*
- Recreation (low importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of low magnitude as a worst-case scenario;*
  - *The resulting effect would be negligible (not significant);*
- Biodiversity (medium importance):
  - *It is possible that the local land drains within and adjacent to the Site could experience a localised and temporary impact with the potential to affect ecology (fish, invertebrates etc., resulting from a change in water quality). Considering a*

worst-case scenario, this impact is evaluated to result in an impact of low magnitude in the localised area; and

- *The significance of this effect is therefore considered to be negligible (not significant).*

NELIDB Watercourses

13.6.29 Potential impacts and effects on the NELIDB watercourses from runoff of contaminated surface water are assessed below:

- Water quality and WFD status (medium importance):
  - *Any contaminated run off is likely to infiltrate into the surface layers or pond on the surface, allowing clean up, prior to reaching the watercourse. The surface drainage system would be designed with attenuation features that have the potential to capture any contaminated runoff for treatment. If, however, a spillage of pollutant did reach the NELIDB watercourses, considering the importance of the attribute, the potential impact would be short-term, localised, temporary and of very low magnitude as a worst-case scenario (but is unlikely to occur based on impact avoidance measures to be implemented);*
  - *The significance of this effect is therefore considered to be negligible (not significant);*
- Recreation (medium importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of very low magnitude as a worst-case scenario;*
  - *The resulting effect would be negligible (not significant);*
- Biodiversity (medium importance):
  - *It is possible that the NELIDB watercourses could experience a short-term, localised and temporary impact with the potential to affect ecology (invertebrates etc., resulting from a change in water quality). Considering a worst-case scenario, this impact is evaluated to result in an impact of very low magnitude in the localised area; and*
  - *The resulting effect would be negligible (not significant).*

Humber Lower

13.6.30 Potential impacts and effects on the Humber Lower from runoff of contaminated surface water are assessed below:

- Water quality and WFD status (very high importance):
  - *Any contaminated run off is likely to infiltrate into the surface layers or pond on the surface, allowing clean up, prior to reaching the Humber Lower. The surface drainage system would be designed with attenuation features that have the potential to capture any contaminated runoff for treatment. If, however, a spillage of pollutant did reach the Humber Lower, considering the importance of the attribute, the potential impact would be short-term, localised, temporary and of very low magnitude (but is unlikely to occur based on impact avoidance measures to be implemented);*
  - *No effect on water quality and WFD status would be experienced, the significance of this effect is therefore considered to be minor adverse (not significant);*

- Recreation (high importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of very low magnitude as a worst-case scenario;*
  - *The resulting effect on recreation would be negligible (not significant);*
- Biodiversity (very high importance):
  - *It is possible that Humber Lower could experience a short-term, localised and temporary impact with the potential to affect ecology (species of International and National Value etc. being affected from the changes to water quality). Considering a worst-case scenario, this impact is evaluated to result in an impact of very low magnitude in the localised area immediately adjacent to the Site;*
  - *No effect on biodiversity and WFD status would be experienced, the significance of this effect is therefore considered to be minor adverse (not significant); and*
  - *The predicted effect on river habitats of International and National Value are therefore not significant.*

Rosper Road Pools

13.6.31 Potential impacts and effects on the Rosper Road Pools from runoff of contaminated surface water are assessed below:

- Water quality and WFD status (medium importance):
  - *Any contaminated run off is likely to infiltrate into the surface layers or pond on the Site surface, allowing clean up, prior to reaching the other water features. The surface drainage system would be designed with attenuation features that have the potential to capture any contaminated runoff for treatment. If, however, a spillage of pollutant did reach the water features, considering the importance of the attribute, the potential impact would be short-term, localised, temporary and of very low magnitude (but is unlikely to occur based on impact avoidance measures to be implemented);*
  - *No effect on water quality would be experienced, the significance of this effect is therefore considered to be negligible (not significant);*
- Recreation (high importance):
  - *There exists the potential for a short-term, localised temporary impact on recreational activity, but given the localised nature, such an impact is evaluated to be of very low magnitude as a worst-case scenario;*
  - *The resulting effect on recreation would be negligible (not significant);*
- Biodiversity (high importance):
  - *It is possible that the surface water features could experience a short-term, localised and temporary impact with the potential to affect ecology (birds etc., resulting from a change in water quality). Considering a worst-case scenario, this impact is evaluated to result in an impact of very low magnitude in the localised area;*
  - *No effect on biodiversity would be experienced, the significance of this effect is therefore considered to be negligible (not significant); and*
  - *The predicted effect on water habitats of Local Value (Rosper Road Pools LWS) is therefore not significant.*

Drainage and Flow to Surface Waters

13.6.32 Surface water discharge would be restricted to greenfield runoff rates and discharge to the local land drain located directly adjacent to the southern Site boundary, via a new surface water system on the Power Plant Site, subject to confirmation with the NELIDB. Therefore effects on the land drain would be negligible (not significant).

13.6.33 Although the detailed drainage design would not be completed until the detailed design stage, drainage systems would be designed so as not to increase flood risk. These measures allow the design criterion of no flooding during a 1 in a 100 year (1.0% AEP) plus climate change storm to be achieved.

Flood Risk

13.6.34 The FRA for the Proposed Development, included within Appendix 13A (ES Volume 3), concludes that development of the Site would not increase the risk of flooding from fluvial, tidal, groundwater or overland flow sources.

13.6.35 A high level drainage strategy has been developed for the Site and is presented in Appendix 13A: Flood Risk Assessment (ES Volume 2)). As detailed in the drainage strategy and summarised in Section 13.5 above, surface water discharged from the Proposed Development would be restricted to a greenfield runoff rate of 4.2 l/s via an attenuation tank and an appropriate flow control device.

13.6.36 Surface water from the attenuation tank would outfall, via new drainage infrastructure, into the local land drainage ditch located directly adjacent to south of the Site, subject to agreement with NELIDB.

13.6.37 For outline design purposes the 1% AEP, critical storm rainfall event with a 40% climate change allowance has been used to size surface water drainage for the Proposed Development. This ensures that ponding of the Site due to exceedance of drainage network flow capacity is unlikely to occur during the design life of development.

13.6.38 The Site would be assessed as part of the detailed drainage design to consider the risk posed by any flooding up to and beyond the 1% (1 in 100 year) flood event. Any flooding would be diverted away from critical infrastructure or access routes and retained on the Site wherever possible.

13.6.39 Other SuDS techniques such as swales, permeable paving and soakaways may be considered at the detailed design stage.

Decommissioning

13.6.40 Decommissioning of the Proposed Development would be undertaken in accordance with the Environmental Permit. This would include decommissioning of all potentially polluting plant and equipment so that it does not pose an unacceptable risk of contamination.

13.6.41 It is assumed that all underground infrastructures would remain in-situ; however, all connection and access points would be sealed or grouted to ensure disconnection.

13.6.42 On this basis, decommissioning impacts are expected to be limited to watercourses in close proximity to the Site and would be the same as construction impacts, as discussed above.

Summary of Potential Impacts on WFD Status

13.6.43 The WFD status of the Humber Lower has been considered for each of the potential impacts described as part of this assessment.

13.6.44 Given the nature of the impacts (notably that they are indirect, largely of temporary nature and/or unlikely to affect the WFD elements), and assuming the measures included in Section 13.5 would be effectively implemented, there would be no effect on WFD status and objectives.

13.6.45 Mitigation measures already in place on the Lower Humber include the strategic management of sediment, management of disturbance, reducing impact of dredging and reducing sediment re-suspension.

13.6.46 Proposed WFD mitigation measures as included within the Humber RBMP include the preservation of marginal aquatic habitat, banks and the riparian zone, managed realignment of flood defence, and the removal of hard bank reinforcement / revetment, or replacement with soft engineering solution.

13.6.47 The Proposed Development is unlikely to impact upon the ability of these mitigation measures to be implemented and for the current mitigation measures to remain. The effect on the WFD status of the Humber Lower is therefore likely to be negligible (not significant).

13.7 Mitigation and Enhancement Measures

13.7.1 A number of legislative and best practice measures which would be followed during the construction, opening and operation and decommissioning of the Proposed Development are detailed in Section 13.5. The design and impact avoidance measures have been taken into account in the assessment and no additional mitigation requirements have been identified.

13.8 Limitation or Difficulties

13.8.1 The following assumptions have been applied throughout this assessment process, but are not considered to significantly affect the robustness of the assessment:

- A conceptual design for the Proposed Development has been available, but detailed design would not be undertaken until after the planning process has been concluded. however, it is unlikely that detailed design would change the outcome of the assessment therefore; the Rochdale Envelope applied (see Chapter 4: The Proposed Development) has no effect on the assessment of water, flood risk and drainage;
- Similarly as no details of construction techniques are available, it is assumed that standard best practice construction techniques would be used; and
- It is assumed that the mitigation measures identified in this ES would be implemented, which could influence the mitigation strategy proposed by this chapter.

13.8.2 Hydrological and hydraulic information for minor local watercourses (ordinary watercourses and IDB drains/watercourses) in the vicinity of the Site is limited; therefore the assessment is based on professional judgement together with information taken from mapping, publically available data sources and local knowledge gained through consultation with statutory consultees.

13.9 Residual Effects and Conclusions

13.9.1 This chapter assesses potential impacts from the Proposed Development on the quality and quantity of surface waterbodies, and the effects of these potential changes on key receptors (or attributes). Water features that could potentially be affected include local land drains (located adjacent to the Site boundary), wider NELIDB watercourses (Watercourse 9 and 9A), the Humber Lower (Humber Estuary) and the Rosper Road Pools. A summary of the impact assessment findings is provided in Table 13-7.

13.9.2 The standard impact avoidance measures proposed would reduce the risk of many impacts occurring during the construction, operational and decommissioning phases. These include implementation of Environment Agency GPPNs, PPGs, construction staff awareness and training, implementation of pollution plans and the appropriate discharge/disposal of site runoff.

13.9.3 The assessment has identified the 'worst-case scenario', such as significant pollution events, which have a low probability of occurrence due to the procedures and measures that would be put in place.

13.9.4 Adverse residual effects on the key receptors have predominantly been assessed as minor adverse to negligible and therefore not significant.

13.9.5 The FRA (Appendix 13A (ES Volume 3)) concludes that development of the Site would not increase the risk of flooding from tidal, fluvial, groundwater, overland flow, drainage infrastructure or artificial watercourse sources.

13.9.6 As no mitigation measures additional to those described within Section 13.5 have been identified, the residual effects remain as described in Section 13.6. It is acknowledged that even with the implementation of impact avoidance measures, there is still a very limited potential for some residual risk to the water environment associated with the construction, operation and decommissioning of the Proposed Development.

Table 13.7. Residual effects summary table

Predicted Impact	Sensitivity of resource/receptor	Mitigation	Magnitude of impact	Classification of effect
Construction				
Contaminated runoff and spillage of pollutants polluting local land drains adjacent to the Site	Water Quality – Low	No additional mitigation required - see Section 13.5.	Medium	Negligible
	Recreation – Low		Low	Negligible
	Biodiversity – Medium		Medium	Minor Adverse
Contaminated runoff and spillage of pollutants polluting the NELIDB Watercourses	Water Quality –Medium	No additional mitigation required - see Section 13.5.	Low	Negligible
	Recreation – Medium		Low	Negligible
	Biodiversity – Medium		Low	Negligible
Contaminated runoff and spillage of pollutants polluting the Humber Lower	Water Quality – Very High	No additional mitigation required - see Section 13.5.	Very Low	Minor Adverse
	Recreation – High		Very Low	Negligible
	Biodiversity – Very High		Very Low	Minor Adverse
Contaminated runoff and spillage of pollutants polluting Rosper Road Pools	Water Quality – Medium	No additional mitigation required - see Section 13.5.	Very Low	Negligible
	Recreation – High		Very Low	Negligible
	Biodiversity – High		Very Low	Negligible
Suspended sediments in site runoff/Re-suspension of Sediments polluting local land drains adjacent to the Site	Water Quality – Low	No additional mitigation required - see Section 13.5.	Medium	Negligible
	Recreation – Low		Low	Negligible
	Biodiversity – Medium		Medium	Minor Adverse
Suspended sediments in site runoff/ Re-suspension of Sediments polluting the NELIDB Watercourses	Water Quality –Medium	No additional mitigation required - see Section 13.5.	Very Low	Negligible
	Recreation – Medium		Very Low	Negligible
	Biodiversity – Medium		Low	Negligible
Suspended sediments in site runoff/ Re-suspension of Sediments polluting the Humber Lower	Water Quality – Very High	No additional mitigation required - see Section 13.5.	Very Low	Minor Adverse
	Recreation – High		Very Low	Negligible
	Biodiversity – Very High		Very Low	Minor Adverse
Suspended sediments in site runoff/ Re-suspension of	Water Quality – Medium	No additional mitigation required - see Section 13.5.	Very Low	Negligible

Predicted Impact	Sensitivity of resource/receptor	Mitigation	Magnitude of impact	Classification of effect
Sediments polluting the Rosper Road Pools	Recreation – High		Very Low	Negligible
	Biodiversity – High		Very Low	Negligible
Opening/Operation				
Leakage from drainage system polluting local land drains adjacent to the Site	Water Quality – Low	No additional mitigation required - see Section 13.5.	Low	Negligible
	Recreation – Low		Low	Negligible
	Biodiversity – Medium		Low	Negligible
Leakage from drainage system polluting the NELIDB Watercourses	Water Quality –Medium	No additional mitigation required - see Section 13.5.	Very Low	Negligible
	Recreation – Medium		Very Low	Negligible
	Biodiversity – Medium		Very Low	Negligible
Leakage from drainage system polluting the Humber Lower	Water Quality – Very High	No additional mitigation required - see Section 13.5.	Very Low	Minor Adverse
	Recreation – High		Very Low	Negligible
	Biodiversity – Very High		Very Low	Minor Adverse
Leakage from drainage system polluting the Rosper Road Pools	Water Quality – Medium	No additional mitigation required - see Section 13.5.	Very Low	Negligible
	Recreation – High		Very Low	Negligible
	Biodiversity – High		Very Low	Negligible
Contaminated runoff and spillages of pollutants polluting local land drains adjacent to the Site	Water Quality – Low	No additional mitigation required - see Section 13.5.	Low	Negligible
	Recreation – Low		Low	Negligible
	Biodiversity – Medium		Low	Negligible
Contaminated runoff and spillages of pollutants polluting the NELIDB Watercourses	Water Quality –Medium	No additional mitigation required - see Section 13.5.	Very Low	Negligible
	Recreation – Medium		Very Low	Negligible
	Biodiversity – Medium		Very Low	Negligible
Contaminated runoff and spillages of pollutants polluting the Humber Lower	Water Quality – Very High	No additional mitigation required - see Section 13.5.	Very Low	Minor Adverse
	Recreation – High		Very Low	Negligible
	Biodiversity – Very High		Very Low	Minor Adverse

Predicted Impact	Sensitivity of resource/receptor	Mitigation	Magnitude of impact	Classification of effect
Contaminated runoff and spillages of pollutants polluting the Rosper Road Pools	Water Quality – Medium	No additional mitigation required - see Section 13.5.	Very Low	Negligible
	Recreation – High		Very Low	Negligible
	Biodiversity – High		Very Low	Negligible
Potential impact on WFD status		No additional mitigation required - see Section 13.5.		No effect
Decommissioning – considered to be same as construction stage as detailed above				

13.10 References

Ref 13-1 European Commission (2000) Directive 2000/60/EC The Water Framework Directive.

Ref 13-2 HM Government (1991) The Water Resources Act.

Ref 13-3 HM Government (2010) Flood and Water Management Act 2010.

Ref 13-4 HM Government (2003) The Water Act.

Ref 13-5 HM Government (2014) The Water Act.

Ref 13-6 HM Government (1995) Environment Act.

Ref 13-7 HM Government (1990) Environmental Protection Act.

Ref 13-8 HM Government (1991) The Land Drainage Act.

Ref 13-9 HM Government (2003) The Water Environment (Water Framework Directive) (England and Wales) Regulations.

Ref 13-10 HM Government (2015) The Water Environment (WFD) Regulations.

Ref 13-11 HM Government (2015) The Water Framework Directive (Standards and Classification) Directions.

Ref 13-12 HM Government (1999) The Anti-Pollution Works Regulations.

Ref 13-13 HM Government (2001) *The Control of Pollution (Oil Storage) (England) Regulations.*

Ref 13-14 HM Government (2009) The Groundwater (England and Wales) Regulations.

Ref 13-15 HM Government (2009) The Environmental Damage Regulations.

Ref 13-16 HM Government (2009) The Flood Risk Regulations.

Ref 13-17 HM Government (2009) The Water Resources Act (Amendment) (England & Wales) Regulations.

Ref 13-18 HM Government (2010) The Environmental Permitting (England and Wales) Regulations.

Ref 13-19 HM Government (2000) The Water Supply (Water Quality) Regulations 2000.

Ref 13-20 Cabinet Office (2008) The Pitt Review. Learning Lessons from the 2007 Floods.

Ref 13-21 Department for Communities and Local Government (2012) National Planning Policy Framework (NPPF).

Ref 13-22 Department for Communities and Local Government (2010), Planning Policy Statement 25 (PPS25) Development and Flood Risk

Ref 13-23 Department of Communities and Local Government (2004) Planning Policy Statement 23: Planning and Pollution Control.

Ref 13-24 Communities and Local Government (2014) Planning Practice Guidance.

Ref 13-25 Department for Environment, Food and Rural Affairs (2015) Non-statutory Technical Standards for Sustainable Drainage Systems.

Ref 13-26 Marine Management Organisation (2014) East Inshore and East Offshore Marine Plans. [Online]

Ref 13-27 Department for Environment, Food and Rural Affairs (2011) UK Marine Policy Statement.

Ref 13-28 North Lincolnshire Council (2011) North Lincolnshire Core Strategy Adopted 2011.

Ref 13-29 Department for Environment, Food and Rural Affairs (2012) Internal Drainage Board Model Land Drainage Byelaws. [Online]

Ref 13-30 Environment Agency (2000) Pollution Prevention Guidelines 1 General guide to the prevention of pollution.

Ref 13-31 Environment Agency (2017) Guidance for Pollution Prevention 2 Above ground oil storage tanks.

Ref 13-32 Environment Agency (2007) Pollution Prevention Guidelines 3 Use and design of oil separators in surface water drainage systems.

Ref 13-33 Environment Agency (2017) Pollution Prevention Guidelines 5 Works and Maintenance in, or near watercourses.

Ref 13-34 Environment Agency (2010) Pollution Prevention Guidelines 6 Working at construction and demolition sites.

Ref 13-35 Environment Agency (2004) Pollution Prevention Guidelines 7 Refuelling activities.

Ref 13-36 Environment Agency (2017) Guidance for Pollution Prevention 8 Safe storage and disposal of used oils

Ref 13-37 Environment Agency (2007) Pollution Prevention Guidelines 13 Vehicle washing and cleaning.

Ref 13-38 Environment Agency (2000) Pollution Prevention Guidelines 18 Managing fire water and major spillages.

Ref 13-39 Environment Agency (2017) Guidance for Pollution Prevention 21 Pollution incident response planning.

Ref 13-40 CIRIA (2001) Control of water pollution from construction Sites: Guidance for consultants and constructors. C532.

Ref 13-41 CIRIA (2015) The SuDS Manual. C753.

Ref 13-42 Department for Transport (2003) Transport Analysis Guidance. [Online]

Ref 13-43 Highways Agency (2009) Design Manual for Roads and Bridges Volume 11, Section 3 Part 10 - Document Number HA 45/09 [Online]

Ref 13-44 Multi-Agency Geographical Information for the Countryside (MAGIC) (2018) MAGIC website [Online]

Ref 13-45 Environment Agency (2018) Environment Agency Interactive Maps. [Online]

Ref 13-46 Environment Agency (2016) Water for Life and Livelihoods. Humber River Basin District River Basin Management Plan: Updated December 2015.

Ref 13-47 North Lincolnshire Council and North East Lincolnshire Council (2011). North and North East Lincolnshire Strategic Flood Risk Assessment.

Ref 13-48 Entec (2011). North Lincolnshire Preliminary Flood Risk Assessment.

Ref 13-49 Humber Management Scheme (2011) Humber Estuary European Marine Site.

Ref 13-50 European Commission (2008) Directive 2008/105 EC Priority Substances Directive

Ref 13-51 Environment Agency, (2001), Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.

Ref 13-52 Health and Safety Executive (HSE) (2002) Control of Substances Hazardous to Health 2002 (COSHH). London. 2002.

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Tables

14. Cumulative and Combined Effects

14.1 Introduction

14.1.1 This chapter of the Environmental Statement (ES) addresses the potential for combined or cumulative effects to occur as a result of the Proposed Development. It draws on the assessment of impacts provided in Chapters 7 to 13 of this ES, and information relating to other known developments that are proposed within the study area. This assessment does not consider developments that are already constructed and operating for the assessment of cumulative effects, as existing operational facilities are accounted for in the baseline conditions established for the main assessments within Chapters 7 to 13 of this ES.

14.1.2 Similarly, the assessment does not consider developments that are being constructed and would be operating in the future, prior to construction of the Proposed Development. Effects of such future operational facilities are accounted for in the future baseline conditions established for the main assessments within Chapters 7 to 13 of this ES.

14.1.3 As discussed in Chapter 2: Assessment Methodology of this ES, and as required by the 2017 EIA Regulations; when considering the potential environmental effects of the Proposed Development, there is a need to consider the potential for cumulative and combined effects. Combined and cumulative effects are defined herein as:

- **Cumulative effects**: effects that may arise where the impacts associated with the Proposed Development have the potential to interact with those associated with one or more other committed developments located in proximity to the Proposed Development (e.g. interaction of impacts which leads to effects of the same type (e.g. air quality)) on the same receptor.
- **Combined effects**: effects that may arise when several different impacts resulting from the Proposed Development (e.g. decrease in air quality, increase in noise disturbance) have the potential to affect a single receptor.

14.1.4 This chapter provides details of other proposed schemes in the vicinity of the Proposed Development that may be of relevance to the cumulative assessment, using information that is in the public domain. This includes proposed schemes that have planning applications registered with the local planning authorities and/or already consented developments, that have not yet been constructed or are not yet operational.

14.1.5 This chapter is supported by Figure 14.1 (ES Volume 2) which illustrates the Site location in relation to the developments with the potential to have a cumulative impact with the Site.

14.2 Legislation, Planning Policy and Guidance

Legislative Background

14.2.1 The requirement for cumulative and combined impact assessments is stated in the relevant European Directive and domestic legislation, as detailed below:

- European Directive 2014/52/EU (Ref 14-1) on the assessments of effects of certain public and private projects on the environment requires an assessment of *'the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project*'.'; and
- Schedule 4 Part 5 of The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (Ref 14-2) which states the following:

"The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development…"

14.2.2 The Rochdale Envelope, amongst other things, allows flexibility in respect of the following:

- The number of gas engines (between 33 and five);
- The number of emissions stacks (between 33 and five);
- The orientation of the gas engines and components within the Proposed Power Plant Site; and
- The height, width and length of building/structures (maximum dimensions have been applied to define the Rochdale Envelope).

14.2.3 For illustrative purposes, two indicative layouts (termed Layout 'A' and Layout 'B') have been prepared which demonstrate the different types and number of gas engines and associated components that could be utilised.

14.2.4 Subject to the planning and other consents being granted (and an investment decision being made), work on site could commence in early 2019 and will consist of approximately 12 – 18 months of construction work with the Proposed Development expected to commence commercial operation in 2020.

14.3 Assessment Methodology

Impact Assessment and Significance Criteria

14.3.1 There is no standard prescriptive method for assessing cumulative and combined effects.

14.3.2 With regard to cumulative effects, the ability to quantify the extent to which the environmental effects of other schemes can interact with those associated with the Proposed Development depends upon on the level of information available regarding such other schemes. Where environmental assessment information regarding other schemes is not available or is uncertain, the cumulative assessment is necessarily qualitative and assessment is primarily based upon professional opinion. However, matrices and modelling has been used, where appropriate and where sufficient information is available.

14.3.3 With regard to the assessment of combined effects, this has taken account of the assessment findings reported within Chapters 7 to 13 of this ES and the ability of these findings to interact and impact upon common receptors.

14.3.4 When considering cumulative and combined effects, the mitigation measures set out in Chapters 7 to 13 have been taken into account (i.e. only residual (after mitigation) effects of the Proposed Development have been considered within this chapter).

14.3.5 Cumulative and combined effects are assessed to be neutral, minor, moderate or major. Moderate or major effects are considered to be significant, using the methodologies outlined in each technical chapter (refer to Chapters 7 – 13 of this ES).

Cumulative Effects

14.3.6 Cumulative effects are those that accrue over time and space caused by the interaction of impacts associated with a number of developments. The framework provided for assessing cumulative effects as detailed in Planning Inspectorate Advice Note 17 'Cumulative effects assessment relevant to nationally significant infrastructure projects' (Planning Inspectorate, December 2015) (Ref 14-3) has been used in undertaking the cumulative effects assessment (CEA) reported in this chapter. While it is recognised that the Proposed Development is not a Nationally Significant Infrastructure Project (NSIP), in the absence of

other guidance on cumulative effects assessment for Town and Country Planning Applications, this advice note has been followed to allow a comprehensive assessment of cumulative effects.

14.3.7 The advice note sets out a four stage approach to the assessment of cumulative effects:

- Stage 1: identify the Zone of Influence and identify a long list of other schemes;
- Stage 2: identify short list of other schemes for cumulative assessment;
- Stage 3: information gathering; and
- Stage 4: assessment.

14.3.8 The Zone of Influence is discussed in the study area section herein. A long list of schemes in the vicinity of the Proposed Development was identified following a search of the relevant planning databases, whilst an initial short list of schemes considered to be of relevance to the cumulative assessment given the nature of the Proposed Development and the nature of the potential effects.

14.3.9 The schemes identified for cumulative assessment have been categorised into tiers to indicate the level of certainty associated with each scheme (as shown in Table 14.1 below). Those in Tier 1 are most certain, while those in Tier 3 are least certain and have been assessed, where possible, at a high level, in accordance with PINS Advice Note 17 (Ref 14-3).

Table 14.1. Level of certainty for each tier

Tier	Degree of certainty	Decreasing level of detail likely to be available
Tier 1	Under construction*; Permitted application(s), whether under the PA2008 or other regimes, but not yet implemented; Submitted application(s) whether under the PA2008 or other regimes but not yet determined.	↓
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a scoping report has been submitted.	
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a scoping report has not been submitted. Identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited. Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.	

** Where other projects are expected to be completed before construction of the proposed NSIP and the effects of those projects are fully determined, effects arising from them should be considered as part of the baseline and may be considered as part of both the construction and operational assessment. The ES should clearly distinguish between projects forming part of the baseline and those in the CEA.*

Adapted from Table 3 in Pins Advice Note 17 (Ref 14-3).

14.3.10 In order to assess the potential for cumulative effects to arise in relation to other schemes, there is a need to understand their potential for generating environmental effects. Where a planning application has been made, information presented within the ES or environmental reports accompanying the planning application has been obtained and reviewed. For schemes that are known to be proposed (either via screening or scoping opinion requests

submitted to the local authority/Planning Inspectorate or following presentation of information in the public domain), but where an ES or other environmental reports has not yet been prepared or submitted, readily available information has been obtained and reviewed (Stage 3). This includes communication with local authorities, public consultation material and reference to material available via the internet.

14.3.11 Following information gathering from available sources, the effects of the Proposed Development have been considered in conjunction with the potential effects from other schemes or activities that are both reasonably foreseeable, in terms of delivery (e.g. the applicable scheme has planning consent or is in the planning process) and are geographically located in a position where environmental impacts could act together to create an effect that is more (or less) significant overall than the effect of the individual developments alone (Stage 4).

14.3.12 Operational impacts are generally long-term, and whilst construction impacts are often short-term and temporary, they can potentially be of a large magnitude. Consequently, when cumulative effects that could be associated with construction at one site and operation at another are considered, the difference in duration and reversibility is considered within the assessment.

14.3.13 In assessing cumulative effects, it is appropriate to also acknowledge the relative contributions that different schemes make to a cumulative effect, and carefully consider whether a cumulative effect could occur at all. For example, effects associated with a large scale scheme may be significant, and whilst a smaller scheme may contribute to this effect, the cumulative effect of the schemes together may only be considered as being significant if it is of greater significance than the effect of either project in isolation. It follows that if the environmental effects associated with the Proposed Development are assessed as being negligible, cumulative effects could not be generated, given that Proposed Development impacts would be very low/low, or the receptor sensitivity would be very low/low.

14.3.14 Where applicable, the assessment considers all other known developments that have the potential to generate cumulative effects with the Proposed Development, thus representing a worst-case assessment.

Study Area

14.3.15 Cumulative effects are generally unlikely to arise unless the other proposed development sites are in close proximity to the Site, recognising that actual distance varies with the nature of the potential effect and the nature of the receptor (e.g. cumulative air quality effects could occur for developments a greater distance apart than, for example, noise effects). Construction projects are, as a matter of routine, required to employ regulatory and managerial controls and good practice to mitigate environmental impacts wherever possible. Nevertheless, consideration has been given to the presence of common pathways from nearby schemes to a single receptor, and whether there is potential for impacts of a sufficient magnitude that could result in a particular receptor experiencing cumulative effects.

14.3.16 The study area for the consideration of cumulative and combined effects has been developed taking into account the predicted extent of impacts associated with the Proposed Development as detailed within Chapters 7 – 13 of this ES.

14.3.17 The study area for each environmental assessment topic has been defined in the relevant technical chapter of this ES (Chapters 7 – 13) and is outlined in Table 14.2 below. Information on the likely extent of impacts associated with other developments in the area has also been considered.

Table 14.2. Zone of Influence Table

Environmental Topic	Zone of Influence (ZOI)
Air Quality	Construction: 350m ZOI for emissions and construction dust. Operation: 10km ZOI for international statutory designated ecology sites 2km for non-statutory designations Refer to Chapter 7: Air Quality for more information.
Noise and Vibration	Construction and Operation: 1km ZOI Refer to Chapter 8: Noise and Vibration for more information.
Ecology and Nature Conservation	Construction and Operation: A maximum ZOI of 10km has been applied: • 10km for international statutory designated sites; • 2km ZOI for national and locally designated sites; and • 500m for ponds. Refer to Chapter 9: Ecology for more information.
Landscape and Visual Amenity	Construction and Operation: 2km Refer to Chapter 9: Landscape and Visual Amenity for more information.
Cultural Heritage	Construction: On site. Operation: 2km Refer to Chapter 11: Cultural Heritage for more information
Ground Conditions and Hydrogeology	Construction and Operation: 2km ZOI Refer to Chapter 12: Ground Conditions and Hydrogeology for more information.
Water Resources, Flood risk and Drainage	Construction and Operation: 2km ZOI Refer to Chapter 13 Surface Water, Flood Risk and Drainage for more information

Consultation

14.3.18 The proposed approach to this cumulative assessment was described in the EIA Scoping Report (Appendix 1A of this ES, Volume 3). No substantive responses on this assessment have been received.

14.4 Cumulative Effects Assessment for ES

14.4.1 The staged methodology advocated in the PINS Advice Note 17 (Ref 14-3) has been applied to the CEA for the Proposed Development and is outlined by each stage below.

Stage 1: Establishing the ZOI and Identifying Long List of 'Other Development'

14.4.2 Stage 1 involved re-establishing the Proposed Development's Zone of Influence (ZoI) and identifying a long list of 'other development' (as discussed above).

14.4.3 An initial screening exercise (Stage 1 of the cumulative effects assessment) was undertaken to identify potential schemes within the vicinity of the Proposed Development requiring consideration within the cumulative assessment. This process identified potential major developments within an initial 5km radius of the Proposed Development considered to be proportionate and a 'worst-case' for the majority of technical to create an initial long list for consideration. Available information on each of these schemes was obtained, and detail was provided on each, as shown in Table 14.3 below.

14.4.4 As outlined in Chapter 1: Introduction of this ES, the Applicant's parent company (Vitol), is investigating the opportunity to develop a further power project on a site adjacent to the existing CHP plant. This is at an early stage of evaluation but it is likely to require an application for a Development Consent Order (DCO) under the Planning Act 2008. As there are no details yet available regarding the potential environmental effects associated with the

scheme, it is not yet possible to evaluate potential cumulative effects of the Proposed Development with this scheme. Cumulative effects of the two schemes would therefore be assessed in any future DCO application.

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

14.4.5 Stage 2 involves identifying a short list of other developments for assessment. The Stage 1 long list was subsequently re-screened based on the ZOI for each of the technical disciplines considered within this ES. In addition to the ZOI threshold criteria, the geographical and temporal scope of the 'other development' was considered in relation to the geographical and temporal scope of the Proposed Development and professional judgement was applied to identify the short list of development to be considered further within Stage 3.

14.4.6 The location of the 'other developments' is detailed in Table 14-3 below are shown in Figure 14.1 (ES Volume 2).

Table 14.3. Identification of 'Other Development' for CEA

'Other development' details						Stage 1		Stage 2			
ID	Application Reference	Applicant for 'other development' and brief description	Distance from project	Status	Tier	Within ZOI?	Progress to Stage 2?	Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Other factors	Progress to Stage 3/4?
1	EN10038	C.Gen Application for a 470MWe power station Planning Inspectorate	2km	Consented	1	Falls within the ZOI for all topics scoped into ES except noise	Yes	Not known.	Yes. Nature, scale of development and proximity to the Proposed Development have the potential to give rise to cumulative effects that require assessment.	n/a	Yes (relevant topics to consider potential for cumulative effects)
2	PA/2016/1240	Uniper Ltd Construction of a compound with 14 gas reciprocating engine generators and ancillary equipment. North Lincolnshire Council	1.5km	Consented	1	Falls within the ZOI for all topics scoped into ES except noise	Yes	Not known	Yes. Nature and and proximity to the Proposed Development have the potential to give rise to cumulative effects that require assessment.	n/a	Yes (relevant topics to consider potential for cumulative effects)
3	DM/0802/16/FUL	AMP Energy Services Limited Construction of a standing reserve power plant comprising 12 gas reciprocating engine generators North East Lincolnshire Council	5km	Consented	1	For ecology & air quality only in relation to sites carrying international designation	Yes	Not known	Unlikely given the scale and distance from the Proposed Development	n/a	No

'Other development' details						Stage 1		Stage 2			
ID	Application Reference	Applicant for 'other development' and brief description	Distance from project	Status	Tier	Within ZOI?	Progress to Stage 2?	Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Other factors	Progress to Stage 3/4?
4	DM/0026/18/FUL	North Beck Energy Ltd Erect an Energy Recovery Facility and associated infrastructure North East Lincolnshire Council	5km	Pending Decision	2	For ecology & air quality only in relation to sites carrying international designation	Yes	Operation planned for 2022	Unlikely given the scale and distance from the Proposed Development	n/a	No

Stage 3: Information Gathering

14.4.7 Following an initial information search on the short list developments at Stage 2, more detailed information was obtained on the developments listed above which was taken forward to Stage 3. This included searching for and noting the following information, where available:

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

14.4.8 As discussed in Section 14.3, the information gathered at this stage was primarily from the public domain (including planning portals and the Planning Inspectorate website).

Stage 4: Assessment

14.4.9 A detailed CEA has been conducted and is presented in Table 14.4 below. Each technical environmental discipline of the EIA has considered the potential for cumulative effects with the short-listed projects.

14.5 Cumulative and Combined Effects Assessment (Stage 4)

Air Quality

Table 14.4. Refined short list of projects within the Zone of Influence identified at Stage 2 of the CEA – Air Quality

ID	Tier	Application Reference	Applicant for 'other development' and brief description	Assessment of cumulative effect with Proposed Development	Proposed mitigation applicable to Proposed Development including any apportionment	Residual cumulative effect
1	1	EN10038	C.Gen Application for a 470MWe power station Planning Inspectorate	Due to the location of this plant, the prevailing wind direction and the much higher stack, it is considered that cumulative impacts with the Proposed Development would be minimal. The Environmental Statement submitted for the North Killingholme Power Project states that the maximum predicted annual average concentration of NO_2 is 0.2µg/m^3. This was predicted to occur approximately 1.5km to the northeast of the stack. Concentrations in the vicinity of the Proposed Development area of influence would be considerably lower and therefore it is again considered that the cumulative impact would be insignificant.	Other than the mitigation measures already proposed (as reported in Chapter 7: Air Quality), no further mitigation measures to reduce potential cumulative air quality effects are required.	Residual effects would be as reported for the Proposed Development in isolation, as reported in Chapter 7: Air Quality (not significant).
2	1	PA/2016/1240	Uniper Ltd Construction of a compound with 14 gas reciprocating engine generators and ancillary equipment. North Lincolnshire Council	The Killingholme Power Station gas engines are anticipated to run for a maximum of 1,500 hours per year, and therefore it is considered that it is unlikely that both sites will be operating simultaneously. It is therefore considered that the annual average impacts are more pertinent than the short term impacts for the purpose of the cumulative assessment. In terms of the Human Health impacts the Old Vicarage Receptor (R4) was also included. Predicted NO_2 concentrations at this receptor were 0.08µg/m^3, with impacts from the Proposed Development predicted to be 0.03µg/m^3. The cumulative concentration would therefore be 0.11µg/m^3, which represents 0.3% of the relevant AQS, and therefore would be considered to be imperceptible.	Other than the mitigation measures already proposed (as reported in Chapter 7: Air Quality), no further mitigation measures to reduce potential cumulative air quality effects are required.	Residual effects would be as reported for the Proposed Development in isolation, as reported in Chapter 7: Air Quality (not significant).

Ecology

14.5.1 Cumulative effects on habitats are considered as part of the Air Quality assessment above.

Landscape and Visual

Table 11.5. Refined short list of projects within the Zone of Influence identified at Stage 2 of the CEA – Landscape and Visual

ID	Tier	Application Reference	Applicant for 'other development' and brief description	Assessment of cumulative effect with Proposed Development	Proposed mitigation applicable to Proposed Development including any apportionment	Residual cumulative effect
1	1	EN10038	C.Gen Application for a 470MWe power station Planning Inspectorate	Due to the existing industrial character of the LLT and the existing landscape elements within the cumulative development site, it is assessed that a low magnitude of impact would result from construction activities within the cumulative development. Impacts would be short term and temporary. Due to the existing industrial character of the LLT and the existing landscape elements within the cumulative development site, it is assessed that a low magnitude of impact would result from operation of the cumulative development. Impacts would be long term and reversible.	Other than the mitigation measures already proposed (as reported in Chapter 9: Landscape and Visual), no further mitigation measures to reduce potential cumulative air quality effects are required.	Residual effects would be as reported for the Proposed Development in isolation, as reported in Chapter 9: Landscape and Visual (not significant).
2	1	PA/2016/1240	Uniper Ltd Construction of a compound with 14 gas reciprocating engine generators and ancillary equipment. North Lincolnshire Council	This development was not required to undertake a landscape and visual assessment. Accordingly, the effects on both landscape character and visual amenity are considered negligible both individually and cumulatively with the Proposed Development	Other than the mitigation measures already proposed (as reported in Chapter 9: Landscape and Visual), no further mitigation measures to reduce potential cumulative air quality effects are required..	Residual effects would be as reported for the Proposed Development in isolation, as reported in Chapter 9: Landscape and Visual (not significant).

Cultural Heritage

14.5.2 Neither of these schemes are considered likely to have cumulative effects on archaeology. Therefore, there are no cumulative effects on archaeology. There are not considered likely to have any cumulative effects on the setting of any heritage assets.

Ground Conditions and Hydrogeology

14.5.3 Neither of these schemes has the potential to effect ground conditions on the Site and the lack of hydrogeological connectivity means that a cumulative effect on groundwater is not considered possible.

Water Resources, Flood risk and Drainage

14.5.4 A lack of hydrological connectivity between these schemes and the Site means that a cumulative impact is not considered possible.

14.6 Combined Effects Assessment

14.6.1 Whilst there is considered the potential for combine effects to impact a single receptor, in particular Hazel Dene (R1 under Chapter 7: Air Quality and NSR 1 under Chapter 8: Noise and Vibration), neither assessment has identified a significant impact at this receptor, accordingly a combined effect is not anticipated.

14.6.2 No other receptor is considered susceptible to combined effects.

14.7 Limitations and Difficulties

14.7.1 Any limitations that were encountered during the individual assessments are detailed within Chapters 7 to 13.

14.7.2 The cumulative assessment is based on the currently available information on other potential or committed developments in the vicinity of the Site.

14.8 References

Ref 14-1 European Commission (2014) *Directive 2014/52/EU on the assessment of the effects of public and private projects on the environment.*

Ref 14-2 HM Government (2017) Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

Ref 14-3 Planning Inspectorate (2015) Advice Note 17 Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects.

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Tables

15. Summary of Significant Residual Effects

15.1 Introduction

15.1.1 Chapters 7 to 13 of this Environmental Statement (ES) have considered the potential environmental impacts and effects of the Proposed Development. This chapter of the ES provides a summary of those adverse and beneficial environmental effects that are considered to be significant (i.e. moderate and major effects).

15.2 Significant Environmental Effects and Proposed Mitigation Measures

15.2.1 Table 15–1 summarises the significant environmental effects of the Proposed Development that have been identified, following implementation of the embedded mitigation or impact avoidance measures included in the design of the Proposed Development (as detailed in Chapters 7 to 13, where relevant). Table 15–1 also summarises any additional mitigation measures that have been identified in the technical assessments contained in the ES. Cumulative and combined effects are included separately at the end of the table.

15.2.2 As outlined in Chapter 2: Assessment Methodology of this ES, for the purposes of this ES an effect is considered to be 'significant' if it is assessed to be moderate (adverse or beneficial) or major (adverse or beneficial). Minor and neutral effects are only referenced in this chapter where a 'significant' effect has been reduced to a 'not significant' effect following mitigation.

15.2.3 To provide further clarification on the nature of the effects, each has been identified as:

- Short term (St) – effects occurring only over a short period of time, e.g. an effect that only lasts for the duration of the construction period, or one that lasts for only part of the operational phase;
- Medium term (Mt) – effects occurring for the duration of the development's operation, but which cease when operations cease; or
- Long term (Lt) – effects occurring beyond the operation of the proposed scheme, for example the permanent change to archaeology;
- Temporary (T) – effects that are not permanent because the effect would no longer occur if the impact was removed within the relevant timescale (for example the visual amenity impact of construction structures would be described as St, T as the impact goes when the structures are removed);
- Permanent (P) – effects that are permanent and cannot be readily reversed within the relevant timescale (for example an environmental feature that is lost and cannot be replaced until after decommissioning would be Mt, P. In the event that it could not be replaced at all, this would be Lt, P); and
- Direct (D) – effects that result from a direct impact, for example , the loss of ecological habitat; or
- Indirect (In) – also known as secondary effects, are effects that result indirectly, for example, increased traffic could indirectly impact on air quality or creation of construction jobs can indirectly impact upon the local area through increased use of services/ goods.

Table 15-1. Summary of Significant Effects

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 7: Air Quality					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 8: Noise and Vibration					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 9: Cultural Heritage					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 10: Ecology					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 11: Landscape & Visual					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 12: Ground Conditions & Hydrogeology					
Construction	No significant effects identified				

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	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 13: Surface Water, Flood Risk and Drainage					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				

15.3 References

None Applicable

VPI Immingham Energy Park 'A' Power Station

Land adjacent to the existing Combined Heat and Power (CHP) Plant at South Killingholme, Immingham

Environmental Impact Assessment: Environmental Statement

Town and Country Planning (Environmental Impact Assessment) Regulations 2017

Applicant: VPI Immingham LLP
Date: May 2018

GLOSSARY

Abbreviation	Description
AOD	Above Ordinance Datum – a spot height (an exact point on a map) with an elevation recorded beside it that represents its height above a given datum.
BAT	Best Available Techniques – available techniques which are the best for preventing or minimising emissions and impacts on the environment. BAT is required for operations involving the installation of a facility that carries out industrial processes.
BDC	Bassetlaw District Council – the local planning authority with jurisdiction over the area within which the West Burton Power Station Site and Proposed Development Site (the Site) are situated.
BPM	Best Practicable Means – actions undertaken and mitigation measures implemented to ensure that noise levels are minimised to be as low as practicable.
CCS	The Considerate Construction Scheme – a non-profit making, independent organisation founded in 1997 by the construction industry to improve its image.
CEMP	Construction Environmental Management Plan – a plan to outline how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area.
CTMP	Construction Traffic Management Plan – a plan outlining measures to organise and control vehicular movement on a construction site so that vehicles and pedestrians using site routes can move around safely.
CWTP	Construction Workers Travel Plan – a plan managing and promoting how construction workers travel to a particular area or organisation. It aims at promoting greener, cleaner travel choices and reducing reliance on the private car.
DCO	A Development Consent Order made by the relevant Secretary of State pursuant to The Planning Act 2008 to authorise a Nationally Significant Infrastructure Project. A DCO can incorporate or remove the need for a range of consents which would otherwise be required for a development. A DCO can also include rights of compulsory acquisition.
DEMP	Decommissioning Environmental Management Plan – a site-specific plan developed to ensure that appropriate environmental management practices are followed during the decommissioning phase of a project and to detail all remediation, site control, and monitoring activities that will continue once the decommissioning activities are completed.
DTMP	Decommissioning Traffic Management Plan – a plan outlining measures to organise and control vehicular movements associated with the decommissioning phase to minimise impacts upon local highways.
EIA	Environmental Impact Assessment – a term used for the assessment of environmental consequences (positive or negative) of a plan, policy, program or project prior to the decision to move forward with the proposed action.
ELVs	Emission Limit Values – emission limit values based on the Best Available Techniques.
EMF	Electromagnetic fields – a physical field produced by electrically charged objects.
EMS	Environmental Management System – the management of an organisation's environmental programs in a comprehensive, systematic, planned and documented manner.
EPSM	European Protected Species Mitigation – in instances where projects are likely to have an impact on European Protected Species, mitigation must be undertaken and a licence granted by Natural England to provide a derogation to the law.
ES	Environmental Statement – a report in which the process and results of an Environment Impact Assessment are documented.

Abbreviation	Description
GHG	Greenhouse Gas – a gas in the atmosphere that absorbs and emits radiant energy within the thermal infrared range.
GPP	Guidance for Pollution Prevention
ha	Hectare – unit of measurement
HER	Historic Environment Record – information services that provide access to comprehensive and dynamic resources relating to the archaeology and historic built environment of a defined geographic area.
HGV	Heavy Goods Vehicle – vehicles with a gross weight in excess of 3.5 tonnes.
IDB	Internal Drainage Boards – a type of operating authority with permissive powers to undertake work to secure clean water drainage and water level management within drainage districts.
IED	Industrial Emissions Directive, EU Directive 2010/75/EU – European Union Directive committing member states to control and reduce the impact of industrial emissions on the environment.
LDS	Local Development Scheme – a requirement under section 15 of the Planning and Compulsory Purchase Act 2004, it sets out a local authority's work programme in relation to main planning policy documents.
LEP	Local Enterprise Partnerships are voluntary partnerships between local authorities and businesses.
LOAEL	Lowest observed adverse effect level. This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
LWS	Local Wildlife Site
MCPD	Medium Combustion Plant Directive. EU Directive 2015/2193. European Union Directive committing member states to control and reduce the impact of emissions form combusiotn plant between 1 and 50MW thermal input.
MW	Megawatts – unit of energy
NLC	North Lincolnshire Council
NPPF	The National Planning Policy Framework – Policy Framework which came into effect on 27 March 2012 (with some transitional arrangements) replacing the majority of national planning policy other than NPSs. The NPPF is part of the Government's reform of the planning system intended to make it less complex, to protect the environment and to promote sustainable growth. It does not contain any specific policies on Nationally Significant Infrastructure Projects but its policies may be taken into account in decisions on DCOs if the Secretary of State considers them to be both important and relevant.
NPS	National Policy Statements – Statements produced by Government under the Planning Act 2008 providing the policy framework for Nationally Significant Infrastructure Projects. They include the Government's view of the need for and objectives for the development of Nationally Significant Infrastructure Projects in a particular sector such as energy and are used to determine applications for such development.
NSER	No Significant Effects Report – for the Habitats Regulations Assessment (HRA).
NSRs	Noise Sensitive Receptors – locations or areas where dwelling units or other fixed, developed sites of frequent human use occur.
NTS	Non-Technical Summary – this document: a summary of the Environmental Statement written in non-technical language for ease of understanding.
PPGN	Pollution Prevention Guidance Notes

Abbreviation	Description
SSSI	Site of Special Scientific Interest - nationally designated Sites of Special Scientific Interest, an area designated for protection under the Wildlife and Countryside Act 1981 (as amended), due to its value as a wildlife and/or geological site.
TCPA	Town and Country Planning Act 1990 (as amended). The primary legislative instrument regulating the development of land in England and Wales and directly applicable to this proposed development
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ZTV	Zone of Theoretical Visibility - a computer generated tool to identify the likely (or theoretical) extent of visibility of a development.

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VPI Immingham Energy Park 'A' Power Station

Land adjacent to the existing Combined Heat and Power (CHP) Plant at South Killingholme, Immingham

Environmental Impact Assessment: Environmental Statement – Non-Technical Summary

Town and Country Planning (Environmental Impact Assessment) Regulations 2017

Applicant: VPI Immingham LLP
Date: May 2018

GLOSSARY

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1. Introduction

1.1 Introduction

1.1.1 This document presents a Non-Technical Summary (NTS) of the Environmental Statement (ES) that has been prepared in support of an application for the construction and operation of the proposed gas-fired power station (referred to as the Proposed Development), on land adjacent to the existing Combined Heat and Power (CHP) Plant at South Killingholme, Immingham, North Lincolnshire.

1.1.2 The Proposed Development and the land within the Application boundary (referred to as the Site) are described in Sections 3 and 4 of this NTS. The location and Site boundary are shown on Figures NTS1 and NTS2.

Figure NTS1: Site Location

Figure NTS2: Site Boundary

1.1.3 The purpose of this NTS is to describe the Proposed Development and provide a summary in non-technical language of the key findings of the ES. Technical details are provided within the ES (Volume 1: Main Report, Volume 2: Figures, and Volume 3: Technical Appendices).

1.1.4 The ES has been prepared to comply with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations). Environmental Impact Assessment (EIA) is a systematic process used to identify and assess the potentially significant adverse and beneficial effects of the Proposed Development, and outline mitigation or management measures that can be incorporated within the proposal to reduce (or enhance) these effects.

1.2 The Applicant

1.2.1 The Applicant is VPI Immingham LLP, referred to as VPI. VPI owns and operates the existing CHP plant at South Killingholme, one of the largest CHP plants in Europe, providing both electricity and steam to the adjacent oil refineries and electricity to the National Grid.

1.2.2 VPI was acquired by Vitol in 2013, an energy trading company based in Rotterdam, the Netherlands.

1.3 The Proposed Development

1.3.1 The Proposed Development comprises a gas-fired power station with a gross electrical output of up to 49.9 megawatts (MW_e). Subject to obtaining the necessary consents, construction is anticipated to commence around the first quarter (Q1) of 2019 and would take up to 18 months to complete. It is currently anticipated that the Proposed Development would commence commercial operation from as early as 2020.

1.3.2 The Proposed Development Site (termed the 'Site') is located immediately to the north of the existing VPI CHP power station and east of the Lindsey Oil Refinery (LOR) and extends to circa 3.2 hectares (ha) in area with approximately 1.25 ha being used for power generation with the rest of the area used for construction laydown and access during both construction and operation. The areas of the Site are illustrated in Figure NTS3 below.

1.3.3 The Proposed Development will consist of a number of gas engines (between five and 33) that will either be contained within an engine hall or will be separate containerised units. In addition there are a number of ancillary elements including electricity transmission infrastructure, offices and workshops. Connection to the National Grid systems for the export of electricity generated on Site and for the import of natural gas as fuel would be by the existing connections on the adjacent CHP Site

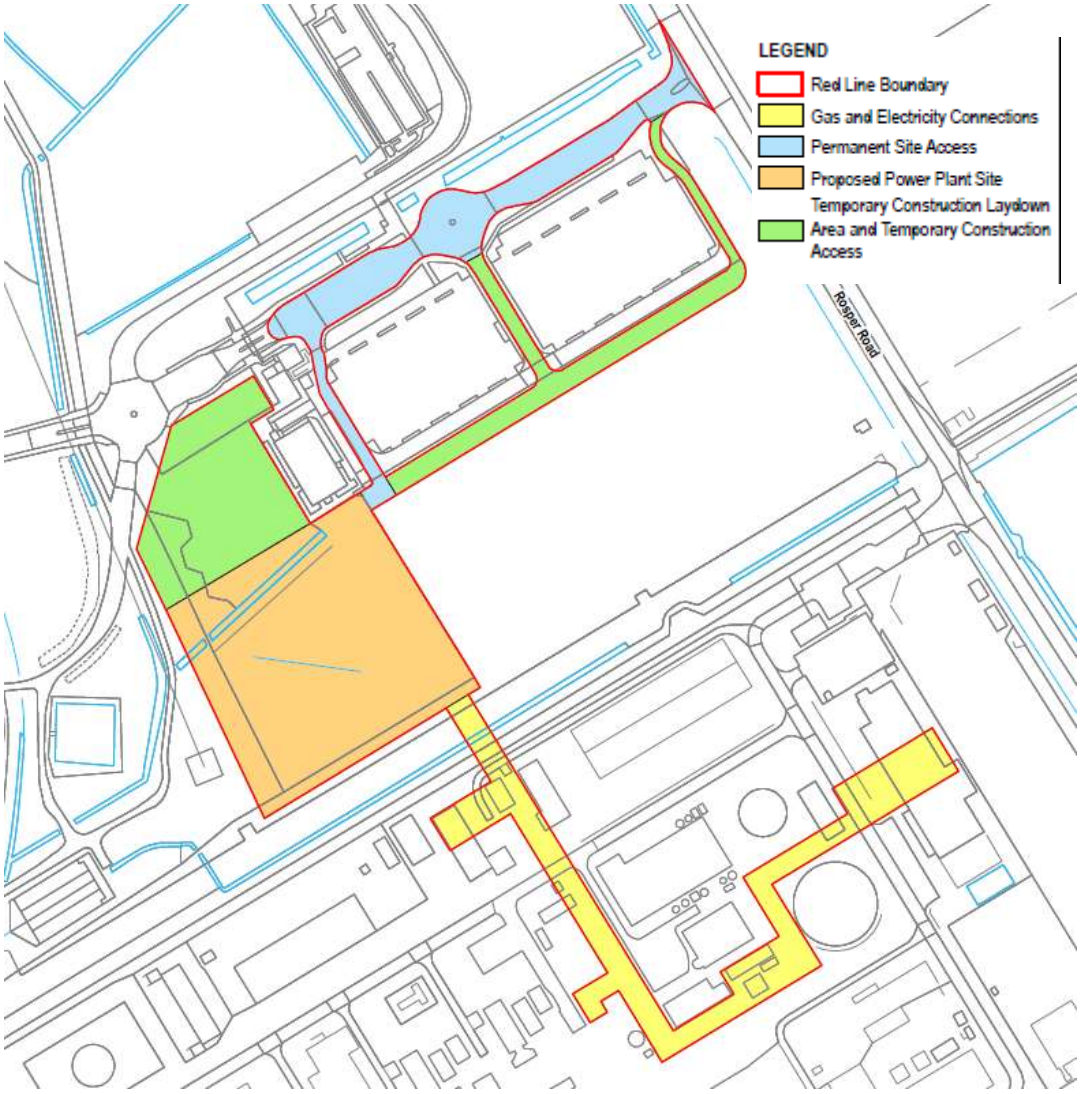
1.3.4 The Proposed Development would provide vital new energy infrastructure required to ensure security of power supply to the UK, operating flexibly, typically during periods of low electricity supply or high demand on the transmission network and to provide technical services to support the electricity grid.

1.3.5 Environmental impacts arising from the Proposed Development have been studied as part of the EIA process, and the initial results are presented within the ES and summarised in this NTS. The baseline for the assessment has been derived from measurements and studies in and around the Site. This is explained further in Chapter 2: EIA Assessment Methodology (ES Volume 1).

1.3.6 The EIA has also considered the potential cumulative impacts of the Proposed Development with other relevant known proposed or consented schemes, as outlined in Section 7 of this NTS.

1.3.7 A number of the design aspects and features of the Proposed Development cannot be confirmed until the tendering process for the design and construction of the power station has been completed. For example, the final selection of the number of engines to be installed and the enclosure or building sizes may vary, depending on the contractor selected and their specific configuration and selection of plant. Therefore this EIA has been undertaken using the Rochdale Envelope approach, whereby the worst case environmental effects of the range of options under consideration have been assessed in each chapter of the ES.

Figure NTS3: Parts of the Site



1.4 The EIA Regulations

1.4.1 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) came into force on 16 May 2017 (Ref NTS-1) and these Regulations are applied for this EIA.

1.4.2 The Proposed Development does not fall under Schedule 1 of the EIA Regulations, as the heat output is less than 300MW. However, Part 3(a) '*Industrial installations for the production of electricity, steam or hot water (unless included in Schedule 1)'* of Schedule 2 of the EIA Regulations identifies that industrial installation developments exceeding 0.5ha may require an EIA to be undertaken, depending on the scale and characteristics of the development and the sensitivity of the environment in which the development would take place. The Site exceeds the 0.5 hectares (ha) threshold set out in Schedule 2 of the EIA Regulations and has the potential to result in significant environmental effects if appropriate mitigation is not applied. Consequently the Applicant considered that an EIA of the Proposed Development should be undertaken and reported on through the ES.

1.5 Consultation

1.5.1 Consultation is integral to developing the proposals and informing stakeholders, regulators and the local community about the Proposed Development. It is used to identify any areas of potential concern that require further investigation, as well as to inform aspects of the design of the Proposed Development.

1.5.2 As part of the pre-application process, the Applicant consulted the relevant local planning authority (North Lincolnshire Council (NLC)), their consultees and various stakeholders and requested pre-application advice during the preparation of the EIA. This process included meetings at NLC's offices with planning and technical staff, to discuss the Proposed Development and scope of the environmental assessment.

1.5.3 The Applicant also agreed with NLC that, owing to the nature of the Site and the type of development proposed, community consultation would be limited to a presentation given to South Killingholme Parish Council.

1.5.4 The Applicant carried out the presentation at the Parish Council's monthly meeting in March 2018. The presentation was well received and contact details for the project team were provided. To date, the Applicant had received no subsequent questions/queries from councillors.

2. EIA Assessment Methodology

2.1 General Assessment Approach

2.1.1 This ES has been prepared to satisfy the requirements of the EIA Regulations.

2.1.2 In preparing this NTS (in line with the 2017 EIA Regulations as it forms part of the EIA process), reference has been made to the following guidance:

- The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations') (Ref NTS-1);
- The National Planning Policy Framework (NPPF) 2012 (Ref NTS-2);
- Planning Practice Guidance – Environmental Impact Assessment (Updated 2017) (Ref NTS-3);
- Department of Environment (DoE) 1995 – Preparation of Environmental Statements for Planning Projects that require Environmental Assessment - A Good Practice Guide (Ref NTS-4); and
- The Institute of Environmental Management and Assessment (IEMA) 2004 & 2006 Guidelines for Environmental Impact Assessment (Ref NTS-5).

2.1.3 Additional guidance on the assessment procedures is provided within best practice guidance relevant to each technical discipline. These documents are identified within the relevant technical chapters of this ES.

2.1.4 Reference has also been made to the Scoping Opinion received from NLC on 31 January 2018 (Appendix 1B (ES Volume 3)) and the advice contained within it regarding assessment methodology, topics and presentation of the ES, together with responses received through consultation.

2.1.5 In response to the Scoping Opinion, the EIA and this NTS include assessments of the following environmental topics:

- Air Quality;
- Noise and Vibration;
- Ecology and Nature Conservation;
- Landscape and Visual Amenity;

- Ground Conditions and Hydrogeology;
- Surface Water, Flood Risk and Drainage; and
- Cumulative and Combined Effects.

2.1.6 The EIA scoping process concluded that traffic and transport; waste management, socio economics, population and health, electronic interference; aviation; and accidental events/ health and safety could be scoped out of the EIA.

2.1.7 The assessment presented in the ES, where possible, uses standard methodologies based on legislation, definitive standards and accepted industry criteria. Methodologies differ between each technical topic, with the method adopted set out within each topic chapter of the ES (Volume 1).

2.1.8 The objective of the EIA process is to anticipate the changes (or 'impacts') that may occur to the environment as a result of the Proposed Development. The changes are compared to the environmental conditions that would have occurred without the Proposed Development (the baseline). The EIA process identifies potentially sensitive 'receptors' that may be affected by these changes (e.g. people living near the development, local flora and fauna) and defines the extent to which these receptors may be affected by the predicted changes (i.e. whether or not the receptors are likely to experience a 'significant effect').

2.1.9 The environmental impacts and effects of the Proposed Development are assessed at key stages in its construction and operation (including maintenance and use) and, where possible and relevant, its eventual decommissioning.

2.2 Development Design, Impact Avoidance and Mitigation

2.2.1 The design process for the Proposed Development has been influenced by the findings of early environmental appraisals and the EIA process. A number of measures have been incorporated into the concept design to avoid or minimise environmental impacts. These measures include those required for legal compliance and also include current industry best practice guidance which would be adopted during construction and operation of the Proposed Development.

2.2.2 Once the likely effects have been identified and quantified, consideration has been given to any further mitigation that may be required to mitigate any potentially significant adverse effects that have been identified. The residual effects (effects remaining after the implementation of mitigation) have then been assessed and presented in each chapter.

2.3 Impact Assessment Methodology and Significance Criteria

2.3.1 Impacts are changes arising from the Proposed Development, and consideration of the results of these impacts on the environment enables the identification of associated effects. The effects are then classified - major, moderate, minor and negligible, and adverse, neutral or beneficial. The classification of effects take into account aspects such as (but not limited to) extent, duration, and the number and sensitivity of receptors affected. Each effect has been classified both before and after mitigation measures have been applied.

2.3.2 In general, the classification of an effect is based on the magnitude of the impact and sensitivity or importance of the receptor, using the matrix shown in Table 2-1. Where there are deviations away from this matrix (due to the technical guidance for a specific assessment topic), this is highlighted within the relevant technical chapter within the ES (Volume I – Main Report) and the reason for the variation explained.

Table 2.1. Classification of effects

Magnitude of impact	Sensitivity/importance of receptor			
	High	Medium	Low	Very low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very low	Minor	Negligible	Negligible	Negligible

2.3.3 In the context of the Proposed Development, short-term effects are considered to be those associated with the construction and/or decommissioning phases, which cease when those works are completed. Long-term effects are those associated with the operational period. Effects may also be permanent (irreversible) or temporary (reversible) and direct or indirect.

3. Description of the Site and its Surroundings

3.1 Site Details

3.1.1 The Site is located immediately to the north of the existing VPI CHP power station and east of the Lindsey Oil Refinery (LOR) in North Killingholme, Lincolnshire DN40 3DZ. The Site boundary and areas within the Site can be found on Figure NTS 3.

3.1.2 Immingham Dock is located approximately 1.75km to the south east at its closest point. The Humber ports facility is located approximately 1.25km north at its closest point and the Humber Refinery is located approximately 550m to the south.

3.1.3 The nearest conurbation are the villages of North and South Killingholme located approximately 1.75km southeast of the Site and the nearest residential property is a single property on Marsh Lane located approximately 650m to the east of the Site. The Site lies entirely within the administrative area of North Lincolnshire unitary authority.

3.1.4 The Site occupies an area of approximately 3.2ha and consists of the following areas:

- The Power Plant Site, on which all components of the Proposed Development will be situated;
- Temporary Construction Laydown area for the receipt, storage and partial assembly of the project equipment and materials to be installed or constructed;
- Site access, both for temporary construction purposes and for operational access; and
- Gas and Electrical connection corridors to the existing CHP site to the south of the Site.

Power Plant Site

3.1.5 The Power Plant Site consists of an area of land of approximately 1.25ha in area located immediately to the south of the existing LOR canteen building. The Power Plant Site is a level area of land approximately 6m Above Ordnance Datum (AOD) and is currently undeveloped and consists of disturbed ground with limited vegetation.

3.1.6 The Power Plant Site is bounded as follows:

- North: Undeveloped land proposed as Construction Laydown area for the Proposed Development (see below), currently used for temporary vehicle parking;
- East: Undeveloped land with Rosper Road beyond;
- South: Pipework and services related to the operation of Humber oil refinery, LOR and other facilities, a vegetated drainage ditch and access trackway and the CHP plant operated by the Applicant; and
- West: Vegetated land, access trackways and ponds associated with the drainage system for LOR. Beyond is a private railway line and LOR itself. A single tower (pylon) associated with a high voltage transmission line is present approximately 20m from the Site boundary.

Gas and Electricity Connections

3.1.7 Gas and electricity connections would be supplied from tie-ins to existing services located on the existing adjacent CHP plant. These connections would largely be overground and will likely include a new above ground pipe bridge passing over existing third party pipelines, drainage ditch and access roadway.

Construction Laydown Areas

3.1.8 The Construction Laydown area consists of an area of land, approximately 0.8ha in area, located immediately to the north of the Power Plant Site and west of the existing LOR canteen building. The land is undeveloped and consists of bare compacted ground and is currently used for temporary vehicle parking.

4. The Proposed Development

4.1 Proposed Development

4.1.1 The Proposed Development comprises a gas-fired power station with a gross electrical output of up to 49.9 megawatts (MWe).

4.1.2 The Proposed Development is intended to supply electricity when required by the National Grid, typically to meet short term periods of high demand, to address shortfalls in supply from intermittent sources or to meet technical demands of the network. This is expected to be weighted towards the winter period, for a few hours at a time. However, as the operation of the plant is driven by the dynamics of the energy market, the plant could run for longer periods, at any time of day, up to the maximum allowed under its Environmental Permit.

4.1.3 In order to ensure a robust assessment of the likely significant environmental effects of the Proposed Development, this Environmental Impact Assessment (EIA) has been undertaken adopting the principles of the 'Rochdale Envelope'.

4.1.4 This involves assessing the maximum (and where relevant, minimum) parameters for the elements where flexibility needs to be retained. Where this approach is applied to the specific aspects of the EIA, notably in assessing air, noise and visual impacts, this has been confirmed within the relevant chapters of this Environmental Statement (ES) and the worst-case potential environmental effects are reported.

4.1.5 In accordance with this approach, two potential indicative layouts (termed Example Layout 'A' and Example Layout 'B') have been developed which illustrate the maximum extent of the Proposed Development in terms of its potential environmental impact. Layout A shows the

maximum extent of larger gas engines housed within an engine hall, while Layout B shows the maximum number of smaller containerised engines that would be located outside, without an engine hall. These are shown illustratively on Figures NTS 4 and NTS 5.

4.2 Components of the Proposed Development

4.2.1 The Proposed Development will include the following key elements:

- An engine hall up to 15m height housing up to 7 gas engines each associated with a stack of up to 35m in height external to the building and a bank of fin fan coolers up to 7m high (Indicative Layout 'A' only); or
- Up to 33 containerised gas engines, each associated with an stack of between 10m and 15m (Indicative Layout 'B' only).

4.2.2 In addition there are a number of ancillary elements that are common to both layouts and are not anticipated to vary as a result of the Rochdale Envelope, although their location within the Site boundary may alter depending on the layout adopted. These elements are:

- Gas pipeline to the adjacent VPI CHP site. This may include an section of above ground pipeline to pass over the existing services, drainage ditch and roadway bordering the Site;
- Gas receiving compound to monitor and regulate the flow of gas to the Site;
- Black start unit (skid mounted diesel fired generator);
- Raw/fire water tank and fire pump for fire control purposes;
- Treated water tank to facilitate cooling of the engines;
- Transformers to allow the export of electricity at the correct voltage;
- Gatehouse to control access to Site;
- Workshop and stores;
- Diesel tank for the storage of fuel for the black start unit;
- Lubrication oil tank, to facilitate the operation of the engines; and,
- Offices, workshops and a control module to facilitate the operation of the power station.

4.3 Design Parameters

4.3.1 The design of the Proposed Development is following an iterative process, based on preliminary environmental assessments and consultation with statutory and non-statutory consultees.

4.3.2 A number of the design aspects and features of the Proposed Development cannot be confirmed until the tendering process for the design and construction of the generating station has been completed. For example, the enclosure or building sizes may vary, depending on the contractor selected and their specific configuration and selection of plant.

4.4 Proposed Development Construction

4.4.1 The Applicant would appoint a contractor for the main works phase. That contractor is likely to appoint sub-contractors to undertake certain items of the construction, for example all of the associated civil works. The Applicant is committed to ensuring a safe working environment for all employees and contractors.

4.4.2 Construction of the Proposed Development is anticipated to start as early as 2019 and would be constructed over a period of up to 18 months. Table 4-1 gives an indication of the construction programme.

Table 4.1. Indicative construction programme

	2018				2019				2020				2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Main civil works																
Plant installation																
Gas and electrical connections																
Commissioning																

4.4.3 Construction working hours would generally be Monday to Friday 07:00 to 19:00 and Saturday 08:00 to 18:00. However, it is likely that some construction activities would be required 24-hours at certain times, because certain construction activities cannot be stopped or are better carried out over short periods (e.g. concrete slip forming and some elements of commissioning). Where on-site works would be conducted outside the core hours, they would comply with any restrictions agreed with the local planning authorities, in particular regarding control of noise and traffic.

4.5 Proposed Development Operation

4.5.1 The operation of the power station would be regulated by the Environment Agency through an Environmental Permit. This permit would be used to control normal emissions to the environment from the plant and would also consider potential abnormal operation scenarios and prevention or minimisation of accidents, through the use of management procedures and process monitoring.

4.6 Proposed Development Decommissioning

4.6.1 The proposed development is capable of a life expectancy of 20 years or more, depending on running hours. Eventually decommissioning would involve the removal of the plant. The gas and electricity connections would be disconnected and made safe. Decommissioning is not anticipated to present any significant environmental effects beyond those assessed for the construction period of the Proposed Development.

5. Planning Policy Framework

5.1.1 Chapter 5: Planning Policy Framework of this ES provides an overview of applicable planning policies Proposed Development, with topic specific policy detailed in the relevant topic chapters (Chapters 7-13 of this ES).

5.1.2 The following planning policy documents from the statutory development plan are considered most relevant to the Proposed Development:

- North Lincolnshire Core Strategy (Adopted June 2011);
- North Lincolnshire Local Plan (Adopted May 2003); and
- North Lincolnshire Housing and Employment Land Allocations Development Plan Document (Adopted March 2016).

5.1.3 The Industrial Development Supplementary Planning Guidance ('SPG') (2003), whilst not comprising part of the statutory development plan, is also a material consideration.

6. Design Evolution and Alternatives

6.1.1 The EIA Regulations state that the ES should include an outline of the main alternatives that have been studied and an indication of the main reasons for decisions made, taking into

account the environmental effects. Under the EIA Regulations there is currently no requirement to assess alternatives, only a requirement to provide information on those that have been considered. These alternatives are discussed further in the ES (Volume 1: Main Report), including consideration of alternative locations, alternative technologies and alternative design options and design evolution.

7. Results of the EIA

7.1 Air Quality

7.1.1 An assessment has been undertaken on air quality which considers:

- The present-day and future baseline conditions during construction and in the opening year of the Proposed Development;
- The effects of construction of the Proposed Development on air quality for human health and ecosystems, with respect to associated construction traffic, construction plant emissions and construction dust;
- The effects of operational process emissions associated with the Proposed Development on air quality for human health and ecosystems; and
- The cumulative effects of emissions associated with the Proposed Development and other committed developments in the vicinity.

7.1.2 The results of the assessment are reported in Chapter 7: Air Quality (ES Volume 1) supported by Figures 7.1 to 7.3 (ES Volume 2) and Appendices 7A and 7B (ES Volume 3).

Construction

7.1.3 No residential or transient human health receptors, nor any ecological receptors, have been identified within the screening distance and therefore the effects of construction dust soiling, have been scoped out from further assessment. In addition, the Local Wildlife Site ecological receptors located less than 50m from the Rosper Road construction traffic route, are more than 500m from the site exit and therefore are beyond the screening distance for trackout effects.

7.1.4 The effects of emissions to air on the identified receptors from the construction site activities associated with the Proposed Development are considered to be not significant, based on the distances to the identified sensitive receptors and the predicted volume of construction traffic accessing the Site. Nevertheless, construction air quality and dust impacts will be

controlled through the use of a Construction Environmental Management Plan (CEMP) prepared and implemented by the appointed construction contractor.

Operation

7.1.5 The operational point source emissions effects on identified receptors (both human and ecological) have been determined through detailed dispersion modelling, based on worst-case assumptions and considering the potential locations for stacks within a defined area of the Site, since the stack locations cannot yet be fixed. Based on emissions to air at regulatory emission limits (IED or MCPD pollutant emission levels (dependent on engine size)) and the stack heights previously outlined, the Proposed Development is predicted to have an imperceptible, minor or negligible adverse effect on air quality at sensitive receptors and therefore the air quality effects are considered to be not significant.

Rochdale Envelope Parameters

7.1.6 The alternative design schemes included within this assessment under the Rochdale Envelope approach have been modelled and the design scheme resulting in the worst-case predicted concentrations at receptors have been used in the assessment of effects significance; this means that the results presented in the this report are considered to be illustrative of several different design schemes and therefore the overall effect of the Proposed Development may be lower than that presented, as the preferred scheme to be taken forward may present lesser impacts on some receptors than presented in this assessment.

Decommissioning

7.1.7 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 based on the groundwork, traffic movements and level of site work required to decommission the Proposed Development being less than that required for its construction. Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a Demolition Environmental Management Plan (DEMP) prepared at that time; no additional mitigation for decommissioning of the Proposed Development beyond such best practice is foreseen to be required at this stage.

7.2 Noise and Vibration

7.2.1 This assessment addresses the potential effects of the Proposed Development on local noise sensitive receptors.

7.2.2 Impacts during the construction, operation and decommissioning phases of the Proposed Development are assessed. In particular, the chapter considers potential impacts on identified receptors in terms of:

- Noise and vibration during the site clearance and construction works associated with the Proposed Development;
- Changes in road traffic noise levels on the local road network during the construction phases; and
- Noise and vibration resulting from operation of the Proposed Development.

7.2.3 The results of the assessment are reported in Chapter 8: Noise and Vibration (ES Volume 1) supported by Figure 8.1 (ES Volume 2) and Appendices 8A and 8B (ES Volume 3).

Construction

7.2.4 It is expected that noise generating activities will occur during the following activities:

- On-site Construction;
- Site Clearance;
- Piling and Foundation Works;
- Building and General Site Activities;
- Fit Out; and
- Landscaping.

7.2.5 There is one identified residential Noise Sensitive Receptor (NSR) in the locality of the Site; this is some 650m from the Power Plant Site. This is a significant distance which will result in high levels of noise reduction between the Site and the NSR. Accordingly the daytime construction noise effects even without mitigation are considered to be negligible. Night time noise will be controlled through restrictions on noisy activities that will not be undertaken at night; only activities that will not give rise to off-site noise impacts would be undertaken. Construction noise will be controlled through the CEMP.

7.2.6 There are no residential receptors in close enough proximity to the Proposed Development to be significantly affected by construction vibration.

Operation

7.2.7 The assessments for both options predict very low impacts and negligible effects at the NSR. This assessment is based upon worst case night time background sound levels; the daytime background sound levels will be higher so the impacts and effects will be even lower. These predicted effects are below the threshold for significance and the local authority agreed criterion for minor adverse (not significant) effects (+5 dB above background levels at the identified NSR).

Decommissioning

7.2.8 The predicted noise effects of eventual decommissioning and demolition of the Proposed Development are considered to be comparable to – or less than – those assessed for construction activities. They would be managed through the use of a DEMP in a similar way to the use of a CEMP as proposed during construction.

Mitigation

7.2.9 The preferred approach for controlling construction noise and vibration is to reduce levels at source where possible and practical. Sometimes a greater noise or vibration level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.

7.2.10 Construction noise and vibration management measures will be managed through the CEMP as outlined above.

7.2.11 Assessment of the Proposed Development, in particular the options derived from the Example Layouts described as part of the Rochdale Envelope has resulted in negligible noise and vibration effects predicted. The necessary noise controls will be built in to the detailed design as described above. As such no additional mitigation is required.

Residual Effects and Conclusions

7.2.12 Residual effects in all phases of the Proposed Development for both day and night noise and vibration are considered to be negligible.

7.3 Landscape and Visual

7.3.1 This assessment addresses the potential effects of the Proposed Development on landscape character (as a resource in its own right) and visual amenity.

7.3.2 The results of the assessment are reported in Chapter 9: Landscape and Visual Amenity (ES Volume 1) supported by Figures 9.1 to 9.12 (ES Volume 2) and Appendix 9A (ES Volume 3).

Landscape

7.3.3 Construction activities undertaken as part of the Proposed Development would introduce mobile plant including piling rigs, heavy plant machinery and cranes. These construction activities would result in the loss of an area of grassland within the Site, alongside removal of vegetation present within. No other on-site or off-site landscape features would be impacted as a result of construction activities.

7.3.4 These construction activities are assessed as likely to result in a low or very low impact on landscape character. This effect is assessed to be minor or negligible adverse and not significant.

7.3.5 The Proposed Development is also assessed as likely to result in a low or very low impact on the wider landscape character, due to the introduction of additional built form which is smaller in form and scale to that within the adjacent refinery sites. This effect is assessed to be minor or negligible adverse and not significant.

7.3.6 Decommissioning activities are assessed as likely to result in a low or very low impact on landscape character. This effect is assessed to be minor or negligible adverse and not significant.

Visual Amenity

7.3.7 Changes in views may give rise to adverse or beneficial visual effects through obstruction in views, alteration of the components of the view and the opening up of new views by removal of screening. Potential visual effects arising from the construction activities may include:

- The introduction of stationary and moving pilling rigs, cranes and other high level construction machinery;
- The introduction of low level construction operations including heavy plant movements, welfare facilities, laydown and storage areas;
- Construction vehicles entering and leaving the Site; and
- The progressive construction of tall structures.

7.3.8 The potential visual effects due to the Proposed Development components were evaluated at 5 representative viewpoints located within the Zone of Theoretical Visibility (ZTV) (Figure NTS4) which take into account proposed future ground levels and the maximum development parameters considered under the Rochdale Envelope.

7.3.9 At this stage a worst-case scenario, including above ground cabling between the Proposed Development and the existing electrical infrastructure within the adjacent CHP power station and a maximum of seven stacks with a height of 35m AGL, have been considered in the assessment.

7.3.10 A series of photomontages and wireframes have been prepared which illustrate the likely visibility of the Proposed Development at three of the assessed viewpoints. These viewpoints were chosen as a range of representative views of the Proposed Development and illustrate the scenario of seven industrial gas engines with individual chimney stacks. The wireframes are illustrated on Figures NTS5, NTS6 and NTS7 below.

7.3.11 It has been assessed that the majority of visual receptors would experience a low or very low magnitude of impact during construction of the Proposed Development, resulting in a minor or negligible adverse effect that is not significant

Figure NTS4: Zone of theoretical visibility

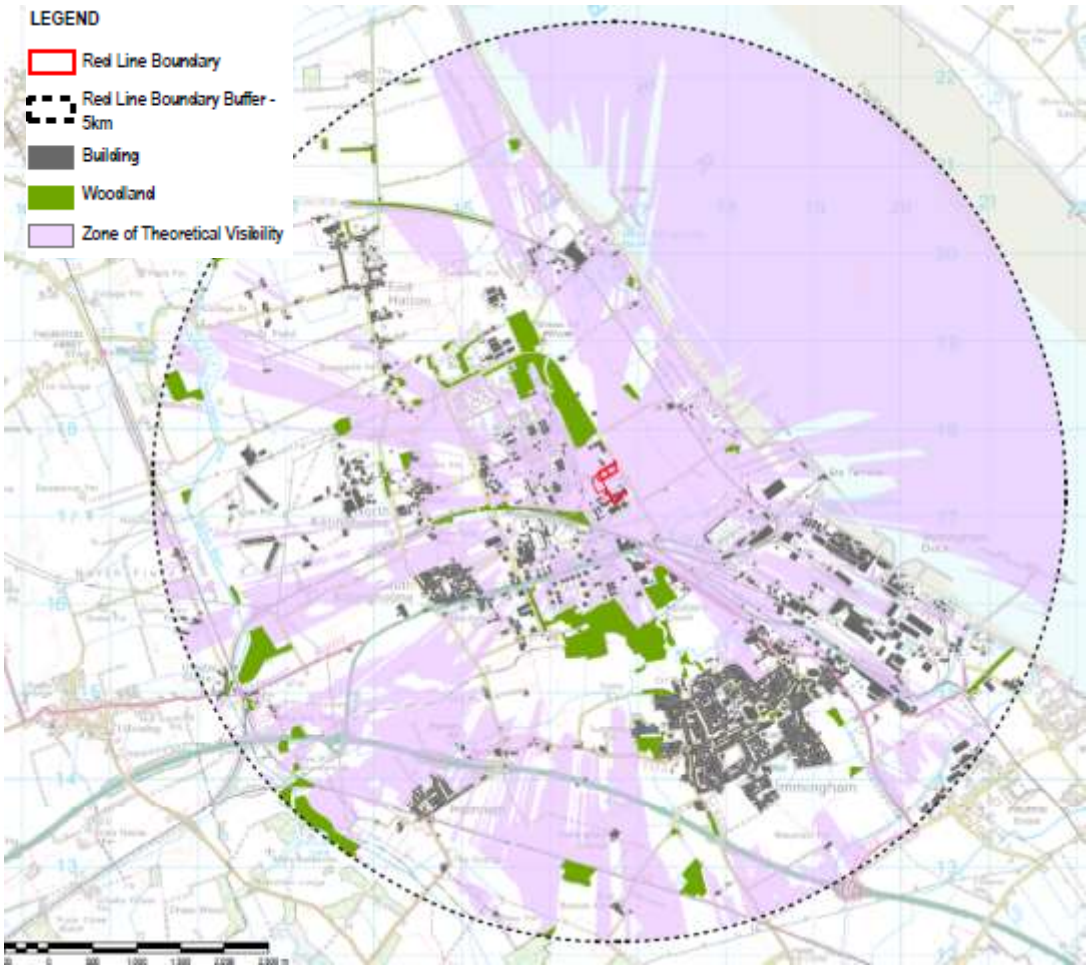


Figure NTS5: Viewpoint 1 Wireframe Example Layout A

Figure NTS6: Viewpoint 2 Wireframe Example Layout A

Figure NTS7: Viewpoint 3 Wireframe Example Layout A

7.4 Ecology

7.4.1 The ecological impact assessment has been conducted considering the following:

- The present-day and future baseline conditions during construction and at opening;
- The effects of construction of the Proposed Development on habitats and species, with respect to construction traffic, construction dust and the Proposed Development footprint; and
- The effects of the operation of the Proposed Development on habitats and species.

7.4.2 Due to the timing of this application, it was not possible to complete all the protected species ecological surveys in advance of submission and so the ecology chapter is based on the information available up to the end of April 2018. However, a preliminary ecological

appraisal has been carried out and seasonal surveys have been started and completed where possible.

7.4.3 Any evaluation of the importance of species or habitats is therefore provisional at present. The potential for impacts on ecological receptors has been identified, but the significance of effects cannot be fully assessed until the results of surveys are available. A revised version of the Ecology Chapter will be re-submitted to the local planning authority in due course with additional information regarding the baseline ecology, assessment of impacts and significance of effects, mitigation and residual effects following the completion of the full suite of ecology surveys in 2018.

7.4.4 The initial results of the assessment are reported in Chapter 10: Ecology (ES Volume 1) supported by Appendices 10A, 10B, 10C and 10D (ES Volume 3).

Construction

7.4.5 The following broad categories of impact and their potential effects on ecological features were used for the purposes of the screening exercise:

- Habitat loss - clearance or damage of habitat to facilitate construction, resulting in temporary or permanent reduction in habitat extent and potential direct and indirect effects on associated species; and
- Disturbance - increased levels of disturbance (noise, vibration, and lighting), potentially resulting in adverse effects on protected and notable species.

7.4.6 For internationally and nationally designated habitats above mean high water, or terrestrial habitats, given the distance between the Proposed Development and the Humber Estuary designated habitats, and taking into account the implementation of best practice during construction to minimise fugitive dust emissions, it is concluded that the Proposed Development would not impact upon them through this pathway. A separate Habitats Regulations Assessment (HRA) screening exercise has been completed and is reported in Chapter 10.

7.4.7 The nature and scale of the Proposed Development is similar to the surrounding industrial areas, which includes the operational Lindsey Oil Refinery and CHP plant. It is therefore reasonable to assume that any waterbirds roosting/ loafing/ foraging in fields on the east side of Rosper Road are habituated to the industrial nature of the surrounding area such that they would not be adversely affected, for example; construction work of a similar scale is currently ongoing at VPI Immingham's CHP plant, which lies immediately to the south of the Site.

7.4.8 Construction of the Proposed Development would result in the permanent and irreversible loss of approximately 1.4 ha of OMH.

7.4.9 A detailed evaluation of this habitat has not been undertaken to date because further botanical survey work is necessary to gather detailed baseline information for screening against the county LWS selection criteria for OMH (and thus to establish whether the habitat meets the criteria for being of Local, District or County nature conservation value).

7.4.10 In the event that populations of reptiles are identified within the Site boundary, it will be necessary to adopt appropriate mitigation to minimise the risk of killing/ injury of reptiles during site clearance works for legislative compliance.

7.4.11 In the absence of mitigation, there is a risk of killing/ injury of reptiles and loss of habitat potentially resulting in a local contraction in range and population size. This would be assessed to result in a minor adverse effect on reptiles, significant at the Site level only.

7.4.12 There is the potential for noise/ visual disturbance during the construction phase. However, given the industrial nature of the surrounding land use which includes the operational VPI CHP plant and the LOR, it is reasonable to assume that otters foraging on ditches in this area would be habituated to current operational activity. It is assessed that construction noise would give rise to neutral effects on foraging/ passage otter.

Operation

7.4.13 The nature and scale of the Proposed Development is similar to the surrounding industrial areas, which includes the operational Lindsey Oil Refinery and VPI CHP plant. It is therefore reasonable to assume that any SPA/ Ramsar waterbirds roosting/ loafing/ foraging in fields on the east side of Rosper Road are habituated to the industrial nature (and its associated noise and visual impact from chimney stacks, pipe racks, buildings etc.) of the surrounding area such that they would not be adversely affected.

7.4.14 The potential effects on habitats as a result of emissions to air are assessed as part of the air quality assessment and HRA screening exercise described above.

Decommissioning

7.4.15 Impacts associated with the decommissioning phase of the Proposed Development are likely to be of a similar nature to those associated with the construction phase and as a result the potential effects on ecological features are not anticipated to differ significantly from those predicted at construction. The extent of habitat loss that is likely to be required during decommissioning is likely to be much less than at construction, and the resulting effects on ecological features are therefore likely to be reduced. Appropriate pre-works surveys and mitigation or impact avoidance measures will be implemented for the decommissioning phase as necessary.

Mitigation and Enhancement Measures

7.4.16 Should species of reptiles be identified within the Site boundary, a minor adverse effect on reptile populations at the Site is predicted during the construction phase. If reptiles are identified on Site, a Precautionary Working Method Statement (PWMS) would be prepared for the construction phase to avoid the killing/ injury of reptiles during initial site clearance works. This will involve a fenced capture and translocation of reptiles away from the working area (including permanent and temporary works).

7.4.17 Mitigation for the loss of OMH habitat on the Site will be delivered through the creation and management of pockets of this habitat type in undeveloped areas of the Site. The management of these areas will maintain the brownfield habitat type, and will prevent the natural succession of the habitat to grassland as would otherwise occur on the OMH habitat currently present on Site. The remainder of the OMH habitat to the west of the Site will be retained.

7.4.18 In addition, the following habitat enhancements are proposed to meet the requirements of no net loss of biodiversity in the NPPF:

- Creation of log pile refuges in undeveloped parts of the Site (in the southern parts of the Site close to the ditch corridor) to create ecological niches for reptiles, amphibians and terrestrial invertebrates;
- Installation of bird nest boxes on buildings;
- Planting of native species of trees and berry-bearing shrubs to provide nesting opportunities for breeding birds, and sources of food for overwintering and passage birds; and
- Creation of species-rich wildflower grassland on undeveloped areas of the Site.

Residual Effects and Conclusions

7.4.19 If reptiles are present, the implementation of appropriate mitigation through PWMS will ensure that there are no significant residual effects on this species.

7.4.20 No significant effects on other ecology features have been identified.

7.5 Cultural Heritage

7.5.1 An assessment of the potential effects of the construction and operation of the proposed VPI-Immingham Energy Park 'A' (the Proposed Development) on cultural heritage has been conducted.

7.5.2 The results of the assessment are reported in Chapter 11: Cultural Heritage (ES Volume 1) supported by Figures 11.1 and 11.2 (ES Volume 2) and Appendices 11A and 11B (ES Volume 3).

Construction

7.5.3 Construction impacts include those impacts associated with construction activities, such as ground breaking, moving machinery, noise and construction traffic. Construction works at the site could also result in impacts on the settings of heritage assets including scheduled monuments and listed buildings.

7.5.4 There are three previously recorded assets which could be impacted by the Proposed Development.

Ditch (A19)

7.5.5 Ditch (A19) is thought to be medieval in date due to a sherd of 13th – 15th Toynton ware pottery recovered from it. The ditch is of very limited archaeological and historic significance for the information it contains regarding the land management of the area in the medieval period. The significance (heritage value) ascribed to this asset is low. It will be destroyed by the development, resulting in a magnitude of impact of high. This results in a significance of effect of moderate adverse prior to mitigation.

Hedgerows (A21)

7.5.6 The second asset within the Proposed Development boundary is the line of historically important hedgerows (A21). There are no hedgerows surviving within the Proposed Development here, and as this part of the Proposed Development is only required for site access, no further below ground impact will be required. The area in the vicinity of this asset will be used only for site access and no further effects are anticipated.

Circular and Linear Cropmark Features (A15)

7.5.7 The circular and linear cropmark features (A15) are no longer extant, and any remains will have been removed during the construction of the extant car park area, and no further below ground impact will be required. The area in the vicinity of this asset will be used only for site access and no further effects are anticipated.

Unrecorded Remains

7.5.8 There is potential for previously unrecorded remains to be located within the Proposed Development. Any such remains are most likely to be of Iron Age or Roman date, and would most likely represent agricultural activity on the peripheral of the settlement activity which surrounds the site. If any such remains are located, they would likely be of no more than low significance (heritage value) and contain limited archaeological significance. The

development will have significant physical effect on any unrecorded buried remains, resulting in a high magnitude of impact, resulting in a moderate adverse significance of effect before mitigation.

Designated Assets

7.5.9 There will be no physical impact upon any designated heritage assets during construction.

Operation

7.5.10 It is not anticipated that the operation and maintenance of the development will result in any operational impacts on the heritage resource described above beyond those already experienced as part of the working oil refinery.

Mitigation

7.5.11 It is considered that the likely adverse effects arising from the construction of the Proposed Development can be mitigated by a programme of archaeological work, consisting of a strip, map and record within the areas of ground disturbance within the Proposed Development boundary.

Residual Effects and Conclusions

7.5.12 The archaeological strip, map and record of any previously unrecorded remains will allow the archaeological deposits to be preserved by record. This would reduce the magnitude of impact on asset A19, as well as any previously unrecorded remains, to be reduced from high to medium. This will result in an effect of minor adverse significance.

7.5.13 There is the potential for physical effects on the site of the medieval ditch. This will result in a minor adverse significance of effect with mitigation in place. There will also be a minor adverse effect on the listed lighthouses.

7.5.14 It is proposed that archaeological strip, map and record is carried out during intrusive ground works within the Proposed Development boundary.

7.6 Ground Conditions and Hydrogeology

7.6.1 An assessment has been undertaken of the potential impacts to the existing geological and hydrogeological conditions from the Proposed Development.

7.6.2 The results of the assessment are reported in Chapter 12: Ground Conditions (ES Volume 1) supported by Figure 12.1 (ES Volume 2) and Appendices 12A and 12B (ES Volume 3).

Construction

7.6.3 Potential impacts during the construction phase are anticipated to include the following:

- The discovery of soils exhibiting visual and olfactory evidence of contamination during groundworks and the potential disturbance of residual soil contamination through construction activities such as the removal of existing Site drainage;
- The discovery of impacted groundwater/surface water recovered during dewatering which may not be suitable for discharge to ground without treatment;
- Foundation methods and construction activities that may open and/or modify potential pollutant linkages;
- Re-profiling of the Site including the possible introduction of new fill materials and the removal of unsuitable or excessive materials;
- Runoff from contaminated material exposed and/or stockpiled during Site construction works;
- Contamination arising from spillages associated with vehicles and construction materials;
- Airborne contamination arising from potentially contaminated dust;
- Removal of any waste materials and/or contaminated soil; and
- Introduction of contaminated materials during infilling activities.

Operation

7.6.4 Potential impacts during the operational phase are anticipated to include the following:

- Leaks, spills and contamination from storage of chemicals, fuels and wastes on site affecting site users and groundwater; and
- Presence of gases, vapours and groundwater in the ground affecting site users and buildings.

Decommissioning

7.6.5 Potential impacts during the decommissioning phase are anticipated to include the following:

- Generation and removal of wastes during decommissioning ;
- The discovery of soils exhibiting visual and olfactory evidence of contamination during demolition and the potential disturbance of residual soil contamination through demolition activities such as the removal of existing Site drainage;
- Demolition activities that may open and/or modify potential pollutant linkages, including the disturbance of sediments;

- Re-profiling of the Site including the removal of unsuitable materials;
- Runoff from contaminated material exposed and/ or stockpiled during site demolition works;
- Contamination arising from spillages associated with vehicles and demolition materials;
- Airborne contamination arising from potentially contaminated dust; and
- Introduction of contaminated materials during infilling activities.

Potential Effects and their Mitigation

7.6.6 Construction effects will be controlled through the use of a CEMP to be prepared by the appointed contractor. This will include measures to prevent contamination of watercourses or groundwater during construction through controls, siting of storage areas and preventative maintenance of equipment and plant.

7.6.7 Operational effects would be controlled through the Environmental Permit required for the operation of the plant. This will include preventative measures such as the use of impermeable surfacing and bunding of storage areas..

7.6.8 It is concluded that, with the implementation of the impact avoidance measures and best practice guidance, potential effects upon identified sensitive receptors as a result of the impacts identified would be minor adverse or negligible (not significant).

7.7 Surface Water, Flood Risk and Drainage

7.7.1 An assessment has been undertaken which considers the potential effects of the Proposed Development on water resources, flood risk and drainage.

7.7.2 The results of this assessment are presented in Chapter 13: Surface Water, Flood Risk and Drainage (ES Volume 1) and supported by Figure 13.1 (ES Volume 2) and Appendix 13A: Flood Risk Assessment (FRA, ES Volume 3).

7.7.3 The main watercourses with the potential to be in hydraulic conductivity in the vicinity of the Site are: local land drains (located within and directly adjacent to the Site boundary), wider North East Lincolnshire Internal Drainage Board (NELIDB) watercourses (Watercourse 9 and 9A), the wider land drainage network and the Humber Estuary. The assessment considers watercourses within an area spanning from immediately upstream of the Site, to as far downstream as a potential impact may influence the quality or quantity of the watercourse.

7.7.4 The Proposed Development has the potential to impact on the surface waterbodies in the vicinity of the Site through both quality and quantity changes (though quantitative changes

are only considered here in relation to the any general changes to the quantity of a waterbody as a resource).

Construction

7.7.5 During construction, there is an elevated risk of leakage or accidental spillage of construction materials and potential pollutants used on Site, migrating to nearby surface watercourses. Washout facilities (washing of tools, plant and equipment), storage and use of various liquids and soluble solids, unstable exposed soils, excavated materials, stored aggregates, contaminated road surfaces, and fuel storage and handling all have the potential to result in pollution of water resources. Inappropriate disposal of waste materials associated with the construction phase also has the potential to enter surface water.

7.7.6 However, the effect of this on nearby surface water receptors (assuming implementation of standard good practice) is considered to be of minor adverse or negligible effect and therefore not significant.

Operation

7.7.7 The Proposed Development would utilise the land drainage ditch immediately adjacent to the southern Site boundary in terms of surface water drainage, via a new drainage connection, subject to agreement from NELIDB.

7.7.8 The operational phase of the Proposed Development would require storage, transport, handling and use of minor volumes of potentially polluting substances (e.g. diesel). Throughout its lifetime, the facility would be regulated by the EA through an Environmental Permit, which would include conditions relating to handling, storage and use of diesel and other chemicals, including emergency procedures in line with the use of Best Available Techniques (BAT). These measures would be in place to prevent pollution during plant operation in accordance with the permit.

7.7.9 There is minimal contaminated wastewater generated from the Proposed Development during operation. Any uncontaminated surface water would be discharged directly to the land drainage ditch immediately adjacent to the southern Site boundary via attenuation storage. The effect of this on nearby surface water receptors (assuming implementation of standard good practice) is considered to be of minor adverse or negligible effect and therefore not significant.

Flood Risk

7.7.10 The FRA for the Proposed Development, included within Appendix 13A (ES Volume 3), concludes that development of the Site would not increase the risk of flooding from fluvial, tidal, groundwater or overland flow sources.

7.7.11 As a precaution, flood resilience measures would be incorporated into the Proposed Development design to minimise the amount of damage and reduce the recovery time in the unlikely case of the Site becoming inundated. During construction the opportunity would be taken to adopt flood resilient design techniques for the Proposed Development.

7.7.12 If technically feasible, critical equipment will be raised above the expected 0.5% climate change scenario flood depth of 5.93 mAOD (for the year 2083); and flood sensitive equipment will be raised a minimum of 600 mm above ground/ floor level;

Decommissioning

7.7.13 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 would be prepared to identify required measures to prevent pollution during this phase of the Proposed Development, based on the detailed decommissioning plan.

7.8 Cumulative and Combined Effects

7.8.1 As required by the 2017 EIA Regulations, when considering the potential environmental effects of the Proposed Development, there is a need to consider the potential for cumulative and combined effects defined as follows:

- Cumulative effects may arise where the impacts associated with the Proposed Development have the potential to interact with those associated with one or more other developments located in proximity to the Proposed Development (e.g. air quality); and
- Combined effects may arise when several different impacts resulting from the Proposed Development (e.g. decrease in air quality, increase in noise disturbance) have the potential to affect a single receptor.

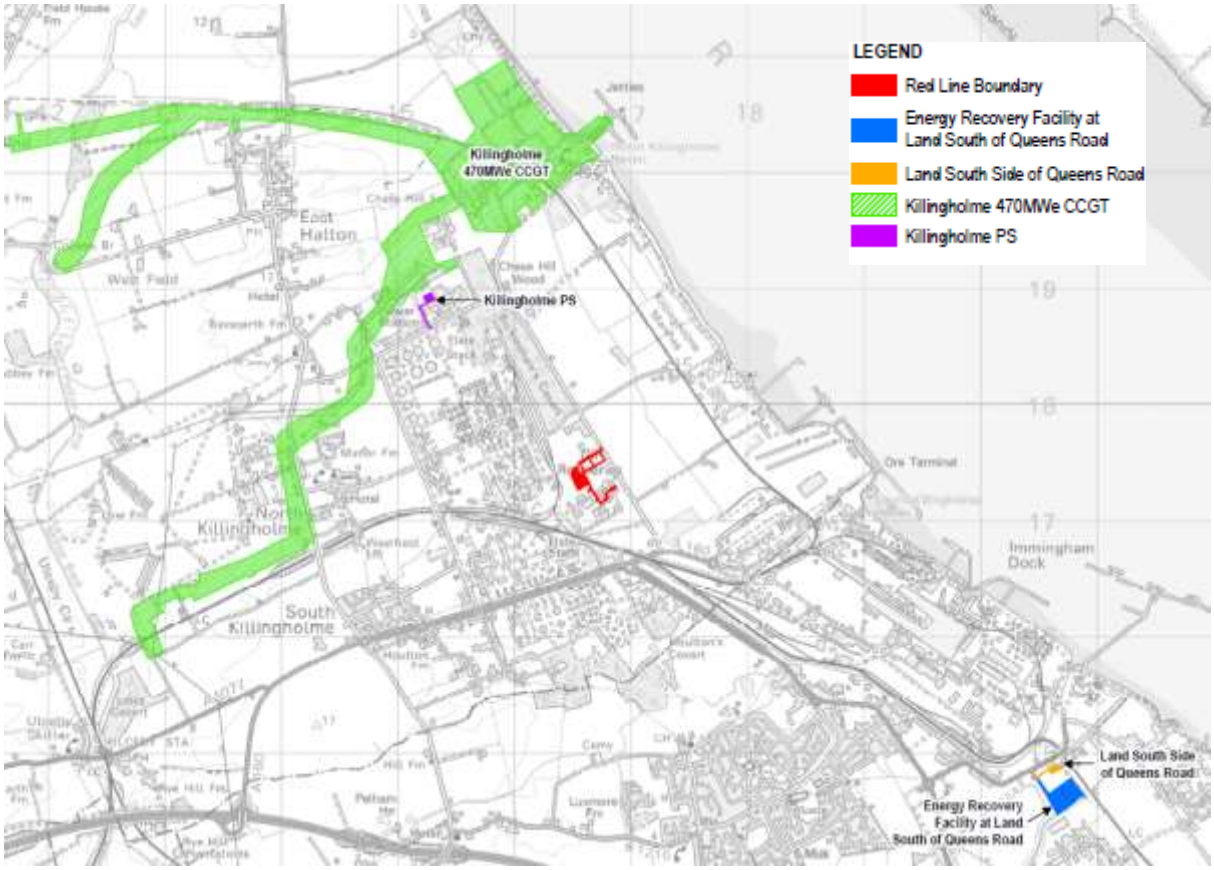
7.8.2 Chapter 14: Cumulative and Combined Effects (ES Volume 1) provides details of other identified proposed schemes in the vicinity of the Proposed Development which were initially considered. Of the developments identified, only those illustrated on Figure NTS8 were considered to have the potential to generate potential cumulative effects and thus scoped into the assessment.

- The consented Killingholme Power Station development for a 14 gas reciprocating engine generators with electrical output of 23MWe (PA/2016/1240);
- The consented North Killingholme Power Project development of a 470MWe CCGT;

- Pending planning decision for the construction of a standing reserve power plant at Land South Side of Queens Road, Immingham comprising 12 gas reciprocating engine generators (DM/0100/18/FUL); and

- Pending planning decision for an Energy Recovery Facility at Land South of Queens Road, Immingham (Ref: DM/0026/18/FUL).

Figure NTS8: Cumulative Schemes



7.8.3 Due to the distances between the Proposed Development and the identified other developments, the only potential cumulative effect identified relates to operational air quality impacts from the developments; all other effects would not have the potential to coincide.

7.8.4 The Killingholme Power Station gas engines are located approximately 1.5km to the North of the Site, and comprise a similar development to that of the Proposed Development. The Killingholme Power Station gas engines are anticipated to run for a maximum of 1,500 hours per year

7.8.5 Due to the prevailing wind coming from a south-westerly direction, and the location of the two sites, the area of peak impact from both developments will not occur at the same location.

7.8.6 In terms of the Human Health impacts the Old Vicarage Receptor was also included in the Killingholme Power Station gas engines Air Quality Assessment as well as in this assessment. The cumulative nitrogen dioxide concentration would be 0.11 microgrammes per cubic metre, which represents 0.3% of the relevant Air Quality Standard, and therefore would be considered to be imperceptible.

7.8.7 In terms of the Ecological impacts, the impacts from the Killingholme Power Station gas engines were predicted to be insignificant at all designated ecological receptors, therefore it is considered that the cumulative impacts with the Proposed Development would not be significant. However, this has been considered further in the HRA screening exercise.

7.8.8 The consented North Killingholme Power Project is located approximately 2km north of the Proposed Development Site and comprises a 470MWe CCGT. Again due to the location of this plant, the prevailing wind direction and the much higher stack, it is considered that cumulative impacts with the Proposed Development would be minimal.

7.8.9 The two developments off Queens Road (Energy Recovery Centre and the 12 reciprocating engines), Immingham are approximately 5km from the Proposed Development site, and therefore it is considered that the cumulative impacts would be minimal.

7.8.10 It should be noted that the Applicant's parent company (Vitol), is investigating the opportunity to develop a further power project on a site adjacent to the existing CHP plant. This is at an early stage of evaluation but it is likely to require an application for a Development Consent Order (DCO) under the Planning Act 2008. As there are no details yet available regarding the potential environmental effects associated with the scheme, it is not yet possible to evaluate potential cumulative effects of the Proposed Development with this scheme. Cumulative effects of the two schemes would therefore be assessed in any future DCO application.

7.9 References

Ref NTS-1 Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended)

Ref NTS-2 The National Planning Policy Framework (NPPF) 2012

Ref NTS-3 Planning Practice Guidance – Environmental Impact Assessment (Updated 2017)

Ref NTS-4 Department of Environment (DoE) 1995 – Preparation of Environmental Statements for Planning Projects that require Environmental Assessment - A Good Practice Guide

Ref NTS-5 The Institute of Environmental Management and Assessment (IEMA) 2004 & 2006 Guidelines for Environmental Impact Assessment

Appendix 1A – Scoping Report

VPI-Immingham Energy Park 'A"

Proposed 49MW Gas-fired Power Station
Environmental Impact Assessment EIA Scoping Report

VPI Immingham LLP

Project Number: 60547702

20th December 2017

Quality information

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1. Introduction

1.1 Background

1.1.1. AECOM Infrastructure and Environment Ltd (AECOM) has been commissioned by VPI Immingham LLP ('the Applicant' or 'VPI' as appropriate) to prepare this Environmental Impact Assessment (EIA) Scoping Report to accompany a request for a Scoping Opinion under Regulation 15 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') for a proposed gas-fired power station on land adjacent to the existing Combined Heat and Power (CHP) Plant at South Killingholme Immingham ('the Site', see Figure 1 and Figure 2)

1.1.2. The proposed power station, currently referred to as VPI-Immingham Energy Park 'A' (the 'Proposed Development') would be gas fired and have a gross electrical output of up to 49.9MW and would export electricity onto the UK National Electricity transmission system (the 'National Grid') through existing substation infrastructure. The power station would be intended to supply electricity when required by the National Grid, typically to meet short term periods of high demand, to address shortfalls in supply from intermittent renewables sources or to meet technical demands of the network.

1.1.3. The Applicant intends to apply for Planning Permission under the Town and Country Planning Act 1990 (as amended) (the TCPA) for the Proposed Development and considers that it constitutes an 'EIA Development' within the terms of the EIA Regulations. As such the Applicant intends to prepare an Environmental Statement (ES) to accompany the Planning Application and is seeking advice from North Lincolnshire Council (NLC) as the Local Planning Authority (LPA) as to the scope and content of the ES.

1.1.4. This Scoping Report considers the environmental context of the Site and the potential environmental impacts of the Proposed Development. Where impacts are considered to have the potential to cause significant environmental effects, these are identified and the proposed approach to be used to characterise the impacts and understand the significance of their effects is outlined. This Scoping Report also outlines issues perceived to be not significant and therefore are not proposed to be subject to formal assessment as part of the EIA.

1.2 Consenting & Regulatory Regime

1.2.1. As the Proposed Development will have an electrical output of less that 50MW it does not represent a Nationally Significant Infrastructure Project requiring development consent from the Secretary of State under the Planning Act 2008. Instead, it will require planning permission under the TCPA, with the required planning application being determined by NLC.

1.2.2. European Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment (the' EIA Directive') established the current legislative framework for EIA. The EIA Directive has a number of aims focussed on reducing the environmental impacts of projects and ensuring informed decision making.

1.2.3. In the UK, the EIA Directive is transposed into English law by way of the EIA Regulations for projects subject to the provisions of the TCPA (i.e. requiring planning permission). The Proposed Development falls under Schedule 2 of the EIA Regulations, specifically, Part 3(a), "*Industrial installations for the production of electricity, steam or hot water (unless included in Schedule 1)"*.

1.2.4. Schedule 2 of the EIA Regulations identifies that industrial developments occupying in excess of 0.5ha area may require an EIA depending on the scale and characteristics of the development and the sensitivity of the surrounding environment. As the Site development area does exceed 0.5ha and the Proposed Development has the potential to give rise to potentially significant environmental effects, the Applicant considers that an EIA should be undertaken.

1.3 Objectives of Scoping

1.3.1. The objectives of this EIA scoping process are to:

- Identify the nature of the Proposed Development including its purpose, physical characteristics, land use requirements and any alternatives that have been considered;

- Identify and describe the key environmental topics for consideration as part of the EIA;
- Identify any environmental topics that are not considered relevant for inclusion in the EIA;
- Define the extent to which the key environmental topics need to be investigated and the methodology for assessment; and
- Enable and initiate preliminary consultation with stakeholders.

1.3.2. In addition, this Scoping Report is intended to meet the information requirements of Regulation 15(2)(a) of the EIA Regulations. The requirements of this Regulation are shown in table 1 below together with the location in this report where the information meeting those requirements can be found.

Table 1: Information provided in the Scoping Report (Regulation 15(2) EIA Regulations

Regulation 15(2) requirements		Location in this report
(i)	*a plan sufficient to identify the land*	Figures 1 & 2
(ii)	*a brief description of the nature and purpose of the development, including its location and technical capacity;*	Section 3: Project Description
(iii)	*an explanation of the likely significant effects of the development on the environment; and*	Section 2: Description of the existing environment & Section 5: Potentially significant environmental issues
(iv)	*such other information or representations as the person making the request may wish to provide or make"*	Section 4: Planning policy and need; Section 6: Non-Significant EIA issues & Section 7: Environmental Impact Assessment Scope and Process

2. Description of the Existing Environment

2.1 The Proposed Development Site

2.1.1. The Proposed Development Site (termed the 'Site') is located immediately to the north of the existing VPI CHP power station and east of the Lindsey Oil Refinery in North Killingholme, Lincolnshire. Immingham Dock is located approximately 1.5km to the south east at its closest point. The Humber ports facility is located approximately 500m north at its closest point and the Humber Refinery is located approximately 500m to the south. The nearest conurbation is the town of Immingham is located approximately 2.5km southeast of the Site and the nearest residential property is a single property on Marsh Lane located approximately 500m to the east of the Site. The Site location is shown on Figure 1.

2.1.2. The Site is located entirely within the boundary of the administrative area of North Lincolnshire Council, which is a unitary authority, and close to the administrative boundary with Lincolnshire County Council and North East Lincolnshire District Council.

2.1.3. The Site comprises an undeveloped parcel of land approximately 4.9 ha lying between the existing VPI CHP plant to the south, Lindsey Oil Refinery to the west and Rosper Road to the east. Immediately to the north of the Site are a car park and a number of single storey structures associated with access to the Lindsey Oil Refinery. This is owned and operated by Total, as is the Oil Refinery.

2.1.4. Natural gas (for fuelling the power station) and electrical connections (to facilitate export of generated electricity) would make use of the connections on the existing VPI CHP plant site. Vehicular access for construction and operation would make use of a new access to be formed onto Rosper Road.

2.2 The Surrounding Area

2.2.1. The Site is located in an area comprising a mix of industrial and agricultural activities. In addition to the activities identified above, the land to the east of the Site on the other site of Rosper Road comprises agricultural fields extending approximately 1km toward the Humber Estuary before industrial activities associated with the storage and export of gas and oil and other port activities commence along the banks of the Estuary itself, approximately 1.4km from the Site at is closest point.

2.2.2. A railway spur runs north-south to the immediate west of the Site. This spur services the Lindsey Oil Refinery and joins the main line approximately 400m south west of the Site. This line is the principal railway line in north east Lincolnshire running between Cleethorpes and Barton on Humber.

2.2.3. A number of environmental receptors have been identified in the vicinity of the Site. Each of these is detailed below under their corresponding environmental discipline. It should be recognised that the list of receptors may not exhaustive at this stage, and additional receptors may be identified through the EIA process. Distances should be considered approximate and are given as the distance between the receptor and the closest point on the Site boundary.

2.3 Ecology and Nature Conservation

Preliminary Ecological Appraisal

2.3.1. A Preliminary Ecological Appraisal (PEA) was undertaken by AECOM in September 2017 with the aim of identifying whether there are known or potential ecological features (statutory and non-statutory nature conservation designations, and protected and notable habitats and species) that may constrain or influence the design and implementation of the Proposed Development (refer to Appendix A – Immingham VPI: Preliminary Ecological Appraisal Report). The PEA included a walkover of the site and its surrounding habitats (where accessible) and a desk study, which collected information from the following sources:

- Multi-Agency Geographic Information for the Countryside (MAGIC) website – international statutory nature conservation designations within 5 km, other statutory nature conservation designations within 2 km, ancient woodlands and notable habitats within 1 km and Higher Level Stewardship (HLS) agreements associated with habitats within the Site boundary;
- Greater Lincolnshire Nature Partnership – non-statutory nature conservation designations within 1 km and protected and notable species records within 1 km (records from the last 10 years only);
- Ordnance Survey 1:2500 Pathfinder maps and aerial photography – information on habitats and habitat connections (based on aerial photography) relevant to interpretation of planning policy and assessment of potential protected and notable species constraints;
- Lincolnshire BAP (LBAP) (Lincolnshire Biodiversity Partnership, 2011) - general information on Local Biodiversity Action Plan Priority Habitats and Species potentially relevant to the Site; and
- North Lincolnshire Local Plan Proposals Map - non-statutory nature conservation designations within 1 km and designated green corridors, wildlife networks etc.

2.3.2. In addition, existing information regarding the habitats on site was obtained from a preliminary site walkover undertaken on behalf of VPI Immingham in January 2017 (SLR, 2017) and a wintering bird survey of the site undertaken in the period January to March 2017 (Catley, 2017).

2.3.3. The findings of the PEA are summarised below, and have informed the scope of further ecological surveys to be undertaken at the appropriate times of year in the 2018 survey season.

Baseline Conditions

Nature Conservation Designations

2.3.4. The Site itself does not carry any designations for ecology or nature conservation purposes. There are no ancient woodlands in the vicinity of the Site, and there are no Higher Level Countryside Stewardship agreements applied to the Site. A summary of the statutory and non-statutory designated sites within the defined study area is provided in Table 2.

2.3.5. The Humber Estuary is located approximately 1.4 km north east of the site and is a nature conservation asset of international importance, which is reflected in its designations as a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar and Site of Special Scientific Interest (SSSI). There are no other SPAs, SACs and Ramsar sites within 10km of the site and no other SSSIs within 2km of the site. These areas are defined as the 'study area' for the purposes of this report.

2.3.6. Four non-statutory Local Wildlife Sites (LWS) were also identified in the study area.

Table 2: Designated Nature Conservation Sites within the study area

Designation	Reason(s) for Designation	Relationship to the Site
Statutory Nature Conservation Sites		
Humber Estuary SAC	Internationally important for its estuary and inter-tidal mudflat and sandflat habitats. Other qualifying features encompass: <u>Habitats</u> • Sandbanks which are slightly covered by sea water all the time • Coastal lagoons • Salicornia and other annuals colonizing mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Embryonic shifting dunes • Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") • Fixed coastal dunes with herbaceous vegetation ("grey dunes") • Dunes with *Hippophae rhamnoides* <u>Species</u> • Sea lamprey (*Petromyzon marinus*) • River lamprey (*Lampetra fluviatilis*) • Grey seal (*Halichoerus grypus*)	1.4 km to the north-east
Humber Estuary SPA	The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. In summer, it supports important breeding populations of bittern (*Botaurus stellaris*), marsh harrier (*Circus aeruginosus*), avocet (*Recurvirostra avosetta*) and little tern (*Sterna albifrons*).	1.4 km to the north-east
Humber Estuary Ramsar	Internationally important as a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons. Internationally important for its breeding colony of grey seal, and its assemblage of non-breeding and wintering waterfowl and the component populations of individual bird species.	1.4 km to the north-east
Humber Estuary SSSI	Supports a series of nationally important habitats. These are the estuary itself (with its component habitats of intertidal mudflats and sandflats and coastal saltmarsh) and the associated saline lagoons, sand dunes and standing waters. The site is also of national importance for the geological interest at South Ferriby Cliff (Late Pleistocene sediments) and for the coastal geomorphology of Spurn. The estuary supports nationally important numbers of 22 wintering waterfowl and nine passage waders, and a nationally important assemblage of breeding birds of lowland open waters and their margins. It is also nationally important for a breeding colony of grey seal, river lamprey and sea lamprey, a vascular plant assemblage and an invertebrate assemblage.	1.4 km to the north-east
Non-statutory Nature Conservation Sites		
Eastfield Road Railway Embankment LWS	Strip of sheltered, botanically-rich woodland glades containing a variety of grassland species with a calcareous influence and some scrub.	>1km
Burkinshaw's Covert LWS	Woodland dating from 1800's with scattered scrub and seasonally wet areas which support rapidly changing flora such as St John's-wort, meadow vetchling, hairy buttercup and glaucous sedge.	0.4km north
Station Road Field LWS	Predominantly grassland site with decent floristic diversity and small area of wetland which supports good range of common farmland bird and butterfly species (including yellowhammer, meadow brown and ringlet). Pond adjacent to site boundary held breeding great crested newts in 2006.	0.4km north
Rosper Road Pools LWS	Artificial Flood Relief Reservoir with occasionally species-rich grassy sward. Site supports many breeding, wintering and migrant birds, associated with both wetland and scrubby habitat. Water vole was recorded in 2002, and the	0.6km south

Designation	Reason(s) for Designation	Relationship to the Site
	fauna as a whole is likely to be rich.	

Habitats

2.3.7. A Phase 1 Habitat survey was undertaken by an AECOM ecologist on 7th September 2017 and all habitats mapped in accordance with the standard survey method (Joint Nature Conservation Committee, 2010).

2.3.8. The Site is set in a landscape dominated by the industrial areas of Lindsey Oil Refinery and VPI CHP plant, which are located to the west and south of the Site respectively. Arable and improved grassland areas are present to the east of Rosper Road, between the road and the Humber Estuary. North of the Site is car parking and buildings associated with the adjacent oil refinery, beyond which lies the wooded strip of Burkinshaw's Covert LWS. The semi-natural habitat surrounding the Power Plant Area is dissected by a series of man-made drains.

2.3.9. The habitat assemblage within the Site boundary represents an example of the Open Mosaic Habitats on Previously Developed Land (OMH) habitat type which has developed through natural colonisation of a previously disturbed area and includes the following habitat types: ephemeral/ short perennial, neutral grassland, temporary standing water, scattered scrub, tall herbs and localised swamp vegetation. This habitat is considered, based on available data, to be of moderate-high biodiversity value, however further survey is required to fully assess this habitat under Local Wildlife Sites Guidelines for Lincolnshire[1] (refer to Appendix A – Preliminary Ecological Appraisal (Table 5.2).

Protected Species

2.3.10. The presence of protected species on the Site cannot be ruled out. Accordingly, the Applicant is proposing to undertake additional survey effort. This is detailed in Section 5.2 below.

2.4 Cultural Heritage

2.4.1. There are no World Heritage Sites or Registered Battlefields within 5km of the Site. There is one Registered Garden (Brocklesby Park) located approximately 5km south west of the Site.

2.4.2. There are six Scheduled Ancient Monuments (SAMs) within 5km of the Site. These are:

- Manor Farm moated site, located approximately 2km west of the Site;
- North Garth moated site and associated enclosures, located approximately 2.4km northwest of the Site;
- Moated site and associated earthworks at Baysgarth Farm, located approximately 2.6km northwest of the Site;
- Manor Farm moated site, East Halton, located approximately 3.5km north of the Site; and
- Thornton Abbey Augustinian monastery, including gatehouse, precinct, medieval road and bridge, moat, fishponds, post-Dissolution college and school, and house, located approximately 4.6km northwest of the Site.

2.4.3. There are 5 listed buildings located in and around the settlements of North Killingholme and East Halton, all within 3km of the Site. Of these, two are Grade I Listed Churches (The Church of St Denys at North Killingholme and the Church of St Peter at East Halton. There is a Grade II* Listed Manor House, associated with the Scheduled Monument at Manor Farm 2km west of the site. There are also two Grade II listed buildings within 2.5 Km, one of which is also associated with Manor Farm.

2.4.4. There are no Conservation Areas within 5km of the Site.

[1] Greater Lincolnshire Nature Partnership (2013) Local Wildlife Site Guidelines for Lincolnshire, 3rd Edition. Greater Lincolnshire Nature Partnership

2.4.5. There are 52 non-designated heritage assets recorded within 1km of the site in the North Lincolnshire Historic Environment Record. Many entries relate to Iron Age and Romano British enclosures in the immediate area and have been identified and evaluated through a series of investigations comprising geophysical surveys, field walking and evaluation trenching.

2.4.6. Immediately to the west of and running roughly parallel with Rosper Road, an Iron Age ditch extending over 400 metres was identified during excavations in advance of the construction of works associated with the Total oil refinery. It is believe that this feature, and other evidence of Iron Age settlement, may be associated with a contemporary settlement known from the excavations of the Immingham CHP plant to the south.

2.4.7. The position of the site on the edge of the deposits of glacial till and alluvial deposits means that there is good potential for the preservation of archaeological deposits and features.

2.5 Traffic and Transport

2.5.1. The Site has good access to the road network with Rosper Road joining Humber Road approximately 500m to the southeast of the Site. Humber Road passes underneath the railway line before joining the A160 at a roundabout. The A160 is dualled in both directions westwards from this roundabout.

2.6 Air Quality

2.6.1. There are no declared Air Quality Management Areas (AQMA) within 5km of the Site. There is one former AQMA located in the town of Immingham approximately 3.25km southeast of the Site; however, this AQMA was revoked in 2016.

2.6.2. Key receptors include the single residential property located on Marsh Lane approximately 0.5km east of the Site; the villages of South and North Killingholme, located approximately 1.7km west /southwest of the Site; the town of Immingham, located approximately 2.4km south of the Site at its closest point; and residential properties in the vicinity of Chase Hill Road, located approximately 2.25km northwest of the Site.

2.6.3. The Applicant contributes to an ambient air quality monitoring station (along with the other local principal industries). This is located at Killingholme Primary School, School Road, South Killingholme and measures ambient air concentrations of nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and particulates (PM_{10}). Results from the monitoring station indicate that local air quality for pollutants that could be released from the Proposed Development is generally good.

2.7 Noise

2.7.1. The Applicant conducts regular (approximately annual) surveys of ambient noise levels at a single receptor (the single dwelling located on Marsh Lane) in order to characterise the noise from the existing power station as well as general ambient noise levels in the area. Results from recent monitoring surveys indicate that the local ambient noise environment although dominated by the industrial noise including the oil refineries, of the existing CHP plant site and other sites. The sound emitted by the existing CHP plant does not have tonal or impulse noise characteristics and meets the existing Environmental Permit requirement not to exceed the existing background level by more than 3 dB(A).

2.8 Surface Water, Flood Risk and Drainage

2.8.1. There are two surface water features located within the Site to the west and south west. These are associated with the main route of the treated surface water and process water effluent from the p66 refinery prior to treatment at the existing VPI CHP plant site effluent plant (to the south of the Proposed Development and subsequent discharge.

2.8.2. The following notable watercourses have been identified in close proximity to the Site:

- A land drain running parallel with and directly adjacent to the southern Site boundary;
- A land drain running parallel with and directly adjacent to the eastern Site boundary and Rosper Road;

- Watercourse 9A (a North East Lindsey IDB drain) located approximately 50m to the south east of the Site to the east of Rosper Road;
- A series of land drains approximately 53m to the west of the Site;
- A series of land drains approximately 120m to the north of the Site;
- Watercourses 9B, 10, and 10A (North East Lindsey IDB drains) that outfall to the Humber Estuary approximately 1.5km north east of the Site;
- South Killingholme Main Drain located 500m to the south west of the Site; and
- The Humber Estuary, located approximately 1.4km to the west.

2.8.3. In addition, the area surrounding the Site is drained via a network of small land drainage ditches that convey surface water from the surrounding greenfield areas located between the Site and the Humber Estuary.

2.8.4. The Humber Estuary is designated under the Nitrates Directive, Bathing Water Directive, Conservation of Wild Birds Directive, Habitats and Species Directive and the Urban Wastewater Treatment Directive. The Humber Estuary also has ecological and chemical classification under the Water Framework Directive (WFD).

2.8.5. The smaller land drains and North East Lindsey IDB drains, whilst shown on the Digital Rivers Network Map, do not have ecological and chemical classification under the WFD.

2.8.6. The Environment Agency online Flood Map for Planning (accessed 14.11.17) shows the Site is located entirely within Flood Zone 3. Areas located within Flood Zone 3 are classified as having a 'high risk' of flooding from fluvial or tidal sources. Flood Zone 3 comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1.0%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. The site is not located within an area defined as Functional Floodplain (Flood Zone 3b).

2.8.7. There are no formal flood defences in close proximity to the proposed works; however, there are tidal flood defences in place along the entire south bank of the Humber Estuary. The existing defences to the north and east of the proposed development comprise a combination of earth embankments topped by concrete wave return walls and small areas of reclaimed land. However, the Site is not located in an area shown on Environment Agency's flood maps to benefit from flood defences.

2.9 Geology/ Hydrogeology

2.9.1. It is considered likely that the Site is overlain by a layer of Made Ground associated with previous industrial developments in the area. The Superficial geology is understood to include Devensian Till overlying the bedrock of the Burnham Chalk formation.

2.9.2. The Site is not located within a Source Protection Zone. The superficial geology is characterised as a Secondary 'A' Undifferentiated Aquifer, whilst the bedrock geology is classed as a Principal Aquifer.

2.10 Landscape

2.10.1. The Site is not located within or adjacent to any national or regional designations for landscape protection (e.g. Area of Outstanding Natural Beauty (AONB) or Green Belt land). The Site is located with National Character Are 41: the Humber Estuary, which is focussed on the expanse of the Humber Estuary and associated low-lying land. There are no Public Rights of Way (PRoW) across the Site or immediately adjacent to it.

3. Project Description

3.1 The Proposed Development

3.1.1. The Proposed Development comprises the construction, commissioning and operation of a gas-fired power station with a gross electrical output of up to 49.9MW. Natural gas will be the main fuel used for the plant. No secondary or backup fuel is proposed.

3.1.2. The Proposed Development would comprise a number of gas engines. The total number and size of the engines is still under consideration by the Applicant. Further studies will ensure that the most suitable plant is selected taking into consideration local and environmental constraints and the operational regime of the plant.

3.1.3. In a reciprocating engine, fuel is combusted in the cylinders of a multi-cylinder gas engine, utilising the air that is usually first pressurised by the turbo charger(s) and then compressed by the pistons. The force developed turns a crank shaft, which then turns an alternator, which generates the electricity for export to the electricity network.

3.1.4. Reciprocating engines have been widely used for power generation, particularly for peaking and back-up generation, because of their ability to start up and shut down quickly and operate flexibly across a range of loads.

3.1.5. The engines are available in a range of sizes. For the Proposed Development, consideration is being given to engines ranging from 1.5MW up to 20MW electrical output capacity. This means the number of engines installed may range from, for example, up to 33 x 1.5MW; to two or three engines in the 15-20MW range, such that the total output capacity will not exceed 49.9MW. The number of options within this range will depend on a number of commercial, environmental and engineering factors.

3.1.6. Depending on a number of factors including engine choice and potential environmental impact, the engines may be individually containerised, with each unit exhausting through their own stack, or they may be housed in one or more buildings with engine exhausts discharging through a common stack(s) on the building roof. The smaller sized engine (e.g. 1.5MW gas engine) would have typical dimensions of 12m in length x 3m in width (excluding the engine auxiliaries), each with a stack height typically less than 25m.

3.1.7. A smaller number of larger engines are more likely to be housed in a building (potentially up to a maximum building height of approximately 25m) and discharge through a common stack of up to approximately 45m in height.

3.1.8. The scope and methodology proposed for the EIA as set out in **Sections 5 and 6** of this Scoping Report is the same for each of the different options presented above. Where these differences would impact on the assessment methodology, these have been explained.

3.1.9. The infrastructure proposed to be installed at the Site may include:

- A number of reciprocating gas engines with stack(s) and transformer(s) with associated switchgear and ancillary equipment, either individually housed or contained within one or more buildings;
- Above ground gas pipeline to the existing adjacent VPI CHP plant site;
- Above ground electrical transmission equipment to convey generated electricity to the existing grid supply point on the existing adjacent VPI CHP plant site. ;
- Step-up transformer at the VPI CHP plant site to connect to the NGT main transmission system;
- Water supply and pipeline;
- One or more liquid fuel tanks;
- Workshop and stores;
- Electrical, control room, and administration buildings;
- Above ground raw water and fire water storage tank;
- Waste water treatment plant;
- Storm water attenuation system, with connection to the existing drainage system;
- Internal access roads and car parking;
- Small diesel generator set & tank to facilitate safe start up and shut down of the main generating sets;
- Landscaping and fencing;
- Construction laydown areas;

- Auxiliary cooling equipment;
- Roadways;
- Welfare buildings; and
- Other minor associated infrastructure and auxiliaries/services.

3.1.10. Laydown areas for the storage of plant and equipment and use of contractors during construction would be incorporated within the Site boundary.

3.1.11. All of the above elements would be located within the Site boundary shown on **Figure 2**.

3.1.12. The electrical generation technology proposed for this development is presented in detail below.

Black Start Capability

3.1.13. The Proposed Development may provide a 'black start' capability. This could provide the capability to start other grid connected assets (such as the VPI CHP Plant sited adjacent to the plant) in the event of a total or partial shutdown of the national grid system (so called 'black-start' capability).

3.1.14. The inclusion of black start capability and the provision of emergency back-up fuel supplies might require the use and storage of distillate fuel in above ground tank(s) within the Site, although natural gas would continue to be the fuel used during normal plant operation. The distillate would only be used to support black start operations or to provide emergency supplies if connection to the grid system was lost.

Electricity Substation and Network Connection

3.1.15. The Proposed Development would connect to either the existing 400kV substation or to the existing 15.75kV supply via the electrical infrastructure within the existing VPI CHP plant site. Studies are underway to determine the best option.

Gas Connection

3.1.16. The gas connection for the Proposed Development would use the existing gas supply infrastructure on the adjacent VPI CHP plant site. This would be facilitated by a new above ground pipeline.

3.2 Construction

3.2.1. It is currently anticipated that construction of the Proposed Development would commence around Q1 2019 and would take up to 12 months to complete.

3.2.2. Construction of the Proposed Development is anticipated to create 50 temporary construction jobs at peak. Small volumes of construction traffic would be generated during the construction period and these would vary throughout the construction programme, depending on the requirements of each phase. The construction traffic over this period would be of a very low volume, such that it would be unlikely to have the potential to give rise to significant environmental effects. Nevertheless, details of the likely traffic movements during construction would be reported within the EIA.

3.2.3. Anticipated normal construction working hours would be Monday – Friday 07:00 to 19:00, Saturday 08:00 to 18:00. Should on-site construction works need to be conducted outside of these normal construction working hours, they would comply with any restrictions agreed with the local planning authority, in particular regarding control of noise and traffic.

3.2.4. The ES will include details of the proposed construction activities and their anticipated duration, along with an indicative programme of each phase of the works.

3.2.5. The ES will also be supported by a framework Construction Environmental Management Plan (CEMP), which will describe the specific measures to be followed by the appointed construction contractor to reduce potential nuisance impacts from:

- Use of land within the Site for temporary laydown areas etc.;
- Construction traffic (including parking and access requirements);
- Earthworks;

- Noise and vibration;
- Dust generation
- Pollution prevention measures; and
- Waste generation.

3.2.6. The framework CEMP will identify all the procedures to be adhered to throughout construction. This framework will then be adopted by the appointed contractor in the drafting of their more detailed CEMP for planning authority approval prior to commencement of construction.

3.2.7. Contracts with companies involved in the construction works will incorporate environmental control and health and safety procedures based on current regulations and best practice guidance, with the intention that construction activities are sustainable and appropriate. All contractors involved with the construction stages would be required to meet agreed best practice and all relevant environmental legislation including: Control of Pollution Act 1974 (COPA, Environment Act 1995 and The Hazardous Waste (England and Wales) Regulations 2005.

3.2.8. All construction works would adhere to the Construction (Design and Management) Regulations 2015 (CDM).

3.3 Operation

3.3.1. The power stations will be used to rapidly supply electricity to the network when required. As a result, the Proposed Development would provide vital new energy infrastructure required to ensure security of supply to the UK, operating flexibly, typically during periods of low electricity supply (from intermittent renewable sources for example) or high demand on the transmission network and to provide technical services to support the network.

3.3.2. Operation of the Proposed Development is anticipated to create up to 6 operational roles, which may be new jobs or integrated with other VPI operations at the adjacent existing CHP plant, thereby supporting continuity of local employment. Temporary and contractor employees associated with maintenance activities would also be employed at the site, as required.

3.4 Decommissioning

3.4.1. The power station is capable of a life expectancy of 40 years or more, depending on running hours. Eventually, decommissioning would involve the removal of the plant. The gas and electricity connections would be disconnected and made safe. Gas engines are plant modular, transportable and small scale. Therefore, decommissioning is not anticipated to present any significant environmental effects beyond those assessed for the construction period of the Project.

3.5 Alternatives

3.5.1. Alternatives to the Proposed Development that will be considered through the EIA process include:

- No development;
- Similar development at an alternative site;
- Alternative development within the Site; and
- Alternative technologies.

4. Planning Policy and Need

4.1 Introduction

4.1.1 This section details the main planning policy documents taken into account in terms of defining the scope of the EIA.

4.2 National Policy Context

4.2.1 The UK electricity generation mix is going through a time of reform. With a number of the UK's coal power stations set to close over the next few years, the country is facing a large shortfall in its electricity generating capacity. The increasing reliance on intermittent renewables (such as wind) means an increased need for conventional thermal generation in a back-up capacity. The current reforms of the electricity market are intended to help tackle the 'energy trilemma': how to decarbonise electricity supply while ensuring security of supply and keeping prices affordable for consumers. The Capacity Market is one of the central pillars of the UK's electricity market reform proposals and is aimed primarily at ensuring security of our electricity supply.

4.2.2 The principles behind the Capacity Market were first published in the Energy White Paper Planning our Electric Future: a White Paper for Secure, Affordable and Low-Carbon Electricity in July 2011 and legislated through the Energy Act 2013. Further details have been given between June and December 2013 through a series of detailed design proposals, consultations and the Electricity Market Reform (EMR) Delivery Plan, which was published by the Department of Energy & Climate Change (DECC) in December 2013.

4.2.3 DECC guidance on the Capacity Market states:

> *"[The] Capacity Market will ensure security of electricity supply by providing a payment for reliable sources of capacity, alongside their electricity revenues, to ensure they deliver energy when needed. This will encourage the investment we need to replace older power stations and provide backup for more intermittent and inflexible low carbon sources."*

4.2.4 It is anticipated that the Applicant would seek to qualify for Capacity Payments through the Capacity Market Auction/s, to provide power at times of stress, when generation does not meet demand. The Proposed Development responds directly to the Government's recognised need for flexible electricity generation capacity to secure reliable energy supplies and support the transition to a low carbon economy.

4.2.5 Whilst the Proposed Development is not a nationally significant infrastructure project (NSIP), the principles outlined in the National Policy Statements for energy infrastructure are relevant to the Proposed Development, as outlined below.

4.3 Overarching National Policy Statement for Energy (EN-1)

4.3.1 The Overarching National Policy Statement for Energy (EN-1) (NPS EN-1) sets out national policy for energy infrastructure developments that meet the Planning Act 2008 definition of NSIPs. In addition, paragraph 3 of the National Planning Policy Framework (NPPF) (see Section 4.4) states:

> *"National policy statements form part of the overall framework of national planning policy, and are a material consideration in decisions on planning applications."*

4.3.2 Paragraph 3.3.11, 3.6.1 and 3.6.3 of NPS EN-1 recognise that flexible electricity generation facilities powered by fossil fuel are required to provide back-up for intermittent renewable energy and therefore are necessary to support the decarbonisation of electricity generation. Paragraph 3.3.11 states:

> *"…the more renewable generating capacity we have the more generation capacity we will require overall, to provide back-up at times when the availability of intermittent renewable sources is low. If fossil fuel plant remains the most cost-effective means of providing such back-up, particularly at short notice, it is possible that even when the UK's electricity supply is almost entirely decarbonised, we may still need fossil fuel power stations for short periods when renewable output is too low to meet demand, for example when there is little wind."*

4.3.3 Paragraph 3.3.12 of NPS EN-1 also states:

> *"… increasing reliance on renewables will mean that we need more total electricity capacity than we have now, with a larger proportion being built only or mainly to perform back-up functions".*

4.3.4 Paragraph 3.6.1 of NPS EN-1 states:

> *"Fossil fuel power stations play a vital role in providing reliable electricity supplies: they can be operated flexibly in response to changes in supply and demand, and provide diversity in our energy mix. They will continue to play an important role in our energy mix as the UK makes the transition to a low carbon economy, and Government policy is that they must be constructed, and operate, in line with increasingly demanding climate change goals".*

4.3.5 Paragraph 3.6.3 of NPS EN-1 states:

> *"Some of the new conventional generating capacity needed is likely to come from new fossil fuel generating capacity in order to maintain security of supply, and to provide flexible back-up for intermittent renewable energy from wind. The use of fossil fuels to generate electricity produces atmospheric emissions of carbon dioxide. The amount of carbon dioxide produced depends, amongst other things, on the type of fuel and the design and age of the power station. At present coal typically produces about twice as much carbon dioxide as gas, per unit of electricity generated. However … new technology offers the prospect of reducing the carbon dioxide emissions of both fuels to a level where, whilst retaining many of their existing advantages, they also can be regarded as low carbon energy sources."*

4.4 National Planning Policy Framework and Planning Practice Guidance

4.4.1 The National Planning Policy Framework (NPPF) was adopted in March 2012 and replaced the majority of Planning Policy Statements and Planning Policy Guidance Notes. The policies contained within the NPPF are expanded upon and supported by the 'Planning Practice Guidance', which was published in March 2014 and regularly updated.

4.4.2 The NPPF details the Government's planning policies for England and how these are to be applied. It is a material consideration in planning decisions made by local planning authorities. The NPPF will be reviewed and appropriate policies identified which may have a bearing on the decision making process. Further details will be provided in the ES and Planning Statement accompanying the Planning Application.

4.5 Local Planning Policy

4.5.1 The Site lies entirely within the administrative area of North Lincolnshire Council, which is a unitary authority. The local development plan documents of relevance to the Proposed Development include the saved policies of the North Lincolnshire Local Plan (adopted 2003), the Core Strategy (adopted June 2011) and the Housing and Employment Land Development Plan Document (adopted March 2016).

4.5.2 The Proposals Map identifies the Site as forming part of the South Humber Bank Area that is subject to Policy SHBE-1 of the Housing and Employment Land Development Plan Document. This policy identifies the area as being suitable for B1 office/light industry, B2 general industry, B8 storage and distribution and port related development.

4.5.3 Full details of the local policy context will be provided in the ES and Planning Statement accompanying the planning application.

4.6 The Need for the Proposed Development

4.6.1 The Energy White Paper 'Meeting the Energy Challenge' published in 2007 by the Department for Trade and Industry, which formed the basis of the Energy Act 2008, sets out the Government's plans for tackling climate change by reducing carbon emissions whilst ensuring the availability of secure, clean, affordable energy.

4.6.2 The White Paper and the Overarching NPS for Energy (EN-1) both emphasise the importance of a diverse mix of energy generating technologies, including renewables, nuclear and fossil fuels, to avoid over-dependence on a single fuel type and thereby ensure security of supply.

4.6.3 In the transition to the low carbon economy, the large-scale deployment of renewable technologies and construction of new nuclear power plant will change the energy mix of the UK. This is compounded by the Government's commitment to close all coal-fired power stations by 2025, which would remove plant currently providing a balancing service to the national grid when the need should arise. As a result,

there is a need for power plants that can operate flexibly. This need is underpinned by a combination of Government policy drivers and the Industrial Emissions Directive (IED) resulting in the closure of fossil generation plant and is reflected in future generation projections.

4.6.4 Energy Market Reform (EMR) is intended to deliver low carbon energy and reliable supplies that the UK needs, while minimising costs to consumers. EMR introduces a mechanism to provide incentives for the investment required in low carbon generation infrastructure, the Capacity Market. The Capacity Market provides a regular retainer payment to reliable forms of capacity (both demand and supply side) in return for such capacity being available when needed.

4.6.5 The reformed electricity market is intended to transform the UK electricity sector to one in which low-carbon generation can generate in an affordable way, while maintaining the security of supply and ensuring a cleaner, more sustainable energy mix. In the run up to 2050, gas generation is still required to meet electricity demand. It is preferable over coal generation as generating electricity from gas is more efficient and of lower carbon intensity, resulting in significantly lower CO_2 emissions per generated megawatt from gas-fired power stations compared to coal-fired power stations.

4.6.6 Whilst other peaking technologies, such as pumped storage schemes or batteries, also exist and are an increasingly important part of the energy mix, flexible gas-fired plant remains one of the most cost effective generating technologies.

4.6.7 For these reasons, the Applicant considers that there is a clear and compelling need for the development of a new flexible gas-fired electricity generating station and has selected the Site as the preferred location for technical, environmental and commercial reasons. The Applicant, therefore, proposes to seek planning permission for the construction, operation and decommissioning of a gas-fired power station of up to 49.9MW capacity at the Site.

5. Potentially Significant Environmental Issues

5.1 Introduction

5.1.1. The following sections identify the potential environmental impacts associated with the Proposed Development proposed for inclusion within the ES. The methodology and assessment criteria that are proposed to be used to assess the potential significance of the identified impacts are also outlined, alongside potential mitigation measures for implementation following assessment.

5.2 Ecology and Nature Conservation

Scope of the Assessment

5.2.1. Potential impacts on ecological receptors will be assessed using the Chartered Institute for Ecology and Environmental Management (CIEEM) Ecological Impact Assessment Guidelines (2016) (CIEEM, 2016). Any likely significant adverse effects will be mitigated or compensated for and a number of ecological enhancements will also be considered where appropriate, in accordance with relevant planning policy. Following the implementation of mitigation and compensation, any residual effects on ecological receptors will be identified.

5.2.2. The following potential impacts may be associated with the Proposed Development:

- Permanent loss of habitats within the Site during construction;
- Disturbance of ecological receptors (including noise, dust and light impacts) in the vicinity of the Site during construction, operation and decommissioning;
- Impacts on aquatic habitats and water quality due to construction works and
- Air quality impacts on ecological receptors in the zone of influence of the proposed development during operation.

5.2.3. Based on the results of the PEA, further surveys for protected and notable species will be undertaken during the course of the following year and used to inform mitigation strategies (if required). The scope and methods for these surveys are summarised in Table 3.

5.2.4. Each of the specialist surveys will be reported in a separate document to be incorporated as a technical appendix to the Ecology Chapter of the ES where they are completed prior to the submission of the planning application. Those completed post submission will be submitted as Addenda to the EIA.

Table 3: Further Surveys to be undertaken in 2018 in support Planning Application

Ecology Feature	Rationale	Method	Timing
Botanical survey	Open mosaic habitat on Site has the potential to be of high value, and requires evaluation against LWS selection criteria to inform ecological impact assessment.	Botanical survey to collect detailed species list for analysis against LWS selection criteria	June 2018
Great crested newt	Desk study indicates presence in the wider local area. Ponds on site (if found to hold water in the breeding season) and off-site within 500m are potentially suitable for GCN. Terrestrial habitat on Site offers potential foraging, refuge and hibernation opportunities for GCN.	Presence/ absence survey: eDNA survey **OR** 4 x field survey visits (bottle trap, egg search, torch survey, netting)	March – June 2018
		If GCN present, additional population size class assessment surveys: 2 x field survey visits (bottle trap, egg search, torch survey, netting)	March – June 2018
Reptiles	Open mosaic habitat on Site provides suitable basking, refuge and hibernation sites for reptiles.	Presence/ absence survey: 7 x surveys using artificial refuges at a minimum density of 10 per hectare of suitable habitat. Visual transect surveys	April/ May and/ or September 2018
Breeding birds	Open mosaic habitat and wetland areas provide nesting opportunities for a range of breeding birds including ground nesting species.	3 x surveys to identify breeding species and map territories.	April – June 2018
Terrestrial invertebrates	Open mosaic habitat may support notable species or assemblages of terrestrial invertebrates	Preliminary appraisal by specialist to inform scope of works for further surveys (if necessary). Scope and timings of further surveys are dependent on the potential species present.	April 2018

5.2.5. Further surveys for the following species have been scoped out and these ecology features will also be scoped out of the ecological impact assessment:

- Wintering birds – Based on the habitat and topographical context of the Site, it is considered highly unlikely that the site would have a specific value for passage and wintering birds associated with the Humber Estuary SPA/ Ramsar. This was confirmed by the wintering bird surveys carried out on the Site in 2017 (Catley, 2017). The only waterfowl species that were recorded were snipe (*Gallinago gallinago*) and woodcock (*Scolopax rusticola*), which do not form part of the SPA/ Ramsar assemblage. Although the wintering bird surveys were only undertaken in January, February and March 2017 (and therefore missed the late autumn and early winter periods) when considered alongside the unsuitability of the habitat for SPA/ Ramsar species, the results are considered to be sufficiently robust to scope out wintering birds as an ecology feature requiring further survey and impact assessment;
- Bats (roosting) – no potential roosting habitat is present within the Site boundary;
- Bats (foraging and commuting) - habitats within the Site are considered to represent sub-optimal habitat for foraging bats, due to its close proximity to the existing VPI CHP plant and the expected high levels of nocturnal light emissions from surrounding industrial developments that may deter foraging bats;

- Badger (*Meles meles*) - no badger activity (including setts and digging by badger) was recorded during the Phase 1 habitat survey undertaken by AECOM, or during the earlier ecological walkover survey undertaken by SLR (SLR Consulting, 2017). It is therefore reasonable to conclude that this species is likely absent from the Site; and
- Water vole (*Arvicola amphibius*) – this species is known to be present in the wider local area through desk study records and there are a number of drains adjacent to the Site that may be provide suitable habitat. However, it is unlikely that any drains will be directly or indirectly affected by the Proposed Development, and therefore there is considered to be no requirement for further survey for this species. If impacts on drains (either direct or indirect) are predicted as the design/ layout of proposed development evolves, surveys for this species would be undertaken where necessary.

Habitats Regulations Assessment

5.2.6. Due to the proximity of the proposed development to the Humber Estuary SAC/ SPA/ Ramsar, a signposting report to inform Habitat Regulations Assessment (HRA) screening for Likely Significant Effects (LSE) on the Humber Estuary Natura 2000 site will be presented as a technical appendix to the Ecology Chapter of the ES.

5.2.7. It is not considered that the land within the Site boundary represents 'functionally linked' habitat supporting the passage and wintering bird interest of the Humber Estuary SPA/ Ramsar, because the habitats are unsuitable for foraging and roosting waterbirds. This is because waterbirds generally prefer flat open vistas and short vegetation (where their sight-lines are unrestricted in terms of predator detection) and the undulating topography and stands of tall ruderal vegetation at the Power Plant Area are likely to deter waterfowl from using the site for foraging and roosting. The results of the wintering bird survey carried out within the Site by Catley (2017) support this conclusion, because no SPA/ Ramsar species were recorded.

5.2.8. Potential indirect effects on the Humber Estuary SPA/ SAC/ Ramsar arising from noise, hydrology, water quality and air quality would be subject to LSE screening.

5.3 Cultural Heritage

Scope of the Assessment

5.3.1. An assessment will be carried out in line with the relevant national, regional and local planning policies with regard to archaeology and cultural heritage, and undertaken with reference to the following legislation, standards and guidance:

- Ancient Monuments and Archaeological Areas Act (1979);
- Planning (Listed Buildings and Conservation Areas) Act (1990);
- Chartered Institute for Archaeologists (CIfA): Standards and guidance for historic environment desk-based assessment (2014 & 2017);
- NPPF 4, Section 12: Conserving & Enhancing the Historic Environment (2012);
- Historic England: Historic Environment Good Practice Advice in Planning Note 3: The Setting of Heritage Assets[2] (2015);
- Local Plans; and
- Saved policies of the North Lincolnshire Local Plan.

5.3.2. The Proposed Development may have visual impacts on the setting of the Listed Buildings and Scheduled Monuments within the Zone of Theoretical Visibility (ZTV, see Section 5.6: Landscape and Visual Amenity below) and a variety of direct impacts on buried archaeological resource, if present within the Site or pipeline route.

5.3.3. Construction activities may result in temporary indirect effects upon the settings of designated heritage assets in the vicinity of the scheme, such as nearby Listed Buildings and any Scheduled Monuments.

[2] GPA3 Has been revised and a new version is due to be formally adopted.

5.3.4. The construction of the Proposed Development could impact directly upon buried archaeological remains, should they exist within the footprint of the Proposed Development area (including associated aspects required to deliver the scheme, such as haul roads and construction compounds). It may also have potential visual impacts on the setting of the Listed Buildings and Scheduled Monuments within the ZTV.

5.3.5. Temporary and permanent impacts to archaeological and cultural heritage assets may lead to significant effects; therefore these have been scoped into further assessment in the ES.

5.3.6. Operational effects of the Proposed Development have been scoped out of this assessment.

5.3.7. A study area of 1km from the Site boundary will be used to provide baseline information for the assessment. A wider study area will be used to identify assets which may have their setting affected. The study area for the assessment on setting will be limited to 3km. The setting assessment will be limited to assets which fall within the Zone of Theoretical Visibility (ZTV). Some assets beyond this distance may also be considered where elements of their setting extend closer to the Proposed Development.

5.3.8. The assessment will define the settings of listed buildings and other heritage assets, and will describe how their setting contributes to their significance. Possible intervisibility of the settings with each other and the Proposed Development will be assessed using the ZTV in liaison with the Landscape and Visual Impact Assessment (LVIA) specialist to ensure that relevant viewpoints are considered.

5.3.9. Desk-based research will be undertaken as part of the EIA. Additional information will be gathered from the following sources as applicable/available:

- The National Heritage List England;
- The North Lincolnshire Historic Environment Record;
- The local County Record Office and/or local studies library;
- Historic mapping;
- Aerial photographic evidence;
- Geotechnical data and other assessments as appropriate and available; and
- An archaeological walkover survey to assess known sites and to determine the potential for previously unrecorded heritage sites.

5.3.10. Information collected from the sources will be used to describe the known archaeology and built heritage of the 3 km study area. The results of the desk-based research and the layout design will be discussed with the North Lincolnshire Historic Environment Team to agree any requirement for additional field evaluation, such as geophysical survey or evaluation excavation, prior to determination

5.3.11. Guidance to be used in the assessment includes:

- Good Practice Advice in Planning (GPA2) Managing Significance in Decision - Taking in the Historic Environment (Historic England 2015) – this advice note provides information to support the NPPF and PPG, such as aiding in assessing the significance of heritage assets.
- Good Practice Advice in Planning (GPA3) The Setting of Heritage Assets (Historic England 2015) – this advice note sets out a staged approach for assessing the impact of a proposed development on the heritage significance of assets, due to changes in their setting.
- Planning Practice Guidance 18a: Conserving and enhancing the historic environment, Scoping and consultation (Department for Communities and Local Government, 2014).

5.3.12. The significance (heritage value) of a heritage asset is determined by professional judgement, guided but not limited to any designated status the asset may hold. The value of an asset is also judged upon a number of different factors including the special characteristics the assets might hold which can include evidential, historical, aesthetic, communal, archaeological, artistic and architectural values.

5.3.13. The significance of a place is defined by the sum of its heritage values. Taking these criteria into account, each identified heritage asset can be assigned a level of significance (heritage value) in accordance with a three-point scale as set in Table 3.

Table 3: Criteria for determining the significance (heritage value) of heritage assets

Significance (Heritage Value)	Typical descriptors
High	Assets of inscribed international importance, such as World Heritage Sites, Grade I and II* listed buildings, Grade I and II* registered historic parks and gardens, Registered battlefields, Scheduled monuments, Non-designated archaeological assets of schedulable quality and importance.
Medium	Grade II listed buildings, Grade II listed registered historic parks and gardens, Conservation Areas, Locally listed buildings included within a conservation area Non-designated heritage assets of a regional resource value
Low	Non-designated heritage assets of a local resource value as identified through consultation, Locally listed buildings, Non-designated heritage assets whose heritage values are compromised by poor preservation or damaged so that too little remains to justify inclusion into a higher grade

5.3.14. Having clearly established the significance of the heritage assets, the assessment will then consider the degree of impact on heritage assets as a result of development. Impacts may arise during construction or operation and can be temporary or permanent. Impacts can occur to the physical fabric of the asset or affect its setting.

5.3.15. When professional judgement is considered, some sites may not fit into the specified category in this table. Each heritage asset is assessed on an individual basis and takes into account regional variations and individual qualities of sites.

5.3.16. The level and degree of impact (impact rating) is assigned with reference to a four-point scale as set out in Table 4. In respect of cultural heritage an assessment of the level and degree of impact is made in consideration of any scheme design mitigation (embedded mitigation).

Table 4: Criteria for determining the magnitude of impact on heritage assets

Magnitude of Impact	Description of Impact
High	Change such that the significance of the asset is totally altered or destroyed. Comprehensive change to setting affecting significance, resulting in a serious loss in our ability to understand and appreciate the asset.
Medium	Change such that the significance of the asset is affected. Noticeably different change to setting affecting significance, resulting in erosion in our ability to understand and appreciate the asset.
Low	Change such that the significance of the asset is slightly affected. Slight change to setting affecting significance resulting in a change in our ability to understand and appreciate the asset.
Minimal	Changes to the asset that hardly affect significance. Minimal change to the setting of an asset that have little effect on significance resulting in no real change in our ability to understand and appreciate the asset

5.3.17. An assessment of the level of significance of effect, having taken into consideration any embedded mitigation, is determined by cross-referencing between the significance (heritage value) of the asset (Table 3) and the magnitude of impact (Table 4). The resultant level of significant effect (Table 5) can be negligible, adverse or beneficial.

Table 6.3: Criteria for determining the significance of effect

Significance (heritage value)	Magnitude of impact			
	High	Medium	Low	Minimal
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Negligible

5.3.18. The ES reports on the significance of effect in accordance with EIA regulations. Effects of major or moderate significance are considered to be significant.

5.3.19. An assessment of the predicted significance of effect is made both prior to the implementation of mitigation and after the implementation of mitigation to identify residual effects. This first highlights where mitigation may be appropriate and then demonstrates the effectiveness of mitigation and provides the framework for the assessment of significance which takes mitigation measures into consideration.

5.3.20. Mitigation will consider the predicted impacts of the Proposed Development and aim to avoid adverse effects on archaeology and heritage assets within the study area. In the case of archaeological remains, mitigation will aim to avoid undisturbed archaeological remains and preserve them in situ. Where this is not possible, preservation by record will be proposed as mitigation.

5.3.21. Mitigation measures could include early design intervention to avoid physical impacts on known heritage assets. If it is not possible to avoid heritage assets, mitigation may include detailed landscape/topographic surveys, archaeological excavation of any features being destroyed and archaeological monitoring/watching brief.

5.3.22. The assessment will determine whether there would be any residual effects with respect to cultural heritage, either beneficial or adverse, following the application of any mitigation measures that are identified as being required for the Proposed Development.

5.3.23. The assessment will consider whether the Proposed Development and other proposed construction projects within the local area will have any cumulative effects upon heritage assets, whether that be beneficial or adverse.

5.3.24. Consultation will be undertaken with the North Lincolnshire Archaeological Officer and the Built Environment Officer and the local Heritage England Inspector of Ancient Monuments to discuss the heritage assets potentially affected by the Proposed Development, to establish a plan for any further investigation and to formulate outline mitigation measures that may be required.

5.4 Air Quality and Greenhouse Gas Emissions

Scope of the Assessment: Air Quality

5.4.1. The following potential impacts may be associated with the Proposed Development:

- Emission of pollutants, to air from the stack(s) during operation;
- Emission of pollutants to air from vehicles associated with construction, commissioning, operation and decommissioning; and
- Construction dust and mobile plant exhaust emissions generated during construction and decommissioning.

5.4.2. The Proposed Development, when operational, would emit known pollutants to air, via a stack(s). These would include the combustion products nitrogen oxides (NOx) and carbon monoxide (CO), for which Air Quality Objectives (AQS) have been set as part of the National Air Quality Strategy, as well as CO_2 and potentially additional trace pollutants. Sulphur dioxide (SO_2) emissions and particulate emissions are expected to be minimal when the plant is running on natural gas.

5.4.3. The plant would be designed to comply with the requirements of the IED or Medium Combustion Plant Directive (MCPD) depending on the capacity of the installed units and in accordance with Environment Agency guidance. The relevant Directive will set Emission Limit Values for pollutant releases to air from the plant that would be met. Performance against these emission limit values would be regulated through an Environmental Permit.

5.4.4. An air impact assessment will be undertaken for the main point source emissions, utilising air dispersion modelling to assess the impact to air quality potentially brought about through the generation and dispersion of emissions from the operation of the Proposed Development. The study will be desk-based and will assess the predicted concentrations of combustion pollutants specifically detailed in the IED/MCPD, which are potentially hazardous to human health and designated habitats sites, at identified receptors (such as residential homes, nature sites) within the local area.

5.4.5. The modelling will be based on Emission Limit Values set by the IED/MCPD and at full operating load, thereby presenting a worst-case scenario in the ES. Should it be deemed appropriate to model lower loads, justification for this will be provided and the load clearly stated in the assessment. Modelling will be undertaken in accordance with Environment Agency guidance.

5.4.6. The atmospheric dispersion modelling study of operational emissions will be undertaken using the Atmospheric Dispersion Modelling System (ADMS) model, currently version 5.1. ADMS is widely used by industry and the regulatory authorities.

5.4.7. The dispersion modelling study will be used to determine the most appropriate height for the emission stacks and configuration (single or combined stacks) based on the resultant maximum short-term and long-term ground level concentrations predicted. Several different stack heights will be evaluated.

5.4.8. Potential impacts on ecological receptors will be assessed, including internationally designated habitat sites within 10km of the Proposed Development and nationally and non-statutory habitat sites within 2km of the Proposed Development, in accordance with EA guidance.

5.4.9. An air quality screening assessment will be undertaken on the potential effects of road traffic on the local road network associated with the construction of the Proposed Development, in accordance with the methods outlined in the guidance for local authorities. The Highways England's (HE) Design Manual

for Roads and Bridges (DMRB) screening model will be used. Based on expected traffic volumes, it is not considered that detailed ADMS-Roads dispersion modelling will be required.

5.4.10. In addition, potential impacts and nuisance from site clearance, construction dust and mobile plant exhaust emissions generated during the construction period of the plant will be considered using a screening assessment and supplemented by case studies where appropriate. This will be performed in accordance with the Institute for Air Quality Management (IAQM). Where necessary, mitigation measures will be proposed for the control of dust and site plant emissions during site preparation and construction works to minimise the potential effects.

5.4.11. The AQS objectives set within the National Air Quality Strategy are intended to protect the most sensitive parts of the population. Therefore it is considered that compliance with such objectives means that a separate Human Health Risk Assessment (HHRA) for this type of development is not required.

5.4.12. Given the subjectivity that can occur when attempting to assign a level of significance to a given air quality impact, AECOM has produced a set of quantitative significance criteria for air quality matters. These are based on Environment Agency and the Institute of Air Quality Management (IAQM) guidance and will be used to determine the significance of the predicted effects of the Proposed Development.

Climate Assessment

5.4.13. A number of factors will be considered in the climate assessment for the Project Development:

- Impact on climate change as a result of Greenhouse Gas (GHG) emissions arising from the operation of the power station) (termed a Lifecycle greenhouse gas impact assessment);
- The resilience of the Scheme to climate impacts (climate resilience assessment);
- How the scheme may impact the overall resilience of the surrounding environment against the predicted impacts of climate (in-combination climate impacts assessment).

5.4.14. Further information on these three aspects is presented below.

Scope of the GHG Assessment

5.4.15. The Proposed Development may have a potential impact on climate change associated with the emission of greenhouse gas emissions at various stages in the project lifecycle including

- Emission of greenhouse gases from the stack(s) during operation;
- Emission of greenhouse gas from vehicles associated with construction, commissioning, operation and decommissioning; and
- Embodied greenhouse gases associated with the materials used in the construction of the Proposed Development

5.4.16. The two main stages of the project which are expected to have potentially significant emissions of greenhouse gases are the construction and operational phases. In relation to greenhouse gas emissions, the ES will quantify the greenhouse gas emissions budget predicted to arise as a consequence of the Proposed Development, using forecast operational scenario data, and taking into account the technologies under consideration.

5.4.17. For greenhouse gas emissions, emerging guidance from the Institute of Environmental Management and Assessment (IEMA) states that:

> *"...in the absence of any significance criteria or a defined threshold, it might be considered that all GHG emissions are significant and an EIA should ensure the project addresses their occurrence by taking mitigating action."*

5.4.18. As such, it is proposed to scope in greenhouse gas emissions and provide a quantitative assessment of the scale of GHG emissions associated with the construction and operational stages of the scheme. This will enable key mitigation measures to be considered and, where necessary, incorporated in the ongoing design. As part of this consideration, the expected plant efficiency will be benchmarked against current comparable UK plants. The total calculated GHG emissions footprint will also be compared

against the UK's overall national GHG inventory and more particularly the current carbon budget that the UK has adopted.

The Climate Resilience Assessment

5.4.19. The climate resilience assessment will identify how the project design has considered and reflected the key climate change projections for the project lifetime. Based on an initial review of the climate projections for the region, this will focus on extreme weather and flooding issues as the key issues of concern. Commentary from this assessment will be included in the ES as part of the project description and options assessment.

In-combination climate impacts assessment

5.4.20. The Applicant considers that the principle aspect of climate change considered to be relevant for the Project Development is the risk of extreme events and sea level rise including flood risk. The risks and impacts associated with this issue will be covered in the flood risk assessment that will accompany the ES. Other aspects of in-combination climate impacts are not considered likely to be significant.

5.5 Noise and Vibration

Scope of the Assessment

5.5.1. The assessment and control of noise and vibration emissions from the development will involve establishing the current baseline, agreeing noise limits at sensitive receptors and mitigation of effects where necessary.

5.5.2. The following potential impacts may be associated with the Proposed Development:

- Construction and decommissioning noise and vibration impacts, including construction and decommissioning traffic on public roads;
- Operational noise impacts from the proposed plant, including commissioning; and
- Operational noise impacts from road traffic on public roads.

5.5.3. Based on the distance between the Site and the nearest residential receptors, significant vibration impacts associated with on-site activities are considered unlikely, although they will still be considered, where relevant, as part of the EIA.

5.5.4. The proposed scope of the noise and vibration assessment comprises:

- Identification of nearest noise sensitive receptors;
- Liaison with North Lincolnshire Council's Environmental Health Officer(s) to agree scope and methodology of noise assessment, including whether any supplementary baseline monitoring is required for beyond that already gathered;
- Establishment of baseline noise levels in the locality (as agreed necessary);
- Qualitative assessment of construction/decommissioning noise and vibration impacts based on available information on the likely works;
- Quantitative assessment of operational noise associated with the proposed plant; and
- Screening assessment and where necessary, further quantitative assessment of road traffic noise level changes on affected roads during both operation and construction/decommissioning based upon the standard methodology outlined in the Calculation of Road Traffic Noise by the Department of Transport (Stationery Office, 1988).

5.5.5. The noise and vibration assessment will be carried out in accordance with the following guidance:

- NPPF, 2012;
- Noise Policy Statement for England, 2010; and
- Planning Practice Guidance for Noise, 2014; and.

- NPS EN-1.

5.5.6. Additionally, reference will be made, but not be limited, to the following:

- British Standard (BS) 5228-1 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Part 1: Noise';
- BS 5228-2 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration';
- International Organisation for Standardisation (ISO) 9613-2: 1996 'Attenuation of sound during propagation outdoors. Part 2: General method of calculation';
- BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound';
- BS 8233:2014 'Methods for rating and assessing industrial and commercial sound';
- World Health Organisation (WHO) (1999), 'Guidelines for Community Noise';
- World Health Organisation (WHO) (2009), 'Night Noise Guidelines for Europe';
- BS 7385: 1993 'Evaluation and measurement for vibration in buildings';
- BS 6472: 2008 'Guide to evaluation of human exposure to vibration in buildings';
- Control of Pollution Act 1974;
- Calculation of Road Traffic Noise (CRTN) (DoT, 1988); and
- Design Manual for Road and Bridges (DMRB) Volume 11 Section 3 Part 7 HD213/11 (Revision 1)' Traffic Noise and Vibration'.

5.5.7. Qualitative assessment of construction noise and vibration impacts is proposed given that a construction contractor will not be appointed at the time of preparing the EIA. Therefore, the detailed site specific information on the construction works required to complete a quantitative assessment will not be available. The focus of the assessment will, therefore, be on recommendations for appropriate mitigation. Additionally, noise increases at sensitive receptors due to any construction traffic on public roads will be calculated according to the methods given in CRTN.

5.5.8. The operational noise impact of the Proposed Development will be predicted using computer noise modelling software (SoundPLAN or Cadna-A), based on information regarding plant layout, the operating conditions and the predicted levels of noise generated by plant items and vehicles, based on manufacturer data. The noise modelling software enables a detailed consideration of the proposed equipment and buildings, existing surrounding buildings and ground features. The software implements the methodology in ISO 9613-2 for the calculation of noise levels from industrial sources.

5.5.9. The significance of the noise impact of the Proposed Development during operation will be assessed using the method given in BS 4142 and will make reference to guidance provided by the World Health Organisation (WHO) and contained in BS 8233. BS 4142 provides a method for rating the acceptability of noise from industrial sources affecting noise-sensitive receptors, and the WHO/BS 8233 guidance provides information regarding assessment of sleep disturbance. Further details of the approach will be discussed and agreed with the Environmental Health Department at North Lincolnshire Council.

5.5.10. The construction, operation and decommissioning phases are not considered likely to have a potentially significant impact on traffic flows on local roads around the Site. Based on experience with other similar developments, the maximum number of HGVs predicted to access the Site at the peak of construction, are considered likely to significantly below the threshold for further assessment of highway, noise or air quality impacts as outlined in the relevant national guidance (DMRB) (see Section 7 for further detail). Therefore no noise assessment of traffic flows is proposed.

5.6 Landscape and Visual Amenity

Scope of the Assessment

5.6.1. The following potential impacts may be associated with the Proposed Development:

- Temporary changes to landscape character and views from sensitive receptors in the vicinity of the Site during construction and decommissioning; and

- Permanent changes to landscape character and views from sensitive receptors in the vicinity of the Site during operation.

5.6.2. The proposed method of landscape and visual impact assessment has been devised to address the specific impacts likely to result from a development of this scale and nature. The methodology draws upon the following established best practice guidance:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3);
- An Approach to Landscape Character Assessment;
- Visual representation of development proposals Technical Guidance Note 02/17 (31 March 2017); and
- Landscape Institute Advice Note 01/11: Photography and photomontage in landscape and visual impact assessment.

5.6.3. The EIA process requires that a clear distinction is drawn between landscape and visual impacts, as follows:

- Landscape impacts relate to the degree of change to physical characteristics or components of the landscape, which together form the character of that landscape, e.g. landform, vegetation and buildings; and
- Visual impacts relate to the degree of change to an individual receptor's view of that landscape, e.g. local residents, users of public footpaths or motorists passing through the area.

5.6.4. A detailed study of the existing landscape components, character and views of the will be undertaken in consideration of the following:

- Site context;
- Topography;
- Vegetation, including green infrastructure;
- Roads, public rights of way and access;
- Settlement and land-use;
- Landscape character; and
- Representative views.

5.6.5. This will be supported by and photographs as appropriate. The planning context with respect to landscape character and visual amenity will also be assessed, taking into account relevant European, national, regional and local planning policies. The baseline study will form the basis of the assessment of the predicted impacts of the Proposed Development.

5.6.6. Representative views will be identified through the production of a ZTV assessment that will be undertaken based on the largest structures within the Proposed Development, i.e., the stack(s). The ZTV will be generated using a bare ground Digital Terrain Model (DTM) and be validated through filed work. The following criteria will be used to determine the selection of representative views which form the basis of the visual assessment:

- Receptor function/activity;
- Distance from the Site;
- Topography and elevation;
- Degree and period of exposure;
- Designation of the viewing place; and
- Distribution of receptors.

5.6.7. From the initial site visit and planning policy context review, and based on a stack height of up to 30-45m, a 5km radius study area is proposed for the visual impact assessment of the Proposed Development. Given the existing landscape character of the Site context is dominated by large scale industrial sites, a 2 km study area is proposed for the landscape character assessment. It is not considered that there is a potential for any significant landscape or visual impacts beyond these areas.

5.6.8. Up to six accurate Visual Representations of the Proposed Development for agreed representative views (visual receptors) will be produced in line with the guidance within the Landscape Institute Visual representation of development proposals Technical Guidance Note 02/17 (31 March 2017) and Advice Note 01/11: Photography and photomontage in landscape and visual impact assessment. The location of representative views and photomontages will be agreed in consultation with North Lincolnshire Council and neighbouring authorities as appropriate.

5.6.9. Where the assessment indicates the need for mitigation as a result of significant effects on landscape character or visual amenity, these will be outlined within the ES that forms part of the planning application.

5.7 Surface Water, Flood Risk and Drainage

Scope of the Assessment

5.7.1. The following potential impacts may be associated with the construction and decommissioning of the Proposed Development:

- Increased sediment supply to watercourses through earthworks and erosion of exposed soils by runoff, potentially impacting water quality and geomorphology of water bodies;
- Potential supply of construction material (e.g. concrete) to surface waters through accidental spillage or leakage of fuel oils and lubricants from construction works and vehicles, with impacts on surface water quality;
- Alteration in fluvial and overland flow paths, and potential increase in flood risk, as a result of storing construction materials in the floodplain;
- Increased risk of blockage of drains as a result of increased material (sands, gravels etc.) transported in runoff from site; and
- Increase in flood risk (fluvial, surface water and drainage infrastructure) due to changes to the rate and volume of surface water runoff entering the identified watercourses due to earthworks and changes in land use.

5.7.2. The following potential impacts may be associated with the operation of the Proposed Development:

- Potential operational pollution of surface watercourses from accidental spillages;
- Increased risk of fluvial flooding to the development and surrounding area due to loss of floodplain storage;
- Increased risk of flooding from fluvial flooding to the development and surrounding area over its lifetime due to climate change effects (increasing peak river flows);
- Increase in flood risk (fluvial, surface water and drainage infrastructure) due to an increase in surface water runoff from the development;
- Increase in risk of sewer flooding due to surface water runoff from the development; and
- Increased risk of groundwater flooding (particularly to any below ground development) as a result of high water table and/ or groundwater recharge.

5.7.3. A Flood Risk Assessment (FRA) is required in accordance with the NPPF and NPS EN-1 due to the size (over 1ha) and location of the Proposed Development (in Flood Zone 3). The FRA will consider flood risk from all sources to the Proposed Development as well as the potential for the Proposed Development to increase flood risk off site. This will inform the design of the Proposed Development (including finished ground and floor levels) as well as the EIA.

5.7.4. The EIA will also consider the potential for impacts on surface watercourses and waterbodies in proximity to the Site, including potential impacts on the River Humber.

5.7.5. A surface water management strategy is required in accordance with NLC local policy, (NLC are the Lead Local Flood Authority (LLFA) for the area) and the North East Lindsey IDB, where required. The strategy would outline how surface water runoff from the developed site will be managed to maintain pre-development runoff rates promoting the use of SUDS, where Site conditions allow.

5.8 Ground Conditions and Hydrogeology

Scope of the Assessment

5.8.1. The following potential impacts may be associated with the Proposed Development:

- Disturbance of contaminated soils and contamination of perched groundwater and creation of new pathways to sensitive receptors (including construction workers and controlled waters) during construction;
- Pollution of soils and controlled waters within or near the Site during construction and decommissioning, for example due to the spillage of polluting materials (if an appropriate Environmental Management Plan is not adhered to); and
- Pollution of soils and controlled waters within or near the Site during operation, for example due to the spillage of polluting materials (if materials are not appropriately stored in accordance with an appropriate Environmental Permit, Operational Environmental Management Plan and/or an appropriate drainage system is not implemented and maintained).

5.8.2. A desk based assessment (Phase 1) will be completed to identify potential contaminative uses of the Site. This desk based assessment will identify the potential for land contamination and potential pathways to sensitive receptors. The desk based assessment will consider the potential for contaminants associated with current and historic land use in and around the Site to be present within the footprint of the Proposed Development.

5.8.3. The results of the desk based assessment and conceptual site model will be used to assess data gaps and uncertainties and, if required for the basis of additional site investigation. It is anticipated that the requirements for intrusive investigation will be discussed and agreed in advance with the Environment Agency and North Lincolnshire Council.

5.8.4. An assessment of potential impacts on existing ground conditions will be undertaken as part of the EIA, including the potential for the Proposed Development to result in land contamination, as defined in the Environment Act 1995 Part 2A. Consideration will also be given to potential impacts associated with the construction and operation of the Proposed Development and how these will be prevented or minimised.

5.8.5. Based on the assessment of the baseline and the identification of any potential impacts, the ES will propose appropriate mitigation measures. These may include further intrusive investigation to address residual data gaps or better delineate identified contamination hotspots or plumes, quantitative risk assessment, remediation and validation. It will also propose possible mitigation measures to be employed by contractors, should any previously unidentified contamination be encountered during the construction phase.

5.9 Cumulative Effects

5.9.1. An assessment of potentially significant cumulative effects with other proposed developments in the vicinity of the Proposed Development will be undertaken for each of the topics described above, and reported in the ES.

5.9.2. Information on other developments that have the potential for cumulative effects with the Proposed Development will be identified in consultation with the relevant local planning authorities.

6. Non-Significant EIA Issues

6.1 Introduction

6.1.1. The aim of the scoping stage is to focus the EIA on those environmental aspects that may be significantly affected by the Proposed Development. In so doing, the significance of impacts associated with each environmental aspect becomes more clearly defined, resulting in certain aspects being considered ‘non-significant’. The following section provides a summary of those issues, considered during the preparation of this Scoping Report, which are not considered likely to lead to significant environmental effects. It is proposed that these will, therefore, not be considered in the ES.

6.2 Traffic and Transport

6.2.1. A maximum of 50 HGVs per day are predicted to access the Site at the peak of construction, supported by up to 29 light vehicles, which is significantly below the threshold for further assessment of highway, noise or air quality impacts as outlined in the relevant national DMRB guidance (i.e. changes in Annual Average Daily Traffic (AADT) flows of more than 1,000 vehicles or 200 HGV movements[3]). Construction and operational traffic flow are also likely to significantly below the threshold indicated by the Institute of Air Quality Managers (IAQM) threshold (changes in AADT flows of more than 200 HGV movements or 1,000 total vehicles movements for construction and 100 HGV movements or 500 LDV movements, operational phase[4]).

6.2.2. This small volume of construction traffic would vary throughout the construction period, depending on the requirements of each period and would be unlikely to have the potential to give rise to significant environmental effects. Details of the likely traffic movements during construction and their management would be submitted with the planning application, including consideration of the management of any abnormal loads.

6.2.3. Operational traffic would be even lighter than that required during construction, since only up to six operational roles may be created to operate the plant, and there will be only occasional deliveries of chemicals and materials.

6.3 Waste Management

6.3.1. Due to the size and nature of the Proposed Development, waste arisings are anticipated to be very minor in nature from the operational power plant and would be managed by adopting the procedures already in place for the existing power station. Construction wastes are also not expected to be significant as it is not envisaged that significant spoil volumes would be generated to create the required development platform. Any construction waste arisings will be managed through a Site Waste Management Plan. Any spoil arising from site clearance and preparation works is envisaged to be retained on site for beneficial use. Therefore, significant effects from waste are not anticipated.

6.4 Socio-Economics

6.4.1. The Proposed Development is relatively small scale and will not require a large workforce for its operation. Likewise, while a number of construction jobs will be created, these will be temporary in nature and while beneficial, are not considered significant for the region. The proposed Site is not agricultural land, nor is the proposed route for the gas pipeline from the existing power station. For these reasons the impact upon land use, agriculture and socio-economics are not anticipated to be significant.

6.5 Population and Health

6.5.1. Population and human health can be considered to be the physical, mental and social wellbeing of society. There is currently an emerging body of guidance for considering population and human health in the context of EIA, including recent IEMA guidance following implementation of the revised EIA Regulations. Broadly speaking, this guidance emphasises that the scoping of population and human health issues into EIA should focus on whether the potential impacts are likely to be significant and advocates use of a source-pathway-receptor model to determine the likelihood for plausible health impacts. Consequently, health impacts are not considered plausible where either:

- There is not a clear source from where a potential health impact could originate; or
- The source of a potential health impact lacks a means of transmission to a population; or
- Receptors that would be sensitive or vulnerable to the health impact are not present.

6.5.2. Given that the Proposed Development is sited adjacent to an existing larger operational gas-fired power station and a number of petrochemical sites; and the relatively low number and distance from sensitive receptors, it is not anticipated that the Proposed Development would result in any impact on, or change to, the population and human health.

[3] DMRB Volume 11 Environmental Assessment Section 3 Environmental Assessment Techniques Part 1 Ha 207/07 Air Quality
[4] IAQM guidance 'Land-Use Planning & Development Control: Planning for Air Quality' (2017)

6.5.3. Nevertheless, the air quality and noise assessments being prepared will consider the effects on human health due to emissions, and, for the air impact assessment, with comparison to national air quality objectives set specifically for the protection of human health of the general population. The plant must also comply with emission limits set by Regulations and enforced by the Environment Agency through the environmental permitting regime. It is therefore considered that health effects of the Proposed Development will be insignificant and a separate population and health assessment has therefore been scoped out of the EIA.

6.6 Electronic Interference

6.6.1. The proposed maximum building heights and expected temporary construction cranes would be substantially lower than the existing stacks and cooling towers associated with the existing power station. Therefore an assessment of the Proposed Development's effect on electronic interference is not considered to be required.

6.6.2. Further to this, analogue signals have ceased to be transmitted and have been replaced by digital signals. As such, the Proposed Development's potential to interfere with television, radio (both analogue and digital) and mobile phone reception is considered negligible.

6.7 Aviation

6.7.1. The Civil Aviation Association (CAA) has a general interest in charting all known structures of 91.4m (300 feet) or more above ground level. .

6.7.2. Given the Site's distance from the nearest airfield (Humberside airport, approximately 9.5km to the southwest) and as none of the proposed buildings or structures would be 91.4m or more above ground level (with the tallest structures envisaged to be roughly half that height), an assessment of the potential impacts of the Proposed Development on aviation is not considered to be required. It is therefore proposed that Aviation is scoped out of the EIA.

6.8 Accidental Events/Health and Safety

6.8.1. The description of the Proposed Development in the ES will be prepared so as to provide sufficient information to allow the key environmental issues identified to be adequately assessed. Accidental events such as the potential for fuel spillages and abnormal air emissions and how the risk of these events would be minimised, will be detailed in the relevant chapters of the ES.

6.8.2. Accidental events will be covered by a concise risk assessment in the ES, which will include reference to the Applicant's overarching principles of emergency management. Accidental events are also controlled through the environmental permitting regime and preventative maintenance measures that will be adopted at the Proposed Development. It is therefore not proposed to include a standalone accidental events/health and safety chapter in the ES.

7. Environmental Impact Assessment Scope and Process

7.1 Proposed Scope of the EIA

7.1.1. Based on an evaluation of the baseline environmental information that exists for the Site and surrounding area and the potential environmental effects of the Proposed Development, it is proposed that the EIA will include the following technical disciplines as described in Section 6:

- Planning Policy Context;
- Ecology and Nature Conservation
- Cultural Heritage
- Air Quality and Greenhouse gas Emissions;
- Noise and Vibration;
- Landscape and Visual Amenity;
- Surface Water, Flood Risk and Drainage;
- Ground Contamination and Hydrogeology; and,
- Cumulative and Combined Effects.

7.1.2. As outlined in Section 7, a number of assessments are not considered relevant to the EIA for this Proposed Development, as no significant environmental effects are anticipated to occur. The term 'significant' is an important distinction because a development may cause minor impacts to occur which would not have significant environmental effects. As such, the following topics have been scoped out of the EIA; the rationale for scoping out these topics is provided in Section 7:

- Traffic and Transport;
- Waste management;
- Socio-Economics;
- Population and Health;
- Electronic Interference;
- Aviation;
- Accidental Events/Health and Safety; and

7.2 EIA Methodology and Reporting

7.2.1. Regulation 18(3(a)) of the 2017 EIA Regulations requires the developer to ensure that the ES is prepared by competent experts and the ES must be accompanied by a statement from the developer outlining the relevant expertise or qualifications of such experts. Inputs across the various technical environmental disciplines, as detailed in Section 6, are being provided by appropriately qualified discipline technical specialists from within the AECOM environment team. It is thus considered that the AECOM environmental team who will prepare the ES for the Proposed Development comply with the requirements of Regulation 18 (3(a)).

7.2.2. The ES will set out the process followed during the preparation of the EIA including the methods used for the collection of data and for the identification and assessment of impacts. Any assumptions made will be clearly identified.

7.2.3. The EIA process is designed to be capable of, and sensitive to, changes that occur as a result of changes to the design, including any mitigation measures that are incorporated during the EIA. This will be particularly important for the Proposed Development as the design and layout are still being refined, and technology selection and minor changes are likely to be made following submission of this Scoping Report.

7.2.4. The EIA will be based on a number of related activities, as follows:

- Establishing existing baseline conditions;

- Consultation with statutory and non-statutory consultees throughout the application process;
- Consideration of relevant local, regional and national planning policies, guidelines and legislation relevant to EIA;
- Consideration of technical standards for the development of significance criteria;
- Review of secondary information, previous environmental studies and publicly-available information and databases;
- Physical surveys and monitoring;
- Desk-top studies;
- Computer modelling, as appropriate;
- Reference to current legislation and guidance; and
- Expert opinion.

7.2.5. Impacts will be considered on the basis of their magnitude, duration and reversibility. Cumulative and combined effects will also be considered, where appropriate. Significance will be evaluated on the basis of the scale of the impact and the importance or sensitivity of the receptors, in accordance with standard assessment methodologies (major, moderate, minor and not significant).

7.2.6. Where likely significant environmental effects are identified in the assessment process, measures to mitigate these effects will be put forward in the form of recommendations to be undertaken as part of the development.

7.3 Proposed Structure of the Environmental Statement

7.3.1. The ES will comprise the following set of documents:

- Non-Technical Summary (NTS): this document will provide a summary of the key issues and findings of the EIA in non-technical language;
- Volume I: Environmental Statement: this will contain the full text of the EIA with the proposed chapter headings as follows:
  - Chapter 1: Introduction;
  - Chapter 2: Assessment Methodology;
  - Chapter 3: Description of the Site;
  - Chapter 4: The Proposed Development;
  - Chapter 5: Planning Policy Context;
  - Chapter 6: Air Quality and Greenhouse Gas Emissions;
  - Chapter 7: Noise and Vibration;
  - Chapter 8: Ecology and Nature Conservation;
  - Chapter 9: Landscape and Visual Amenity;
  - Chapter 10: Ground Conditions and Hydrogeology;
  - Chapter 11 Surface Water, Flood Risk and Drainage;
  - Chapter 12: Cumulative and Combined Effects; and
  - Chapter 13: Summary of Significant Residual Effects and Mitigation;
- Volume II: Figures: this will provide supporting figures of the environmental studies conducted during the EIA; and
- Volume III: Technical Appendices: these will provide supplementary details of the environmental studies conducted during the EIA including relevant data tables, figures and photographs. A table outlining the proposed mitigation measures and how they are to be secured will also be provided.

Structure of Technical Chapters

7.3.2. Chapters 6-11will be structured based on the following sub-headings:

Introduction

7.3.3. The Introduction will describe the format of the assessment presented within the chapter.

Legislation and Planning Policy Context

7.3.4. The Legislation and Planning Policy Context section of the technical chapters will provide an overview of the relevant legislation, planning policy and technical guidance to the Proposed Development and the assessment.

Assessment Method and Significance Criteria

7.3.5. The methods used in undertaking the technical study will be outlined in this section with references to published standards (e.g. British Standards, Building Research Establishment), guidelines (e.g. Design Manual for Roads and Bridges and Institute of Environmental Management & Assessment guidelines) and relevant significance criteria.

7.3.6. The significance of effects before and after mitigation will be evaluated with reference to definitive standards, accepted criteria and legislation where available. Where it is not possible to quantify impacts, qualitative assessments will be carried out, based on available knowledge and professional judgment. Where uncertainty exists, this will be noted in the relevant technical assessment chapter.

7.3.7. Specific criteria for each technical assessment will be developed, giving due regard to the following:

- Extent and magnitude of the impact;
- Impact duration (whether short, medium or long-term);
- Impact nature (whether direct or indirect, reversible or irreversible);
- Whether the impact occurs in isolation, is cumulative or interactive;
- Performance against environmental quality standards where relevant;
- Sensitivity of the receptor; and
- Compatibility with environmental policies and standards.

7.3.8. For issues where definitive quality standards do not exist, significance will be based on the:

- Local, district, regional or national scale or value of the resource affected;
- Number of receptors affected;
- Sensitivity of these receptors; and
- Duration of the impact.

7.3.9. In order to provide a consistent approach to expressing the outcomes of the various studies undertaken as part of the EIA, and thereby enable comparison between effects upon different environmental components, the following terminology will be used throughout the ES to define effects:

- Adverse – detrimental or negative effect to an environmental resource or receptor; or
- Beneficial – advantageous or positive effect to an environmental resource or receptor; and
- Negligible – imperceptible effect to an environmental resource or receptor; or
- Minor – slight, very short or highly localised effect of no significant consequence; or
- 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.

7.3.10. As indicated above, for the purpose of this EIA, moderate and major effects will be deemed ‘significant’. Where possible, mitigation measures will be identified to reduce the effects to ‘not significant’.

7.3.11. Each of the technical chapters will provide the criteria, including sources and justifications, for quantifying the different levels of residual effect. Where possible, this will be based upon quantitative and accepted criteria, together with the use of value judgement and expert interpretation to establish to the scale of an effect.

Baseline Conditions

7.3.12. In order to assess the potential impacts and effects of the Proposed Development, it is necessary to determine the environmental conditions that currently exist on site and in the surrounding area, for comparison. These are known as the 'existing baseline conditions'. Existing baseline conditions are determined using the results of site surveys and investigations or desk-based data searches, or a combination of these, as appropriate.

7.3.13. In order to compare future operations against the baseline that is likely to occur at the time of full operation, for most technical disciplines it will be necessary to establish future baseline conditions taking account of any planned or likely changes.

Development Design and Impact Avoidance

7.3.14. Measures that have been integrated into the Proposed Development in order to avoid or reduce adverse environmental effects will be described. Such measures may include refinement of the design and layout of the Proposed Development to minimise impacts on sensitive receptors, implementation of Construction and Operational Environmental Management Plans, and adherence of relevant legislation, guidance and best practice.

Likely Impacts and Effects

7.3.15. This section will identify the potential impacts resulting from the Proposed Development. The magnitude of impacts are defined with reference to the relevant baseline conditions (existing or future, as appropriate), and effects are determined in accordance with the identified methodology.

Mitigation

7.3.16. The mitigation section will describe the measures that will be implemented by the Applicant to reduce any significant adverse effects identified by the assessment and enhance beneficial effects during construction and operation of the Proposed Development. The means by which any mitigation would be secured will also be explained.

Residual Effects and Conclusions

7.3.17. Effects of the Proposed Development remaining following the implementation of available mitigation measures are known as 'residual effects'. These will be discussed for each of the potential effects, and their significance level identified.

Cumulative and Combined Effects

7.3.18. In accordance with the EIA Regulations, consideration will also be given to the potential for cumulative impacts to arise. Other developments to be considered in the cumulative impact assessment will be agreed with North Lincolnshire Council.

7.3.19. Cumulative impacts are those that could arise from a number of development activities. The impact of the Proposed Development will be considered in conjunction with the potential impacts from other projects or activities which are both reasonably foreseeable in terms of delivery (e.g. have planning permission) and are located within a realistic geographical scope, where environmental impacts could act together to create a more significant overall effect.

7.3.20. The combination of predicted environmental impacts resulting from a single development on any one receptor that may collectively cause a greater effect (such as the combined effects of noise and air quality/ dust impacts during construction on local residents), are referred to as combined effects. Combined effects will also be assessed in the ES that forms part of the planning application.

Consultation

7.3.21. The process of consultation is critical to the development of a comprehensive and balanced ES. The views of statutory and non-statutory consultees serve to focus the environmental studies and to identify specific issues that require further investigation. Consultation is an ongoing process, which enables mitigation measures to be incorporated into the project design thereby limiting adverse effects and enhancing environmental benefits.

7.3.22. Public Consultation events will also be arranged potentially including public exhibitions, leafleting and the provision of information through a website. The details of these arrangements are yet to be determined.

8. Summary

8.1.1. This EIA Scoping Report has identified the potential for significant effects to arise from the construction and operation of the Proposed Development and therefore an EIA will be prepared to support the planning application for the Proposed Development, which will be focussed on the key issues identified in this report. The following technical specialist assessments are proposed to be undertaken as part of the EIA:

- Ecology and Nature Conservation;
- Cultural Heritage;
- Air Quality and Greenhouse Gas Emissions;
- Noise and Vibration;
- Landscape and Visual Amenity;
- Surface Water, Flood Risk and Drainage;
- Ground Contamination and Hydrogeology; and
- Cumulative and Combined Effects.

8.1.2. The detailed assessments for each of these topics will be undertaken in accordance with standard guidance and best practice as outlined in this report and reported in the ES that accompanies the planning application. Where significant effects are identified, mitigation measures will be described, where possible, to reduce the residual effects.

8.1.3. This EIA Scoping Report is submitted to North Lincolnshire Council with a formal request for a Scoping Opinion in accordance with Regulation 15 of the EIA Regulations.

Figures

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

Red Line Boundary

Purpose of Issue: FINAL

Client: VPI IMMINGHAM

Project Title: VPI-IMMINGHAM ENERGY PARK 'A'

Drawing Title: SITE LOCATION

Drawn	Checked	Approved	Date
JW	BB	MS	20/12/2017

AECOM Internal Project No.	Scale @ A3	Inset Map
60547702	1:30,000	/ 1:200,000

AECOM
Midpoint
Alencon Link, Basingstoke
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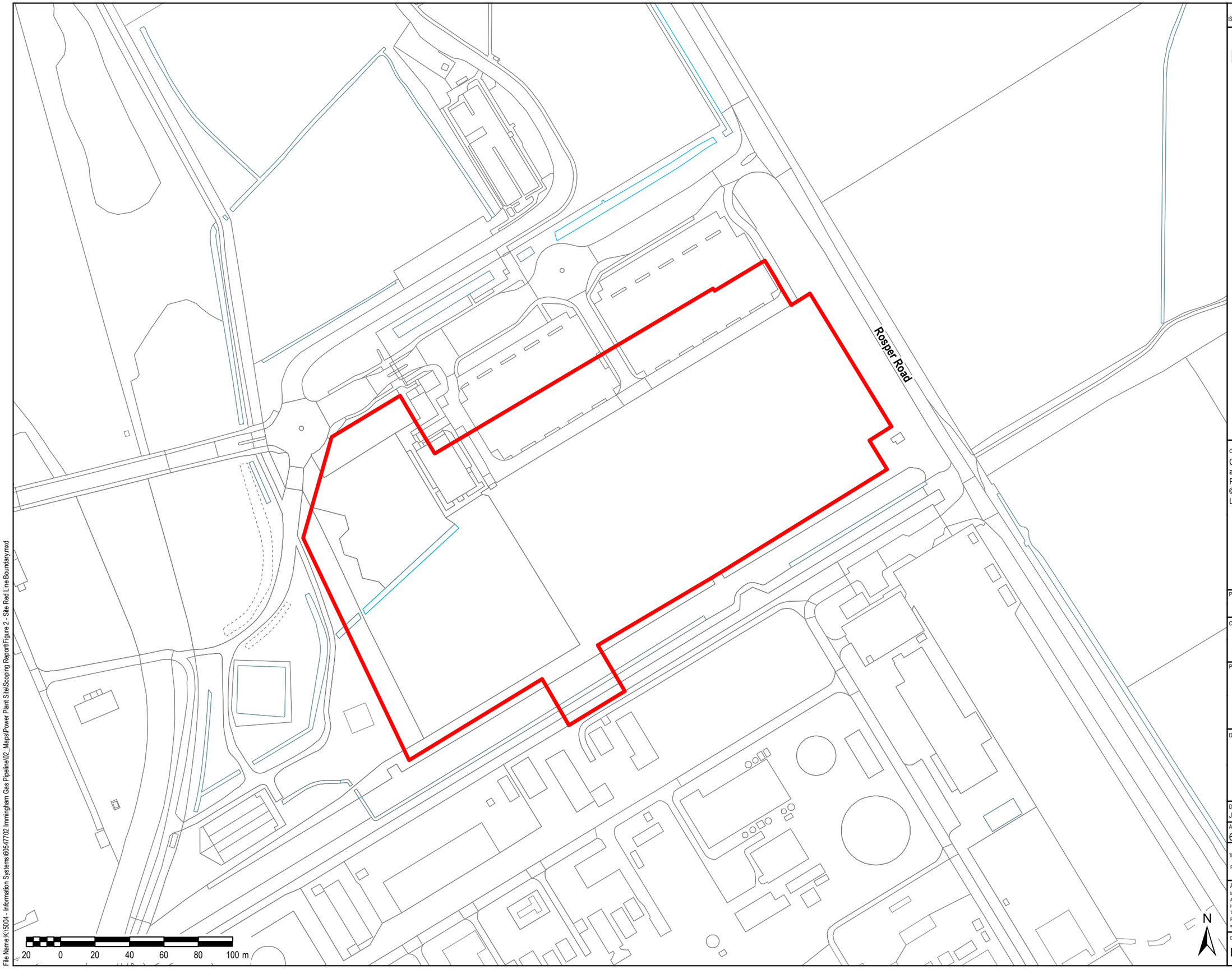

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LEGEND

Red Line Boundary

Purpose of Issue: FINAL

Client: VPI IMMINGHAM

Project Title: VPI-IMMINGHAM ENERGY PARK 'A'

Drawing Title: SITE RED LINE BOUNDARY

Drawn	Checked	Approved	Date
JW	BB	MS	07/12/2017

AECOM Internal Project No.	Scale @ A3
60547702	1:2,000

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Drawing Number: **FIGURE 2**

Rev:

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Scoping Report\Figure 2 - Site Red Line Boundary.mxd

Appendix A: Preliminary Ecological Appraisal

VPI Immingham

Preliminary Ecological Appraisal (PEA) Report

Client: VPI Immingham

Project Number: 60547702

November 2017

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	October 2017	Draft for internal review			
1	November 2017	Revised to following client comments			

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Summary

VPI Immingham is considering developing a new power station on land adjacent to the existing Combined Heat and Power (CHP) on Rosper Road in North Killingholme, North Lincolnshire (the 'Power Plant Area'). The proposed development is in the early stage of development with VPI considering submitting an application under planning legislation. This appraisal is intended to contribute to the evidence base to support any future Ecological Impact Assessment that may be required.

The habitat assemblage within the Power Plant Area boundary represents an example of the Open Mosaic Habitats on Previously Developed Land (OMH) habitat type which has developed through natural colonisation of a previously disturbed area and includes the following habitat types: ephemeral/ short perennial, neutral grassland, temporary standing water, scattered scrub, tall herbs and localised swamp vegetation. This habitat is considered, based on available data, to be of moderate-high biodiversity value.

Further surveys for protected and notable species are recommended in advance of the submission of the DCO planning application as follows:

- Great crested newt – known presence in off-site ponds and there is suitable terrestrial and pond habitat within the Power Plant Area;
- Reptiles – the Open Mosaic Habitat represents suitable habitat for reptiles;
- Habitat surveys – a survey of the Open Mosaic Habitat (OMH) during early summer is required for EcIA and to determine mitigation requirements;
- Breeding birds – potential importance for breeding species;
- Terrestrial invertebrates (preliminary appraisal) – the habitat context of the site (OMH) provides opportunities for a range of terrestrial invertebrates, possibly nationally or regionally notable species.

The Power Plant Area is located approximately 1.4 km south-west of the Humber Estuary SSSI, SAC, SPA and Ramsar. The DCO application is therefore likely to require a Habitat Regulations Assessment (HRA) signposting report to support HRA screening for Likely Significant Effects (LSE) by the relevant competent authority. It is considered unlikely that the construction and operation of the proposed development would directly impact these designations at the distance concerned.

1. Introduction

1.1 Purpose of Survey

AECOM was instructed by VPI Immingham to carry out a Preliminary Ecological Appraisal (PEA) of habitats within the footprint of a proposed new power station. This would be on land adjacent to the existing Combined Heat and Power (CHP) plant on Rosper Road. The Site is located to the north of and adjacent to the existing Rosper Road CHP plant, and to the west of the Lindsey Oil Refinery off Rosper Road in North Killingholme, North Lincolnshire. The proposed development is in the early stage of development with VPI considering submitting an application under planning legislation. This appraisal is intended to contribute to the evidence base to support any future Ecological Impact Assessment that may be required.

The boundary of the proposed power station site is shown by the red line boundary on Figure 1. This area is referred to as the 'Power Plant Area' herein.

This PEA was commissioned to identify whether there are known or potential ecological features (nature conservation designations, and protected and notable habitats and species) that may constrain or influence the design and implementation of the proposed development. The approach applied when undertaking this PEA accords with the *Guidelines for Preliminary Ecological Appraisal* published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2013). The PEA addresses relevant wildlife legislation and planning policy as summarized in Section 2 of this report, and is consistent with the requirements of *British Standard 42020:2013 Biodiversity. Code of Practice for Planning and Development*.

1.2 Scope of Works

In order to deliver the PEA, a desk study and an extended Phase 1 Habitat survey were undertaken by an appropriately experienced ecologist, to identify ecological features within the site and the wider potential zone of influence of the proposed development (where access to adjacent land had been agreed). The potential zone of influence (see also Section 3: Methods) was defined with reference to available information about the likely nature of the proposed scheme.

The purpose of the PEA was to:

- identify and categorise all habitats associated with the proposed scheme and any adjacent areas where there may be potential for direct or indirect effects (the "zone of influence");
- carry out an appraisal of the potential of the habitats recorded to support protected or notable species of fauna and flora;
- provide advice on any potential ecological constraints and opportunities in the zone of influence, including the identification (where relevant) of any requirements for follow-up habitat and species surveys and/or requirements for ecological mitigation; and
- provide a map showing the location of the identified ecological features of relevance.

The purpose of this report is to provide a high level appraisal of the ecological risks and opportunities associated with the proposed scheme and to provide a basis for the assessment of the likely relevant ecological features that might be impacted by the proposed scheme, and requirements for further survey and impact assessment to assess this further. The report makes evidence based recommendations on the scope of further work (where necessary) that would be required to support a planning application. High level recommendations are made on (a) potential options for the avoidance, mitigation or compensation of the potential impacts of the proposed development (where known or where they can reasonably be anticipated) on the identified ecological features in accordance with objectives to deliver No Net Loss for biodiversity, and (b) potential enhancements that could be delivered in accordance with objectives to secure Net Gain for biodiversity as a consequence of new development.

1.3 Background Information

The ecological survey work described above undertaken by AECOM follows an earlier walkover of the site to identify likely environmental constraints to the proposed development by SLR Consulting in January 2017 (SLR

Consulting, 2017). Wintering bird surveys were subsequently undertaken by Graham Catley on behalf of SLR Consulting in the period January to March 2017 (Catley, 2017).

2. Wildlife Legislation and Planning Policy

2.1 Wildlife Legislation

The following wildlife legislation is potentially relevant to the proposed scheme (Table 2.1). This legislation has been considered when planning and undertaking this PEA using the methods described in Section 3, when identifying potential constraints to the proposed scheme, and when making recommendations for further survey, design options and mitigation, as discussed in Section 5. Compliance with legislation may require the attainment of relevant protected species licences prior to the implementation of the proposed scheme.

Further information on the requirements of the above legislation is provided as Appendix B.

Table 2.1: Summary of Relevant Legislation

Document	Requirements/ Purpose
The Conservation of Habitats and Species Regulations 2010 (as amended) (the Habitats Regulations)	Affords protection to European Protected Species, such as bats and great crested newt (*Triturus cristatus*), listed on Schedule 2. It is an offence (subject to exceptions) to deliberately capture, kill, disturb or trade in listed animals. In certain circumstances, licences can be granted to permit some actions prohibited under the Act. Regulation 9A of the Conservation of Habitats and Species (Amendment) 2012 Regulations requires that competent authorities must take such steps in the exercise of their functions as they consider appropriate to secure the preservation, maintenance and re-establishment of a sufficient diversity and area of habitat for wild birds … as appropriate, and having regard to the requirements of Article 2 of the new Wild Birds Directive. This includes the use of planning and development control measures.
Wildlife and Countryside Act 1981 (as amended) (WCA)	Part 1 of the Act affords general protection to all species of wild bird and specific protection to flora and fauna listed on Schedules 1 (birds protected by special penalties), 5 (other animals) and 8 (flora, fungi and lichens). In certain circumstances, licences can be granted to permit some actions prohibited under the Act. The Act contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, including prohibiting the planting and spread of plants listed in Schedule 9.
Countryside and Rights of Way (CRoW) Act 2000	The Act increases powers for the protection and management of SSSIs and places a duty on public bodies to further the conservation and enhancement of SSSIs.
Natural Environment and Rural Communities (NERC) Act 2006	Section 41 (s41) includes a list of habitats and species of principal importance for nature conservation in England which is to be used by decision-makers to guide the implementation of their duties under section 40 of the Act, so as to have regard to the conservation of biodiversity in England, when carrying out their normal functions.
Protection of Badgers Act 1992	If badger (*Meles meles*) is present, the legislation may have a bearing on post-consent implementation and mitigation, and the baseline evidence required to support development of this. Legislation makes it an offence to kill or take a badger, to cruelly ill-treat a badger, or to interfere with a badger sett, including disturbing a badger while it is occupying a sett. In certain circumstances, licences can be granted to permit some actions prohibited under the Act.
Water Framework Directive (WFD) 2000	Proposed developments or activities that have the potential to affect the water environment require a WFD Assessment. Compliance with the WFD means attainment of good ecological status, prevention of deterioration in status, and prevention of failure to achieve future attainment of good status where it is not already achieved within waterbodies. However, Article 4.7 provides legislation for exemption conditions that could allow implementation of schemes that cause deterioration in ecological status, for example for reasons of overriding public interest

2.2 Relevant Planning Policy and Related Guidance

Relevant national and local planning policies and related guidance applicable to North Lincolnshire are detailed in Table 2.2. For the precise wording of each specific policy please refer back to the source documents. This planning policy has been considered when assessing potential ecological constraints and opportunities identified by the desk study and field surveys; and, when assessing requirements for further survey, design options and ecological mitigation, as described in Section 5.

Table 2.2: Summary of Planning Policy

Document	Planning Policy	Purpose
National Planning Policy Framework (NPPF)	Section 11	Relates specifically to "Conserving and Enhancing the Natural Environment". Paragraph 109 states that "*The planning system should contribute and enhance the natural and local environment by:* • *Protecting and enhancing valued landscapes, geological conservation interests and soils;* • *Recognising the wider benefits of ecosystem services; and* • *Minimising impacts on biodiversity and providing net gains in biodiversity where possible, … including by establishing coherent ecological networks that are more resilient to current and future pressures; ...*" Paragraph 113 adds to this and states: "*When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles:* • *if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused; …* • *planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss; …*"
Core Strategy	CS5	New development should incorporate appropriate landscaping and planting which enhances biodiversity and contribute to habitat linkages.
	CS16	Protect, enhance and support a diverse multi-functional landscape, including through the protection of trees and hedgerows.
	CS17	Promote effective stewardship of biodiversity resources by protecting national and international nature conservation designations, paying due regard to the presence of European and nationally protected species, protecting and maintaining features of biodiversity and geological interest, maintaining wildlife networks and green corridors, and ensuring ecological enhancement through good design.
	CS21	Planning applications for mineral extraction should, where appropriate, contribute to the attainment of local biodiversity targets. [e.g. as detailed in the LBAP and NRA profile]
Local Plan	LC1	Affords protection to international nature conservation designations.
	LC2	Affords protection to national nature conservation designations.
	LC4	Affords protection for sites of local nature conservation importance.
	LC5	Prohibits development that would have an adverse impact on protected species, except where appropriate mitigation can be delivered.
	LC6	Promotes ecological enhancement through the creation of new

Document	Planning Policy	Purpose
		habitats, including restoration of former mineral workings to a nature conservation end use.
Standing Advice	-	The purpose of standing advice is to guide decision-makers on the determination of proposals with potential to affect protected species. The guidance sets out responsibilities and minimum requirements for survey and mitigation.
Providing and protecting habitat for wild birds	-	Standing advice to local planning authorities on how they should maintain wild bird populations by supporting and protecting their habitats. This guidance has been prepared to support delivery of a legal obligation specified through amendment of the Habitats Regulations. It is important to acknowledge that this guidance requires competent authorities to 'consider' and 'take steps', but it does not require the complete protection of all bird habitats, the mitigation of all losses, and there are no national population targets have been set for wild birds.
NE399	-	NCA profiles are guidance documents intended to help local decision-making. The information they contain supports the planning of conservation initiatives at a landscape scale, informs the delivery of Nature Improvement Areas and encourages broader partnership working through Local Nature Partnerships. Each profile includes a description of the relevant natural and cultural features. Statements of Environmental Opportunity (SEOs) are suggested, which draw on this integrated information. The SEOs offer guidance on the critical issues, which could help to achieve sustainable growth and a more secure environmental future.

3. Methods

3.1 Desk Study

A desk study was carried out to identify nature conservation designations, and protected and notable habitats and species potentially relevant to the proposed scheme.

A stratified approach was taken when defining the desk study area, based on the likely worst case zone of influence of the proposed development on different ecological features, and an understanding of the maximum distances typically considered by statutory consultees. Accordingly, the desk study identified any international nature conservation designations within 5 km of the proposed scheme[1]; other statutory nature conservations designations within 2 km of the proposed scheme, and local non-statutory nature conservation designations and protected and notable habitats and species within 1 km of the proposed scheme.

The desk study was carried out using the data sources detailed in Table 3.1. Protected and notable habitats and species include those listed under Schedules 1, 5 and 8 of the WCA; Schedules 2 and 5 of the Habitats Regulations; species and habitats of principal importance for nature conservation in England listed under section 41 (s41) of the NERC Act; and other species that are Nationally Rare, Nationally Scarce or listed in national or local Red Data Lists and Biodiversity Action Plans.

Table 3.1: Desk study data sources

Data Source	Date obtained	Data Obtained
Multi-Agency Geographic Information for the Countryside (MAGIC) website	08/09/2017	• International statutory designations within 5 km • Other statutory designations within 2 km • Ancient woodlands and notable habitats within 1 km • Higher Level Environmental Stewardship agreements applied to the site • Information on habitats and habitat connections (based on aerial photography) relevant to interpretation of planning policy and assessment of potential protected and notable species constraints
Greater Lincolnshire Nature Partnership	22/09/2017	• Non-statutory designations within 1 km • Protected and notable species records within 1 km (records for the last 10 years only)
Ordnance Survey 1:2500 Pathfinder maps and aerial photography	08/09/2017	• Information on habitats and habitat connections (based on aerial photography) relevant to interpretation of planning policy and assessment of potential protected and notable species constraints
Lincolnshire BAP (LBAP) (Lincolnshire Biodiversity Partnership, 2011)	08/09/2017	• General information on Local Biodiversity Action Plan Priority Habitats and Species
North Lincolnshire Local Plan Proposals Map	08/09/2017	• Non-statutory designations within 1 km • Designated green corridors, wildlife networks and other such features
VPI Immingham – Site Walkover Report (SLR, 2017)	Sept 2017	• Habitat and protected species appraisal for the proposed plant area
VPI Immingham – Wintering Bird Report (Catley, 2017)	Sept 2017	• Wintering bird records within the proposed plant area.

[1] This may need to be extended when undertaking detailed EcIA to consider e.g. air quality effects, where the potential zone of influence of the proposed development may be greater than 5 km.

3.2 Field Survey

3.2.1 Phase 1 Habitat Survey

A Phase 1 Habitat survey was undertaken in accordance with the standard survey method (Joint Nature Conservation Committee, 2010). Phase 1 Habitat survey is a standard method of environmental audit. It involves categorising different habitat types and habitat features within a survey area. The information gained from the survey can be used to determine the likely ecological value of a site, and to direct any more specific survey work which may need to be carried out prior to the submission of a planning application. The standard Phase 1 Habitat survey method can be "extended" to record target notes on protected, notable and invasive species.

The survey was undertaken on 7th September 2017 by a suitably qualified AECOM ecologist who recorded and mapped habitat types present within the survey area, along with any associated relevant ecological features observed. The survey area encompassed all safely accessible parts of the Power Plant Area.

Where relevant to the PEA, target notes (Appendix C) were recorded and the position of these is shown on the Phase 1 Habitat map (Figure 1). Typical and notable plant species were recorded for different habitat types and reflect the conditions at the time of survey. This was not intended to be a detailed inventory of the plant species present in the survey area, as this is not required for the purposes of Phase 1 Habitat survey.

3.2.2 Appraisal of potential suitability of habitats to support protected and notable species

An appraisal was made of the potential suitability of the habitats present to support protected and notable species of plants or animals. Field signs, habitat features with potential to support protected species and any sightings or auditory evidence were recorded when encountered. No detailed surveys were carried out for any particular species, because such surveys are beyond the scope of this PEA, with the exception of the following:

- examination of aerial photography and 1:2,500 Ordnance Survey mapping to attempt to identify all potential permanent standing waters within 500 m of the Power Plant Area and Proposed Pipeline Corridor respectively. This process could not guarantee to definitively identify all waterbodies present, but is the best that can be achieved within the limits of available data; and
- inspection of all of the accessible standing waters their suitability for great crested newt (*Triturus cristatus*). In particular, the aim was to identify permanent waterbodies (referred to as ponds in this report) which would need further survey, and temporary standing waters which could be discounted as they would not retain water for long enough to allow breeding by great crested newt.

A note was made of visible instances of invasive non-native plant species listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), including Japanese knotweed (*Fallopia japonica*). Locations of plants or stands of any such invasive non-native plant species found were recorded.

Section 5 of this report identifies further requirements for species survey based on the results of the habitat survey. These surveys should be completed prior to submission of a planning application as the results are likely to be material for determination of the planning application.

3.3 Limitations

3.3.1 Desk Study

The data provided from meta-databases is based on existing records but does not necessarily constitute a comprehensive list of protected and notable species records. These records are not exhaustive, as there is currently no national or regional policy for systematic data gathering. Therefore, absence of data does not constitute evidence of absence. It is also possible that other data exist within this area that has not been made available to AECOM. The quality of the ecological data from the different sources may be highly variable.

3.3.2 Power Plant Area

The red line boundary that is shown on Figure 1 and 2 is similar to the red-line boundary that was used for the field survey, however, due to subsequent phases of the evolving scheme design, the boundary of the Power Plant Area was extended slightly to include the north-western part compartment of the Power Plant Area to the east of

the building and car park. This area was not accessible or visible at the time of the field survey and the habitat was mapped based on analysis of aerial photography. To reduce the effect of this limitation a second survey of the Open Mosaic Habitat is proposed in early summer 2017 (refer to Section 6.3).

4. Desk Study Results

4.1 Nature Conservation Designations

4.1.1 Statutory Designations

Table 4.1 details the statutory nature conservations designations identified by the desk study, based on the method given in Section 3.1 of this report. The designations are listed in descending order, with those closest to the proposed scheme listed first.

Table 4.1: Statutory nature conservation designations

Designation	Reason(s) for Designation	Relationship to the Power Plant Area
Humber Estuary SAC	Internationally important for its estuary and inter-tidal mudflat and sandflat habitats. Other qualifying features encompass: <u>Habitats</u> • Sandbanks which are slightly covered by sea water all the time • Coastal lagoons • Salicornia and other annuals colonizing mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Embryonic shifting dunes • Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") • Fixed coastal dunes with herbaceous vegetation ("grey dunes") • Dunes with *Hippophae rhamnoides* <u>Species</u> • Sea lamprey (*Petromyzon marinus*) • River lamprey (*Lampetra fluviatilis*) • Grey seal (*Halichoerus grypus*)	1.4km to the north-east
Humber Estuary SPA	The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. In summer, it supports important breeding populations of bittern (*Botaurus stellaris*), marsh harrier (*Circus aeruginosus*), avocet (*Recurvirostra avosetta*) and little tern (*Sterna albifrons*).	1.4km to the north-east
Humber Estuary Ramsar	Internationally important as a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons. Internationally important for its breeding colony of grey seal, and its assemblage of non-breeding and wintering waterfowl and the component populations of individual bird species.	1.4km to the north-east
Humber Estuary SSSI	Supports a series of nationally important habitats. These are the estuary itself (with its component habitats of intertidal mudflats and sandflats and	1.4km to the north-east

Designation	Reason(s) for Designation	Relationship to the Power Plant Area
	coastal saltmarsh) and the associated saline lagoons, sand dunes and standing waters. The site is also of national importance for the geological interest at South Ferriby Cliff (Late Pleistocene sediments) and for the coastal geomorphology of Spurn. The estuary supports nationally important numbers of 22 wintering waterfowl and nine passage waders, and a nationally important assemblage of breeding birds of lowland open waters and their margins. It is also nationally important for a breeding colony of grey seal, river lamprey and sea lamprey, a vascular plant assemblage and an invertebrate assemblage.	

4.1.2 Non-statutory Designations

Table 4.2 details the non-statutory nature conservation designations identified by the desk study based on the method given in Section 3.1 of this report. The designations are listed in descending order, with those closest to the Power Plant Area and Proposed Pipeline Corridor listed first.

There are no ancient woodlands in the search area, and there are no Higher Level Countryside Stewardship agreements applied to land in the boundary of the proposed scheme.

Table 4.2: Non-statutory nature conservation designations

Designation	Reason(s) for Designation	Relationship to the Power Plant Area
Eastfield Road Railway Embankment LWS	Strip of sheltered, botanically-rich woodland glades containing a variety of grassland species with a calcareous influence and some scrub.	>1km
Burkinshaw's Covert LWS	Woodland dating from 1800's with scattered scrub and seasonally wet areas which support rapidly changing flora such as St John's-wort, meadow vetchling, hairy buttercup and glaucous sedge.	0.4km north
Station Road Field LWS	Predominantly grassland site with decent floristic diversity and small area of wetland which supports good range of common farmland bird and butterfly species (including yellowhammer, meadow brown and ringlet). Pond adjacent to site boundary held breeding great crested newts in 2006.	0.4km north
Rosper Road Pools LWS	Artificial Flood Relief Reservoir with occasionally species-rich grassy sward. Site supports many breeding, wintering and migrant birds, associated with both wetland and scrubby habitat. Water vole was recorded in 2002, and the fauna as a whole is likely to be rich.	0.6km south

5. Results

5.1 Habitats

5.1.1 Phase 1 Habitat Types within the Power Plant Area

The Power Plant Area is set in a landscape dominated by the industrial areas of Lindsey Oil Refinery, VPI Immingham CHP Plant and the arable and improved grassland areas to the east of Rosper Road, between the road and the Humber Estuary. The semi-natural habitat surrounding the Power Plant Area is dissected by a series of man-made drains.

There are two small areas of apparently permanent standing water within the Power Plant Area that are dominated by emergent swamp vegetation (Ponds 1 & 2 [refer to Figure 2] at Target Notes 1 and 2). These have developed on areas of impeded drainage within the site. Within 500 m of the Power Plant area there is a pond approximately 450m to the north close to the western boundary of Rosper Road. An emergency water storage lagoon is located within the boundary of the Lindsey Oil refinery approximately 150 m south-east of the Power Plant Area (Pond 3 [refer to Figure 2]).

The habitats recorded within the Power Plant Area boundary are described below and summarised in Table 5.1, with the latter summarising their relative extent and contribution to the total land area within or immediately bordering the Power Plant Area. The distribution of each habitat is shown on Figure 2. The associated target notes are provided in Appendix C and located on Figure 2. Illustrative photographs are provided where relevant in Appendix D.

The habitat assemblage within the Power Plant Area boundary is considered to represent an example of the Open Mosaic Habitats on Previously Developed Land (OMH) priority habitat type detailed in 5.1.2 of this report. This habitat has developed through natural colonisation of a previously disturbed area, which it is understood was used for the storage of material cleared from the area north of the Power Plant Area during construction of the adjacent car park (SLR Consulting, 2017). Consequently the habitat is undulating with vegetated mounds of rubble/ spoil.

Semi-improved neutral grassland

This is the main habitat type in the northern part of the Power Plant Area (Photo 1). This grassland is typified by a rank unmanaged grass dominated sward with locally abundant tufted hair-grass (*Deschampsia caespitosa*) indicating where ground is drainage impeded during the winter. The grassland is species poor and forb species include locally frequent teasel (*Dipsacus fullonum*), colt's-foot and creeping thistle (*Cirsium arvense*), with occasional fleabane (*Pulicaria dysenterica*) and rare wild carrot (*Daucus carota*).

This habitat contributes to the Open Mosaic Habitats on Previously Developed Land (OMH) detailed in 5.1.2 of this report. OMH is not a discrete habitat for the purposes of Phase 1 Habitat survey, but instead is a matrix derived from a variety of different habitat types and associated habitat and land-use features and characteristics, and edaphic conditions

Swamp vegetation

There are small localised areas where ground is drainage impeded, where sea-club rush (*Bolboschoenus maritimus*) and bulrush (*Typha latifolia*) are abundant (Photograph 2). Two permanently shallow ponds are located in the northern part of the Power Plant Area at the base of the bunds. Both supported vegetation that indicated the area holds water for much of the year, although seasonal drying (or a reduction in extent) in the summer months cannot be ruled out. The southern pond (Pond 1 [refer to Figure 2], Target Notes 1, Photograph 3 & 4) supports a high emergent cover of common spike rush (*Eleocharis* sp.) with frequent bulrush and rare grey club-rush (*Schoenoplectus tabernaemontani*) whereas the northern pond is characterised by abundant bulrush (Pond 2 [refer to Figure 2] Target Note 2).

This habitat contributes to the OMH habitat type detailed in 5.1.2 of this report.

Ephemeral/ short perennial

This is a transitional habitat resulting from colonisation of bare ground and spoil (including hummocks of limestone pebbles) by ruderal plant species. The habitat blends into the semi-improved neutral grassland and tall ruderal habitat (Target Note 4; Photographs 5-13).

Higher plants occur at high cover (>50% total cover), with forb species present including locally abundant creeping cinquefoil (*Potentilla reptans*) and colt's-foot (*Dactylis glomerata*) with frequent bristly ox-tongue (*Picris echioides*), fleabane, willowherb (*Epilobium* spp.) species and ribwort plantain (*Plantago lanceolata*). There is occasional scentless mayweed (*Tripleurospermum inodorum*), yellow-wort (*Blackstonia perfoliata*), common century (*Centaurium erythraea*), and ragwort (*Senecio jacobaea*) and, rarely occurring, knapweed (*Centauria nigra* agg.) and blue fleabane (*Erigeron acer*).

This habitat contributes to the OMH habitat type detailed in 5.1.2 of this report.

Tall herbs

The raised areas of the bunds and spoil heaps have been colonised by tall ruderal species including hemlock (*Conium maculatum*), creeping thistle and great willowherb (*Epilobium hirsutum*) [Target Note 3; Photograph 14]. This habitat contributes to the OMH habitat type detailed in 4.2.2 of this report.

Scattered scrub

There are localised areas of scattered sallow *(Salix* spp.) dominated scrub, mainly associated with the tall herb areas.

This habitat contributes to the OMH habitat type detailed in 4.2.2 of this report.

Table 5.1: Habitats present within the Power Plant Area , in descending order based on spatial area occupied (refer to footnote)

Habitat	Area (ha)	% of Site area (approx.)
Semi-improved neutral grassland	0.33	6.68%
Ephemeral/ Short perennial	2.8	55.45%
Tall ruderal herbs	0.48	9.6%
Swamp vegetation	0.04	0.87%
Bare Ground[1]	0.46	9.2%
Hard Standing (car park)	0.84	16.9%
Buildings	0.06	1.25%

1 Mapped based on analysis of aerial photograph

5.1.2 Phase 1 Habitat Types adjacent to the Power Plant Area

The following Phase 1 habitat types were recorded immediately adjacent to the proposed Power Plant Area within land owned by the Lindsey Oil Refinery.

Ephemeral/ Short Perennial

This is a transitional habitat located immediately adjacent to the Power Plant Area resulting from colonisation of bare ground by ruderal plant species and grasses, for example Yorkshire-fog (*Holcus lanatus*). Forb species include locally frequent bird's-foot trefoil (*Lotus corniculatus*) and occasional yellow-wort, common centaury, scarlet pimpernel (*Anagallis arvensis*) and, rarely occurring, blue fleabane. There are localised areas dominated by creeping thistle (Target Note 5; Photograph 16).

This habitat contributes to the OMH habitat type detailed in 5.1.2 of this report.

Tall Ruderal/Scattered Scrub/Ditch/Standing Water

There is a small stand of impenetrable tall ruderal and scattered scrub habitat between the aforementioned stand of ephemeral vegetation and the railway (Target Note 6). There is scattered hawthorn (*Crataegus monogyna*) and dog rose (*Rosa canina* agg.) amongst a field layer of frequent teasel, locally frequent great willowherb and frequent false-oat-grass (*Arrhenatherum elatius*). Bramble (*Rubus fruticosus* agg.) is dominant throughout. The area is dissected by two short sections of drain with dominant emergent bulrush.

The emergency water storage lagoon within the Lindsey Oil Refinery referred to above is located in the northern part of this area, but was inaccessible at the time of the survey (Pond 3 [refer to Figure 2]).

Built Structure - Settling Lagoons

These artificial structures contained stagnant water with no emerging macrophyte vegetation and appeared to be of negligible important for wildlife (Target Note 7, Photograph 15). These lagoons are part of the industrial processes within the oil refinery, and as such are likely to be periodically emptied and/ or maintained. They are therefore discounted from further consideration because there is no reasonable likelihood of them supporting any protected species.

5.1.3 Notable Habitats

Table 5.2 provides a summary of notable habitats within the Power Plant Area based on the results of the Phase 1 Habitat survey and with reference to guidance for the recognition of NERC Act S41 (Maddock, 2011), LBAP and Local Wildlife Site (LWS) (Greater Lincolnshire Nature Partnership, 2013) habitats. This assessment is preliminary and further surveys may be required to investigate the value of habitats further, as detailed in Section 7 of this report.

Table 5.2: Notable habitats associated with the Power Plant Area

Habitat	NERC Act?	LBAP?	LWS Quality?	Supporting Comments
OMH	✓	✓	?	The flora and habitat conditions recorded during the Phase 1 habitat survey supports this assessment. It encompasses the following Phase 1 habitats and features described in Section 4.1: ephemeral/ short perennial, neutral grassland, temporary standing water, scattered scrub, tall herbs and localised swamp vegetation. This habitat is approx. 4.2ha in size so meets the minimum criteria of 0.25ha detailed in the NERC Act S41 priority criteria for priority habitat open mosaic habitat. Additionally, there is a diversity of different successional communities and a varied topography of spoil mounds, bunds (with localised steep slopes and shallow cliff faces) that would provide ecological niches for terrestrial invertebrates. This habitat is known as “brownfield” in the LBAP and LWS guidelines. An approach for the assessment of OMH in Lincolnshire is given in GLNP (2013). Criterion BM1 requires a ‘*brownfield mosaic at least 0.25 ha in extent with loose substrate or bare ground and at least two of the early successional communities in Table 15 and a minimum brownfield features index score of four using Table 16. At least one early successional community should be flower-rich*.’ Based on these criteria the “brownfield” habitat at the Power Plant Site is of Local Wildlife Site quality, with the only uncertainty relating to the level of species richness within any one of the relevant early successional communities (this

Habitat	NERC Act?	LBAP?	LWS Quality?	Supporting Comments
				would need to be fully assessed at an appropriate time of the year (ie. early June).

Key to symbols: ✓ = yes, x = no, ? = likely or possible, further survey required to determine this.

5.2 Protected and Notable Species

Table 5.3 provides a summary of potentially relevant species identified through a combination of desk study and review of the habitat data collected during the field survey. The table summarises the conservation status of each species and provides comment on the likelihood of presence.

Where species are identified in Table 5.3 as likely or possible, they are likely to represent legal constraints, or may be relevant to determination of a planning application. Further surveys will or may be required to determine presence/ likely absence. Requirements for further survey are identified in Section 5 of this report.

No invasive non-native species listed under Schedule 9 of the Wildlife and countryside Act 1981 (as amended) were recorded during the Phase 1 survey.

Table 5.3: Protected and notable species relevant or potentially relevant to the proposed development

Species	Legally Protected Species?	Species of Principal Importance?	Other Notable Species?	Present on Site or in potential ZoI?	Supporting Comments
European Protected Species					
Great crested newt	✓	✓	x	✓	Desk study returned 21 records of GCN from within 2km of the Power Plant Area in the past 10 years. The closest record to the Power Plant Area is 60m (to the west). There are also records from Station Road Field LWS (which is located 0.4km to the north at its closest point). Two areas of standing water are present within the Power Plant Area (Pond 1 & 2 [refer to Figure 2]). The presence of standing water and associated emergent aquatic vegetation in late summer/early autumn is indicative that that these are permanent waterbodies (ponds) and that there is the potential that they could retain water long enough to allow breeding by GCN. Two ponds are present within 500m of the Power Plant Area; one approximately 450 m to the north and Pond 3, an emergency water storage lagoon, approximately 150 m south-west (refer to Figure 2a) The Power Plant Area provides good quality terrestrial habitat with opportunities for foraging and also hibernating GCN.
Bats	✓	✓	x	?	The desk study returned four records of noctule bat *(Nyctalus noctula),* nine records of common pipistrelle *(Pipistrellus pipistrellus*) and one record of soprano pipistrelle *(Pipistrellus pygmaeus)* within 2km of the Power Plant Area boundary in the past

Species	Legally Protected Species?	Species of Principal Importance?	Other Notable Species?	Present on Site or in potential ZoI?	Supporting Comments
					10 years. There is no potential for roosting within the Power Plant Area. Habitats within the Power Plant Area are considered to represent sub-optimal habitat for foraging bats, due to its close proximity to the existing VPI CHP Plant and the expected high levels of nocturnal light emissions that may deter foraging bats. **Not considered further.**
Other Species					
Reptiles	✓	✓	x	?	There are no records within the past 10 years.. Habitats within the Power Plant Area are potentially suitable for common lizard (*Zootoca vivipara*), and slow worm (*Anguis fragilis*). These habitats have been established for sufficiently long that there is a possibility that reptile species may have colonised.
Water vole (*Arvicola amphibius*)	✓	✓	x	x	There are 31 records of water vole presence within 2km of the Power Plant Area boundary in the past 10 years (the closest record is approximately 210m) There are a number of drains adjacent to the Power Plant Area that may be suitable to support water vole, although it is unlikely that any will be directly affected.
Brown hare (*Lepus europaeus*)	x	✓	x	✓	There are two records of brown hare being present at Rosper Road Pools in 2007-2008, which is approximately 0.6km from the Power Plant Area. The closest record is approximately 447m away. The site provides suitable cover and foraging habitat for this species, complementing arable habitats in the wider landscape.
Harvest mouse (*Micromys minutus*)	x	✓	x	?	There is a recent record of harvest mouse being present at Killingholme Airfield which is located >2.8km away. There is a general paucity of dense grass, tall reed and dense bramble vegetation, which represent favourable harvest mouse habitat. **Not considered further.**
Hedgehog (*Erinaceus europaeus*)	x	✓	x	?	There are no recent desk study records for this species. A possible hedgehog dropping was found within the Power Plant Area during the walkover survey in early 2017 (SLR Consulting, 2017), and this species may therefore be present on site.
Badger	✓	x	x	?	There are eight records of badger within 2km of the Power Plant Area boundary since 2007 (the closest

Species	Legally Protected Species?	Species of Principal Importance?	Other Notable Species?	Present on Site or in potential ZoI?	Supporting Comments
					record is approximately 121m). The Power Plant Area offers opportunities for foraging badger. However, no badger activity (including setts and digging by badger) was recorded during the Phase 1 habitat survey, or during the earlier ecological walkover survey undertaken by SLR (SLR Consulting, 2017). **Not considered further.**
Barn owl (*Tyto alba*)	✓	x	✓	?	There are five records of barn owl flights within 2km of the Power Plant Area boundary since 2007, the majority at Rosper Road Pools (approx. 621m to the south-east). The site supports extensive grassland habitat with potential to be used on occasion as foraging habitat by barn owl. There are no features on or immediately adjacent to the site that are suitable for nesting.
Other birds (breeding)	✓	✓	x	✓	Desk study returned numerous bird records since 2007, including Schedule 1 species. However, habitats within the site do not represent favourable breeding habitat for Schedule 1 species. Habitats within the site are suitable for ground nesting birds, for example skylark (*Alauda arvensis*).
Other birds (passage and wintering)	✓	✓	x	x	Based on the habitat and topographical context of the Power Plant Area, it is highly unlikely that the site would have a specific value for passage and wintering birds associated with the Humber Estuary SPA. This was confirmed by the wintering bird surveys carried out on the Power Plant Area in 2017 (Catley, 2017). The only waterfowl species that were recorded were snipe (*Gallinago gallinago*) and woodcock (*Scolopax rusticola*), which do not form part of the SPA/ Ramsar assemblage. **Not considered further.**
Common toad (*Bufo bufo*)	x	✓	x	?	Desk study provided eight records of common toad within 2km of the Power Plant Area boundary since 2007. This species may utilise ponds within the Power Plant Area for breeding and the site affords opportunities for foraging and hibernation.
Invertebrates	x	✓	✓	?	Desk study returned several records of Moths, Butterflies and Beetles since 2007, including cinnabar moth *(Tyria jacobaeae),* blood-vein moth *(Timandra comae)* and small heath butterfly *(Coenonympha pamphilus).* The habitat context of the site (OMH) provides opportunities for a range of terrestrial invertebrates, possibly nationally or regionally notable species.

Key to symbols: ✓ = yes, x = no, ? = likely or possible, see Supporting Comments for further rationale.

Species	Legally Protected Species?	Species of Principal Importance?	Other Notable Species?	Present on Site or in potential ZoI?	Supporting Comments

Species present on site are those for which recent direct observation or field signs confirmed presence. Species which are possibly present are those for which there is potentially suitable habitat based on the results of the Phase 1 Habitat survey, or this combined with desk study records.

Legally protected species are those listed under Schedules 1, 5 and 8 of the WCA; and, Schedules 2 and 4 of The Habitat Regulations.

Species of Principal Importance as those listed under Section 41 of the NERC Act. Planning Authorities have a legal duty under Section 40 of the same Act to consider such species when determining planning applications.

Other notable species include native species of conservation concern listed in the LBAP (except species that are also of Principal Importance), those that are Nationally Rare, Scarce or Red Data List. .

No non-native controlled weed species listed under Schedule 9 of the WCA (as amended) were recorded during the Phase 1 survey of the Power Plant Area.

6. Ecological Constraints and Opportunities: Risks and Recommendations for Further Action

6.1 Approach to the Identification of Ecological Constraints

Relevant ecological features that may represent constraints to the proposed development, or that provide opportunities to deliver ecological enhancement in accordance with planning policy, are identified in Section 4 of this report, and supported by Figure 2.

The NPPF and local planning policy (summarised in Section 2 of this report) specify requirements for the protection of features of importance for biodiversity. Planning policy is a material consideration when determining planning applications.

Compliance with planning policy requires that the proposed development considers and engages the following mitigation hierarchy where there is potential for impacts on relevant ecological features:

1. Avoid features where possible;
2. Minimise impact by design, method of working or other measures (mitigation) e.g. by enhancing existing features; and
3. Compensate for significant residual impacts, e.g. by providing suitable habitats elsewhere (whether in the control of VPI Immingham or otherwise legally enforceable through planning condition or Section 106 agreement).

This hierarchy requires the highest level to be applied where possible. Only where this cannot reasonably be adopted should lower levels be considered. The rationale for the proposed mitigation and/ or compensation should be provided with planning applications, including sufficient detail to show that these measures are feasible and can be provided.

The likelihood, where present, of the relevant ecological features constraining the proposed development has been assessed with reference to the scale described in Table 7.1. The higher the importance of the ecological receptor for the conservation of biodiversity at national and local scales, the more likely it is to be a specific consideration during determination of the planning application for the proposed scheme.

In pursuance of the objective within the NPPF of providing net gains in biodiversity where possible, consideration should be given to the scope for enhancement as part of the proposed scheme. This should represent biodiversity gain over and above that achieved through mitigation and compensation. Enhancement could be achieved on and/ or off-site. Where such recommendations are made in this PEA they are high level only, recognising that this report has been prepared to support a request for a scoping opinion and not to support a planning application.

High level opportunities to secure ecological enhancement are not scaled in Table 7.1, but are identified in the accompanying appraisal (Section 7.4 of this report). There may be scope for ecological enhancement where existing habitat features could be improved or enhanced as part of the proposed scheme as designed, or with only minor amendment to the design of the proposed scheme. Ecological enhancement may not be possible where there is little scope to accommodate enhancement measures within the proposed scheme, e.g. due to a lack of utilisable space, or where land is required for essential mitigation. In such circumstances, consideration could be given to enhancing biodiversity in the vicinity of the proposed scheme, subject to there being appropriate mechanisms to secure this.

Table 6.1: Scale of Constraint to Development

Likelihood	Definition
High	An actual or potential constraint that is subject to relevant legal protection and is likely to be a material consideration in determining the planning application (e.g. statutory nature conservation designations and European/nationally protected species). Further survey likely to be required (as detailed in this report) to support a

Likelihood	Definition
	planning application.
Medium	An actual or potential constraint that is covered by national or local planning policy and, depending on the level of the potential impact as a result of the proposed development, may be a material consideration in determining the planning application. Further survey may be required (as detailed in this report) to support a planning application.
Low	Unlikely to be a constraint to development or require further survey prior to submission of a planning application. Mitigation is likely to be covered under Construction Environmental Management Plan (CEMP) or precautionary working method statement (e.g. generic requirements for the management of nesting bird risks).

6.2 Constraints and Requirements for Further Survey: Designations

6.2.1.1 Statutory Designations

The Power Plant Area is located approximately 1.4 km south-west of the Humber Estuary SSSI, SAC, SPA and Ramsar. The DCO application is therefore likely to require a Habitat Regulations Assessment (HRA) signposting report to support HRA screening for Likely Significant Effects (LSE) by the relevant competent authority. It is considered unlikely that the construction and operation of the proposed development would directly impact these designations at the distance concerned.

The habitats present at the Power Plant Area, as defined in this PEA, are unlikely to be of functional importance for bird species from these designations for the following reasons:

- The area is subject to high levels of human disturbance associated with the car park which is located immediately adjacent to the Power Plant Area;
- Waterfowl (such as curlew [*Numenius arquata*] and golden plover [*Pluvialis apricaria*] and geese) generally prefer flat open vistas and short vegetation (where their sight-lines are unrestricted in terms of predator detection). Therefore the undulating topography and stands of tall ruderal vegetation at the Power Plant Area are likely to deter waterfowl from using the site for foraging and roosting.

The results of the wintering bird survey carried out within the Power Plant Area by Catley (2017) support this conclusion, because no SPA/ Ramsar species were recorded. Indirect effects are also unlikely, but would need to be screened in detail with regard to other relevant information (particularly in respect of noise, hydrogeology, water quality and air quality). Natural England may advise that the proposed scheme is located in an area where industrial developments would need to be assessed for their potential to impact the designations.

Given the above, further wintering and passage bird surveys on the proposed Power Plant Area are not recommended or necessary. However, the breeding bird surveys recommended in Section 5.4 along with previous survey data for the Power Plant Area will provide data that allows the ornithological context of the proposed scheme to be further defined and potential impacts on birds to be assessed in detail in the EcIA.

6.2.1.2 Non-Statutory Designations

There are three non-statutory nature conservation designations within a 1 km radius of the Power Plant Area. It is considered unlikely that the construction and operation of the proposed development would directly impact these designations at the distance concerned. However, there is the potential for indirect impacts in respect of noise, hydrogeology, water quality and air quality.

6.3 Constraints and Requirements for Further Survey: Habitats and Protected Species

Table 7.2 identifies those protected species that are likely to be specific constraints to the proposed scheme and require specific action to inform planning/ design of the scheme (including mitigation and habitat restoration), to support a planning application, and/ or during operation of the proposed development.

See Table 7.3 for those surveys considered necessary for the purposes of Ecological Impact Assessment (EcIA) and to support a DCO application for the proposed scheme.

The constraints outlined here will need to be reassessed if there is a significant change to the type or scale of development proposed, or if there are any significant changes in the use or management of the land that would affect the habitats and species. If a DCO application is made two years or more after a PEA it would be advisable to review the available survey data and update this where the baseline conditions or risks may have changed over time.

Table 6.2: Summary of Likely Relevant Ecological Constraints and High Level Recommendations for Further Action

Receptor	Scale of Constraint	Further Requirements, Including Potential Mitigation Requirements	Driver	When is Action Likely to be Required		
				To Inform Design	Before Planning Application	Site Mobilisation onwards
Ephemeral/short perennial habitat, OMH and associated habitats	Medium	Retain where practical. Demonstrate a scheme consistent with policy for No Net Loss and Net Gain.	NERC Act S41 NPFF, Local Policies CS5, CS16, CS17, CS21, LC4, LC6	✓	✓	✓
Great Crested Newt	Medium (potential for a small population)	Determine potential impacts with reference to survey data. Design/ specify/ implement appropriate species and habitat mitigation, where necessary.	WCA, NERC Act S41, NPFF, Local Policies CS21, LC5, Standing Advice	✓	✓	✓
Reptiles	Medium (potential for a small population based on habitat quality)	Determine potential impacts with reference to survey data. Design/ specify/ implement appropriate species and habitat mitigation, where necessary.	WCA, NERC Act S41, NPFF, Local Policies CS21, LC5, Standing Advice	✓	✓	✓
Breeding Birds	Medium	Determine potential impacts with reference to survey data. If breeding birds are found to be present then to ensure legal compliance, site clearance works should be phased to occur outside the breeding bird season (March-August for most bird species).	WCA, NERC Act S41, NPFF, Local Policies CS21, LC5, Standing Advice	✓	✓	✓

Receptor	Scale of Constraint	Further Requirements, Including Potential Mitigation Requirements	Driver	When is Action Likely to be Required		
				To Inform Design	Before Planning Application	Site Mobilisation onwards
		Implement necessary species mitigation.				
Butterflies and other terrestrial invertebrates	Medium	Determine potential impacts with reference to survey data. Design/ specify/ implement appropriate habitat mitigation, where necessary.	NERC Act S41, NPFF, Local Policies CS21, LC5, Standing Advice	✓	✓	✓

Table 7.3: Requirements for Further Survey

Survey	Season	Why required	When required		
			To Inform Design	Before Planning Application	Site mobilisation onwards
Ephemeral/short perennial habitat, OMH and associated habitats	Early June	Required for EcIA and to determine mitigation requirement The north-western compartment of the Power Plant Area was not subject to field survey (refer to Section 3.3.2 – Limitations)	✓	✓	-
Great Crested Newt	March to June HSI assessment of all waterbodies within 500 m. Ponds 1 & 2 - either presence/ absence survey (minimum of 4 visits); and/ or	Required for EcIA and to determine mitigation requirements	✓	✓	-

Survey	Season	Why required	When required		
			To Inform Design	Before Planning Application	Site mobilisation onwards
	environmental DNA (eDNA) sampling [15th April to the 30th June]				
Reptiles	April/ May and/ or September, subject to suitable conditions for survey. Minimum of 7 visits using artificial refuges to determine likely presence/ absence.	Required for EcIA and to determine mitigation requirements	✓	✓	-
Breeding Birds	April to June (3 survey visits)	Required for EcIA and to determine mitigation requirements	✓	✓	-
Terrestrial Invertebrates (Preliminary Appraisal)	Single visit in April	Required for EcIA and to determine mitigation requirements	✓	✓	-

6.4 Opportunities for Ecological Enhancement

As part of the master planning process, consideration should be given to the identification of suitable options for achieving significant ecological enhancement, in accordance with the requirements of the NPPF and supporting policy.

It is considered that the potential likely relevant ecological constraints could be the basis for the development of plans for ecological enhancement. The following potential opportunities are identified:

- Maintain the continuity of the soils and OMH vegetation environmental character within a 'Wildlife Buffer Zone', which is protected during the construction phase, at the southern periphery of the Power Plant Area. This habitat could be enhanced for invertebrates by creating spoil mounds with steep slopes and shallow cliff faces;
- Wildlife ponds could be created within the aforementioned Wildlife Buffer Zone of the Power Plant Area with the purpose of providing habitat for breeding amphibians and also in terms of complementing the OMH terrestrial habitat.

7. References

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Appendix A Figures

Appendix B Overview of Relevant Legislation

The Conservation of Habitats & Species Regulations 2010 (as amended)

The Habitats Regulations consolidate all the various amendments made to the Conservation (Natural Habitats, &c.) Regulations 1994 in respect of England and Wales. The 1994 Regulations transposed Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) into national law. The Regulations came into force on 30th October 1994. In Scotland the Habitats Directive is transposed through a combination of the Habitats Regulations 2010 (in relation to reserved matters) and the 1994 Regulations. The Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) transpose the Habitats Directive in relation to Northern Ireland.

The Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.

Under the Regulations, competent authorities i.e. any Minister, Government department, public body, or person holding public office, have a general duty, in the exercise of any of their functions, to have regard to the EC Habitats Directive.

The Regulations place a duty on the Secretary of State to propose a list of sites which are important for either habitats or species (listed in Annexes I and II of the Habitats Directive respectively) to the European Commission. Once the Commission and EU Member States have agreed that the sites submitted are worthy of designation, they are identified as Sites of Community Importance (SCIs). The EU Member States must then designate these sites as Special Areas of Conservation (SACs) within six years. The Regulations also require the compilation and maintenance of a register of European sites, to include SACs and Special Protection Areas (SPAs) classified under Council Directive 79/409/EEC on the Conservation of Wild Birds (the Birds Directive). These sites form a network termed Natura 2000.

The Regulations enable the country agencies to enter into management agreements on land within or adjacent to a European site, in order to secure its conservation. If the agency is unable to conclude such an agreement, or if an agreement is breached, it may acquire the interest in the land compulsorily. The agency may also use its powers to make byelaws to protect European sites. The Regulations also provide for the control of potentially damaging operations, whereby consent from the country agency may only be granted once it has been shown through Appropriate Assessment that the proposed operation will not adversely affect the integrity of the site. When considering potentially damaging operations, the country agencies apply the precautionary principle' i.e. consent cannot be given unless it is ascertained that there will be no adverse effect on the integrity of the site.

In instances where damage could occur, the appropriate Minister may, if necessary, make special nature conservation orders, prohibiting any person from carrying out the operation. However, an operation may proceed where it is or forms part of a plan or project with no alternative solutions, which must be carried out for reasons of overriding public interest. In such instances the Secretary of State must secure compensation to ensure the overall integrity of the Natura 2000 system. The country agencies are required to review consents previously granted under the Wildlife and Countryside Act 1981 for land within a European site, and may modify or withdraw those that are incompatible with the conservation objectives of the site.

The Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. Licenses may be granted for a number of purposes (such as science and education, conservation, preserving public health and safety), but only after the appropriate authority is satisfied that there are no satisfactory alternatives and that such actions will have no detrimental effect on wild population of the species concerned.

The Regulations make special provisions for the protection of European marine sites, requiring the country agencies to advise other authorities of the conservation objectives for a site, and also of the operations which may affect its integrity. The Regulations also enable the establishment of management schemes and byelaws by the relevant authorities and country agencies respectively, for the management and protection of European marine sites.

Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 is the major domestic legal instrument for wildlife protection in the UK, and is the primary means by which the following are implemented:

- The Convention on the Conservation of European Wildlife and Natural Habitats ('the Bern Convention'); and
- The Council Directive 79/409/EEC on the Conservation of Wild birds (the 'Bird Directive')

Wild Birds

The Act makes it an offence (with exception to species listed in Schedule 2) to intentionally:

- kill, injure, or take any wild bird,
- take, damage or destroy the nest of any wild bird while that nest is in use or being built (also [take, damage or destroy the nest of a wild bird included in Schedule ZA1] under the Natural Environment and Rural Communities Act 2006), or
- take or destroy an egg of any wild bird.

Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young. The Secretary of State may also designate Areas of Special Protection (subject to exceptions) to provide further protection to birds. The Act also prohibits certain methods of killing, injuring, or taking birds, restricts the sale and possession of captive bred birds, and sets standards for keeping birds in captivity.

Other Animals

The Act makes it an offence (subject to exceptions) to intentionally kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places. The Act also prohibits certain methods of killing, injuring, or taking wild animals.

Flora, Fungi and Lichens

The Act makes it an offence (subject to exceptions) to intentionally) pick, uproot or destroy:

- any wild plant listed in Schedule 8, or
- unless an authorised person, to intentionally uproot any wild plant not included in Schedule 8,
- to sell, offer or expose for sale, or possess (for the purposes of trade), any live or dead wild plant included in Schedule 8, or any part of, or anything derived from, such a plant.

Non-native Species

The Act contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, prohibiting the release of animals and planting of plants listed in Schedule 9 in England and Wales. It also provides a mechanism making any of the above offences legal through the granting of licences by the appropriate authorities.

Countryside and Rights of Way (CRoW) Act 2000

The Countryside and Rights of Way Act 2000 applies to England and Wales only. Part III of the Act deals specifically with wildlife protection and nature conservation.

The Act places a duty on Government Departments and the National Assembly for Wales to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

Schedule 9 of the Act amends the SSSI provisions of the Wildlife and Countryside Act 1981, including increased powers for their protection and management of SSSIs. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increase penalties on conviction where the provisions are breached; and include an offence whereby third parties can be convicted for damaging SSSIs.

Schedule 12 of the Act amends the species provisions of the Wildlife and Countryside Act 1981, strengthening the legal protection for threatened species. The provisions make certain offences 'arrestable', include an offence of reckless disturbance, confer greater powers to police and wildlife inspectors for entering premises and obtaining wildlife tissue samples for DNA analysis, and enable heavier penalties on conviction of wildlife offences.

Natural Environment and Rural Communities (NERC) Act 2006

The Natural Environment and Rural Communities (NERC) Act came into force on 1st October 2006. Section 41 (S41) of the Act required the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list was drawn up in consultation with Natural England, as required by the Act.

The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006, to have regard to the conservation of biodiversity in England, when carrying out their normal functions.

Fifty-six habitats of principal importance are included on the S41 list. These are all the habitats in England that were identified as requiring action in the (now withdrawn) UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework. They include terrestrial habitats such as upland hay meadows to lowland mixed deciduous woodland, and freshwater and marine habitats such as ponds and subtidal sands and gravels.

There are 943 species of principal importance included on the S41 list. These are the species found in England which were identified as requiring action under the (now withdrawn) UK BAP and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework. In addition, the hen harrier has also been included on the list because without continued conservation action it is unlikely that the hen harrier population will increase from its current very low levels in England.

Protection of Badgers Act 1992

Badgers and their setts (burrows) are protected under the Act. This makes it an offence to kill or take a badger, to cruelly ill-treat a badger, or to interfere with a badger sett, including disturbing a badger while it is occupying a sett.

Licences to permit otherwise prohibited actions can be granted under section 10 of the Act for various purposes. This includes licences to interfere with a badger sett for the purpose of development as defined by section 55(1) of the Town and Country Planning Act 1990.

Licences may be granted in order to close down setts, or parts of setts, prior to development or to permit activities close to a badger sett that might result in disturbance. A licence will be required if a sett is likely to be damaged or destroyed in the course of development or if the badger(s) occupying the sett will be disturbed.

Licences can be applied for at any time, but a licence for development will not normally be issued unless full planning permission has been granted. The closure of setts under licence is normally only permitted during July to November, inclusive.

Water Framework Directive 2000

The Water Framework Directive (EC Directive 2000/60/EC) came into force in 2000. At the heart of the WFD is the philosophy to “make waterbodies better” through sustainable development for the joint benefits of aquatic habitats and the human environment.

The WFD requires members states achieve “good status” for all groundwater and surface waters (rivers, lakes, transitional waters, and coastal waters). For surface water, overall status comprises two elements: "good ecological status" and "good chemical status". Ecological status is defined by the biological condition or health of a watercourse, in combination with water quality and physical conditions that underpin biological conditions. The classification of ecological status considers biological elements (the abundance of aquatic flora and fauna), physical habitat availability (hydromorphology), and water quality factors such as the availability of nutrients, salinity, temperature and pollution by key chemical pollutants. The biological elements used as indicators of ecological quality include fish, macroinvertebrates, macrophytes and diatoms.

Any proposed developments or activities that have the potential to affect the water environment require a WFD Assessment (WFDa). Compliance with the WFD means attainment of good ecological status, prevention of deterioration in status, and prevention of failure to achieve future attainment of good status where it is not already achieved within waterbodies. However, WFD Article 4.7 provides legislation for exemption conditions that could allow implementation of schemes that cause deterioration in ecological status, for example for reasons of overriding public interest.

Appendix C Target Notes

Target Note	Description
	Power Plant Area
1	A shallow pond with a high emergent cover of spike rush (*Eleocharis* sp.) with frequent bulrush and rare grey club-rush (*Schoenoplectus tabernaemontani*)
2	Abundant bulrush (*Typhae latifolia*) indicating a wet ponded area
3	The raised areas of the bunds and spoil heaps are represented by a stand of hemlock (*Conium maculatum*), creeping thistle and great willowherb (*Epilobium hirsutum*)
4	Abundant creeping cinquefoil (*Potentilla reptans*) and colt's-foot (*Dactylis glomerata*) with frequent bristly ox-tongue (*Picris echioides*), fleabane, willowherbs (*Epilobium spp*.) species and ribwort plantain (*Plantago lanceolata*). There is occasional scentless mayweed (*Tripleurospermum inodorum*), yellow-wort (*Blackstonia perfoliata*), common century (*Centaurium erythraea*), and ragwort (*Senecio jacobaea*) and rare knapweed (*Centauria nigra* agg.) and blue fleabane (*Erigeron acer*).
	Land adjacent to Power Plant Area
5	This is a transitional habitat located immediately adjacent to the Power Plant Area (within the Proposed Pipeline Corridor) resulting from colonisation of bare ground by ruderal plant species and grasses [for example *Holcus lanatus*]. Forb species include locally frequent bird-foot trefoil (*Lotus corniculatus*) and occasional yellow-wort, common centuary, scarlet pimpernel (*Anagallis arvensis*) and rare blue fleabane. There are localised areas dominated by creeping thistle.
6	The area is dissected by two short sections of drain with dominant emergent bulrush.
7	Inaccessible settling lagoons with stagnant water with no emerging macrophyte vegetation and appeared to be of negligible important for wildlife

Appendix D Photographs

Photo1 (Power Plant Area): Linear stand of unmanaged semi-improved neutral grassland in the background, adjacent to the car park

Photo 2 (Power Plant Area): Abundant sea club-rush (*Bolboschoenus maritimus*) with some bulrush (*Typha latifolia*) indicating waterlogged ground conditions

Photo 3: (Power Plant Area): Bulrush growing in shallow pond

Photo 4 (Power Plant Area): Shallow pond with abundant spike rush (*Eleocharis* sp.)

Photo 5 (Power Plant Area): Ephemeral/ short perennial vegetation with the linear stand of semi-improved neutral grassland in the background adjacent to the car park.

Photo 6: (Power Plant Area): Localised patches of abundant tufted hair grass (*Deschampsia caespitosa*) amongst ephemeral/ short perennial vegetation. Indicates impeded drainage.

	
Photo 7 (Power Plant Area): Yellow-wort (*Blackstonia perfoliata*) and colt's-foot (*Tussilgo farfara*) growing amongst various types of bare industrial substrates	Photo 8 (Power Plant Area): Ephemeral/ short perennial vegetation growing on undulating spoil mounds
	
Photo 9 (Power Plant Area): Ephemeral/ short perennial vegetation growing on varied topography	Photo 10 (Power Plant Area): Shallow cliff faces and steep slopes can provide high quality habitats for invertebrates when found in Open Mosaic Habitat
	
Photo 11(Power Plant Area): Flat area of Ephemeral/ short perennial vegetation surrounded by scattered scrub and steep slopes	Photo 12 (Power Plant Area): Blue Fleabane (*Erigeron acer*)

	
Photo 13 (Power Plant Area): Ephemeral/ short perennial vegetation	Photo 14 (Power Plant Area): Tall ruderal vegetation with the dead stems of hemlock (*Conium maculatum*)
	
Photo 15 (land adjacent to the western boundary of the Power Plant Area: Settling Lagoons with negligible wildlife potential	Photo 16 (land adjacent to the western boundary of the Power Plant Area)): Ephemeral/ short perennial vegetation, with bird's-foot trefoil (*Lotus corniculatus*) in the foreground

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Appendix 1B – Scoping Opinion

Case officer: Andrew Law
Telephone: 01724 297490
Email: planning@northlincs.gov.uk

Our Ref: PA/SCO/2017/3

Date: 31 January 2018

Mr Geoff Bullock
Dalton Warner Davis LLP
6 New Bridge Street
London
EC4V 6AB

Dear Mr Bullock

Scoping Opinion - Regulation 15 of the Town and Country Planning (Environment Impact Assessment) Regulations 2017- VPI Immingham Energy Park 'A' Gas Fired Power Station at Land to the North-West of the Existing VPI Immingham Combine Heat and Power Plant, Rosper Road, South Killingholme, DN40 3DZ.

I refer to your request for a scoping opinion for the above project. The purpose of this letter is to provide VPI Immingham (applicant) with the scoping opinion of North Lincolnshire Council (NLC) in its role as the local planning authority. This scoping opinion should advise the preparation of an Environmental Statement to accompany the applicant's proposal for a new gas fired power station to the north-west of the applicant's existing CHP plant on Rosper Road, South Killingolme.

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (2017 Regs) provide for the submission of an Environmental Statement with applications for planning permission for Environmental Impact Assessment (EIA) development. The National Planning Practice Guidance (NPPG) provides guidance on how local planning authorities should interpret and implement the 2017 Regs. The NPPG states that scoping allows the local planning authority to clarify what it considers the main effects of the development are likely to be and, therefore, the aspects on which the applicant's Environmental Statement should focus (paragraph 36).

In this instance it is considered that your Environmental Statement will need to focus upon the following issues, this assessment has been informed by consultees and their responses are enclosed. It is considered that you have addressed all of the topic areas which should inform the Environmental Statement.

Ecology and Nature Conservation

The council's ecologist has confirmed his broad agreement with the approach to ecology set out in the submitted scoping report. However comments are made on several points which are summarised below.

The applicant will need to provide all of the information reasonably required for NLC to determine whether there will be a likely significant effect on the Humber Estuary SAC, SPA and/or Ramsar site. A non-exhaustive list of the information required in this regard is set out within the enclosed response from the council's ecologist, Andrew Taylor. The application will need to be considered in combination with other plans and projects and the applicant is advised to review the Humber Nature Partnership In-combination Database for information on other plans and projects in the area.

The application site supports brown field land, rough grassland and scrub and lies close to hedgerows, a drain and a pond. The council's Ecologist has confirmed that where these habitats are present protected species surveys will be required. The scoping report confirms that a preliminary ecological appraisal has been carried out and our ecologist has confirmed that appropriate proposals for further ecological surveys have been made. The appropriate survey standards for these species are set out within the enclosed response from the Ecologist.

Biodiversity enhancement should be secured by using locally native trees, shrubs and wildflowers for landscaping, by incorporating wetland habitats into any drainage features required and by implementing any mitigation and enhancement measures required as a result of ecological surveys. The proposals set out in section 6.4 of the preliminary ecological appraisal report are welcomed. Habitat enhancement measures for water voles may also be of value.

Archaeology and Cultural Heritage

The council's Historic Environment Record agree that the spatial extent and methodology of the cultural heritage assessment set out in section 5.3 of the Scoping Report is satisfactory. However, further comments on this issue are offered below.

With regards to archaeology, this will comprise desk based research and a walkover survey. It is, however, important to note that further archaeological field evaluation may be required depending on the findings of the desk based research and walkover survey.

In respect of built heritage it should be noted that Section 2.4 of the scoping report, which details the listed buildings that are potentially affected by the proposals, fails to include three listed lighthouses located on the South Humber Bank, within the 3km radius for assessing impact. These lighthouses are prominent within the landscape and have intervisibility with the application site and as such need including within the cultural heritage assessment. The buildings in question are Killingholme High Lighthouse, Killingholme North Low Lighthouse and South Low Lighthouse.

Proposals for further consultation with the Historic Environment Record are welcomed.

Air Quality

The submitted scoping report identifies that air quality is to be considered as part of the Environmental Statement via an Air Quality Impact Assessment. The council's Environmental Health Officer has confirmed that this approach is acceptable and that they are satisfied with the proposed extent of this assessment.

Noise and Vibration

The council's Environmental Health Officer has confirmed that they are satisfied with the scope of the proposed assessment of noise and vibration and has no further comments to offer in this regard.

Contaminated Land

The submitted scoping report identifies that contaminated land will be considered via a Phase 1 Report and that liaison will take place with NLC and the EA regards the findings of this report. The council's Environmental Health Officer is supportive of this approach and has no further comments to make at this stage.

Further to the above, the EA has confirmed that they have no concerns with the scope of the assessment outlined in Section 5.8 of the scoping report with regards to risks posed to controlled waters from contamination at the site.

Landscape and Visual Amenity

The submitted scoping report identifies that an assessment of visual impact will be provided as part of the Environmental Statement. NLC agrees with the scope and extent of the proposed assessment.

Surface Water, Flood Risk and Drainage

The EA has confirmed that the scope of the report in respect of surface water has been appropriately addressed. They offer recommendations in respect of potential sedimentation impacts into adjacent land drains and potential leakage of construction materials into watercourses; these are set out in the enclosed EA response.

Under the Water Framework Directive (WFD) the applicant will need to ensure that deterioration in water body status class is prevented both during and after construction.

The EA has also confirmed that the scope of the report regarding flood risk has been appropriately addressed. As acknowledge in the scoping report, a Flood Risk Assessment is required and this should include an assessment of how flood risk will be managed over the lifetime of the development. This assessment needs to include an assessment of the consequences should a breach of the tidal defences occur and should demonstrate that flood risk will not be increased elsewhere.

Non-significant Issues

NLC agrees with the findings of Section 6 of the scoping report with regards to the non-significant issues which can be ‘scoped out’ and would therefore not form part of the Environmental Statement.

With regards to traffic and transport, it is acknowledged and agreed that details of likely traffic movements during construction and their management, along with consideration of abnormal load movements would be submitted with the planning application.

Other Matters

Please note that, despite consultation taking place, no response has been received from Natural England with regards to the scoping report. I will forward this response as soon as I have received it.

This scoping opinion has been prepared in line with my knowledge and understanding of the site and environment, the nature of existing operations on adjacent sites and the nature of development at the time of writing.

Please do not hesitate to contact me should you wish to discuss the contents of this letter.

Yours sincerely

Andrew Law
Senior Planning Officer

Environment Agency

Mr Andrew Law
North Lincolnshire Council
Planning Department
Civic Centre Ashby Road
Scunthorpe
DN16 1AB

Our ref: AN/2018/126875/01-L01
Your ref: SCO/2017/3

Date: 25 January 2018

Dear Mr Law

Scoping Opinion for VPI-Immingham Energy Park 'A' power station
Land north of VPI Power Station, Rosper Road, South Killingholme, DN40 3DZ

Thank you for forwarding the above Scoping Opinion request from Dalton Warner Davis to us on 5 January 2018.

We have reviewed the Environmental Impact Assessment (EIA) Scoping Report (ref: 60547702) by AECOM, dated 20 December 2017 and are satisfied with the list of technical disciplines to be scoped in.

The report acknowledges the requirement for regulation by the Environment Agency through an environmental permit.

Groundwater protection
We have no concerns with the Scope of Assessment outlined in Section 5.8 - Ground Conditions and Hydrogeology, in so far as it relates to the assessment of the risks posed to controlled waters from contamination at the site. We agree with the proposal in Section 5.8.2 that a desk based assessment (Phase 1) is the appropriate first phase in assessing the risks from contamination at the site.

We recommend that developers should:

- Follow the risk management framework provided in CLR11, Model Procedures for the Management of Land Contamination, when dealing with land affected by contamination.
- Refer to the Environment Agency Guiding principles for land contamination for the type of information that we required in order to assess risks to controlled waters from the site. The Local Authority can advise on risk to other receptors, such as human health.
- Consider using the National Quality Mark Scheme for Land Contamination Management which involves the use of competent persons to ensure that land contamination risks are appropriately managed.
- Refer to the contaminated land pages on GOV.UK for more information.

Surface water protection
Overall, we agree that the scope of the report in respect of surface water has been appropriately addressed.

During the construction stage, the report highlights issues with sedimentation impacts into adjacent land drains and potential leakage of construction materials into watercourses. We have the following recommendations for the developer to consider:

- Include settling tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake.
- Incorporate the use of SuDS techniques, interceptors and separators as required
- Areas at risk of spillage can be bunded and carefully sited to minimise the risk of hazardous substances entering local watercourses.

Water Framework Directive
The Water Framework Directive (WFD) River Basin Management Plans require that the watercourses continue to show improvements in overall quality in line with the quality standards specified in these documents. Under WFD, developers will need to ensure that deterioration in water body status class is prevented both during and after construction.

Flood risk
We are satisfied the scope of the report regarding flood risk has been appropriately addressed.

As acknowledged within the report, a flood risk assessment is required. Included within the FRA should be an assessment of how flood risk will be managed now and over the lifetime of the development. This analysis needs to include assessment of the consequences should a breach of the tidal defences occur. It should also be demonstrated that the development will not increase the risk of flooding elsewhere.

Should you require any additional information, or wish to discuss these matters further, please do not hesitate to contact me on the number below.

Yours sincerely

Nicola Farr
Sustainable Places - Planning Advisor

Direct dial 02030 255023
Direct e-mail nicola.farr@environment-agency.gov.uk

End

I N T E R

O F F I C E

MEMO

NORTH LINCOLNSHIR COUNCIL

To: Andrew Law, Development Control

From: Andrew Taylor, Environment Team

Your Ref: PA/SCO/2017/3

Date: 31 January 2018

Subject: VPI-Immingham Energy Park 'A", Rosper Road, South Killingholme
Proposed 49MW Gas-fired Power Station Environmental Impact Assessment EIA Scoping

Summary

- **The applicant should provide the information "reasonably required" for a Habitats Regulations Assessment.**
- **Landscape and visual impacts will also need to be considered.**
- **The applicant has made appropriate proposals for further ecological surveys to be carried out on 2018.**
- **If permission is ultimately granted, there will be a need to secure biodiversity enhancements in accordance with the National Planning Policy Framework.**

Thank you for consulting the Environment Team on the above scoping request. I broadly agree with the approach to ecology set out in the submitted scoping report. However, I shall make some comments below:

Humber Estuary SSSI, SAC, SPA, Ramsar

The SSSI Impact Risk Zone tool indicates that Natural England will need to be consulted on this proposal. The applicant will need to provide all the information reasonably required for North Lincolnshire Council to determine whether there will be a likely significant effect on the Humber Estuary SAC, SPA and/or Ramsar site. This will include, but will not be limited to:

- Details of aerial emissions.
- Data search results and/or survey information for SPA waterbirds in fields within 150 metres. Note that at present, the applicant has only surveyed for wintering and passage birds on the application site itself.

Data on wintering birds on the far side of Rosper Road are available in the public domain thanks to the recently submitted PA/2017/2141 (see below).

- Details of likely construction lighting, noise and visual disturbance levels.

This application should be considered in combination with other plans or projects, including the Local Development Framework, Local Plan, Environment Agency plans and projects and developments at Able Marine Energy Park and the recently submitted Able UK car storage proposal (PA/2017/2141). The applicant is advised to interrogate the Humber Nature Partnership In-combination Database for other plans and projects.

Protected and Priority Species

I have considered this application in accordance with Natural England's standing advice for protected species- http://www.naturalengland.org.uk/ourwork/planningtransportlocalgov/spatialplanning/standingadvice/default.aspx.

The application site supports brown field land, rough grassland and scrub and lies close to hedgerows, a drain and a pond. With these habitats, the standing advice guides us to consider the following protected species or groups:

Habitat, building or land	Species to look for
Ponds or slow-flowing water bodies (like ditches) on the site, or within 500m and linked by semi-natural habitat such as parks or heaths	Breeding birds, fish, great crested newts, water voles, invertebrates and crayfish
Rough grassland and previously developed land (brownfield sites), on or next to the site	Breeding bird, reptiles, invertebrate and protected plants
Woodland, scrub and hedgerows on, or next to the site	Bats, breeding birds, badgers, dormice, invertebrates, great crested newts, smooth snakes (see reptiles) and protected plants

Dormice, smooth snakes and white clawed crayfish* do not occur in North Lincolnshire and do not need to be considered further.

A preliminary ecological appraisal has been carried out, and the applicant has made appropriate proposals for further ecological surveys to be carried out on 2018. Survey standards are set out in Appendix 2. As part of the ecological report, it will be necessary to make use of data search results from the Lincolnshire Environmental Records Centre.

Biodiversity Enhancement
The National Planning Policy Framework states that:

"The planning system should contribute to and enhance the natural and local environment by:

- protecting and enhancing valued landscapes, geological conservation interests and soils;
- recognising the wider benefits of ecosystem services;
- minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures..."

and

"opportunities to incorporate biodiversity in and around developments should be encouraged;"

With this application, biodiversity enhancement should be secured by using locally native trees, shrubs and wildflowers for landscaping, by incorporating wetland habitats into any drainage features required and by implementing any mitigation and enhancement measures required as a result of ecological surveys. I welcome the proposals in section 6.4 of the submitted preliminary ecological appraisal report. Habitat enhancement measures for water voles may also be of value.

Landscape
Landscape and visual impacts will also need to be considered in terms of the adopted Landscape Assessment and Guidelines and the Countryside Design Summary. I would also recommend the use of the Guidelines for Landscape and Visual Impact Assessment 3rd Edition (GLVIA3, 2013), produced by the Landscape Institute and the Institute of Environmental Management & Assessment.

Core Strategy Spatial Objective 10, policies CS5 and CS16 and Saved Local Plan Policies LC7 and LC20 should also be considered.

Sources of further Advice
The applicant may wish to make use of the following sources of advice:

- Natural England's Discretionary Advice Service: https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals

- Humber Nature Partnership Advice to Developers: http://www.humbernature.co.uk/our-work/ecological-services

If you have any questions, please do not hesitate to contact me.
Andrew Taylor
Project Officer (Ecologist)

Appendix 1- Ecology and Legal Protection

Bats

All species of bat are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of The Conservation of Habitats and Species Regulations 2010 making all species of bat European Protected Species. Details of the legislation can be found at:

Wildlife and Countryside Act
http://www.legislation.gov.uk/ukpga/1981/69/contents

The Countryside and Rights of Way Act:
http://www.opsi.gov.uk/acts/acts2000/ukpga_20000037_en_7#pt3-pb8-l1g81

The Conservation of Habitats and Species Regulations 2010
http://www.opsi.gov.uk/si/si2010/uksi_20100490_en_1

Nesting birds

It is an offence under Section 1 of the Wildlife and Countryside Act of 1981(WCA 1981) to intentionally take, damage or destroy the nest of any wild bird while it is use or being built. The WCA 1981 also provides that all wild birds and their eggs are protected and cannot be killed or taken except under licence.

Great Crested Newts

The great crested newt is fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of The Conservation of Habitats and Species Regulations 2010 making it an European Protected Species. Details of the legislation are the same as those for bats (see above).

Reptiles

The adder, common lizard, grass snake and slow worm are protected against intentional killing or injuring under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).

Water voles

The water vole is fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Details of the legislation can be found at:

Wildlife and Countryside Act
http://www.legislation.gov.uk/ukpga/1981/69/contents

The Countryside and Rights of Way Act:
http://www.opsi.gov.uk/acts/acts2000/ukpga_20000037_en_7#pt3-pb8-l1g81

Appendix 2- Survey Standards

Species/Group	Survey Standards
Great crested newts	Great crested newts are European Protected Species (EPS), given very strong protection in law (see Annex). For great crested newts, surveys should be carried out by a licensed and experienced surveyor using standard methods at the appropriate time of year (April-June), in accordance with English Nature (2001) Great Crested Newt Mitigation Guidelines. Alternatively, eDNA surveys carried out in accordance with Natural England guidance shall be accepted. The results should be made available **before the application can be determined.** The following link gives the standing advice relating to great crested newts: https://www.gov.uk/guidance/great-crested-newts-surveys-and-mitigation-for-development-projects
Reptiles	Surveys should be carried out by a competent person at the appropriate time of year in accordance with Gent, T. and Gibson, S. (2003) Herpetofauna Workers' Manual (JNCC). The area of search should be described and justified in the submitted report.
Amphibians	Amphibians generally- surveys should be carried out by a competent person at the appropriate time of year in accordance with Gent, T. and Gibson, S. (2003) Herpetofauna Workers' Manual (JNCC). The area of search should be described and justified in the submitted report.
Breeding birds	Surveys should be carried out by a competent person at the appropriate time of year in accordance with the Common Birds Census Methods. In terms of territory mapping, attention should focus on Schedule 1, BAP and red/amber listed species of conservation concern. A number of evening/crepuscular visits will be necessary to assess to use of the area by barn owls and other species for breeding and foraging.
Vascular plants	Any notable records of species or communities should be highlighted in the Phase 1 survey. More detailed survey should be carried out at the appropriate time of year where interest is identified in the Phase 1 survey. This should use either Lincolnshire Local Wildlife Site methods or National Vegetation Classification methods to be agreed with the Environment Team.
Invertebrates	Phase 1 survey may identify the need to survey for various invertebrate taxa. Such surveys should be carried out by a competent person at the appropriate time of year. Taxa surveyed, methods used and the area of search should be described and justified in the submitted reports. Grayling, small heath and wall butterflies will require at least one survey visit in sunny conditions in late summer.
Section 41 Species	It will also be necessary to survey for Species of principle importance as listed in accordance with Section 41 of the Natural Environment and Rural Communities Act (2006). These species are broadly equivalent to Priority or UKBAP species.

PLANNING CONSULTATIONS

REFERENCE: SCO/2017/3

CASE OFFICER: ANDREW LAW

NORTH LINCOLNSHIRE COUNCIL
www.northlincs.gov.uk

TEAM: HISTORIC ENVIRONMENT RECORD

AUTHOR: ALISON WILLIAMS, HISTORIC ENVIRONMENT OFFICER

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HER
North Lincs
Environment Record

SUBJECT: Scoping opinion for VPI-Immingham Energy Park 'A' Power Station, land north of VPI Power Station, Rosper Road, South Killingholme, DN40 3DZ

PARISH: SOUTH KILLINGHOLME

DATE ISSUED: 05/01/2018

SUMMARY OF ADVICE

- Thank you for consulting the HER on this scoping opinion
- The proposed development has the potential for direct and indirect affects on designated and non-designated heritage assets and their settings; the site contains archaeological remains identified during a previous evaluation
- Cultural Heritage is thus scoped into the EIA
- The spatial extent and methodology of the cultural heritage assessment set out in section 5.3 of the Scoping Report is satisfactory
- This will comprise desk based research and a walkover survey; it is important to note that further archaeological field evaluation may be required prior to a determination of any planning permission in accordance with national and local planning policy (5.3.10)
- I welcome the proposal for further consultation with the HER
- Eddie Rychlak may wish to comment further on the assessment of built heritage assets within 3km of the proposed site.

HISTORIC ENVIRONMENT RECORD (HER) GROUP FUNCTION: To hold, maintain, interpret and manage heritage information, enhancing the understanding of the area's historical development as a distinctive and attractive place. HER information provides source material for interpretation by heritage professionals and for use by community groups and individuals.

The Group also provides advice on development proposals that affect, or may affect, the sites and settings of all heritage assets i.e. designated and non-designated historic buildings, archaeological sites and monuments, and historic places, areas and landscapes. This advice is provided against saved local plan policies and national historic environment policies.

For further information about the HER see http://www.northlincs.gov.uk/planning-and-environment/historic-environment-and-conservation/.

PLANNING CONSULTATIONS

REFERENCE: SCO/2017/3

CASE OFFICER: ANDREW LAW

NORTH LINCOLNSHIRE COUNCIL
www.northlincs.gov.uk

TEAM: HISTORIC ENVIRONMENT RECORD

AUTHOR: Eddie Rychlak, HISTORIC ENVIRONMENT OFFICER

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HER
North Lincs Environment Record

SUBJECT: Scoping opinion for VPI-Immingham Energy Park 'A' Power Station, land north of VPI Power Station, Rosper Road, South Killingholme, DN40 3DZ

PARISH: SOUTH KILLINGHOLME

DATE ISSUED: 08/01/2018

SUMMARY OF ADVICE

- The proposed development has the potential for direct and indirect affects on designated and non-designated heritage assets and their settings.
- Cultural Heritage is thus scoped into the EIA
- The spatial extent and methodology of the cultural heritage assessment set out in section 5.3 of the Scoping Report is satisfactory
- Section 2.4 which details the listed building affected by the proposal does not include the three listed lighthouses on the south Humber bank which are 1.5km from the development site and with the 3km radius of assessing impact on the setting of listed buildings. These lighthouses are prominent in the landscape and have intervisibility with the application site as there is no intervening infrastructure and the impact needs assessing to the methodology described in section 5.3 of the Scoping report.

  The three lighthouses are in South Killingholme parish, Killingholme High Lighthouse, Killingholme North Low Lighthouse and South Low Lighthouse

HISTORIC ENVIRONMENT RECORD (HER) GROUP FUNCTION: To hold, maintain, interpret and manage heritage information, enhancing the understanding of the area's historical development as a distinctive and attractive place. HER information provides source material for interpretation by heritage professionals and for use by community groups and individuals.

The Group also provides advice on development proposals that affect, or may affect, the sites and settings of all heritage assets i.e. designated and non-designated historic buildings, archaeological sites and monuments, and historic places, areas and landscapes. This advice is provided against saved local plan policies and national historic environment policies.

For further information about the HER see http://www.northlincs.gov.uk/planning-and-environment/historic-environment-and-conservation/.

Appendix 1C – Scoping Opinion and Consultation Response Tracker

Introduction

This Technical Appendix provides the details of how the Scoping Opinion and Consultation response have been dealt with within the ES.

Table 1C.1: Consultation Summary Table

Consultee or organisation approached	Summary of Response	How comments have been addressed
North Lincolnshire Council January 2018 (Scoping Opinion)	**Ecology and Nature Conservation** The applicant will need to provide all of the information reasonably required for NLC to determine whether there will be a likely significant effect on the Humber Estuary SAC, SPA and/or Ramsar site.	**ES Volume 1 Chapter 7: Air Quality** Predicted changes in air quality relative to the baseline and the absolute emission levels have been provided. Report to inform HRA screening provided as Appendix 10B (ES Volume 3).
	Landscape and Visual Landscape and visual impacts will also need to be considered in terms of the adopted Landscape Assessment and Guidelines and the Countryside Design Summary.	**ES Volume 1 Chapter 9 : Landscape and Visual Impact**
	Ecology and Nature Conservation The application site supports brown field land, rough grassland and scrub and lies close to hedgerows, a drain and pond. The council's ecologist has confirmed that where these habitats are present, protected species surveys will be required.	**ES Volume 1 Chapter 10 – Ecology**
	The application will need to be considered in combination with other plans and projects and the applicant is advised to review the Humber Nature Partnership In-combination Database for information on other plans and projects in the area.	Discussion with HNP has determined that cumulative database', which is not currently live or accessible to the public. HNP have committed to inform us if there are any relevant projects (for ecology) to consider. No further information was available at time of submission.
	Biodiversity enhancement should be secured by using locally native trees, shrubs and wildflowers for landscaping, by incorporating wetland habitats into any drainage features required and by implementing any mitigation and enhancement measures as a result of ecological surveys.	**ES Volume 1 Chapter 10 – Ecology** Ecological enhancements included in Section 10.7

Consultee or organisation approached	Summary of Response	How comments have been addressed
	Archaeology and Cultural Heritage Further archaeological field evaluation may be required depending on the findings of desk based research and walkover survey. Section 2.4 of the Scoping report failed to included three listed lighthouses located on the South Humber Bank within 3km of the Proposed Development- Killingholme High Lighthouse, Killingholme North Low Lighthouse and South Low Lighthouse.	**ES Volume 1 Chapter 11 Cultural Heritage** (Section 11.3, 11.4 and 11.6)
	Air Quality The submitted scoping report identifies that air quality is to be considered as part of the Environmental Statement via an Air Quality Impact Assessment. The council's Environmental Health Officer has confirmed that this approach is acceptable and that they are satisfied with the proposed extent of this assessment.	**ES Volume 1 Chapter 7 and ES Volume 3 Technical Appendix 7A** Predicted changes in air quality relative to the baseline and the absolute emission levels have been provided.
	Surface Water, Flood and Drainage Under the Water Framework Directive (WFD) the applicant will need to ensure that deterioration in water body status class is prevented both during and after construction. A Flood Risk Assessment is required and should include an assessment of how flood risk will be managed over the lifetime of the development. The assessment needs to include an assessment of the consequences should a breach of the tidal defences occur and should demonstrate that flood risk will not be increased elsewhere.	**ES Volume 1 Chapter 13 and Appendix 13 A Flood Risk Assessment**
	Traffic and Transport It was acknowledged and agreed that details of likely traffic movements during construction and their management, along with consideration of abnormal, load movements would be submitted with the planning application.	**Not part of this Environmental Statement**
Environment Agency 25 January 2018 (Scoping Opinion)	**Groundwater Protection** Recommended that: The risk management framework provided in CLR11, Model Procedures for the Management of Land Contamination, is followed when dealing with land affected by contamination. Reference to the Environment Agency Guiding principles for land contamination is made for the type of information that is required in order to assess the risk to controlled waters from the site. Consideration of the National Quality Mark Scheme for Land Contamination Management, which involve the use of competent persons to ensure that land contamination risks are appropriately managed.	**ES Volume 1 Chapter 13**

Consultee or organisation approached	Summary of Response	How comments have been addressed
	Surface Water Protection The Scoping Report highlighted potential issues with sedimentation impacts into adjacent land drains and potential leakage of construction materials into watercourses. The EA recommended: • Including settlement tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake. • Incorporation of the use of SuDS techniques, interceptors and separators as required. • Areas at risk of spillage can be bunded and carefully sited to minimise the risk of hazardous substances entering the local watercourses.	**ES Volume 1 Chapter 13**
Annie Ward Environmental Protection Officer NLC Church Square House Scunthorpe PO Box 42 DN15 6NL 27th -29th March 2018 (telecom and follow up email)	**Noise and Vibration** North Lincolnshire Council was contacted to discuss and agree the assessment methodology. The proposed methodology was: • Comparison of the predicted plant sound levels with the background sound level using the method set out in BS4142:2014. • Derivation of noise limits for the detailed design of the plant based on achieving noise levels below the Lowest Observed Adverse Effect Level (LOAEL). • Use of a single assessment location (Hazeldene). • Use of data from the routine CHP site noise monitoring for determination of the representative background sound levels. Annie Ward confirmed her department's agreement with this approach by email	**ES Volume 1 Chapter 8: Noise and Vibration**
North Lincolnshire Council 15 February 2018 by email	**Landscape and Visual** Sought agreement on selection of representative viewpoints to be used within the Landscape and Visual Impact Assessment chapter - Proposed viewpoints considered reasonable.	**ES Volume 1 Chapter 9: Landscape and Visual Impact**

Appendix 4A – Framework Construction Environmental Management Plan

Appendix 4A – Framework Construction Environmental Management Plan

Introduction

This document presents a framework for the Construction Environmental Management Plan (CEMP) that will be produced by the appointed construction contractor prior to works commencing. That CEMP would adhere to the principles set out in this Framework CEMP.

Potential impacts have been identified through the Environmental Impact Assessment (EIA) process and are reported in the Environmental Statement (ES) Volume 1. A range of 'standard' or best practice mitigation and construction management measures were accounted for in the assessments presented within the ES and these will be implemented during construction of the Proposed Development. This framework CEMP demonstrates how the commitments in the ES would be implemented. It also sets out the monitoring and auditing activities designed to demonstrate that such mitigation measures are carried out and that they are effective.

This document provides the likely structure of the detailed CEMP, some preliminary information relevant to the CEMP, and indicates what additional information might be included under each sub-section within the final CEMP.

The detailed CEMP would be produced in line with this framework document once a planning permission had been granted for the project. It would be agreed with NLC in advance of the development commencing.

The key elements of the CEMP will include:

- An overview of the Proposed Development and associated construction programme;
- Prior assessment of environmental impacts (through the EIA);
- Reduction of potential adverse impacts through design and other mitigation measures;
- Monitoring of effectiveness of mitigation measures;
- Corrective action procedures; and
- Links to other complementary plans and procedures.

In summary, the CEMP would identify how commitments made in the EIA would be translated into actions on Site and includes allocation of key roles and responsibilities.

The appointed contractor would be responsible for working in accordance with the environmental controls documented in the CEMP. The overall responsibility for implementation of the CEMP would lie with the owner of the Site.

The CEMP would be designed with the objective of compliance with the relevant environmental legislation and the mitigation measures set out within the ES. It should be read alongside any other environmental documents related to the construction phase and the ES.

Any additional construction licences, permits or approvals that are required would be listed in the detailed CEMP, including any environmental information submitted in respect of them.

Construction Programme

It is anticipated that site preparation, construction and commissioning of the Proposed Development would be undertaken over a period of around 18 months.

Allowing sufficient time to receive planning consent and to discharge the planning conditions, it is anticipated that the earliest that site preparation and enabling works on Site for the Proposed Development would start in early 2019. Table 4A.1 below provides an indicative construction programme.

Table 4A.1: Indicative Construction Programme

	2018				2019				2020				2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Main civil works																
Plant installation																
Gas and electrical connections																
Commissioning																

Construction working hours would generally be Monday to Friday 07:00 to 19:00 (except bank holidays) and Saturday 08:00 to 18:00. However, it is likely that some construction activities could be required to be 24 hours at certain times. This is principally construction activities that cannot be stopped, such as concrete slip forming, if that is required. Where on-site works are to be conducted outside the core hours they would comply with any restrictions agreed with the planning authorities, in particular regarding the control of noise and traffic. Abnormal or emergency construction traffic movements may occur outside of normal working hours. In the event of these occurrences, specific noise mitigation measures would be put in place to reduce potential noise impacts at nearby noise sensitive receptors.

Parking Provisions and Off-Site Facilities

The location and size of parking provisions on Site, access/egress routes/gates, loading and unloading areas for plant and materials, storage areas, wheel washing facilities and construction traffic management measures would be set out in the detailed CEMP. It would also include a description of any laydown areas or contractor accommodation areas.

Off-Site Delivery Routes

The CEMP would provide details of the designated routes for HGV movements and worker car movements. It is proposed that all HGVs associated with the construction of the Proposed Development would arrive and depart the Site via the existing Main Entrance for the Lindsey Oil Refinery (LOR) off Rosper Road. During the construction phase, traffic would be directed through the private road network associated with the existing car park to a new temporary haul road to be constructed along the southern boundary of the existing car park.

A HGV routing plan would be distributed to all drivers during their induction. It would be a condition of contract between VPI and its appointed contractor(s) to ensure that all HGV deliveries to the Site are instructed to use the designated route to access and egress the construction site. Sanctions would be put in place to deal with non-compliance, including in extreme circumstances driver bans.

The contractor would erect signage at the main junctions to ensure that all HGV traffic relating to the Proposed Development would be directed in the appropriate directions. These would be in place for the duration of the construction phase and checked regularly to ensure they are visible throughout.

The appointed contractor would be required to maintain all the HGV route signage.

Recycling and Disposing of Waste

In order to control the waste generated on Site during site preparation and construction, the contractor would separate the main waste streams on Site, prior to them being taken to a waste facility for recycling or disposal.

A Site Waste Management Plan (SWMP) would be developed, which would specify the waste streams to be estimated, monitored and goals set with regards to the waste produced. A Framework SWMP is included in Annex A of this Plan. The SWMP would be finalised with specific measures to be implemented prior to the start of construction, in accordance with any planning conditions imposed.

All waste to be removed from Site would be undertaken by fully licensed waste carriers and taken to licensed waste facilities.

Best Practice Measures

The Considerate Constructors Scheme (CCS) would be adopted to assist in reducing pollution and nuisance from the Proposed Development, by employing best practice measures which go beyond statutory compliance.

Management and Mitigation Plan

This section of the framework CEMP sets out the mitigation and management measures to be included, as a minimum, in the CEMP. It also illustrates how the monitoring strategy would be set out and the responsible party identified for each mitigation/enhancement measures or monitoring requirement.

Table 4A 2: Air Quality

Potential Impact	Mitigation/Enhancement Measure	Monitoring Requirements	Responsibility
Increased NO_2 and PM_{10} from on-site construction vehicle/plant emissions. Increased particulates and deposited dust from soil and spoil movements and handling.	Appropriate standard and best practice control measures would be includes in the detailed CEMP, which may include: • Avoid roughening of concrete surfaces; • Store sand and aggregates in bunded areas; • Use water suppression and regular cleaning to minimise mud on road; • Cover tipper trucks leaving the site, if used; • Employ wheel wash systems at site exits; • Restrict unmade road access; • Use water suppression to control dust during demolition activities; • Prohibit open fires on Site. Best practice would also be employed for the siting and operation of non-road mobile machinery, to control associated emissions, including: • Location of machinery and dust causing activities away from sensitive receptors where possible; • Minimise vehicle and plant idling; and • Minimise operating time outside of normal working hours/daylight hours.	To be confirmed in detailed CEMP.	To be confirmed in detailed CEMP.

Table 4A.3: Noise and Vibration

Potential Impact	Mitigation/Enhancement Measure	Monitoring Requirements	Responsibility
Vibration due to construction activities causing annoyance at Noise Sensitive Receptors and damage to building structures. Evening and night-time noise effect due to construction activities at nearby noise sensitive receptors.	Mitigation measures would be undertaken to mitigate noise. These would be included in the detailed CEMP and would include: • Abiding by construction noise limits at nearby NSRs and monitoring of baseline and ongoing noise levels during construction; • Ensuring that all processes are in place to minimise noise before works begin and ensuring that best practicable means (BPM) are being achieved throughout the construction programme, including the use of localised screening around significant noise producing plant and activities; • Ensuring that modern plant is used, complying with the latest European noise emission requirements. Selection of inherently quiet plant where possible; • If piling is required, use of lower noise piling (such as rotary bored or hydraulic jacking) rather than the driven piling techniques, where possible; • Off-site pre-fabrication, where practical; • All plant and equipment being used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use; • All contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) (BSI, 2014a and b) (Ref 4A-1 and Ref 4A-2), which should form a prerequisite of their appointment; • Loading and unloading of vehicles, dismantling of equipment such as scaffolding or moving equipment or materials around the Site, to be conducted in such a manner as to minimise noise generation; • All vehicles used on Site shall incorporate broadband reversing warning devices as opposed to the typical tonal reversing alarms to minimise	To be confirmed in detailed CEMP.	To be confirmed in detailed CEMP.

Potential Impact	Mitigation/Enhancement Measure	Monitoring Requirements	Responsibility
	noise disturbance; • Appropriate routing of construction traffic on public roads and along access tracks; • Consultation with NLC and local residents to advise of potential noisy works that are due to take place; and • Noise complaints should be monitored, reported to the contractor and immediately investigated. A detailed construction noise and vibration assessment will 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).		

Table 4A.4: Landscape and Visual Amenity

Potential Impact	Mitigation/Enhancement Measure	Monitoring Requirements	Responsibility
Loss of existing landscape features and visibility of new landscape features. Temporary disturbance to agricultural fields. Increased visibility of construction and operation activities. Loss of an area of grassland within the Site which would be utilised as the construction laydown area, alongside removal of vegetation present within the Site.	• Lighting would be designed to reduce unnecessary light spill outside of the Site boundary. • Suitable materials would be used, where possible, in the construction of structures to reduce reflection and glare and to assist with breaking up the massing of the buildings and structures. • The selection of finishes for the buildings and other infrastructure would be informed by the finishes of the adjacent developments and agreed with NLC at the detailed design stage in order to minimise the visual impact of the Proposed Development.	To be confirmed in detailed CEMP.	To be confirmed in detailed CEMP.

Table 4A.5: Ecology and Nature Conservation

Potential Impact	Mitigation/ Enhancement Measure	Monitoring Requirements	Responsibility
Potential for obtrusive glare, upward light spill and light trespass to impact on ecology. Potential for spillages to enter watercourses and impact ecology. Clearance or damage of habitat to facilitate construction - resulting in temporary or permanent reduction in habitat extent and potential direct and indirect effects on associated species. Dust deposition on sensitive ecological receptors.	• Compliance with industry good practice and environmental protection legislation (e.g. prevention of surface and ground water pollution, fugitive dust management, noise prevention or amelioration). • The Proposed Development has been sited to avoid, as far as possible, areas of high quality habitat, such as mature trees and woodland/wetland habitats associated with Local Wildlife Sites (LWS) in the vicinity of the Site. • To ensure legislative compliance in relation to nesting birds, all clearance of suitable vegetation during site preparation would be undertaken outside the breeding season (typically March-August inclusive for most species), where possible. In situations where this is not possible, an ecologist would check the working area for nests before works commence. If nests were discovered, appropriate mitigation would be implemented to ensure that they are not disturbed or destroyed before any works can commence in that area. This would include imposing exclusion zones between the works and nest(s) and suspending vegetation clearance works within the area until any young had fledged. • Precautionary measures would be implemented to prevent trapping wildlife in construction excavations in order to ensure compliance with animal welfare legislation. All excavations deeper than 1m would be covered overnight, or where this is not practicable a means of escape would be fitted (e.g. battered soil slope or scaffold plank), to allow animals (e.g. badger or otter) to vacate excavations should they fall in. • All habitats subject to temporary impacts during construction, such as those within the proposed construction laydown area and electrical connection routes would be reinstated on at least a like-for-like basis following construction. • If working at night is required, light spillage onto adjacent habitats, such as hedgerows or woodland, should be minimised to reduce the potential	To be confirmed in detailed CEMP.	To be confirmed in detailed CEMP.

Potential Impact	Mitigation/ Enhancement Measure	Monitoring Requirements	Responsibility
	impact on species. Temporary lighting should be directed at the working area only, using suitable covers/hoods as necessary. • Construction temporary lighting would be arranged so that glare would be minimised outside the construction site. • A pre-construction badger survey would be completed and protection zones would be established around any identified badger setts where possible. • Updated surveys would be completed prior to the commencement of construction, as necessary to gain up to date information on relevant protected or notable species whose status or distribution may have changed since baseline surveys were completed (e.g. badger). This would be required to inform protected species licence applications (where necessary), or otherwise to determine appropriate mitigation requirements.		

Table 4A.6: Archaeology

Potential Impact	Mitigation/ Enhancement Measure	Monitoring Requirements	Responsibility
Potential for impact upon previously unknown buried heritage assets. Loss of archaeological deposits.	In the event that during construction, in-situ archaeology is identified: • All works must stop; • The area be closed off to reduce the possibility of further disturbance; • The foreman to contact the Site Manager; and • The Site Manager to contact NLC and the local historic environmental officer to seek advice. Construction works can only recommence with NLC consent.	To be confirmed in detailed CEMP.	To be confirmed in detailed CEMP.

Table 4A.7: Ground Conditions and Hydrogeology

Potential Impact	Mitigation/Enhancement Measure	Monitoring Requirements	Responsibility
Potential for risks to human health associated with waste generation, land contamination, airborne contamination and groundwater contamination. Potential risks of explosion if explosive gases were to accumulate in excavations. The discovery of ground contamination during groundworks.	• Good operational practices (e.g. employing suitable surface water drainage control). • 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 (PPE), hygiene facilities and the implementation of dust control where considered necessary. • 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; • Implement pollution control measures including: – All plant and machinery would be checked regularly and, where possible, the use of drip trays would be employed, should vehicles be parked on unsurfaced areas of the site; – An emergency spillage action plan would be produced and provisions made to contain any leak/spill; – Diesel storage tanks and related fuel delivery infrastructure associated with the 'black-start' capability should be fit for purpose and contained with an adequately and effectively bunded area, and comply with EA Oil Storage Regulations; – Should any potentially contaminated ground, including isolated 'hotspots' of contamination be encountered during construction, the contractor would be required to investigate the areas and assess the need for containment or disposal of the material. The contractor 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	To be confirmed in detailed CEMP.	To be confirmed in detailed CEMP.

Potential Impact	Mitigation/Enhancement Measure	Monitoring Requirements	Responsibility
	Agency and other appropriate consultees. To further minimise the risks of contaminants being mobilised 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; – The contractor would be required to place arisings and temporary stockpiles away from watercourses and drainage systems, whilst surface water would be directed away from stockpiles to prevent erosion; – The contractor 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. This may include a Materials Management Plan as an appendix, to deal with any removal of materials off-site. – The risk to surface water and groundwater from run-off from any contaminated stockpiles during construction works would be further reduced by implementing suitable measures, including sealing stockpiles to prevent rainwater infiltration. Alternatively bunding and/or temporary drainage systems would be put in place, designed in line with current good practice, following appropriate guidelines and obtaining all relevant licences including discharge consents; – Any waters removed from excavations by dewatering would be discharged appropriately, subject to the relevant licences being obtained; – The contractor would implement a dust suppression/management system in order to control the potential risk from airborne		

Potential Impact	Mitigation/Enhancement Measure	Monitoring Requirements	Responsibility
	contamination migrating off-site to adjacent sites; • 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. For example, water supply pipes would be designed in accordance with current good practice and applicable guidance to ensure pipes are protected from potential impacts associated with any contamination; and • If piling is required, piling design and construction works would be completed following the preparation of a piling risk assessment, completed in accordance with the Environment Agency's 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention'. A piling and penetrative foundation design method statement would be submitted to and approved by the local planning authority prior to relevant works commencing. • Following completion of the Phase 2 intrusive ground investigation, and any other site specific site investigations which may be required, the need for any mitigation measures additional to the impact avoidance measures as presented above would be defined and presented in the final CEMP to be prepared by the appointed contractor.		

Table 4A.8: Flood Risk

Potential Impact	Mitigation/ Enhancement Measure	Monitoring Requirements	Responsibility
Potential for impact upon surface water from the storage of materials on Site. Potential for impacts from runoff from the Site causing pollution or flooding. Potential for increased flood risk.	• Placing arisings and temporary stockpiles outside of the Flood Zone 3 flood extent and away from drainage systems, and directing surface water away from stockpiles to prevent erosion. If areas located within Flood Zone 2 are to be utilised for the storage of construction materials, then a permit will be obtained from the EA; • Containment measures would be implemented, including drip trays, bunding or double-skinned tanks of fuels and oils; all chemicals would be stored in accordance with their Control of Substances Hazardous to Health (COSHH) guidelines, whilst spill kits would be provided in areas of fuel/oil storage; • An Emergency Spillage Plan would be produced, which site staff would have read and understood; • The mixing and handling of materials would be undertaken in designated areas and away from surface water drains; • Plant and machinery would be kept away from surface water bodies wherever possible and would have drip trays installed beneath oil tanks/engines/gearboxes and hydraulics, which would be checked and emptied regularly. Refuelling and delivery areas would be located away from surface water drains; and • Exposed ground and stockpiles would be protected as appropriate and practicable to prevent windblown migration of potential contaminants. Water suppression would be used if there is a risk of fugitive dust emissions. Measures that would be considered for implementation for temporary drainage through the construction design and/or CEMP include: • Installation of measures such as swales, silt fences and appropriately sized settlement tanks/ponds to reduce sediment load; • Cut-off ditches or geotextile silt-fences, installed around excavations, exposed ground and stockpiles to prevent uncontrolled release of	To be confirmed in detailed CEMP.	To be confirmed in detailed CEMP.

Potential Impact	Mitigation/ Enhancement Measure	Monitoring Requirements	Responsibility
	sediments from the Proposed Development; • Site access points would be regularly cleaned to prevent build-up of dust and mud: • A valve would be installed to isolate the settlement tank/ponds in the event of a polluted discharge; • Oil interceptors to be installed (notably the outflow from the settlement pond/tank) to reduce the potential risk for contamination of groundwater and surface water; and • All potentially polluted waters (including washdown areas, stockpiles and other areas of risk for water pollution) to have separate drainage and to be tankered away from the Site. Examples of measures that would be implemented in the Proposed Development areas in Flood Zones 2 and 3 include: • Topsoil and other construction materials would be stored outside of the 1 in 100 year floodplain extent. If areas located within Flood Zone 2 are to be utilised for the storage of construction materials, then a permit will be obtained from the EA; • Connectivity would be maintained between the floodplain and the River Humber, with no changes in ground levels within the floodplain as far as practicable; • The construction laydown area site office and supervisor would be notified of any potential flood occurring by use of the Floodline Warnings Direct service; and • The Contractor would be required to produce a Flood Risk Management Action Plan/Method Statement which would provide details of the response to an impending flood and include: – *A 24 hour availability and ability to mobilise staff in the event of a flood warning;* – *The removal of all plant, machinery and material capable of being*		

Potential Impact	Mitigation/ Enhancement Measure	Monitoring Requirements	Responsibility
	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 areas.*		

Table 4A.9: Waste and Resources

Potential Impact	Mitigation/ Enhancement Measure	Monitoring Requirements	Responsibility
Potential to impact on sensitive receptors (humans, wildlife and controlled waters) if not stored and managed appropriately.	• All operational waste would be dealt with in accordance with the waste duty of care in Section 34 of the Environmental Protection Act 1990 (the Duty) and the 2011 Regulations and consigned via a registered waste carrier to treatment or disposal at a suitably licensed waste facility. • The contractor would prepare and implement a Site Waste Management Plan (SWMP) in accordance with the framework set out in Annex A of this framework CEMP. • As part of the SWMP, the contractor would segregate waste to be reduced, re-used and recycled where possible. • Earthworks would be balanced so that quantities of 'cut' material match quantities of 'fill' material so there is not expected to be significant quantities of surplus excavation waste from the Site. To minimise impacts of waste on the surrounding environment, the following measures would be implemented: • Damping down of surfaces during spells of dry weather and brushing/water spraying of heavily used hard surfaces/access points across the Site as required; • Off-site prefabrication, where practical, including the use of prefabricated structural elements, cladding units, mechanical and electrical risers and packaged plant rooms; • Burning of waste or unwanted materials would not be permitted on Site; • All hazardous materials including chemicals, cleaning agents and solvent containing products to be properly sealed in containers at the end of each day prior to storage in appropriately protected and bunded storage areas; • All construction workers would be required to use appropriate PPE whilst performing activities on-site;	To be confirmed in detailed CEMP.	To be confirmed in detailed CEMP.

Potential Impact	Mitigation/ Enhancement Measure	Monitoring Requirements	Responsibility
	• Any waste effluent would be tested and where necessary, disposed of at the correctly licensed facility by a licensed specialist contractor(s); and • Materials requiring removal from the Site would be transported using licensed carriers and records would be kept detailing the types and quantities of waste moved, and the destinations of this waste, in accordance with the relevant regulations.		

Implementation and Operation

The detailed CEMP would include an organogram showing roles and responsibilities, training requirements, communication methods, document control and environmental emergency procedures.

Checking and Corrective Action Monitoring

To meet the requirement of the CEMP, environmental monitoring would be undertaken throughout the construction phase. In particular, the following requirements of the CEMP would be closely monitored:

- Licences and approvals;
- Dust and noise monitoring;
- Water pollution prevention; and
- Vegetation protection.

As part of the monitoring process the contractor would allocate a designated Environmental Site Officer(s), who would be present on Site throughout the construction process and when new activities are commencing. The Environmental Site Officer would observe site activities and report any deviations from the CEMP in a log book, along with the action taken and general conditions at the time. The Applicant would be informed of any deviations from the CEMP as soon as possible following identification of such issues. The Environmental Site Officer would also act as a principal point of contact with NLC and other regulatory agencies such as the Environment Agency.

During construction, the Environmental Site Officer would conduct daily walkover surveys to ensure all requirements of the CEMP are being met. Action from these surveys would be documented on an Environmental Action Schedule, discussed with the Site Foreman for programming requirements and issued weekly for actioning.

The Environmental Manager/Project Manager would arrange regular formal inspections to ensure the requirements of the CEMP are being met. After completion of the works, the Environmental Site Officer would conduct a final review.

Records

The Environmental Manager/Project Manager would retain records of environmental monitoring and implementation of the CEMP. This would allow provision of evidence that the CEMP is being implemented effectively. These records would include:

- Environmental Action Schedule;
- Licences and approvals;
- Results of inspections by Environmental Manager/Project Manager;
- Other environmental surveys and investigations; and
- Environmental equipment test records.

The CEMP would be updated as necessary, with a full review as required (at least quarterly) throughout the construction period.

A brief report would be produced at the end of each key activity shown in the construction programme, and following completion of commissioning. This would summarise the monitoring process, observed deviations from the CEMP and the corrective actions taken. This would be available to NLC and other regulators (e.g. Environment Agency) on request.

Management Review

The CEMP would be signed off on completion of the construction works and would form the basis of the Handover Environmental Management Plan (HEMP).

Annex A – Framework Site Waste Management Plan

Introduction

This Framework Site Waste Management Plan (SWMP) provides an outline waste management strategy for the construction phase of the Proposed Development, considering likely waste arising from construction based activities such as earthworks, and addresses how it would be managed through reduction, separation, control and disposal.

This Framework SWMP does not replace the requirement for the completion of a construction stage SWMP. The Framework SWMP presents the approach that would be adopted as a minimum throughout the construction of the Proposed Development and forms a framework for the approach of the construction stage SWMP.

Waste Management Legislation and Policy Context

Relevant waste legislation would be complied with during construction of the Proposed Development. Waste legislation (principally originating from European Directives), includes but is not limited to:

- Control of Pollution (Amendment) Act 1989;
- Environmental Protection (Duty of Care) Regulations 1991;
- Controlled Waste Regulations 1992;
- Environment Act 1995;
- The Hazardous Waste (England and Wales) Regulations 2005;
- The Environmental Permitting (England and Wales) Regulations 2007; and
- The Environmental Damage (Prevention and Remediation) Regulations 2009.

(Note that this list includes base legislative references only – a number of regulations have also been amended.)

National Planning Policy

In England, waste management strategies and principles are set out in a number of documents.

Waste Strategy 2000 (subsequently built upon by the Waste Strategy for England (Defra, 2007)) (Ref 4A-3) introduced new underlying principles of sustainable waste management, some key aspects of which are outlined in Table 4A.9.

National Planning Policy Framework (NPPF) 2012 (DCLG, 2012) (Ref 4A-4) sets out the Government's objectives in order to help achieve sustainable development. The framework does not include specific waste policies. Rather, these have been published as part of the National Waste Management Plan for England (Defra 2013) (Ref 4A-5).

The National Waste Management Plan revoked Planning Policy Statement (PPS) 10 (PPS10) (Ref 4A-6) which set out the requirement for applicants to describe arrangements that are proposed for managing any waste produced and prepare a SWMP. However, preparation of an SWMP remains good practice in order to ensure that wastes are dealt with in terms of the waste hierarchy.

The National Planning Policy for Waste (NPPW) (DCLG 2014 (Ref 4A-7) provides guidance of relevance to the Proposed Development in outlining that it is the responsibility of the local planning authority to ensure that non-waste related development does not impact on existing waste management facilities and does not prejudice implementation of the waste hierarchy or the efficient operation of such facilities. Similarly, there is a requirement that new, non-waste development makes sufficient provision for waste management and

promotes good design to secure the integration of waste management facilities with the rest of the development. NPPW requires the handling of waste arising from the construction such that a development maximises reuse/recovery opportunities, and minimises off-site disposal.

Taking this into account, the arrangements described and defined within the SWMP should include information on the proposed waste recovery and disposal system for all waste generated by the Proposed Development, and an assessment of the impact of the waste arising from the Proposed Development on the capacity of waste management facilities to deal with other waste arising in the area.

The Applicant would seek to minimise the volume of waste produced and the volume of waste sent for disposal.

The Applicant would propose an effective system for managing hazardous and non-hazardous waste arising from the construction of the Proposed Development.

The Applicant would demonstrate:

- Any such waste would be properly managed, both on Site and off-site.
- The waste from the Proposed Development can be dealt with appropriately by the waste infrastructure which is, or is likely to be, available. Such waste arisings should not have an adverse effect on the capacity of existing waste management facilities to deal with other waste arisings in the area.
- Adequate steps have been taken to minimise the volume of waste arisings, and of the volume of waste arisings sent to disposal, except where that is the best overall environmental outcome.

Table 4A.10: Principles of Waste Management – Definitions

Principal	Description
Waste Hierarchy	A theoretical framework used as a guide to the waste management options that should be considered when assessing BAT.
Waste as a Resource	Certain wastes can be directly used or separated/processed for use as a replacement for raw materials, saving resources and potentially reducing energy use or other impacts associated with virgin resource extraction and transport.
Proximity Principle	Waste should generally be managed as close as possible to its place of production, to minimise environmental impact that arises through transportation.
Best Practicable Environmental Option (BPEO) (Superseded by Strategic Environmental Assessment (SEA) / Sustainability Appraisal (SA)	Defined by the Royal Commission on Environmental Pollution (1988) as 'the outcome of a systematic and consultative decision making procedure which emphasises the protection and conservation of the environment across land, air and water'. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefits, as a whole, at acceptable cost, in both the short term and the long term. SA is designed to ensure compliance with SEA and as such includes for requirements on environmental decision making such as an opportunity for the public to express their opinion on draft plans (community involvement), take into account significant environmental effects including those on human health, material assets and climatic factors and a full assessment of alternative options and reasons why alternatives have been assessed and why others have not.

Policy Relating to Specific Waste Types

In regards to Construction, Demolition and Excavation (CD&E) Waste the EU Waste Directive (European Commission, 2008) (Ref 4A-8) has set a recovery target of 70% of construction and demolition waste by 2020.

It should be the aim of the Proposed Development to ensure that good practice waste recovery targets of 70% to 80% are achieved as a minimum in relation to waste produced at the Site.

Approach to Waste Management

The Applicant is committed to delivering a development that is sustainable in regards to matters relating to waste management, and would comply with the relevant statutory requirements (as detailed above), which are underpinned at a national level by the NPPW. This requirement would be passed onto the selected contractor(s).

Waste elimination would start as early as possible and the contractor and their design team would work in conjunction to design and plan waste minimisation at various stages.

In addition, an effective construction phase SWMP would be prepared which would identify, formalise and communicate waste management good site practice and responsibilities during the construction phase for the Proposed Development.

The proposed construction phase SWMP would identify the types and quantities of waste anticipated to be generated, along with the definition of suitable disposal routes. The plan would also include details as to how material reuse and recycling options would be maximised. The plan would 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 and other relevant regulations.

The proposed SWMP would be compiled around the principles of the Waste Hierarchy, examples of which are illustrated in Figure 4A.1.

Figure 4A.1: The Waste Hierarchy

Waste Types and Actions

No spoil is anticipated to be removed to facilitate construction. Therefore, the primary wastes would relate to packaging waste associated with construction materials, as well as general construction waste.

It is not yet possible to identify individual waste types - these would be assessed at the appropriate stage.

Waste Minimisation Actions and Mitigation

During the construction phase of the Proposed Development the contractor would be required to develop and implement a construction phase SWMP, incorporating the recommendations and requirements within this framework SWMP. Waste minimisation actions relating to Site generated waste that are anticipated to be implemented include:

- Agreements with material suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme;
- Implementation of a 'just-in-time' material delivery system to avoid materials being stockpiled, which increases the risk of their damage and disposal as waste;
- Attention to material quantity requirements to avoid over-ordering and generation of waste materials;
- Re-use of materials wherever feasible;
- Segregation of waste at source where practical; and
- Re-use and recycling of materials off-site where re-use on-site is not practical (e.g. through use of an off-site waste segregation facility and re-sale for direct re-use or re-processing).

Additional Actions for Dealing with Waste

In addition to the waste management measures as detailed in the 'Approach to Waste Management' section above, there are actions that would be introduced as part of the construction SWMP which would contribute to the general reduction of waste generation at the Proposed Development Site – these may include:

- Appointment of an Environmental Co-ordinator who would hold overall responsibility for waste management. The role includes co-ordinating all waste or environmental issues on Site from waste data to identifying training needs. Sites with an Environmental Co-ordinator tend to perform better in managing waste.
- Accurate record keeping of waste types, volumes and disposal routes and destinations.

- Staff awareness training to ensure all personnel know the correct procedures on Site for waste segregation, disposal and the identity of the waste champion and actively promote recycling on Site through clear signage (during construction and for commercial and educational facilities).
- Setting of targets/Key Performance Indicators (KPIs) for waste recycling and reduction.
- Establishing a good management structure which would allow prompt decision making relating to improvements in waste management and recycling initiatives.

Indicative Roles and Responsibilities

Personnel at all levels have a role in managing materials and waste correctly, however typical roles and responsibilities that may be defined as part of both the construction and operational phase SWMPs (not an exhaustive list) are summarised below.

Site Manager

- Responsible for ensuring a system is implemented that identifies and manages the waste being produced;
- Implements a waste plan as a 'live' document, identifying an appropriate strategy and KPIs; and
- Co-ordinates waste management on Site.

Site Waste Management Representative

- Co-ordinates the identification of materials for re-use or recycling and identify opportunities for waste reduction;
- Staff training;
- Ensures that all waste storage containers are accurately labelled to show all site workers where to deposit specific materials; and
- Liaises with the management team to ensure the appropriate management of incoming materials, the establishing of waste management contracts, and the provision of receptacles.

All Site Personnel

- Reduction of materials ordered to reduce the amount of waste produced;
- Correct handling and storage of materials to prevent damage and wastage;
- Co-ordinate with the site team the reuse or recycling of materials for alternative usage where possible;
- Correct handling of waste materials by containment, separation and storage;
- Labelling of waste storage containers to show where to deposit specific materials;
- Ensure containers are stored safely and securely; and
- Disposal of waste to appropriate site with correct documentation completed.

The SWMP would define and assign the responsibilities of personnel at the Site.

Audit Monitoring and Review

To be most effective it is important that the SWMP is a live document, which is continually reviewed and updated. Waste would be monitored routinely. Monitoring of waste and waste management plans ensures that waste minimisation obligations, as detailed within the SWMP, are being met and helps to identify opportunities for improvements and potential cost reductions.

The following is not an exhaustive list and represents typical activities undertaken at each stage.

Waste Monitoring (undertaken quarterly as a minimum)

- Update the SWMP at regular intervals to illustrate changes in the development as required by the current SWMP Regulations, such as waste types, volumes, sub-contractors and changes in personnel and to drive continual improvement in promoting management of wastes as high up the waste hierarchy as possible;
- Ensure all legislation and regulations are being met and that the waste management strategy is being implemented appropriately, monitored through regular site inspections;
- Completion of monthly logs detailing the volume of material brought onto Site and the volume of waste generated including the type and the route of disposal/recovery; and
- Collation of monthly data into a quarterly report detailing all waste movements and submitted to the site manager to be utilised during the annual waste audit and waste review.

Waste Audit (undertaken annually as a minimum)

- Collate/review baseline information. This would include, for example reviews of:
  - Operations/ staffing levels, composition, waste monitoring reports and quantity of waste generated;
  - Current waste management procedures;
  - Existing activities including, for example, key roles and responsibilities; and
  - An estimation of waste volumes including a comparison from previous and projected years (where appropriate).
- The results of the waste audit would be used to inform the waste review.

Waste Review (undertaken annually as a minimum)

- A waste review should be undertaken following the completion of a waste audit and the completion of regular waste monitoring. The review would provide an opportunity to consider the suitability of the management strategies that are in place in relation to relevant regulations and best practice procedures, and identify areas for improvement, lessons to be learnt and improved cost saving and sustainability; and,
- The review would consider monthly, quarterly and annual reports, compare waste related data that has been collected and include guidance and proposals to drive continual improvement.

The monitoring procedures detailed above would be undertaken as a minimum and defined within the SWMP.

Conclusion and Summary

This framework SWMP presents the approach that would be implemented at the Proposed Development during its construction.

This plan illustrates and seeks to guide the contractor and the Applicant to:

- Recognise that the SWMP would underpin the approach to waste management for the Proposed Development;
- Define indicative roles and responsibilities within the organisations to ensure those responsible for waste management are aware of the remit;
- Demonstrate that key waste legislation would be met and local and regional drivers would be fulfilled including reviewing procedures should waste legislation and guidance be amended or updated in future;

- Demonstrate that the construction phase would minimise waste in accordance with best practice via the implementation of a construction phase SWMP;
- Develop a proactive and coordinated approach to sustainable waste management, reuse and recycling that would be encouraged and implemented at the Site through a number of recycling initiatives to divert as much recyclable waste as possible from landfill; and
- Record and audit waste movement through, in and out of the Proposed Development as appropriate.

Where individual waste types have not been identified within this framework SWMP, these would be assessed at the appropriate stage.

In Table 4A.11 is a summary of the potential wastes which are likely to be generated from the Proposed Development and proposed management processes to reduce negative impacts.

Table 4A.11: Waste Estimations

Waste Type	Main Management Process
Soil arisings	Reuse on Site where appropriate, remediate where necessary
Concrete, masonry and aggregates	Crush and reuse investigate potential for off-site use
Metals	Recycle via appropriate waste carrier
Paper and cardboard	Segregate and recycle via appropriate waste carrier
Sanitary waste	Remove by specialist waste contractor
Plastics and glass	Recycle via appropriate waste carrier

References:

Ref 4A-1 British Standards Institute (2014) BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.

Ref 4A-2 British Standards Institute (2014) BS 5228-2:2009+A1:2014 – 'Code of practice for Noise and Vibration control on construction and open sites. Part 2:Vibration.'

Ref 4A-3 Department for Environment, Food and Rural Affairs (2007) Waste Strategy for England.

Ref 4A-4 Department for Communities and Local Government (2012) National Planning Policy Framework.

Ref 4A-5 Department for Food, Environment and Rural Affairs (2013) National Waste Management Plan for England.

Ref 4A-6 Department for Communities and Local Government (2010) Planning Policy Statement for Waste.

Ref 4A-7 Department for Communities and Local Government (2014) National Planning Policy for Waste.

Ref 4A-8 Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste.

Appendix 7A – Air Quality Technical Appendix

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Appendix 7A – Air Quality

Introduction

This Technical Appendix supplements Chapter 7: Air Quality and describes the additional details for the dispersion modelling of point source emissions from the operational Proposed Development, as summarised in Chapter 7: Air Quality in ES Report Volume 1.

Point Source Emissions

Dispersion Model Parameters

Due to a number of gas engine types and sizes under consideration at this early design stage for the Proposed Development, all likely combinations of gas engines have been assessed in order to determine the configuration leading to the worst case impacts at receptor locations. Table 7A.1 summarises the emissions for the two layout configurations under consideration.

Table 7A.1 Emissions Inventory for the Gas Engines under Consideration for the Proposed Development

Variable	Indicative Layout A	Indicative Layout B
Engine Numbers and Sizes	5 x 9.8MWe	33 x 1.5MWe
Stack Locations	5 stacks assessed located on the building identified as the Engine Hall. Stacks have been assessed at various locations and orientations to determine the worst case configuration.	33 stacks assessed located in the area identified for gas engine housings. Stacks have been assessed at various locations and orientations to determine the worst case configuration.
Stack Height	Lowest Stack Height of 30m	Lowest Stack Height of 10m
Stack Diameter (m)	1.20	0.37
Flue temperature (°C)	355	388
Actual Volumetric Flow (m^3/sec)	30.5	4.24
Stack velocity (m/s)	27.0	39.5
Reference Volumetric Flow, dry, 0°C, 1 atm, 15% O_2 (Nm^3/sec)	18.5	2.84
NO_x emission concentration (mg/Nm^3)	75	95
NO_x mass emission rate (g/s)	1.39 (6.95 total, five units)	0.27 (8.91 total, 33 units)
CO emission concentration (mg/Nm^3)	100	370
CO mass emission rate (g/s)	1.85 (9.25 total, five units)	1.05 (34.7 total, 33 units)

As detailed in Table 7A.1, individual stacks associated with the position of individual gas engines have been assessed at various locations within the areas defined for the gas engines/ engine hall, in order to determine the worst case configuration for the assessment. In addition, the stacks have also been assessed assuming that they are grouped together in stack clusters (Layout B), or in a single wind shield (Layout A).

The models run with the grouped stacks resulted in lower impacts at all receptor locations than the models run with individual stacks, due to the improved buoyancy achieved, and therefore the results presented in the main assessment are based on the worst case configuration of individual stacks on each gas engine.

Should the final design of the Proposed Development have stacks grouped together in a stack cluster, the impacts would be lower than those presented in this assessment.

Table 7A.1 shows that the smaller gas engines associated with Layout B are compliant with the emission limit for NO_x set out in the MCPD, and the larger engines associated with Layout A are compliant with the lower IED BAT-AELs for NO_x and also the specified CO BAT-AEL.

It can be seen that as Layout B has the largest number of engines, the mass emission of 0.27g/s per engine results in the overall highest mass emission of all the options assessed (total emission of 8.91g/s). In addition, due to the stack height potentially being the lowest of all the options, Layout B also results in the poorest dispersion of the emission, and therefore results in the highest predicted impacts at all receptors.

NO_x to NO_2 Conversion – Combustion Plant

Emissions of nitrogen oxides from industrial point sources are typically dominated by nitric oxide (NO), with emissions from combustion sources typically in the ratio of nitric oxide to nitrogen dioxide (NO_2) of 9:1. However, it is NO_2 that has specified NAQS objectives due to its potential impact on human health. In the ambient air, NO is oxidised to NO_2 by the ozone present, and the rate of oxidation is dependent on the relative concentrations of NO and ozone in the ambient air.

For the purposes of detailed modelling, and in accordance with Environment Agency technical guidance (Ref 7A-1) it is assumed that 70% of emitted nitric oxide is oxidised to nitrogen dioxide in the long term and 35% of the emitted nitric oxide is oxidised to nitrogen dioxide in the local vicinity of the site in the short-term.

Meteorological Data

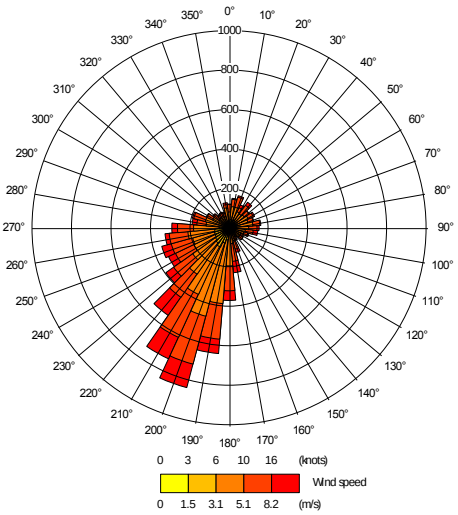
Actual measured hourly-sequential meteorological data is available for input into dispersion models, and it is important to select data as representative as possible for the site that is modelled. This is usually achieved by selecting a meteorological station as close to the site as possible, although other stations may be used if the local terrain and conditions vary considerably, or if the station does not provide sufficient data.

The meteorological site that was selected for the assessment is Humberside airport, located approximately 9.5km south-west of the Proposed Development, at a flat airfield, and therefore a surface roughness of 0.2m (representative of agricultural areas) has been selected for the meteorological site.

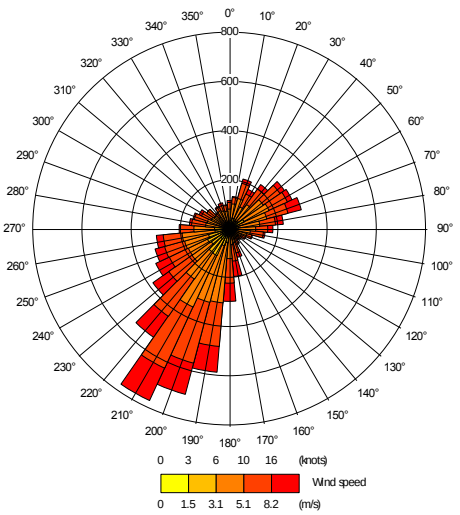
The modelling for this assessment has utilised five years of meteorological data for the period 2012-2016, with no single year providing the worst-case results. Therefore the reported results provided in Chapter 7: Air Quality (ES Report Volume I) are taken from the worst case result obtained for all years assessed and the sensitivity of the results to different years' data is discussed in this Appendix. The wind roses for Humberside airport are provided in Figure 7A.1.

Figure 7A.1 Windroses, Humberside Airport

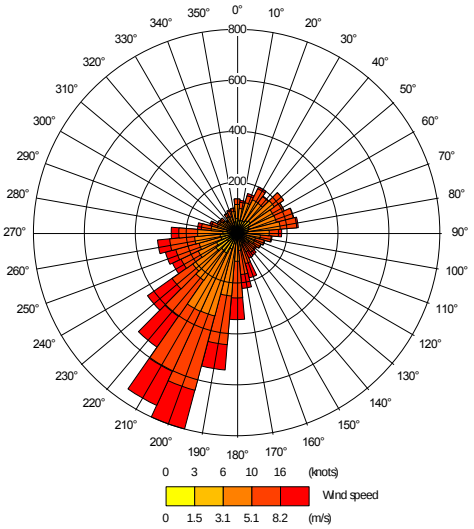
2012



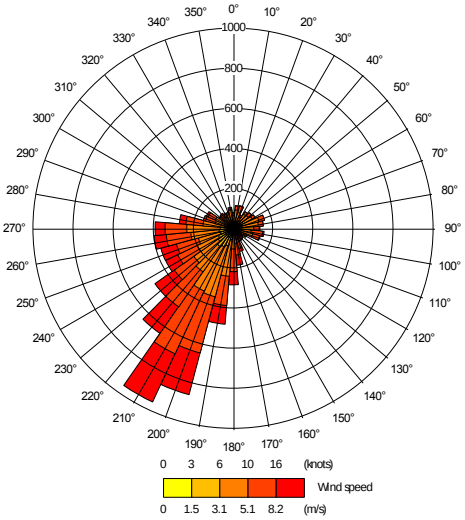
2013



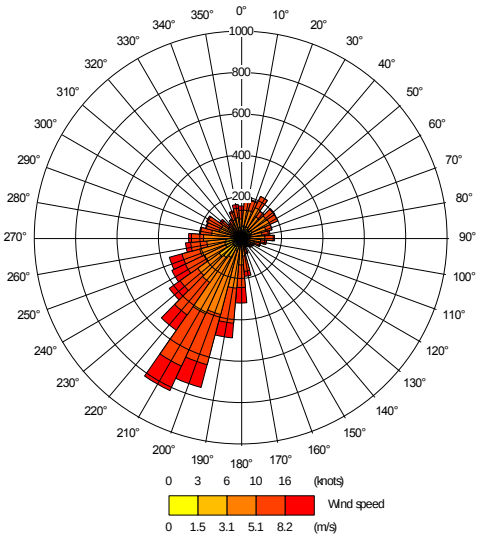
2014



2015



2016



Buildings and Terrain

The presence of buildings or structures near to the emission points can have a significant effect on the dispersion of emissions. The wind field can become entrained into the wake of buildings, which causes the wind to be directed to ground level more rapidly than in the absence of a building. If an emission is entrained into this deviated wind field, this can give rise to elevated ground-level concentrations. Building effects are typically considered where a structure of height greater than 40% of the stack height is situated within 8-10 stack heights of the emissions source.

Buildings associated with the Proposed Development that are considered to be of sufficient height and volume to potentially impact on the dispersion of emissions from the gas engine stacks have been included in the dispersion model. At this stage, the air quality assessment is conservatively based on the maximum (worst-case) building dimensions outlined in Chapter 4: The Proposed Development (ES Report Volume I). In reality, the building dimensions may be smaller than the ones used in the assessment. However, this would be expected to reduce the significance of building impacts on the dispersion of emissions from the stacks and therefore reduce the maximum predicted ground level concentrations. The results presented in Chapter 7: Air Quality (ES Report Volume I) are therefore considered to be conservative with respect to building effects.

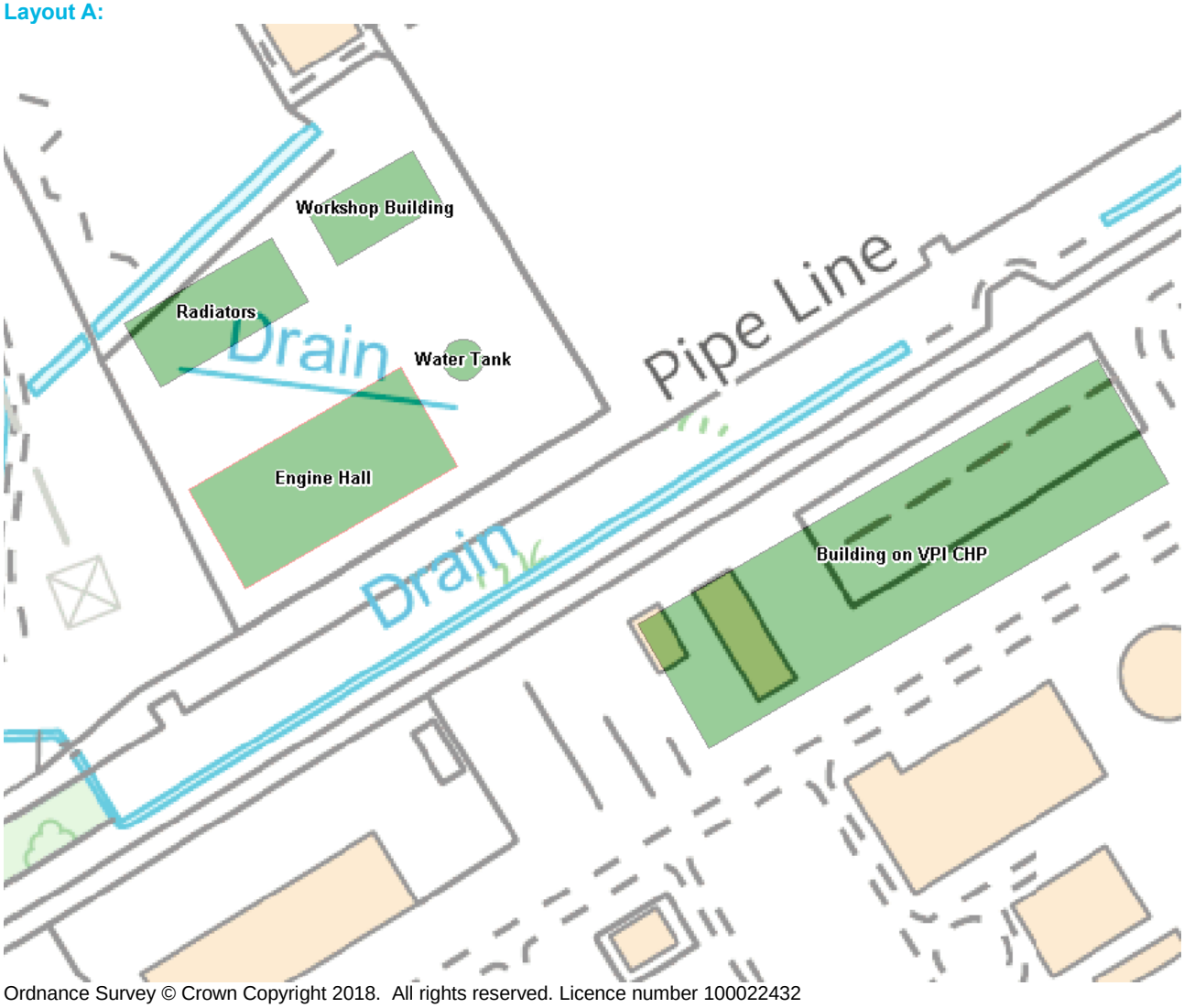
Parameters representing the buildings included in the model are shown in Table 7A.2 and plans showing the alternative building layouts used in the ADMS simulations are illustrated in Figure 7A.2.

Table 7A.2 Buildings Included Within the Modelling Assessment

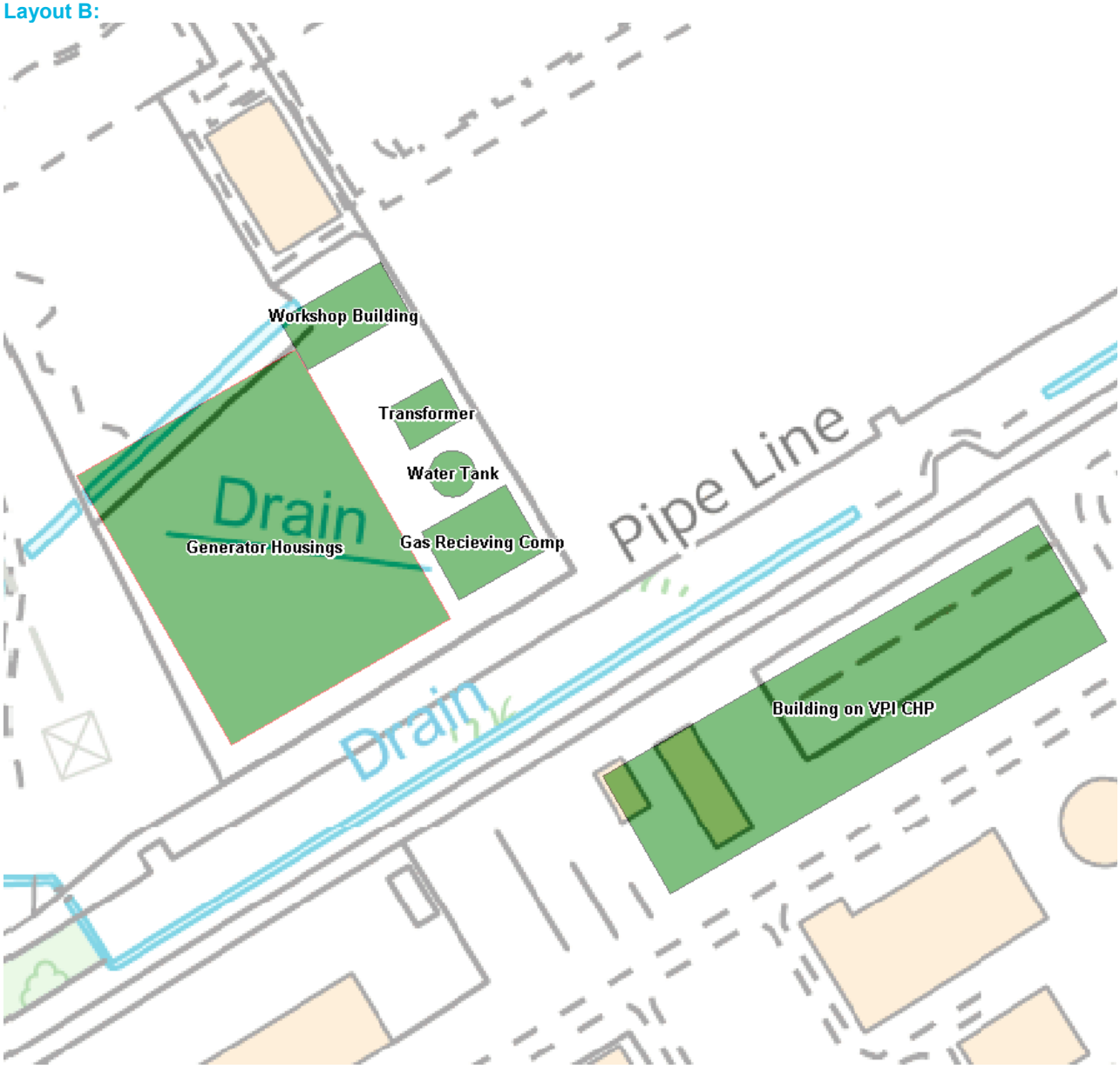
Building	Height (m)	Length (m)	Width (m)	Angle*
Layout A				
Engine Hall	15	60	28	60°
Workshop Building	10	30	15	60°
Water Tank (circular)	10	12	-	-
Radiators	10	42	18	60°
Building on VPI CHP Site	22	130	35	60°
Layout B				
Gas Engines Generator Housings	7	65	80	60°
Workshop Building	10	30	15	60°
Water Tank (circular)	10	12	-	-
Transformer	10	16	12	60°
Gas Receiving Compound	7	25	20	60°
Building on VPI CHP Site	22	130	35	60°

* Angle of building length to north

Figure 7A.2 Buildings Representation for Alternative Model Scenarios Layout A:



Layout B:



The Proposed Development is situated within a largely industrial area, with the existing VPI CHP power station buildings to the south of the Site and the Lindsey Oil Refinery site to the west of the Site. The local area downwind of the Proposed Power Plant Site is undeveloped and flat, and predominantly agricultural to the north and east. A surface roughness of 0.5m, corresponding to the open suburbia and parkland, has therefore been selected to represent the local terrain. The sensitivity of the model results to surface roughness is provided in this Appendix.

Site-specific terrain data has not been used in the model, as typically terrain data will only have a marked effect on predicted concentrations where hills with gradient of more than 1 in 10 are present in the vicinity of the source, which is not the case at the Proposed Development Site.

Modelled Domain and Receptors

The model has been based on a grid extending 1km from the emission sources with a grid resolution output at 40m intervals from the source. The nearest residential receptor to the emission sources is located approximately 730m from the source and therefore this resolution is considered conservative and appropriate.

Discrete receptor locations in the vicinity of the Proposed Development have been included directly within the model, as detailed in Section 7.4 of Chapter 7: Air Quality (ES Report Volume 1); and discrete designated ecological receptor locations within 10km of the source have also been included. Ecological receptor grid references have been determined through identification of the nearest receptor boundary to the Proposed Development. Process contributions at discrete receptor locations have been calculated directly in the model output; process contributions at non-statutory ecological receptors, have been determined from isopleths plots to identify the maximum concentration within the ecological site area in accordance with best practice. Modelled receptor locations are shown in Figure 7.1 (ES Report Volume 2).

Stack Heights

The proposed stack heights assessed have been based on the standard offerings from the current OEMs under consideration. These are therefore considered to be the lowest stack heights that would be applied to the plant, and therefore would result in the worst case impacts. If higher stack heights are employed in the final design, these will improve the dispersion of emissions and therefore reduce the impacts over those presented in this assessment.

Determining Process Contributions

The Proposed Development will not be designed to operate continuously, but to run intermittently to provide power for periods of peak electricity demand. It is therefore not possible to specify which hours of the year the plant will operate. The method by which this is taken into account in the dispersion modelling is dependent on the metric being assessed i.e. annual, daily, 8-hour or hourly mean concentrations.

The annual mean process contributions of NO_x and NO_2 have been factored to take account of the maximum proposed operating hours per year. This will depend upon the final engine selection for the Proposed Development and will therefore be dependent on the predicted impacts of the final design. It is likely that should the smaller engines be selected (Layout B), operating hours will be limited to somewhere in the range of 1,200 hours per year, however due to the lower impacts associated with the larger engines (Layout A), operating hours of up to 3,500 hours per year may be possible depending on final design, stack height and stack configuration. Ultimately this will be determined by the Environmental Permit issued for the Proposed Development and will be based on a revised impact assessment of the final design scheme.

For the purpose of the assessment results presented in Chapter 7: Air Quality of this ES, long term (annual mean) concentrations assuming full load operation for a whole year would be unrealistic. Therefore, long term impacts have been estimated by scaling the results for the worst case option of 33 x 1.5MWe engines running continuously at full load for a more realistic operating period of 1,200 hours per year, i.e.

$$\frac{\text{1,200 (maximum hours of operation in one year)}}{\text{8,760 (total hours in one year)}}$$

This approach is appropriate and is based on the assumption that the range of meteorological conditions under which the gas engines will operate, over the 1,200 hours, will be statistically similar to those experienced over a year. The annual stack contributions have been adjusted when presenting both the impacts at human health receptors close to the Proposed Development and for the ecological modelling when considering annual NO_x concentrations and annual nitrogen/acid deposition. To ensure a level of conservativeness in the assessment, both the human health and ecological assessments have been calculated based on the maximum annual concentrations predicted at each location from the 5 years of meteorological data used in the modelling.

The daily mean NO_x process contribution, for ecological receptors, has been factored to take account of the discontinuous operation, as average operation for the proposed plant would be 3-4 hours per day based on the maximum 1,200 hours per year; the dispersion model has therefore been run with a variable input file for a maximum of 12 hours operation per day to represent a realistic worst-case daily operation, accounting for potential seasonal variation in the operating hours, whilst accounting for variations in meteorological conditions that could lead to peak impacts. The variable input file has been set up for emissions from the gas engines between 06:00-09:00 and 15:00-22:00 hours for each day.

The impacts of the Proposed Development on short term (8 hours or less) pollutant concentrations were modelled assuming that the gas engines were operating at full load continuously for a whole year. This is appropriate since the UK objectives and EU limit values for hourly NO_2 and 8-hourly CO are based on the 18 highest and highest concentrations respectively over a year and, with 1,200 hours of operation per year, it is likely that operations will, at times, coincide with examples of the poorest dispersion conditions.

Sensitivity Analysis

The assessment has taken into consideration the sensitivity of predicted results to dispersion model input variables, to identify the realistic worst-case process contributions at sensitive receptor locations. These variables include:

- Meteorological data, for which five years' recent data from a representative meteorological station (Humberside airport) have been used;
- Buildings, structures and local topography that could affect dispersion from the source;
- Surface roughness; and,
- Engine type.

The maximum predicted concentration of NO_2 at the worst-affected human health receptors and NO_x at the worst-affected statutory designated ecological receptor, associated with the variable input parameters, are presented in Table 7A.3 as the percentage of maximum reported values used in the main assessment.

Table 7A.3. Point Source Dispersion Model Sensitivity Analysis – Worst-case Results NO_2/ NO_x

Model Input Variable	Human Health Receptor		Statutory Ecological Receptor	
	Short-term	Long-term	Short-term	Long-term
Meteorological data (5-year min-max)	91-100%	64-100%	77-100%	91-100%
Buildings representation (including alternative layouts)	98%	100%	101%	102%
Stack orientation (E-W)	100%	99%	100%	100%
Surface roughness representation (0.3 - 1.0m)	91 – 103%	96 – 104%	95 – 113%%	96 - 104%
Engine type (5 x 9.8MWe)	24%	30%	34%	36%

The main uncertainty associated with the model is considered to be meteorological data, with a variation of 64% in the annual mean NO_2 PC at human health receptors; this is equivalent to an overall uncertainty associated with the annual mean PC at the worst-affected receptor of -1.1µg/m^3 (or -3% of the annual average NAQS).

The effect of representation of buildings and stack orientation within the dispersion model has been assessed, with very little variation in short-term and long term PCs at the worst-affected receptors determined for the alternative layouts, or a change in the stack orientation.

Surface roughness representation within the model has been assessed with higher surface roughness leading to a reduction in the predicted concentrations, and the lower surface roughness leading to a slight increase in the predicted concentrations. That said the variation resulted in only 5-13% change in the short-term PC at the worst-affected receptor and at the modelled receptor, and would not impact the conclusions of the assessment.

It can be seen that the impacts associated with the larger engine types are significantly lower than those presented in the assessment for the 33 x 1.5MWe engines, with long term impacts at human health receptors up to 70% less than those reported in the main assessment.

The overall worst-case input parameters have been used to generate the PCs used in the main assessment. Application of the above sensitivity results to PCs does not adversely alter the predicted effects significance assessment.

Likely Impacts and Effects

Assessment of Operational Point Source Emissions

The predicted atmospheric concentrations of pollutants from dispersion modelling of the worst-case operational scenario are shown for human health impacts, and impacts at designated and non-statutory ecological receptors, in the following tables together with baseline concentrations and the assessment of effect at identified receptors.

Nutrient nitrogen deposition and acid deposition are reported for statutory designated ecological receptors only, as existing Critical Load baseline data is typically only available for these sites.

Table 7A.4. Maximum NO_2 (1-hour, 99.79th %ile) Predicted Concentrations at Human Health Receptors (Worst-case Gas Engine Configuration)

Receptor ID	Receptor name	NAQS Objective (µg/m^3)	Hourly mean PC (µg/m^3)	PC/NAQS	Change descriptor	Short-term AC (µg/m^3)[1]	PC as % of headroom (PC/(NAQS-AC)	Effect descriptor
R1	Hazel Dene	200	29.2	15%	Minor	34	18%	Negligible
R2	Church Lane		10.8	5%	Imperceptible	34	6%	Negligible
R3	Station House		20.9	10%	Imperceptible	34	13%	Negligible
R4	Old Vicarage		7.52	4%	Imperceptible	34	5%	Negligible
R5	Manor Farm		9.00	4%	Imperceptible	34	5%	Negligible
R6	Westfield Farm		11.0	5%	Imperceptible	34	7%	Negligible
R7	Staple Road		12.3	6%	Imperceptible	34	7%	Negligible
R8	Humber Road		13.9	7%	Imperceptible	34	8%	Negligible
R9	East End Farm		11.9	6%	Imperceptible	34	7%	Negligible
R10	Immingham		8.09	4%	Imperceptible	34	5%	Negligible
R11	Station Road		15.7	8%	Imperceptible	34	9%	Negligible

Notes: 1: Short term ambient concentration (AC) is represented by twice the annual mean concentration in accordance with EA guidance.

Table 7A.5. Maximum Annual Mean NO_2 Predicted Concentrations at Human Health Receptors (Worst-case Gas Engine Configuration)

Receptor ID	Receptor name	NAQS Objective (µg/m^3)	Annual mean PC (µg/m^3)	PC/NAQS	Change descriptor	Annual mean AC (µg/m^3)	PEC (µg/m^3)	PEC/NAQS	Effect descriptor
R1	Hazel Dene	40	0.40	1.0%	Very Low	17	17.4	44%	Negligible
R2	Church Lane		0.06	0.1%	Imperceptible	17	17.1	43%	Negligible
R3	Station House		0.35	0.9%	Very Low	17	17.4	43%	Negligible
R4	Old Vicarage		0.03	0.1%	Imperceptible	17	17.0	43%	Negligible
R5	Manor Farm		0.04	0.1%	Imperceptible	17	17.0	43%	Negligible
R6	Westfield Farm		0.07	0.2%	Imperceptible	17	17.1	43%	Negligible
R7	Staple Road		0.10	0.2%	Imperceptible	17	17.1	43%	Negligible
R8	Humber Road		0.09	0.2%	Imperceptible	17	17.1	43%	Negligible
R9	East End Farm		0.08	0.2%	Imperceptible	17	17.1	43%	Negligible
R10	Immingham		0.03	0.1%	Imperceptible	17	17.0	43%	Negligible
R11	Station Road		0.17	0.4%	Imperceptible	17	17.2	43%	Negligible

Table 7A.6. Maximum CO (1-hour) Predicted Concentrations at Human Health Receptors (Worst-case Gas Engine Configuration)

Receptor ID	Receptor name	EAL (µg/m^3)	Hourly mean PC(µg/m^3)	PC/NAQS	Change descriptor	Short-term AC (µg/m^3)[1]	PC as % of headroom (PC/(NAQS-AC)	Effect descriptor
R1	Hazel Dene	30,000	392	1%	Imperceptible	263	1%	Negligible
R2	Church Lane		189	<1%	Imperceptible	263	<1%	Negligible
R3	Station House		301	1%	Imperceptible	263	1%	Negligible
R4	Old Vicarage		149	<1%	Imperceptible	263	<1%	Negligible
R5	Manor Farm		163	<1%	Imperceptible	263	<1%	Negligible
R6	Westfield Farm		175	<1%	Imperceptible	263	<1%	Negligible
R7	Staple Road		199	<1%	Imperceptible	263	<1%	Negligible
R8	Humber Road		255	<1%	Imperceptible	263	<1%	Negligible
R9	East End Farm		201	<1%	Imperceptible	263	<1%	Negligible
R10	Immingham		139	<1%	Imperceptible	263	<1%	Negligible
R11	Station Road		257	<1%	Imperceptible	263	<1%	Negligible

Notes: 1: Short term ambient concentration (AC) is represented by twice the annual mean concentration in accordance with EA guidance.

Table 7A.7. Maximum CO (8-hour, running mean) Predicted Concentrations at Human Health Receptors (Worst-case Gas Engine Configuration)

Receptor ID	Receptor name	NAQS Objective (µg/m^3)	8-hr mean PC (µg/m^3)	PC/NAQS	Change descriptor	Short-term AC (µg/m^3)[1]	PC as % of headroom (PC/(NAQS-AC)	Effect descriptor
R1	Hazel Dene	10,000	352	4%	Imperceptible	263	4%	Negligible
R2	Church Lane		88	<1%	Imperceptible	263	<1%	Negligible
R3	Station House		221	2%	Imperceptible	263	2%	Negligible
R4	Old Vicarage		141	1%	Imperceptible	263	1%	Negligible
R5	Manor Farm		92	<1%	Imperceptible	263	<1%	Negligible
R6	Westfield Farm		171	2%	Imperceptible	263	2%	Negligible
R7	Staple Road		194	2%	Imperceptible	263	2%	Negligible
R8	Humber Road		157	2%	Imperceptible	263	2%	Negligible
R9	East End Farm		155	2%	Imperceptible	263	2%	Negligible
R10	Immingham		65	<1%	Imperceptible	263	<1%	Negligible
R11	Station Road		203	2%	Imperceptible	263	2%	Negligible

Notes: 1: Short term ambient concentration (AC) is represented by twice the annual mean concentration in accordance with EA guidance.

Table 7A.8. Maximum NO_x (24-hour) Predicted Concentrations at Ecological Receptors (Worst-case Gas Engine Configuration)

Receptor ID	Receptor name	Receptor type	CL (µg/m^3)	Daily mean NO_x PC (µg/m^3)	PC/Critical Level	Change descriptor
E1	Humber Estuary	SAC, SPA, Ramsar	75	9.6	13%	Minor
E2	North Killingholme Haven Pits	SSSI		6.7	9%	Imperceptible
E3	Eastfield Railway	LWS		16.7	22%	Imperceptible
E4	Burkinshaws Covert	LWS		35.1	47%	Imperceptible
E5	Station Road Fields	LWS		28.5	38%	Imperceptible
E6	Rosper Road Pools	LWS		18.3	24%	Imperceptible

Table 7A.9. Maximum Annual Mean NO_x Predicted Concentrations at Ecological Receptors (Worst-case Gas Engine Configuration)

Receptor ID	Receptor name	Receptor type	CL (µg/m^3)	Annual mean PC (µg/m^3)	PC/Critical Level	Change descriptor	Annual mean AC (µg/m^3)	PEC (µg/m^3)	PEC/Critical Level	Effect descriptor
E1	Humber Estuary	SAC, SPA, Ramsar	30	0.30	1.0%	Very Low	28.5	28.8	96%	Minor
E2	North Killingholme Haven Pits	SSSI		0.22	0.7%	Very Low	23.6	23.9	80%	Negligible
E3	Eastfield Railway	LWS		0.18	0.6%					Negligible
E4	Burkinshaws Covert	LWS		0.73	2.4%					Negligible
E5	Station Road Fields	LWS		1.24	4.1%					Negligible
E6	Rosper Road Pools	LWS		0.29	1.0%					Negligible

Deposition Impacts and Effects on Ecological Receptors

Table 7A.10. Nutrient Nitrogen Deposition (as kg N/Ha/year) at Statutory Designated Habitats (Worst-case Gas Engine Configuration)

Receptor ID	Receptor name (Critical Load Class)	Empirical Critical Load[1]	Annual mean PC	PC/Critical Load (lower)	Magnitude of change	Annual mean baseline[1]	PEC /Critical Load (lower)	Effect descriptor
E1	Humber Estuary SPA and SSSI (Rich Fens)[2]	15 - 30	4.8×10^{-4}	<0.1%	Imperceptible	15.0	100%	Negligible
E1	Humber Estuary SPA and SSSI (Low and medium altitude hay meadows)	20 - 30	0.04	0.2%	Imperceptible	15.0	75%	Negligible
E1	Humber Estuary SPA, SAC and SSSI (Pioneer, low-mid, mid-upper saltmarshes)	20 - 30	0.04	0.2%	Imperceptible	15.0	75%	Negligible
E1	Humber Estuary SAC and SPA (Coastal stable dune grassland - acid type)[3]	8 - 10	3.7×10^{-4}	<0.1%	Imperceptible	15.0	188%	Negligible
E1	Humber Estuary SAC and SPA (Coastal stable dune grassland - calcareous type)[3]	10 - 15	3.7×10^{-4}	<0.1%	Imperceptible	15.0	150%	Negligible
E1	Humber Estuary SAC and SPA (Coastal shifting dunes)[3]	10 - 20	3.7×10^{-4}	<0.1%	Imperceptible	15.0	150%	Negligible
E1	Humber Estuary SPA (Northern wet heath)[2]	10 - 20	4.8×10^{-4}	<0.1%	Imperceptible	15.0	150%	Negligible
E2	North Killingholme Haven Pits SSSI (Pioneer, low-mid, mid-upper saltmarshes)	20 - 30	0.04	0.2%	Imperceptible	16.2	81%	Negligible

Notes:
1 = Critical Loads and existing baseline levels taken from APIS
2 = "Rich Fens" and "Northern Wet Heath" habitat are not considered to occur in the vicinity of the Proposed Development Site. The annual PC has therefore been assessed at a location to the west of the Humber Bridge, which is considered to be the closest location where such habitat could occur.
3 = There are not considered to be any "Dune" type habitats within the vicinity of the Proposed Development Site. The annual PC has therefore been assessed at known dune locations, namely south of Cleethorpes and at Spurn Point.

Table 7A.11. Acid Deposition (as keq/Ha/year) at Statutory Designated Habitats (Worst-case Gas Engine Configuration)

Receptor ID	Receptor name (Critical Load Class)	Empirical Critical Load (keq N/Ha/yr)	Empirical Critical Load (keq S/Ha/yr)	Total Baseline (N:S keq/Ha/yr)[1]	PC of N to acid deposition[1]	PC/ Critical Load	Magnitude of change	PEC/ Critical Load	Effect descriptor
E1	Humber Estuary SPA, SAC and SSSI (Acid Grassland)	0.223-0.643	0.420	1.07:0.32	0.003	0%	Imperceptible	216%	Negligible
E1	Humber Estuary SPA, SAC and SSSI (Calcareous Grassland)	0.856-4.856	4.00	1.07:0.32	0.003	0%	Imperceptible	29%	Negligible
E1	Humber Estuary SPA (Dwarf shrub heath)	0.449-1.312	0.420	1.07:0.32	0.003	0%	Imperceptible	106%	Negligible
E2	North Killingholme Haven Pits SSSI	Habitat not sensitive to acidification							

Notes: 1: Sulphur contribution from Proposed Development assumed to be zero

References

Ref 7A-1: Air Quality Modelling and Assessment Unit, Conversion Ratios for NO_x and NO_2 accessed at http://webarchive.nationalarchives.gov.uk/20140328232919/http://www.environment-agency.gov.uk/static/documents/Conversion_ratios_for__NOx_and_NO2_.pdf on 4th April 2018.

Appendix 7B – Greenhouse Gas Assessment

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Appendix 7B – Greenhouse Gas Emissions

Introduction

Climate change and its associated impact is a key sustainable development issue. The Climate Change Act 2008 has stated a reduction target of at least 80% of 1990 levels by 2050. The UK government has committed to contributing to global emission reductions, to limit global temperature rise to as little as possible above 2°C. The UK has just entered its 3rd carbon budget (2018 to 2022) whereby the carbon budget level is 2,544 MtCO2e and 37% reduction below 1990 levels by 2020.

Legislative and Planning Policy Context

Climate Change Act 2008

The Climate Change Act 2008 sets a legally binding target for the UK to reduce its greenhouse gas emissions from 1990 levels by at least 80% lower than the 1990 baseline by 2050. This overall target is supported by a system of binding five-year '*carbon budgets'* as well as an independent body to monitor progress, the Committee on Climate Change (Ref. 7B-1).

Town and Country Planning (Environmental Impact Assessment) Regulations 2017

The Town and Country Planning Regulations (Ref. 7B-2) outline information for inclusion in environmental statements within Schedule 4 which states:

> *"5. A description of the likely significant effects of the development on the environment resulting from, inter alia:*
>
> *(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change."*

North East Lincolnshire Local Plan 2015

The North East Lincolnshire Emerging Local Plan 2013 – 2032 (Ref. 7B-3) contains policies to guide new development and is used to assess planning applications submitted to the council, within which the Proposed Development is located. Policy 1 of the NE Lincolnshire Local Plan specifically relates to sustainable development stating:

> *"Policy 1: Presumption in favour of Sustainable Development*
>
> *When considering development proposals the Council will take a positive approach that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework. It will always work pro-actively with applicants jointly to find solutions which mean that proposals can be approved wherever possible, and to secure development that improves the economic, social and environmental conditions in the area; working to deliver a strategy which seeks to meet development and infrastructure needs.*
>
> *Planning applications that accord with the policies in this Plan (and, where relevant, with polices in neighbourhood plans) will be approved without delay, unless material considerations indicate otherwise.*

Where there are no policies relevant to the application, or relevant policies are out of date at the time of making the decision, then the Council will grant permission unless material considerations indicate otherwise, taking into account whether:

- *any adverse impacts of granting permission would significantly and demonstrably outweigh the benefits, when assessed against the policies in the National Planning Policy Framework taken as a whole; or,*
- *specific policies in that Framework indicate that development should be restricted."*

A number of other policies are also of relevance, such as:

- Policy 30: Renewable and Low Carbon Infrastructure;
- Policy 31: Energy and Low Carbon Living; and
- Policy 39: Developing a Green Infrastructure Network.

The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, WRI & WBCSD.

Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance, IEMA, 2017.

Assessment Method and Significance Criteria

The GHG assessment has followed a project lifecycle approach that helps to identify GHG emissions 'hotspots' (i.e. the stages and sources likely to generate the largest amount of GHG emissions), and correspondingly enables priority areas for mitigation to be identified. This approach is consistent with the principals set out in the IEMA guidance.

In line with the GHG Protocol (Ref. 7B-4), the GHG emissions assessment will be reported as tonnes of carbon dioxide equivalent (tCO2e) and consider the seven Kyoto Protocol gases:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Sulphur hexafluoride (SF_6);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Nitrogen trifluoride (NF_3)

The expected GHG emissions arising from the construction activities, embodied carbon in materials and operational emissions of the Proposed Development will be quantified using a calculation-based methodology as per the following equation and aligned with the GHG Protocol:

Activity data x GHG emissions factor = GHG emissions value.

Emerging guidance from IEMA for significance of greenhouse gas emissions impacts states that:

"...in the absence of any significance criteria or a defined threshold, it might be considered that all GHG emissions are significant and an EIA should ensure the project addresses their occurrence by taking mitigating action."

Therefore the GHG emissions assessment will provide a quantitative assessment of the scale of emissions associated with construction and operations of the scheme. This will enable key mitigation measures to be identified to avoid, reduce or mitigate GHG emission sources.

For the purposes of this assessment, it has been considered that any increase in GHG emissions compared to the baseline has the potential to be significant due to the high sensitivity of the receptor (global climate). It has not been considered appropriate to define further categories of effects (e.g. minor, moderate, major) due to the subjectivity of these categories in the absence of any defined industry guidance. This is in line with the IEMA guidance (Ref. 7B-5) which states that all GHG emissions have the potential to be significant and that the application of the standard EIA significant criteria is not considered to be appropriate for climate change mitigation assessments.

However, to enable the quantified carbon footprint of the Proposed Development to be put into context, the UK's GHG inventory and the UK national carbon budgets will be used as a proxy for the global climate. The expected efficiency of the plant will be benchmarked against current comparable UK power generation plants.

Baseline Conditions

The baseline for the GHG emissions assessment is a 'business as usual' scenario whereby the scheme does not go ahead. The baseline includes direct and indirect GHG emissions currently arising from the site and carbon stock that is stored within the soil organic carbon and above/ below ground vegetation of the existing site.

The Power Plant Site consists of an area of land of approximately 1ha in area, which is currently undeveloped and consists of disturbed ground with limited vegetation.

The Construction Laydown area consists of an area of land, approximately 0.4ha in area. The land is undeveloped and consists of bare compacted ground and is used for vehicle parking.

Therefore the existing site is considered to have minimal carbon stock stored within its soil and above/ below ground vegetation.

Development Design and Impact Avoidance

The below measures have been integrated into the design of the Proposed Development in order to avoid or reduce GHG emissions.

Construction:

- A Carbon Efficiency Plan will be developed and implemented to manage/reduce carbon emissions and promote good practice e.g. monitoring of fuel use/compressed air leaks, driver/plant use training, avoid oversizing of generators for plant and temporary buildings, separate generators for peak time versus low time demand, nominate individuals with responsibility for site energy management; and,

Operation:

- The design approach will be aligned with the energy hierarchy (energy reduction, energy efficiency, renewable energy).

Likely Impacts and Effects

Emission sources over the lifecycle of the Proposed Development are outlined below by lifecycle stage:

Table 0B.1: Emission Sources over the Lifecycle of the Proposed Development

Lifecycle stage	Activity	Primary Emission Sources
Pre-construction stage	Enabling and earth works	GHG emissions from fuel consumption from construction plant and vehicles, generators on site, and waste disposal and transportation
Product stage	Raw material extraction and manufacturing of products required to	Embodied GHG emissions and emissions from transportation of materials

Lifecycle stage	Activity	Primary Emission Sources
	build the Proposed Development.	
Construction process stage	On-site construction activity	Energy (electricity, fuel, etc.) consumption from plant and vehicles, generators on site,
	Transport of construction materials (where these are not included in embodied GHG emissions)	Fuel consumption from transport of materials to site (where these are not included in embodied GHG emissions)
	Disposal of any waste generated during the construction processes	GHG emissions from disposal and transportation of waste
Operation stage	Operation of the Proposed Development	GHG emissions from energy, provision of potable water, and treatment of waste water
	Disposal of any waste generated by the Proposed Development	GHG emissions from disposal and transportation of waste

Data to quantify GHG emissions from pre-construction, product stage and the construction process are not available. Therefore this assessment was qualitative and focussed on the identification of expected 'hot-spots' that will allow the development of appropriate mitigation measures to avoid or reduce GHG emissions.

GHG emissions from the operations stage of the Proposed Development arise mainly from the combustion of natural gas to generate electricity. Natural gas consumption rates are determined by the type of engine, its efficiency and the running hours per annum. The design team are currently considering various types of engines. These were assessed and compared based on an estimate of the following running hours per annum.

- Jenbacher 420 – 1,200 hours per annum
- Jenbacher 620 50Hz – 2,300 hours per annum
- Man 53/44G TS 12V 50Hz – 2,000 hours per annum
- Wartsila 20V 34SG – 3,300 hours per annum

Table 0B.2: Emissions Arising from the Various Engine Types Considered for the Proposed Development

Emissions Source	Jenbacher 420	Jenbacher 620 50Hz	Man 53/44G TS 12V 50Hz	Wartsila 20V34SG
Scope 1				
Emissions from fossil fuel (natural gas) combustion	28,240	52,600	46,730	65,010
Scope 2				
Electricity imported from the National Grid	-	-	-	-
Scope 3				
Transport of raw materials	n/a	n/a	n/a	n/a
Transport of waste materials	n/a	n/a	n/a	n/a
Gas Combusted (scope 3 well to tank emissions)	3,835	7,140	6,350	8,830
Total annual carbon emissions (tCO_2e)	32,075	59,750	53,000	73,840

Emissions Source	Jenbacher 420	Jenbacher 620 50Hz	Man 53/44G TS 12V 50Hz	Wartsila 20V34SG
Carbon Intensity of generated electricity all scopes (tCO_2e/GWh)	540	516	505	464
Annual Electricity Generation (MWh)	59,400	115,780	105,150	159,000

Table 0B.2 indicates that the total annual carbon footprint of the Proposed Development is calculated between 32 KtCO2e to 74 KtCO2e (rounded to the nearest thousand tonnes). The carbon intensity of the engine types in consideration for the Proposed Development range from 464 to 540 tCO2e per GWh electricity generation.

Table 0B.3 presents the carbon intensity of UK power stations sourced from 'Digest of United Kingdom Energy Statistics 2017) (Ref. 7B-6). The intensity figures stated comprise carbon intensity associated with combustion of the primary fuel source (e.g. coal, natural gas, energy from waste) for power stations (i.e. they do not include other elements of the carbon footprint such as transmission losses of natural gas).

Table 0B.3: Comparison of Carbon Intensities for Existing UK Power Stations

Nature of Power Station	Carbon Intensity of Electricity Supplied (tCO_2e / GWh) Scope 1 only
Average UK power station 2015 – all fossil fuels	623
Average UK power station 2015 - all fuel types (including nuclear & renewable)	334
UK Gas power station 2015	382

Table 0A.4 presents the proportion of the UK carbon budget allocated to gas consumption for grid electricity generation from 2018 to 2032 (this includes the 3rd, 4th and 5th carbon budget periods) that the Proposed Development would account for (Ref. 7B-7).

Table 0A.4: Proportion of UK Carbon Budget allocated for Gas fuelled grid electricity generation from Proposed Development

	Third Carbon Budget (2018 – 2022)	Fourth Carbon Budget (2023 – 2027)	Fifth Carbon Budget
Jenbacher 420	0.068 – 0.067%	0.067 – 0.070%	0.076 – 0.092%
Jenbacher 620 50Hz	0.13 - 0.13%	0.12 – 0.13%	0.14 – 0.17%
Man 53/44G TS 50Hz	0.11 0.11%	0.11 – 0.12%	0.12 – 0.15%
Wartsila 20V34SG	0.16 - 0.15%	0.15 – 0.16%	0.17 – 0.21%

In accordance with the GHG Protocol for Project Accounting, since the proportion of the UK carbon budget for natural gas consumption for grid electricity generation from the Proposed Development is less than 1%, the carbon footprint is deemed immaterial.

Mitigation

Mitigation measures to be implemented by the Applicant to avoid and/ or reduce GHG emissions from the construction period include:

- All vehicles and mechanical plant will be regularly inspected and maintained in good efficient working order and appropriate fuels will be used;
- The use of fuel efficient machinery and vehicles will be maximised;
- Idling time of equipment and vehicles when not in use will be minimised;
- Vehicle movements on-site will be limited and safe driving will be promoted;
- Double handling of materials will be avoided and excavated fill will be reused where feasible;
- Renewable energy to power temporary buildings will be considered;
- Materials with low embodied carbon and high recycled content, that are durable and have a long lifespan, and are locally-sourced, will be considered; and,
- Opportunities will be identified to 'design out' construction waste and avoid over ordering materials.

Mitigation measures to be implemented by the Applicant to avoid and/ or reduce GHG emissions from the Proposed Development's operations include:

- Waste generated on site will be re-used/recycled where ever possible;
- The use of fuel efficient machinery and vehicles will be maximised; and,
- Idling time of equipment and vehicles when not in use will be minimised.

References

Ref. 7B-1 HM Government (2008). Climate Change Act.

Ref. 7B-2 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

Ref. 7B-3 North East Lincolnshire Local Plan 2015 – 2022.

Ref. 7B-4 World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) (2005) Greenhouse Gas Protocol for Project Accounting.

Ref. 7B-5 Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance, IEMA, 2017.

Ref. 7B-6 Department for Energy and Climate Change (2017) Digest of United Kingdom Energy Statistics (DUKES). [Online] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/643414/DUKES_2017.pdf (Accessed 18 April 2018).

Ref. 7B-7 Department for Energy and Climate Change (2017). 2015 UK Greenhouse Gas Emissions, Final Figures.

Ref. 7B-8 The Committee on Climate Change (2017). Home Page [Online] Available from: https://www.theccc.org.uk/ [Accessed 18 April 2018].

Appendix 8A – Baseline Noise Levels

The result of the routine noise monitoring undertake by Bureau Veritas at Hazel Dene (NSR1) since 2005 are given in the table below

Table 8A.1. Results of Routine Noise Monitoring at Hazel Dene since 2005

Date	Wind direction	background sound level L_{AF90} at Hazel Dene	ambient sound level L_{Aeq} at Hazel Dene
February 2005	NW	49	51
March 2005	W	52	54
April 2005	W	53	55
August 2005	NW	49	51
November 2005	W	52	54
February 2006	NW	50	51
May 2006	W/WS	50	52
August 2006	W	52	54
January 2007	SW	52	53
March 2008	NW	48	50
January 2009	SW	51	53
March 2010	NW	52	54
April 2011	NW	52	53
June 2013	NE	41	43
June/July 2014	E	48	50
August 2015	S	44	50
September 2016	NE	50	52
July 2017	NW	51	52

Values are representative values of night time levels presented by Bureau Veritas in their report 6450625/1 Rev 0 dated 13th July 2017

Values marked in red indicated where the wind direction during the survey was not appropriate for the assessment of representative background sound level at Hazel Dene. ie wind not blowing from general direction of site to NSR

Appendix 8B – Noise Model Settings

The data used within the noise model was based upon data provided by potential suppliers of the generating equipment for the project. Noise source selection has been conducted on a worst case (noisiest equipment) basis using the Example Layouts presented in Figures 4.1a and 4.1b (ES Volume 2).

Parameters:

- Noise levels are assumed to be externally radiated sound power levels;
- Noise sources have been modelled as sources at the locations at the shortest distances between the proposed development façade and the NSRs;
- The model is based upon continuous full load operation. This is a conservative assumption for the purposes of the noise assessment and would not occur in practice. Start-up is unlikely to introduce significant additional sound sources;
- No barriers or screening have been factored into the unmitigated operational noise predictions; and
- Prediction methodologies have been based on ISO 9613:2.

Table 6B-1: Source Data Inputs – Externally Radiated Source Levels

Details	Externally radiated Broadband Sound Power Levels L_{WA} dB
Scenario 1 - 5x9.5 MWe Units within a building	
Total for building and radiator	115
Building and stacks (including sound proofing and attenuation applied to the raw sound powers below)	110
Each engine	133
Each air inlet	139
Building wall break out	107
Unsilenced exhaust	129
Silenced exhausts	107
Attenuated building ventilation	100
5 external radiator units	114
Scenario 2 - 33 x 1.5 MWe containerised units:	
Total for 33 sets	114
Each set total (including components below)	97
Exhaust	90
Exhaust pipework	88
Cooler	85
Air intake	90
Air outlet	88
Casing	93

Appendix 9A – Landscape and Visual Assessment Methodology

Appendix 9A Landscape and Visual Impact Assessment Methodology

1.1 Introduction

1.1.1 This Landscape and Visual Impact Assessment (LVIA) has been based on the following guidance:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition. (2013) Landscape Institute and Institute of Environmental Management and Assessment, referred to as GLVIA3 in this assessment; and
- Landscape Character Assessment; Guidance for England and Scotland (2002).The Countryside Agency and Scottish Natural Heritage.

1.1.2 Photography incorporated into the figures accompanying the LVIA has been undertaken in accordance with guidance given in Landscape Institute Advice Note 01/11 "Photography and photomontage in landscape and visual impact assessment" unless stated otherwise.

1.1.3 These publications, supplemented by additional government guidance and topic papers, form the standard reference for undertaking highway related landscape character and visual assessment in the UK.

1.2 Assessment Process

1.2.1 Following assessment of the baseline landscape and visual context of the development the LVIA assesses the:

- Sensitivity of receptors, whether the landscape or viewers;
- Magnitude of effect, whether adverse of beneficial; and
- Significance of the effects based on a comparison of sensitivity of receptor to magnitude of effect.

1.2.2 Effects may be temporary, permanent, short-term or long-term. Landscape and visual effects may be further categorised as being either direct i.e. originating from the site, or indirect, e.g. off-site visual effect of construction traffic.

1.2.3 For the purposes of this LVIA effects of moderate or major significance are considered to be significant (para 3.34 GLVIA3).

1.3 Landscape Assessment Methodology

1.3.1 In assessing the predicted effects on the landscape resulting from the proposed development, the following criteria are considered: landscape value, landscape quality, landscape character and landscape sensitivity.

1.3.2 Landscape effects of the proposed development upon landscape elements and features (or components) are considered, as well as direct or indirect effects on the general landscape character of the surrounding area. The sensitivity of the landscape to change is the degree to which a particular Landscape Character Area (LCA) or feature can accommodate changes or new features without unacceptable detrimental effects to its essential characteristics.

Prediction of Landscape Effects

1.3.3 In predicting the effects of the proposed development on the landscape within the study area GLVIA3 states the following steps should be undertaken in order to identify and describe the landscape effects:

- Identify the components of the landscape that are likely to affected by the scheme (landscape receptors); and
- Identify the interactions between the landscape receptors and different components of the scheme at its different stages.

Sensitivity of landscape receptors

1.3.4 Landscape receptors are described within GLVIA3 (para 5.34) as *'components of the landscape that are likely to be affected by the scheme'*. These can include overall character and key characteristics, individual elements or features and specific aesthetic or perceptual aspects.

1.3.5 It is the interaction between the different components of the proposed development (as described above) and these landscape receptors which has potential to result in landscape effects (both adverse and beneficial)

1.3.6 The sensitivity of the landscape receptor is a combination of their susceptibility to change of the receptor to the specific type of development being assessed combined with the value of the landscape.

Susceptibility to change

1.3.7 The susceptibility to change is a measure of the ability of a landscape to accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies (para 5.40 GLVIA3).

1.3.8 The guidance recognises that in many cases there may be existing landscape sensitivity or capacity studies for the area in which the proposed development is located. These cannot provide a substitute for an individual assessment of the susceptibility of the receptors in relation to change arising from the specific development proposal. The assessment of susceptibility should be recorded as part of the landscape baseline and considered as part of the assessment of the effects. **Table A9.1** considers factors which determine landscape susceptibility to change.

Table A9.1: Landscape Susceptibility to Change

Criteria Level	Susceptibility to Change
High	The receptor has a low capacity to accommodate the proposed development without effects upon its overall integrity. The landscape is likely to have a strong pattern/ texture or is a simple but distinctive landscape and/or with high value features and essentially intact.
Medium	The receptor has some capacity to accommodate the proposed development without effects upon its overall integrity. The pattern of the landscape is mostly intact and/or with a degree of complexity and with features mostly in reasonable condition.
Low	The receptor is robust; it can accommodate the proposed development without effects upon its overall integrity. The landscape is likely to be simple, monotonous and/or degraded with common/ indistinct features and minimal variation in landscape pattern.

Landscape Value

1.3.9 Establishing landscape value is necessary to determine the landscape sensitivity at both a site and study area scale. GLVIA para 5.19 states that landscape value can include areas of landscape as a whole or, to the individual elements, features and aesthetics or perceptual dimensions which contribute to the character of a landscape.

1.3.10 The guidance also refers to the fact that different people and user groups will value the landscape differently and for different reasons. Where landscapes have no formal landscape designations such as National Parks, Areas of Outstanding Natural Beauty (AONB), Conservation Area etc, they may be valued locally. Table A9.2 considers factors which determine landscape value.

1.3.11 The value of the landscape receptor should reflect the following:

- Landscape designations (international, national and local);
- Value attached to Landscape Character Types/Areas; and
- The value of individual elements within the landscape, especially the key characteristics.

1.3.12 Factors that can help in identifying valued landscapes include:

- Presence/absence of statutory landscape designations;
- Presence/absence of local landscape designations and associated policies;
- Landscape quality/condition;
- Scenic quality;
- Rarity of particular elements/features;
- Representiveness;
- Conservation interest;
- Recreation value;
- Perceptual aspects; and
- Cultural associations.

Table A9.2: Landscape Value Criteria

Criteria Level	Value
High	The receptor is highly valued for one or more of its attributes protected by a statutory landscape designation or is of greater than local/county importance.
Medium	The receptor is likely to be valued at a local level only.
Low	The receptor is undesignated and has little or no recognised value.

Landscape Sensitivity

1.3.13 In combining susceptibility to change and value determines the sensitivity of the receptor. Landscape sensitivity is not an absolute scale and requires professional judgement to determine the sensitivity for each receptor. However, it is generally accepted that a combination of high susceptible and high value is likely to result in the highest sensitivity, whereas a low susceptibility and low value is likely to resulting in the lowest level of sensitivity. A summary of the likely characteristics of the different levels of sensitivity is described below in Table A9.3. It must be noted that these are indicative and in practice do not have a clear distinction between criteria levels.

Table A9.3: Landscape Sensitivity Criteria

Criteria Level	Characteristics
High	Key characteristic(s) of landscape could be adversely affected by development; and/or Areas of landscape character that are highly valued for their scenic quality (including most statutorily designated landscapes); and/or Elements/features that could be described as unique; or are nationally scarce; or mature vegetation with provenance such as ancient woodland or mature parkland trees. Mature landscape features which are characteristic of and contribute to a sense of place and illustrates time-depth in a landscape and if replaceable, could not be replaced other than in the long term –for example ancient woodland/mature trees/mature species rich hedgerows/historical land use features.
Medium	A landscape with some key characteristics which could be adversely effected from inappropriate or unsympathetic development that may lead to wider effects on character; and/or Areas that have a positive landscape character but include some areas of alteration/degradation/ or erosion of features; and/or Perceptual/ aesthetic aspects has some vulnerability to unsympathetic development; and/or Features/elements that are locally commonplace; unusual locally but in moderate/poor condition; or mature vegetation that is in moderate/poor condition or readily replicated. Well established landscape features which contribute positively to a sense of place and landscape maturity but are capable of being replaced in the medium term – for example trees in hedgerows, shelter belts or plantations.
Low	A landscape with key characteristics that are robust and unlikely to be adversely effected by development; and/or Areas that are relatively bland or neutral in character with few/no notable features; and/or A landscape that includes areas of alteration/degradation or erosion of features; and/or Perceptual/ aesthetic aspect that are robust and unlikely to be affected by development; and/or Landscape elements/features that are common place or make little contribution to local distinctiveness; and/or Immature or poor quality/degraded landscape features which are capable of being replicated in the short term – for example recently planted woodland/trees/ hedges, agricultural or recreational land or land disturbed by development; and/or Landscape elements/features that might be considered to detract from landscape character such as obtrusive man-made artefacts (e.g. power lines, large scale developments etc).

Magnitude of Landscape Effects

1.3.14 The nature of the effect that is likely to occur, i.e. its magnitude, is determined by considering four separate factors, namely:

- Size/scale;
- Geographical extent;
- Duration; and
- Reversibility.

Size/scale

1.3.15 Making judgements regarding the size or scale of the changes to the landscape need to made for each potential effect. GLVIA3 (para 5.59) specifies that these judgements should take into account of the following:

- The extent of existing landscape elements that will be lost, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape – in some cases this may be quantified;
- The degree to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or by addition of new ones; and
- Whether the effect changes the key characteristics of the landscape, which are critical to its distinctive character.

1.3.16 The criteria should be presented in a verbal scale, which 'distinguishes the amount of change without being overly complex'.(GLVIA3 para 5.49)

1.3.17 The size and scale of an effect is determined by considering the amount of change experienced by a receptor, based on the indicative criteria set out in Table A9.4 below:

Table A9.4: Landscape Size/Scale Criteria

Criteria Level	Feature/element	Aesthetic/perceptual aspect	Key characteristics/ overall character
Large	Total or substantial loss or large scale damage to landscape features resulting in the integrity of the landscape being compromised.	Change wholly or largely alters an aesthetic/ perceptual aspect, such that it becomes difficult/ impossible to appreciate, when considered against the baseline.	Loss of or changes to the critical key characteristics of the landscape, resulting in a change to the overall landscape character.
Medium	Partial loss or medium scale damage to landscape features resulting in a partial change to the element/feature which may in some cases diminish its overall integrity.	Change is such that the development has an influence upon an aesthetic/ perceptual aspect, but said aspect remains appreciable.	Partial loss or small changes to the key characteristics of the landscape but not resulting in an obvious change to the overall character of the area.
Small	Slight loss or small scale damage to landscape features with its integrity remaining unchanged.	Change has little tangible effect upon an aesthetic/ perceptual aspect.	Minor changes to key characteristics which result in no or little change to the overall landscape character.

Geographical Extent

1.3.18 The criteria for defining geographical extent is contained in Table A9.5 below.

Table A9.5: Geographical Extent Criteria

Criteria Level	Value
Large	The effects may influence several landscape types/ character areas.
Medium	The effects may influence the landscape type/character area within which the development is located.
Small	The effects may influence the immediate setting of the site.
Negligible	The effects may influence the development site only.

Duration and Reversibility

1.3.19 The duration of an effect and its reversibility are linked but separate consideration of the criteria for defining these are as below in Tables A9.6 and A9.7.

Table A9.6: Duration Criteria

Criteria Level	Description
Temporary	Less than 12 months
Short-term	0-5 years
Medium-term	5-10 years

Table A9.7: Reversibility Criteria

Criteria Level	Description
Reversible	Change can be wholly or largely reversed. For example the removal of a wind farm development following decommissioning.
Partially reversible	Change is partially reversible. For example the restoration of a quarry to something similar to the baseline.
Irreversible	Change cannot realistically be reversed, i.e, it is permanent.

Magnitude Criteria

1.3.20 The factors above are considered in combination to provide an overall magnitude of impact for each receptor, which may be interpreted as per the indicative scales in Table A9.8 below:

Table A9.8: Landscape Magnitude Criteria (indicative)

Criteria Level	Description
High	Total loss or large scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features and elements; and/or Very obvious permanent and/or long-term change in the balance of landscape characteristics over an extensive area; and/or Substantial changes to the perceptual/ aesthetic qualities; and/or Total or substantial loss or large scale damage to landscape elements or features which cannot be mitigated for.
Medium	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements; and/or

	Changes in an extensive area which whilst notable do not alter the balance of the landscape characteristics; and/or Partial changes to the perceptual/ aesthetic qualities; and/or Partial loss of key landscape features or elements that can be mitigated for.
Criteria Level	**Description**
Low	Barely noticeable loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements; and/or Small short-term/reversible change in landscape character; and/or Changes to the perceptual/ aesthetic qualities which would result in it remaining largely intact; and/or Small scale loss of a landscape feature or element or loss of/change to a very small proportion of an extensive feature. Changes that can be fully mitigated; and/or The addition of new but uncharacteristic features and elements.

Assessing the significance of landscape effects

1.3.21 The overall significance of landscape effects is a combination of the sensitivity of the landscape receptor and the magnitude of the impacts. GLVIA3 (para 5.56) states that there is no definitive rule regarding what defines a significant effect, but in making the judgement it is reasonable to say that:

- Major loss or irreversible negative effects, over an extensive area, on element and/or aesthetic and perceptual aspect that are key to the character of nationally valued landscape are likely to be of the greatest significance; and
- Reversible negative effects of short duration, over a restricted area, on elements and/or aesthetic and perceptual aspects that contribute to but are not key characteristics of landscape value are likely to be the least significant and may depending upon the circumstance, be judged as not significant.

1.3.22 Table A9.9 provides a matrix used to describe the relationship between sensitivity of receptor and magnitude of impacts, and so allow a relative level of significance of any predicted landscape effects to be categorised. The key characteristics of each significance scale can be found in Table A9.10 below.

Table A9.9: Classification of Effects

Sensitivity of Receptor	**Magnitude of Impact**			
	High	**Medium**	**Low**	**Very Low**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible

Table A9.10: Landscape Significance Category Descriptions

Criteria Level	Description
Major Beneficial Effect	Greatly enhanced character (including quality and value) of the landscape. Creation of an iconic high quality feature and/or series of elements. Enabling of a sense of place to be created or greatly enhanced.
Moderate Beneficial Effect	Enhanced character (including quality and value) of the landscape. Enabling of the restoration of characteristic features and elements lost as a result of changes from inappropriate management or development. Enabling of a sense of place to be enhanced.
Minor Beneficial Effect	Improvement of the character (including quality and value) of the landscape. Enabling of the restoration of characteristic features and elements partially lost or diminished as a result of changes from inappropriate management or development. Enabling of a sense of place to be restored.
Negligible Beneficial Effect	Complementing the character (including quality and value) of the landscape. Maintenance or enhancement of characteristic features and elements. Enabling some sense of place to be restored.
Neutral Effect	Maintain the character (including quality and value) of the landscape. Blend in with characteristic features and elements. Enable a sense of place to be retained.
Negligible Adverse Effect	Proposals do not quite fit the character (including quality and value) of the landscape. Are at variance with characteristic features and elements. Detract from a sense of place.
Minor Adverse Effect	Proposals conflict with the character (including quality and value) of the landscape. Have an adverse impact on characteristic features or elements. Diminish a sense of place.
Moderate Adverse Effect	Proposals at considerable variance with the character (including quality and value) of the landscape. Degrade or diminish the integrity of a range of characteristic features and elements. Damage a sense of place.
Major Adverse Effect	Proposals at complete variance with the character (including quality and value) of the landscape. Cause the integrity of characteristic features and elements to be lost. Cause a sense of place to be lost.

1.4 Visual Assessment Methodology

1.4.1 'An assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity' (GLVIA3, para 6.1)

Predicting Visual Impacts

1.4.2 In predicting the impacts of the proposed development on the viewpoints being assessed GLVIA3 states it is helpful to consider (but not restricted to) the following issues:

- Nature of the view (full, partial or glimpsed);
- Proportion of the proposed development visible;

- Distance of the viewpoint from the proposed development and whether it would be the focus of the view or only a small element;
- Whether the view is stationary, transient or sequential; and
- The nature of the changes to the view.

1.4.3 Additionally, the seasonal effects of vegetation are to be considered, in particular the varying degree of screening and filtering of views.

1.4.4 Criteria for describing the distance of the view between the viewpoint assessed and the proposed development are based on the relationship between them and the apparent distance to the horizon from the viewpoint. Where the proposed development appears close to the horizon, the view is considered long. Where the proposed development appears neither close to the horizon nor close to the viewpoint, it is considered medium. Where the proposed development appears close to the viewpoint this is considered short. A summary of definition is provided in Table A9.11.

Table A9.11: Length of View Criteria

Criteria Level	Description
Long	The proposed development appears to be close to the horizon.
Medium	The proposed development appears to be neither close to the horizon nor close to the viewpoint.
Short	The proposed development appears to be close to the viewpoint.

Sensitivity of Visual Receptor

1.4.5 The susceptibility of visual receptors to changes in the view and visual amenity is related to the activity they are engaged in and the extent to which their attention is focussed on the views and visual amenity at that location. As such those receptors most sensitive to change are likely to include people engaged in outdoor activities where an appreciation of the landscape is the focus or residents in areas where the landscape setting contribute to the setting of the properties.

1.4.6 Conversely, those considered least sensitive to change include (but are not restricted to) people engaged in outdoor sports or recreation where there is no focus on the surrounding landscape/views and people at their place of work where there focus is on the work activity.

1.4.7 See Table A9.12 for a full description of the criteria use to assess the susceptibility of viewpoints.

Table A9.12: Visual Susceptibility to Change Criteria

Criteria Level	Susceptibility to Change
High	Residents at home; People engaged in outdoor recreation, whose attention/interest is likely to be focused on the landscape or particular views, including strategic/ popular public rights of way; Visitors to heritage assets or other attractions, where views of the surroundings are an important contributor to the experience; Communities where views contribute to the landscape setting enjoyed by residents; Travellers on scenic routes.
Medium	Travellers on road, rail, or other transport routes; Users of local, and less used Public Rights of Way or where the attention is not focused on the landscape;

Criteria Level	Susceptibility to Change
	Schools and other institutional buildings and their outdoor areas, play areas.
Low	Travellers on road, rail or other transport routes not focused on the landscape/particular views e.g. on motorways and "A" road or commuter routes; People engaged in outdoor sport/recreation which does not involve/depend upon appreciation of views of the landscape; People at their place of work whose attention may be focused on their work/activity and not their surroundings.

Value of Views

1.4.8 In making judgements about the value of each view, the assessment should take into account the following:

- Recognition of the value to a particular view, e.g.,in relation to heritage assets or planning designations;
- Indicators of the value attached to views by others, e.g., in guide books, tourist maps, literary references, painting etc.

1.4.9 Table A9.13 below shows a full description of the criteria used to assess the value of the view.

Table A9.13: Value of View Criteria

Criteria Level	Description
High	A recognised high quality view, well- frequented and/or promoted as a beauty spot/visitor destination. A view with cultural associations (recognised in art, literature or other media). A view which relates to the experience of other features, for example heritage assets.
Medium	The view, whilst it may be valued locally, is not widely recognised for its quality or has low visitor numbers. The view has no strong cultural associations.
Low	A view with no recognised quality and/or is unlikely to be visited specifically to experience the views available.

1.4.10 In combining susceptibility to change and value it is generally accepted that a combination of high susceptible and high value is likely to result in the highest sensitivity, whereas a low susceptibility and low value is likely to resulting in the lowest level of sensitivity. A summary of the likely characteristics of the different levels of sensitivity is described below in Table A9.14. It must be noted that these are indicative and in practice do not have a clear distinction between criteria levels.

Table A9.14: Visual Sensitivity Criteria

Criteria Level	Description
High	A view that is well balanced, containing attractive features and notable for its scenic quality; and/or A view which is an important part of their reason for being there; and/or A view which is experienced by large numbers of people and/or is recognised for its qualities.
Medium	An otherwise attractive view that includes some unattractive or discordant features, or visual detractors; and/or

Criteria Level	Description
	A view which plays a small part in a the receptors being there; and/or A view that is recognised locally.
Low	A view that is unattractive, discordant and/or contains many visual detractors; and/or A view which is unlikely to be part of the receptor experience.

1.5 Magnitude of Visual Impacts

1.5.1 The guidance provided in GLVIA3 (para 6.38) requires that each of the following variable need to be evaluated for each of the visual impacts identified:

- Size or scale of the change of view, including loss of or additional views, degree of contrast in terms of form, mass, scale, colour and texture etc;
- Geographic extent in terms of angle of view, distance etc; and
- Duration and reversibility in term of longevity of effects and whether reversible.

1.5.2 For the descriptions of the criteria for geographic extent, duration and reversibility refer to Tables A9.5, A9.6 and A9.7.

1.5.3 The size and scale of an effect is determined by considering the amount of change experienced by a receptor, based upon the indicative criteria set out in Table A9.15 below.

Table A9.15: Visual Size/Scale Criteria

Criteria Level	Description
Large	The proposed development may result in extensive changes to the existing view(including the loss of existing characteristic features and/or introduction of new discordant landscape features); and/or A change to an extensive proportion of the view; and/or Views where the proposed development would become the dominant landscape feature or contract heavily with the current scene.
Medium	Changes will result in changes to the view but not fundamently change its characteristics; Changes that would be immediately visible but not be the key features of the view.
Small	Changes which would not result in a change to the composition of the view Changes that would only affect a small portion of the view or introduce new features that could be screened.

1.5.4 The geographical extent of an effect is determined by the indicative criteria set out in Table A9.16 below. It should be noted that whether a view is at short, medium or long- range will vary depending upon the type of development proposed.

1.5.5 **Table A9.16: Geographical Extent Criteria**

Criteria Level	Description
Large	Changes where the proposed development is located: in the main focus of the view; and/or at close range; and/or over a large area.

Criteria Level	Description
Medium	Changes where the proposed development is located: obliquely to the main focus of the view; and/or at medium range; and/or over a narrow area.
Small	Changes where the proposed development is located: on the periphery of the main focus of the view; and/or at long range; and/or over a small area.

1.5.6 These four factors are then considered together to derive an overall magnitude of change for each receptor, which is determined by use of professional judgement, based on the indicative criteria set out in Table A9.17 below.

Table A9.17: Magnitude of Visual Impact Criteria (indicative)

Criteria Level	Description
High	The development, or a part of it, would become the dominant and contrasting feature or focal point in the view. Little or no scope for adequate mitigation.
Medium	The development, or a part of it, would form a prominent feature or element of the view which is readily apparent to the receptor. in the view; and/or Partial mitigation is possible.
Low	The development, or a part of it, would be noticeable but not alter the overall balance of features and elements that comprise the existing view Full mitigation is possible.

Assessing the significance of Effects

1.5.7 The overall significance of visual effects is a combination of the sensitivity of the visual receptor and the magnitude of the visual effects. GLVIA3 clearly starts that there is no definitive rule regarding what defines a significant effect, but in making the judgement the following points should be considered (para 6.44):

- Effects on people who are particularly sensitive to changes on views and visual amenity are more likely to be significant;
- Effects on people at recognised and important viewpoints or from recognised scenic routes are more likely to be significant; and
- Large-scale changes which introduce new, non-characteristic or discordant or intrusive elements into the view are more likely to be significant than small changes or changes involving features already present within the view.

1.5.8 The matrix in **Table A9.9** gives an approximation as to how sensitivity and magnitude can be considered together to determine whether an effect is significant or not.

1.5.9 The matrix is indicative of a continuum of effects which are assessed by professional judgement and justification, further clarification of the type of effects which are likely within each category can be found in Table A9.18 below.

Table A9.18: Significance of Effect Category

Criteria Level	Description
Major	These effects may represent key factors in the decision making process. Potentially associated with sites and features of national importance or likely to be important considerations at a regional or district scale. Major effects may relate to resources or features which are unique and which, if lost, cannot be replaced or relocated.
Moderate	These effects, if adverse, are likely to be important at a local scale and the cumulative effects of such issues may lead to an increase in the overall effects on a particular area or on a particular resource or receptor. Effects, which on their own could have a material influence on decision making and particularly so when combined with other similar effects.
Minor	These effects may be raised as local issues and may be of relevance in the detailed design of the project. In isolation, these factors are unlikely to be critical in the decision making process, however when combined with other effects, may be relevant, particularly if they lead to a cumulative adverse effect on a particular resource or receptor.
Negligible	Effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error. Effects which are unlikely to influence decision making, irrespective of other effects.

1.6 References

Landscape Institute and Institute of Environmental Management and Assessment (2013). *Guidelines for Landscape and Visual Impact Assessment 3rd Edition*.

The Countryside Agency (2002) *Landscape character Assessment – Guidance for England and Scotland*

Appendix 10A – Preliminary Ecological Appraisal

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Appendix 10A – Preliminary Ecological Appraisal

Summary

VPI Immingham is considering developing a new power station on land adjacent to their existing Combined Heat and Power (CHP) on Rosper Road in North Killingholme, North Lincolnshire (the Proposed Development). The proposed development is in the early stage of development with VPI considering submitting an application under planning legislation. This preliminary appraisal is intended to contribute to the evidence base to support any future Ecological Impact Assessment that may be required.

The habitat assemblage within the Proposed Development Area represents an example of the Open Mosaic Habitats on Previously Developed Land (OMH) habitat type, which has developed through natural colonisation of a previously disturbed area and includes the following habitat types: ephemeral/ short perennial, neutral grassland, standing open water, wet ditches, scattered scrub, and bare ground. This habitat is considered, based on available data, to be of moderate-high biodiversity value.

Further surveys for protected and notable species have been recommended in advance of the submission of the planning application as follows:

- Great crested newt – known presence in off-site ponds and there is suitable terrestrial and pond habitat within the Proposed Development Area;
- Reptiles – the mosaic habitat and varied topography of the site represents suitable habitat for reptiles;
- Botanical surveys – a botanical survey of the OMH habitat during early summer is required for EcIA and to determine mitigation requirements;
- Breeding birds – potential importance for breeding species;
- Water vole and otter – potential for these species to be present on the adjacent drainage ditch; and
- Terrestrial invertebrates – the habitat context of the site provides opportunities for a range of terrestrial invertebrates, possibly nationally or regionally notable species.

The Proposed Development is located approximately 1.4 km south-west of the Humber Estuary European site, which is designated as a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site and Site of Special Scientific Interest (SSSI). The Proposed Development is therefore likely to require Habitat Regulations Assessment (HRA) screening to determine the potential for likely significant effects (LSE) under the Conservation of Habitats and Species Regulation 2017. If the HRA screening determines that there is the potential for the Proposed Development to result in LSE, then an appropriate assessment should be undertaken to examine whether the proposals will result in any adverse effects on the integrity of the European site.

Figure 2 in Annex A shows the designated sites and Local Wildlife Sites in the vicinity of the Site.

1. Introduction

1.1 Purpose of Survey

In 2017 AECOM was instructed by VPI Immingham to carry out a Preliminary Ecological Appraisal (PEA) of habitats within the footprint of a proposed new power station (referred to hereafter as 'the Proposed Development'). This was based on a parcel of land to the north of the existing VPI Immingham Combined Heat and Power (CHP) plant on Rosper Road, between the Lindsey Oil Refinery (LOR) and Rosper Road in North Killingholme, North Lincolnshire (centred on approximate grid reference TA 166 174).

This PEA was commissioned to identify whether there are known or potential ecological features (nature conservation designations, and protected and notable habitats and species) that may constrain or influence the design and implementation of the proposed development. The approach applied when undertaking this PEA accords with the Guidelines for Preliminary Ecological Appraisal published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2013). The PEA addresses relevant wildlife legislation and planning policy as summarized in Section 2 of this report, and is consistent with the requirements of British Standard 42020:2013 *Biodiversity: Code of Practice for Planning and Development*.

The original PEA survey area encompassed all of the land between LOR and Rosper Road. However, due to the evolving scheme design the final planning application boundary for the Proposed Development was significantly reduced in size from that originally surveyed. Much of the area originally surveyed in 2017 is now outside the Proposed Development boundary, and therefore the PEA has been revised to ensure consistency with Environmental Statement (ES) Chapter 10: Ecology (Volume 1). The survey area references in this PEA have therefore been revised as follows:

- Proposed Development Area (shown in Figure 1) – refers to all land within the red line planning application boundary, including the power plant, temporary laydown areas and access roads; and
- Wider Survey Area – refers to remaining land outside the Proposed Development Area that was surveyed and reported on in Rev 01 of the PEA, encompassing the brownfield land between the Proposed Development Area and Rosper Road.

1.2 Scope of Works

In order to deliver the PEA in 2017, a desk study and an extended Phase 1 Habitat survey were undertaken by an appropriately experienced ecologist in September 2017, to identify ecological features within the site and the wider potential zone of influence of the proposed development (where access to adjacent land had been agreed). The potential zone of influence (see also Section 3: Methods) was defined with reference to available information about the likely nature of the Proposed Development. The Phase 1 Habitat survey was updated in 2018.

The purpose of the PEA was to:

- Identify and categorise all habitats associated with the Proposed Development and any adjacent areas where there may be potential for direct or indirect effects (the "zone of influence");
- Undertake an appraisal of the potential of the habitats recorded to support protected or notable species of fauna and flora;
- Provide advice on any potential ecological constraints and opportunities in the zone of influence, including the identification (where relevant) of any requirements for follow-up habitat and species surveys and/or requirements for ecological mitigation; and
- Provide a map showing the location of the identified ecological features of relevance.

The purpose of this report is to provide a high level appraisal of the ecological risks and opportunities associated with the Proposed Development and to provide a basis for the assessment of the likely relevant ecological features that might be impacted by the Proposed Development, and requirements for further survey and impact assessment to assess this further. The report makes evidence based recommendations on the scope of further work (where necessary) that would be required to support a planning application. High level recommendations are made on (a) potential options for the avoidance, mitigation or compensation of the potential impacts of the proposed development (where known or where they can reasonably be anticipated) on the identified ecological features in accordance with objectives to deliver No Net Loss for biodiversity, and (b) potential enhancements that could be delivered in accordance with objectives to secure Net Gain for biodiversity as a consequence of new development.

1.3 Background Information

The ecological survey work described above undertaken by AECOM follows an earlier walkover of the Proposed Development Area and Wider Survey Area (the 'site') to identify likely environmental constraints to the Proposed Development by SLR Consulting in January 2017 (SLR Consulting, 2017). Wintering bird surveys were subsequently undertaken on the site by Graham Catley on behalf of SLR Consulting in the period January to March 2017 (Catley, 2017).

The previous surveys highlighted the presence of potentially ecologically diverse brownfield mosaic habitat, including grassland, swamp areas and areas of standing water. The wintering bird survey did not record any species that are qualifying species or part of the internationally important waterbird assemblage of the Humber Estuary SPA/ SAC/ Ramsar SSSI, and the value of the site to wintering birds was evaluated as negligible.

2. Wildlife Legislation and Planning Policy

2.1 Wildlife Legislation

The following wildlife legislation is potentially relevant to the Proposed Development (Table 2.1). This legislation has been considered when planning and undertaking this PEA using the methods described in Section 3, when identifying potential constraints to the Proposed Development, and when making recommendations for further survey, design options and mitigation, as discussed in Section 5. Compliance with legislation may require the attainment of relevant protected species licences prior to the implementation of the Proposed Development.

Further information on the requirements of the above legislation is provided as Appendix B.

Table 2.1. Summary of Relevant Legislation

Document	Requirements/ Purpose
The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations)	Affords protection to European Protected Species, such as bats and great crested newt (*Triturus cristatus*), listed on Schedule 2. It is an offence (subject to exceptions) to deliberately capture, kill, disturb or trade in listed animals. In certain circumstances, licences can be granted to permit some actions prohibited under the Act. Regulation 9A of the Conservation of Habitats and Species (Amendment) 2012 Regulations requires that competent authorities must take such steps in the exercise of their functions as they consider appropriate to secure the preservation, maintenance and re-establishment of a sufficient diversity and area of habitat for wild birds as appropriate, and having regard to the requirements of Article 2 of the new Wild Birds Directive. This includes the use of planning and development control measures.
Wildlife and Countryside Act 1981 (as amended) (WCA)	Part 1 of the Act affords general protection to all species of wild bird and specific protection to flora and fauna listed on Schedules 1 (birds protected by special penalties), 5 (other animals) and 8 (flora, fungi and lichens). In certain circumstances, licences can be granted to permit some actions prohibited under the Act. The Act contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, including prohibiting the planting and spread of plants listed in Schedule 9.
Countryside and Rights of Way (CRoW) Act 2000	The Act increases powers for the protection and management of SSSIs and places a duty on public bodies to further the conservation and enhancement of SSSIs.
Natural Environment and Rural Communities (NERC) Act 2006	Section 41 (s41) includes a list of habitats and species of principal importance for nature conservation in England which is to be used by decision-makers to guide the implementation of their duties under section 40 of the Act, so as to have regard to the conservation of biodiversity in England, when carrying out their normal functions.
Protection of Badgers Act 1992	If badger (*Meles meles*) is present, the legislation may have a bearing on post-consent implementation and mitigation, and the baseline evidence required to support development of this. Legislation makes it an offence to kill or take a badger, to cruelly ill-treat a badger, or to interfere with a badger sett, including disturbing a badger while it is occupying a sett. In certain circumstances, licences can be granted to permit some actions prohibited under the Act.

Document	Requirements/ Purpose
Water Framework Directive (WFD) 2000	Proposed developments or activities that have the potential to affect the water environment require a WFD Assessment. Compliance with the WFD means attainment of good ecological status, prevention of deterioration in status, and prevention of failure to achieve future attainment of good status where it is not already achieved within waterbodies. However, Article 4.7 provides legislation for exemption conditions that could allow implementation of schemes that cause deterioration in ecological status, for example for reasons of overriding public interest.

2.2 Relevant Planning Policy and Related Guidance

Relevant national and local planning policies and related guidance applicable to North Lincolnshire are detailed in Table 2.2. For the precise wording of each specific policy please refer back to the source documents. This planning policy has been considered when assessing potential ecological constraints and opportunities identified by the desk study and field surveys; and, when assessing requirements for further survey, design options and ecological mitigation, as described in Section 5.

Table 2.2. Summary of Planning Policy and Guidance

Document	Planning Policy	Purpose
National Planning Policy Framework (NPPF)	Section 11	Relates specifically to "Conserving and Enhancing the Natural Environment". Paragraph 109 states that "*The planning system should contribute and enhance the natural and local environment by:* • *Protecting and enhancing valued landscapes, geological conservation interests and soils;* • *Recognising the wider benefits of ecosystem services; and* • *Minimising impacts on biodiversity and providing net gains in biodiversity where possible, … including by establishing coherent ecological networks that are more resilient to current and future pressures; ...*" Paragraph 113 adds to this and states: "*When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles:* • *if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused; …* • *planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss; …*"
North Lincolnshire Core Strategy	CS5	New development should incorporate appropriate landscaping and planting which enhances biodiversity and contribute to habitat linkages.
	CS16	Protect, enhance and support a diverse multi-functional landscape, including through the protection of trees and hedgerows.
	CS17	Promote effective stewardship of biodiversity resources by protecting national and international nature conservation designations, paying due regard to the presence of European and nationally protected species, protecting and maintaining features of biodiversity and geological interest, maintaining wildlife networks and green corridors, and ensuring ecological enhancement through good design.
	CS21	Planning applications for mineral extraction should, where appropriate, contribute to the attainment of local biodiversity targets. [e.g. as detailed in the LBAP and NRA profile]

Document	Planning Policy	Purpose
North Lincolnshire Local Plan	LC1	Affords protection to international nature conservation designations.
	LC2	Affords protection to national nature conservation designations.
	LC4	Affords protection for sites of local nature conservation importance.
	LC5	Prohibits development that would have an adverse impact on protected species, except where appropriate mitigation can be delivered.
	LC6	Promotes ecological enhancement through the creation of new habitats, including restoration of former mineral workings to a nature conservation end use.
Natural England's Standing Advice	-	The purpose of standing advice is to guide decision-makers on the determination of proposals with potential to affect protected species. The guidance sets out responsibilities and minimum requirements for survey and mitigation.
Providing and protecting habitat for wild birds	-	Standing advice to local planning authorities on how they should maintain wild bird populations by supporting and protecting their habitats. This guidance has been prepared to support delivery of a legal obligation specified through amendment of the Habitats Regulations. It is important to acknowledge that this guidance requires competent authorities to 'consider' and 'take steps', but it does not require the complete protection of all bird habitats, the mitigation of all losses, and there are no national population targets have been set for wild birds.
NE399	-	NCA profiles are guidance documents intended to help local decision-making. The information they contain supports the planning of conservation initiatives at a landscape scale, informs the delivery of Nature Improvement Areas and encourages broader partnership working through Local Nature Partnerships. Each profile includes a description of the relevant natural and cultural features. Statements of Environmental Opportunity (SEOs) are suggested, which draw on this integrated information. The SEOs offer guidance on the critical issues, which could help to achieve sustainable growth and a more secure environmental future.

3. Methods

3.1 Desk Study

A desk study was carried out to identify nature conservation designations, and protected and notable habitats and species potentially relevant to the Proposed Development.

A stratified approach was taken when defining the desk study area, based on the likely worst case zone of influence of the Proposed Development on different ecological features, and an understanding of the maximum distances typically considered by statutory consultees. Accordingly, the desk study identified any international nature conservation designations within 5 km of the Proposed Development[1]; other statutory nature conservations designations within 2 km of the Proposed Development, and local non-statutory nature conservation designations and protected and notable habitats and species within 1 km of the Proposed Development.

The desk study was carried out using the data sources detailed in Table 3.1. Protected and notable habitats and species include those listed under Schedules 1, 5 and 8 of the WCA; Schedules 2 and 5 of the Habitats Regulations; species and habitats of principal importance for nature conservation in England listed under section 41 (s41) of the NERC Act; and other species that are Nationally Rare, Nationally Scarce or listed in national or local Red Data Lists and Biodiversity Action Plans.

Table 3.1. Desk study data sources

Data Source	Date Obtained	Summary of Data Obtained
Multi-Agency Geographic Information for the Countryside (MAGIC) website	08/09/2017	• International statutory designations within 5 km • Other statutory designations within 2 km • Ancient woodlands and notable habitats within 1 km • Higher Level Environmental Stewardship agreements applied to the site • Information on habitats and habitat connections (based on aerial photography) relevant to interpretation of planning policy and assessment of potential protected and notable species constraints
Greater Lincolnshire Nature Partnership	22/09/2017	• Non-statutory designations within 1 km • Protected and notable species records within 1 km (records for the last 10 years only)
Ordnance Survey 1:2500 Pathfinder maps and aerial photography	08/09/2017	• Information on habitats and habitat connections (based on aerial photography) relevant to interpretation of planning policy and assessment of potential protected and notable species constraints
Lincolnshire BAP (LBAP) (Lincolnshire Biodiversity Partnership, 2011)	08/09/2017	• General information on Local Biodiversity Action Plan Priority Habitats and Species
North Lincolnshire Local Plan Proposals Map	08/09/2017	• Non-statutory designations within 1 km • Designated green corridors, wildlife networks and other such features
VPI Immingham – Site Walkover Report (SLR, 2017)	Sept 2017	• Habitat and protected species appraisal for the proposed plant area
VPI Immingham – Wintering Bird Report (Catley, 2017)	Sept 2017	• Wintering bird records within the proposed plant area.

[1] This may need to be extended when undertaking detailed EcIA to consider e.g. air quality effects, where the potential zone of influence of the proposed development may be greater than 5 km.

3.2 Field Survey

3.2.1 Phase 1 Habitat Survey

A Phase 1 Habitat survey was undertaken in accordance with the standard survey method (Joint Nature Conservation Committee, 2010). Phase 1 Habitat survey is a standard method of environmental audit. It involves categorising different habitat types and habitat features within a survey area. The information gained from the survey can be used to determine the likely ecological value of a site, and to direct any more specific survey work which may need to be carried out prior to the submission of a planning application. The standard Phase 1 Habitat survey method can be "extended" to record target notes on protected, notable and invasive species.

The survey was undertaken on 7th September 2017 and then updated in April 2018 by a suitably qualified AECOM ecologist who recorded and mapped habitat types, along with any associated relevant ecological features observed. The survey area encompassed all safely accessible parts of the Proposed Development Area and Wider Survey Area (Figure 3).

Where relevant to the PEA, target notes (Appendix C) were recorded and the position of these is shown on the Phase 1 Habitat map (Figure 1). Typical and notable plant species were recorded for different habitat types and reflect the conditions at the time of survey. This was not intended to be a detailed inventory of the plant species present in the survey area, as this is not required for the purposes of Phase 1 Habitat survey.

3.2.2 Appraisal of potential suitability of habitats to support protected and notable species

An appraisal was made of the potential suitability of the habitats present to support protected and notable species of plants or animals. Field signs, habitat features with potential to support protected species and any sightings or auditory evidence were recorded when encountered. No detailed surveys were carried out for any particular species, because such surveys are beyond the scope of this PEA, with the exception of the following:

- Examination of aerial photography and 1:2,500 Ordnance Survey mapping to attempt to identify all potential permanent standing waters within 250 m of the Proposed Development Area. This process could not guarantee to definitively identify all waterbodies present, but is the best that can be achieved within the limits of available data; and
- Inspection of all of the accessible standing waters for their suitability for great crested newt (GCN) (*Triturus cristatus*). In particular, the aim was to identify permanent waterbodies (referred to as ponds in this report) which would need further survey, and temporary standing waters which could be discounted as they would not retain water for long enough to allow breeding by GCN.

A note was made of visible instances of invasive non-native plant species listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), including Japanese knotweed (*Fallopia japonica*). Locations of plants or stands of any such invasive non-native plant species found were recorded.

Section 5 of this report identifies further requirements for species survey based on the results of the habitat survey. These surveys should be completed prior to submission of a planning application as the results are likely to be material for determination of the planning application.

3.3 Limitations

3.3.1 Desk Study

The data provided from meta-databases is based on existing records but does not necessarily constitute a comprehensive list of protected and notable species records. These records are not exhaustive, as there is currently no national or regional policy for systematic data gathering. Therefore, absence of data does not constitute evidence of absence. It is also possible that other data exist within this area that has not been made available to AECOM. The quality of the ecological data from the different sources may be highly variable.

3.3.2 Field Survey

Due to subsequent phases of the evolving scheme design, which have resulted in minor changes to the 2017 field survey area, the Phase 1 survey was updated in 2018. This is not considered to represent a significant

limitation and a second survey of the Open Mosaic Habitat within the Proposed Development Area is programmed in early summer 2018 (refer to Section 6.3) to obtain a detailed botanical species list.

4. Desk Study Results

4.1 Nature Conservation Designations

4.1.1 Statutory Designations

Table 4.1 details the statutory nature conservations designations identified by the desk study, based on the method given in Section 3.1 of this report. The designations are listed in descending order, with those closest to the Proposed Development listed first. The locations of the sites are shown in Figure 2.

Table 4.1. Statutory nature conservation designations

Designation	Reason(s) for Designation	Relationship to the Proposed Development Area
Humber Estuary SAC	Internationally important for its estuary and inter-tidal mudflat and sandflat habitats. Other qualifying features encompass: <u>Habitats</u> • Sandbanks which are slightly covered by sea water all the time • Coastal lagoons • Salicornia and other annuals colonizing mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Embryonic shifting dunes • Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") • Fixed coastal dunes with herbaceous vegetation ("grey dunes") • Dunes with *Hippophae rhamnoides* <u>Species</u> • Sea lamprey (*Petromyzon marinus*) • River lamprey (*Lampetra fluviatilis*) • Grey seal (*Halichoerus grypus*)	Approx. 1.4 km to the north-east
Humber Estuary SPA	The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. In summer, it supports important breeding populations of bittern (*Botaurus stellaris*), marsh harrier (*Circus aeruginosus*), avocet (*Recurvirostra avosetta*) and little tern (*Sterna albifrons*).	Approx. 1.4 km to the north-east
Humber Estuary Ramsar	Internationally important as a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons. Internationally important for its breeding colony of grey seal, and its assemblage of non-breeding and wintering waterfowl and the component populations of individual bird species.	Approx. 1.4 km to the north-east
Humber Estuary SSSI	Supports a series of nationally important habitats. These are the estuary itself (with its component habitats of intertidal mudflats and sandflats and coastal saltmarsh) and the associated saline lagoons, sand dunes and standing waters. The site is also of national importance for the geological interest at South Ferriby Cliff (Late Pleistocene sediments) and for the coastal geomorphology of Spurn. The estuary supports nationally important numbers of 22 wintering waterfowl and nine passage waders, and a nationally important assemblage of breeding birds of lowland open waters and their margins. It is also nationally important for a breeding colony of grey seal, river lamprey and sea	Approx. 1.4 km to the north-east

Designation	Reason(s) for Designation	Relationship to the Proposed Development Area
	lamprey, a vascular plant assemblage and an invertebrate assemblage.	

4.1.2 Non-statutory Designations

Table 4.2 details the non-statutory nature conservation designations identified by the desk study based on the method given in Section 3.1 of this report. The designations are listed in descending order, with those closest to the Proposed Development Area listed first. Four Local Wildlife Sites (LWS) were identified in the desk study area.

There are no ancient woodlands in the search area, and there are no Higher Level Countryside Stewardship agreements applied to land in the boundary of the Proposed Development.

Table 4.2. Non-statutory nature conservation designations

Designation	Reason(s) for Designation	Relationship to the Proposed Development Area
Eastfield Road Railway Embankment LWS	Strip of sheltered, botanically-rich woodland glades containing a variety of grassland species with a calcareous influence and some scrub.	Approx. 1 km
Rosper Road Pools LWS	Artificial Flood Relief Reservoir with occasionally species-rich grassy sward. Site supports many breeding, wintering and migrant birds, associated with both wetland and scrubby habitat. Water vole was recorded in 2002, and the fauna as a whole is likely to be rich.	Approx. 0.6 km south
Burkinshaw's Covert LWS	Woodland dating from 1800's with scattered scrub and seasonally wet areas which support rapidly changing flora such as St John's-wort, meadow vetchling, hairy buttercup and glaucous sedge.	Approx. 0.4 km north
Station Road Field LWS	Predominantly grassland site with decent floristic diversity and small area of wetland which supports good range of common farmland bird and butterfly species (including yellowhammer, meadow brown and ringlet). Pond adjacent to site boundary held breeding great crested newts in 2006.	Approx. 0.4 km north

5. Results

5.1 Habitats

5.1.1 Phase 1 Habitat Types (Proposed Development Area)

The Proposed Development is set in a landscape dominated by the industrial areas of Lindsey Oil Refinery and VPI Immingham CHP Plant, which are to the west and south respectively. The semi-natural habitat surrounding the Proposed Development is dissected by a series of man-made drains. An area of mature woodland (associated with Burkinshaw's Covert LWS) is present to the north, and there are arable and improved grassland fields to the east of Rosper Road, between the road and the Humber Estuary.

The habitats recorded within the Proposed Development Area are shown in Figure 3. The habitats are described below and summarised in Table 5.1, with the latter summarising their relative extent and contribution to the total land area. The distribution of each habitat is shown on Figure 3. The associated target notes are provided in Appendix C and located on Figure 3. Illustrative photographs are provided where relevant in Appendix D.

The northern part of the Proposed Development Area comprised mostly hardstanding/ rubble spread on an area of cleared land that was within the LOR site boundary and was used for temporary vehicle parking/ materials storage. The habitat assemblage within the southern part of the Proposed Development Area is considered to represent an example of the Open Mosaic Habitats on Previously Developed Land (OMH) priority habitat type. This habitat has developed through natural colonisation of a previously disturbed area. Most recently, an area of dense bramble (*Rubus fruticosus* agg.) scrub has been cleared in the central part of the Proposed Development Area, resulting in substantial area of bare ground being created. The topography of the land within the Proposed Development Area is much flatter than in the Wider Survey Area, where disturbance/ materials storage has resulted in mounds and hummocks creating a varied topography.

Semi-improved neutral grassland

This is the main habitat type in the south-western part of the Proposed Development Area (Photograph 1). This grassland is typified by a rank unmanaged grass dominated sward with locally abundant tufted hair-grass (*Deschampsia cespitosa*) indicating where ground is drainage impeded during the winter. The grassland is species poor and forb species include locally frequent teasel (*Dipsacus fullonum*), colt's-foot and creeping thistle (*Cirsium arvense*), with occasional fleabane (*Pulicaria dysenterica*) and rare wild carrot (*Daucus carota*).

This habitat contributes to the OMH habitat type, which extends eastwards to the previously disturbed area of land in the Wider Survey Area between the Proposed Development and Rosper Road. OMH is not a discrete habitat for the purposes of Phase 1 Habitat survey, but instead is a matrix derived from a mosaic of different habitat types and associated habitat and land-use features and characteristics, and edaphic conditions

Ditches and ponds

There is one area of standing water within the Proposed Development Area; this is an abandoned archaeological trial trench approximately 50 m x 2 m that has been left from previous investigations of the area, and which has become filled with water (Pond 6).

A wet ditch is present within the Proposed Development Area near the western boundary, and a further small drainage ditch bisects the Proposed Development Area flowing north-east to south-west, and draining surface water from the hardstanding temporary car park/ storage area. The ditch supported no marginal or aquatic vegetation with the exception of a small amount of bulrush (Typha spp.) in the north-eastern section. The ditch was shallow, silted and had a moderate flow at the time of the survey.

This habitat contributes to the OMH habitat type.

Ephemeral/ short perennial

This is a transitional habitat resulting from colonisation of bare ground and spoil (including hummocks of limestone pebbles) by ruderal plant species. The habitat blends into the semi-improved neutral grassland and tall ruderal habitat (Target Note 4, Photographs 5 to 13).

This habitat contributes to the OMH habitat type.

Scattered scrub

There are localised areas of scattered sallow *(Salix* spp.) dominated scrub, mainly associated with the tall herb areas.

This habitat contributes to the OMH habitat type.

Table 5.1. Habitats present within the Proposed Development Area

Habitat	Approximate Extent within Proposed Development Area (ha)[1]	Approximate Proportion of the Proposed Development Area
Semi-improved neutral grassland	0.71	27.5%
Continuous Scrub	0.02	0.8%
Ephemeral/ Short perennial	0.69	26.7%

Habitat	Approximate Extent within Proposed Development Area (ha)[1]	Approximate Proportion of the Proposed Development Area
Scattered Scrub based on 3m diameter	0.01	0.4%
Bare Ground	0.46	17.8%
Hard Standing (car park/roads)	0.66	25.5%
Standing Water	0.005	0.2%
Wet Ditch	0.03	1.2%

5.1.2 Phase 1 Habitat Types (Wider Survey Area)

The habitats recorded within the Wider Survey Area are shown in Figure 3. The associated target notes are provided in Appendix C and located on Figure 3. Illustrative photographs are provided where relevant in Appendix D.

The habitat assemblage within the Wider Survey Area is considered to represent an example of the OMH priority habitat type, and is more extensive than that present within the Proposed Development Area. This habitat has developed through natural colonisation of a previously disturbed area, which it is understood was used for the storage of material cleared from the area north of the Proposed Development Area during construction of the adjacent car park (SLR Consulting, 2017). Consequently the habitat is undulating with vegetated mounds of rubble/ spoil whereas the area within the Proposed Development Area has a less varied (flatter) topography.

Ephemeral/ Short Perennial

This is a transitional habitat located adjacent to the Proposed Development Area resulting from colonisation of bare ground by ruderal plant species and grasses, for example Yorkshire-fog (*Holcus lanatus*). Forb species include locally frequent bird's-foot trefoil (*Lotus corniculatus*) and occasional yellow-wort, common centaury, scarlet pimpernel (*Anagallis arvensis*) and, rarely occurring, blue fleabane. There are localised areas dominated by creeping thistle (Target Note 5; Photograph 16).

This habitat contributes to the OMH habitat type.

Tall Ruderal/Scattered Scrub

There is a small stand of impenetrable tall ruderal and scattered scrub habitat between the aforementioned stand of ephemeral vegetation and the railway (Target Note 6). There is scattered hawthorn (*Crataegus monogyna*) and dog rose (*Rosa canina* agg.) amongst a field layer of frequent teasel, locally frequent great willowherb and frequent false-oat-grass (*Arrhenatherum elatius*). Bramble (*Rubus fruticosus* agg.) is dominant throughout. The area is dissected by two short sections of drain with dominant emergent bulrush.

This habitat contributes to the OMH habitat type.

Swamp vegetation, ditches and ponds

There were small localised areas of impeded drainage throughout the Wider Survey Area where sea-club rush (*Bolboschoenus maritimus*) and bulrush were abundant. Two separate seasonal ponded areas in the eastern part of the Wider Survey Area (Ponds 1 and 2) supported vegetation that indicated they held water for much of the year, although seasonal drying (or a reduction in extent) in the summer months cannot be ruled out. Pond 1 supported a high emergent cover of common spike rush (*Eleocharis* sp.) with frequent bulrush and rare grey club-rush (*Schoenoplectus tabernaemontani*) whereas Pond 2 was dominated by bulrush (Pond 2 [refer to Figure 3] Target Note 2). Following a site visit in February 2018, it appeared that the separate 'ponds' identified in early autumn combined to form a large area of shallow ponded water throughout the winter and early spring months, covering most of the eastern part of the site where drainage is impeded.

A further area of standing water was present in the Wider Survey Area (Pond 4) along with a second abandoned flooded archaeological trial trench (Pond 5). These shallow pools supported no aquatic or marginal vegetation, and are likely to regularly dry out in the summer months.

A large square drainage lagoon was present to the west of the Proposed Development Area (Pond 3). This lagoon is part of the LOR process facility, and as such has been scoped out of further surveys.

A substantial drainage ditch was present along the southern boundary of the Wider Survey Area, which drains clean surface water away from the LOR from which there is a drainage outfall at the western end. The ditch was approximately 1 m wide with a moderate flow, and was heavily shaded by a dense band of hawthorn and blackthorn scrub that runs along its length on both banks. The ditch forms part of the wider drainage network in this part of Immingham, and eventually outfalls to the Humber Estuary. A second drainage ditch was present along the boundary to Rosper Road, but this was found to be dry at the time of the survey and dominated by common reed (*Phragmites australis*).

Built Structure - Settling Lagoons

Settling lagoons were present in the LOR site boundary south-west of the Proposed Development Area. This is a large artificial structure that contained stagnant water with no emerging macrophyte vegetation and appeared to be of negligible importanance for wildlife (Target Note 7, Photograph 15). These lagoons are part of the industrial processes within the LOR, and as such are periodically emptied and/ or maintained. They are therefore discounted from further consideration because there is no reasonable likelihood of them supporting any protected species.

Built Structure – Car Parking

A large area of tarmac hardstanding was present to the north of the Wider Study Area, which forms the main car park for the LOR at the gatehouse.

Built Structure – Buildings

A small flat-roofed gatehouse was present at the entrance to LOR. There was also a single storey canteen building adjacent to the gatehouse.

A pipe rack was present immediately adjacent to the ditch that runs along the southern boundary of the Wider Survey Area. The pipe rack is raised approximately 1 m above ground level, with hard standing beneath.

5.1.3 Notable Habitats

Table 5.2 provides a summary of notable habitats within the Proposed Development Area based on the results of the Phase 1 Habitat survey and with reference to guidance for the recognition of NERC Act S41 (Maddock, 2011), LBAP and Local Wildlife Site (LWS) (Greater Lincolnshire Nature Partnership, 2013) habitats. This assessment is preliminary and further surveys may be required to investigate the value of habitats further, as detailed in Section 7 of this report.

Table 5.2. Notable habitats associated with the Proposed Development Area

Habitat	NERC Act?	LBAP?	LWS Quality?	Supporting Comments
Open Mosaic Habitat on Previously Developed Land (OMH)	✓	✓	?	The flora and habitat conditions recorded during the Phase 1 habitat survey supports this assessment. It encompasses the following Phase 1 habitats and features described in Section 4.1: ephemeral/ short perennial, neutral grassland, temporary standing water, scattered scrub, wet ditch and bare ground. This habitat is approx. 1.9ha in size and so meets the minimum criteria of 0.25ha detailed in the NERC Act S41 priority criteria for priority habitat open mosaic habitat. Additionally, there is a diversity of different successional communities) that would provide ecological niches for terrestrial invertebrates. This habitat is known as "brownfield" in the LBAP and LWS guidelines. An approach for the assessment of OMH in Lincolnshire is given in GLNP (2013). Criterion BM1 requires a '*brownfield mosaic at least 0.25 ha in extent*

Habitat	NERC Act?	LBAP?	LWS Quality?	Supporting Comments
				with loose substrate or bare ground and at least two of the early successional communities in Table 15 and a minimum brownfield features index score of four using Table 16. At least one early successional community should be flower-rich.' Based on these criteria the "brownfield" habitat at the Proposed Development Area is of Local Wildlife Site quality, with the only uncertainty relating to the level of species richness within any one of the relevant early successional communities (this would need to be fully assessed at an appropriate time of the year (i.e. early June).

Key to symbols: ✓ = yes, x = no, ? = likely or possible, further survey required to determine this.

5.2 Protected and Notable Species

Table 5.3 provides a summary of potentially relevant species identified through a combination of desk study and review of the habitat data collected during the field survey. The table summarises the conservation status of each species and provides comment on the likelihood of presence.

Where species are identified in Table 5.3 as likely or possible, they are likely to represent legal constraints, or may be relevant to determination of a planning application. Further surveys will or may be required to determine presence/ likely absence. Requirements for further survey are identified in Section 5 of this report.

No invasive non-native plant species listed under Schedule 9 of the Wildlife and countryside Act 1981 (as amended) were recorded during the Phase 1 Habitat survey.

Table 5.3. Protected and notable species relevant or potentially relevant to the Proposed Development

Species	Legally Protected Species?	Species of Principal Importance?	Other Notable Species?	Present on Site or in potential ZoI?	Supporting Comments
European Protected Species					
Great crested newt	✓	✓	x	✓	Desk study returned 21 records of GCN from within 1 km of the Proposed Development Area in the past 10 years. The closest record is approx. 60m (to the west). There are also records from Station Road Field LWS (which is located 0.4 km to the north at its closest point). A European Protected Species Mitigation (EPSM) licence for GCN was obtained for the Able Marine Energy Park (AMEP) consented development, which is north-east of the Proposed Development. GCN were trapped and translocated from ponds in Station Road LWS to new mitigation ponds approximately 2 km to the north. There is one area of standing water within the Proposed Development Area (Pond 6) and four within 250 m (Ponds 1, 2, 4 and 5) that may have potential to support GCN. A square lagoon (Pond 3) and settlement beds associated with LOR are west of the Proposed Development. These waterbodies are considered unsuitable for GCN on the basis that they are

Species	Legally Protected Species?	Species of Principal Importance?	Other Notable Species?	Present on Site or in potential ZoI?	Supporting Comments
					operational processing lagoons. The Proposed Development Area and Wider Survey Area provides good quality terrestrial habitat with opportunities for foraging and hibernating GCN.
Bats	✓	✓	x	?	The desk study returned four records of noctule bat *(Nyctalus noctula),* nine records of common pipistrelle *(Pipistrellus pipistrellus*) and one record of soprano pipistrelle *(Pipistrellus pygmaeus)* within 1 km of the Proposed Development Area. There are no structures or mature trees within the Proposed Development Area, and therefore there is no potential for roosting bats to be present. Habitats within the Proposed Development Area are considered to represent sub-optimal habitat for foraging bats, due to its close proximity to the LOR, VPI CHP Plant and the expected high levels of nocturnal light emissions that may deter foraging bats. **Not considered further.**
Other Species					
Reptiles	✓	✓	x	?	There are no records within the past 10 years from within 1 km. Habitats within the Proposed Development Area are potentially suitable for common lizard (*Zootoca vivipara*), and slow worm (*Anguis fragilis*). The wet ditches may be suitable for grass snake (*Natrix natrix*). These habitats have been established for sufficiently long that there is a possibility that reptile species may have colonised.
Water vole (*Arvicola amphibius*)	✓	✓	x	x	There are 31 records of water vole presence within 1 km of the Proposed Development Area boundary in the past 10 years (the closest record is approximately 210 m). There are a number of drains adjacent to the Proposed Development Area that may be suitable to support water vole, although it is unlikely that any will be directly affected. The surface water drain within the Proposed Development boundary is not suitable for water vole because it supports no vegetation and is likely to dry out in the summer months.
Brown hare (*Lepus europaeus*)	x	✓	x	✓	There are two records of brown hare at Rosper Road Pools, approximately 0.6 km south-east of Proposed Development Area. The closest record of brown hare is approximately 450 m away. The site provides suitable cover and foraging habitat for this species, complementing arable habitats in the wider landscape.

Species	Legally Protected Species?	Species of Principal Importance?	Other Notable Species?	Present on Site or in potential ZoI?	Supporting Comments
Harvest mouse (*Micromys minutus*)	x	✓	x	?	There is a recent record of harvest mouse being present at Killingholme Airfield which is located approximately 2.8 km away. There is a general paucity of dense grass, tall reed and dense bramble vegetation, which represent favourable harvest mouse habitat. **Not considered further.**
Hedgehog (*Erinaceus europaeus*)	x	✓	x	?	There are no recent desk study records for this species. A possible hedgehog dropping was found within the Wider Survey Area during the walkover survey in early 2017 (SLR Consulting, 2017), and this species may therefore be present on site.
Badger (*Meles meles*)	✓	x	x	?	There are eight records of badger within approximately 1 km of the Proposed Development Area since 2007 (the closest record is approximately 120 m). The Proposed Development Area offers some opportunities for foraging badger, although the area is relatively isolated in the surrounding industrial landscape. However, no badger activity (including setts and digging by badger) was recorded during the Phase 1 Habitat survey, or during the earlier ecological walkover survey undertaken by SLR (SLR Consulting, 2017). It is therefore concluded that this species is absent from the Proposed Development Area. **Not considered further.**
Barn owl (*Tyto alba*)	✓	x	✓	?	There are five records of barn owl within 1 km of the Proposed Development Area since 2007, the majority at Rosper Road Pools (approx. 0.6 km to the south-east). The Proposed Development Area supports some grassland habitat with potential to be used on occasion as foraging habitat by barn owl. There are no features on or immediately adjacent to the Proposed Development that are suitable for nesting barn owls.
Other birds (breeding)	✓	✓	x	✓	Desk study returned numerous bird records since 2007, including Schedule 1 species. However, habitats within the site do not represent favourable breeding habitat for Schedule 1 species. Habitats within the site are potentially suitable for ground nesting birds, for example skylark (*Alauda arvensis*).
Other birds (passage and wintering)	✓	✓	x	x	Based on the habitat and topographical context of the Proposed Development Area, it is highly unlikely that it would have a specific value for passage and wintering birds associated with the Humber Estuary SPA/ Ramsar. This was confirmed

Species	Legally Protected Species?	Species of Principal Importance?	Other Notable Species?	Present on Site or in potential ZoI?	Supporting Comments
					by the wintering bird surveys carried out on the Wider Survey Area in 2017 (Catley, 2017). The only waterfowl species that were recorded were snipe (*Gallinago gallinago*) and woodcock (*Scolopax rusticola*), which do not form part of the SPA/ Ramsar assemblage. **Not considered further.**
Common toad (*Bufo bufo*)	x	✓	x	?	Desk study returned eight records of common toad within 1 km of the Proposed Development Area since 2007. This species may utilise the standing water within the Proposed Development Area and Wider Survey Area for breeding and the habitats afford opportunities for foraging and hibernation.
Invertebrates	x	✓	✓	?	Desk study returned several records of moths, butterflies and beetles since 2007, including cinnabar moth *(Tyria jacobaeae),* blood-vein moth *(Timandra comae)* and small heath butterfly *(Coenonympha pamphilus).* The habitat context of the site (OMH) provides opportunities for a range of terrestrial invertebrates, possibly nationally or regionally notable species.

Key to symbols: ✓ = yes, x = no, ? = likely or possible, see Supporting Comments for further rationale.

Species present on site are those for which recent direct observation or field signs confirmed presence. Species which are possibly present are those for which there is potentially suitable habitat based on the results of the Phase 1 Habitat survey, or this combined with desk study records.

Legally protected species are those listed under Schedules 1, 5 and 8 of the WCA; and, Schedules 2 and 4 of The Habitat Regulations.

Species of Principal Importance as those listed under Section 41 of the NERC Act. Planning Authorities have a legal duty under Section 40 of the same Act to consider such species when determining planning applications.

Other notable species include native species of conservation concern listed in the LBAP (except species that are also of Principal Importance), those that are Nationally Rare, Scarce or Red Data List. .

No non-native controlled weed species listed under Schedule 9 of the WCA (as amended) were recorded during the Phase 1 Habitat survey of the Proposed Development Area/Wider Survey Area.

6. Ecological Constraints and Opportunities: Risks and Recommendations for Further Action

6.1 Approach to the Identification of Ecological Constraints

Relevant ecological features that may represent constraints to the proposed development, or that provide opportunities to deliver ecological enhancement in accordance with planning policy, are identified in Section 4 of this report, and supported by Figure 3.

The NPPF and local planning policy (summarised in Section 2 of this report) specify requirements for the protection of features of importance for biodiversity. Planning policy is a material consideration when determining planning applications.

Compliance with planning policy requires that the proposed development considers and engages the following mitigation hierarchy where there is potential for impacts on relevant ecological features:

1. Avoid features where possible;
2. Minimise impact by design, method of working or other measures (mitigation) e.g. by enhancing existing features; and
3. Compensate for significant residual impacts, e.g. by providing suitable habitats elsewhere (whether in the control of VPI Immingham or otherwise legally enforceable through planning condition or Section 106 agreement).

This hierarchy requires the highest level to be applied where possible. Only where this cannot reasonably be adopted should lower levels be considered. The rationale for the proposed mitigation and/ or compensation should be provided with planning applications, including sufficient detail to show that these measures are feasible and can be provided.

The likelihood, where present, of the relevant ecological features constraining the proposed development has been assessed with reference to the scale described in Table 6.1. The higher the importance of the ecological receptor for the conservation of biodiversity at national and local scales, the more likely it is to be a specific consideration during determination of the planning application for the Proposed Development.

In pursuance of the objective within the NPPF of providing net gains in biodiversity where possible, consideration should be given to the scope for enhancement as part of the Proposed Development. This should represent biodiversity gain over and above that achieved through mitigation and compensation. Enhancement could be achieved on and/ or off-site. Where such recommendations are made in this PEA they are high level only, recognising that this report has been prepared to support a request for a scoping opinion and not to support a planning application.

High level opportunities to secure ecological enhancement are not scaled in Table 6.1, but are identified in the accompanying appraisal (Section 6.4 of this report). There may be scope for ecological enhancement where existing habitat features could be improved or enhanced as part of the Proposed Development as designed, or with only minor amendment to the design of the Proposed Development. Ecological enhancement may not be possible where there is little scope to accommodate enhancement measures within the Proposed Development, e.g. due to a lack of utilisable space, or where land is required for essential mitigation. In such circumstances, consideration could be given to enhancing biodiversity in the vicinity of the Proposed Development, subject to there being appropriate mechanisms to secure this.

Table 6.1. Scale of Constraint to Potential Development

Likelihood	Definition
High	An actual or potential constraint that is subject to relevant legal protection and is likely to be a material consideration in determining the planning application (e.g. statutory nature conservation designations and European/nationally protected species). Further survey likely to be required (as detailed in this report) to support a planning application.
Medium	An actual or potential constraint that is covered by national or local planning policy and, depending on the level of the potential impact as a result of the proposed development, may be a material consideration in determining the planning application. Further survey may be required (as detailed in this report) to support a planning application.
Low	Unlikely to be a constraint to development or require further survey prior to submission of a planning application. Mitigation is likely to be covered under Construction Environmental Management Plan (CEMP) or precautionary working method statement (e.g. generic requirements for the management of nesting bird risks).

6.2 Constraints and Requirements for Further Survey: Designations

6.2.1 Statutory Designations

The Proposed Development Area is located approximately 1.4 km south-west of the Humber Estuary SSSI, SAC, SPA and Ramsar. The planning application is therefore likely to require a Habitat Regulations Assessment (HRA) screening to determine whether the Proposed Development would result in Likely Significant Effects (LSE) on the

European site. It is considered unlikely that the construction and operation of the proposed development would directly impact these designations at the distance concerned; however, there is the potential for indirect impacts e.g. air emissions from the power plant.

The habitats present within the Proposed Development Area and Wider Survey Area, as defined in this PEA, are unlikely to be of functional importance for bird species associated with the European site for the following reasons:

- The area is subject to high levels of human disturbance associated with the car park which is located immediately adjacent to the Proposed Development Area/ Wider Survey Area;
- Waterfowl and waders such as curlew (*Numenius arquata*) and golden plover (*Pluvialis apricaria)* and geese generally prefer flat open vistas and short vegetation (where their sight-lines are unrestricted in terms of predator detection). Therefore the undulating topography and stands of tall ruderal vegetation within the Proposed Development Area/ Wider Survey Area are likely to deter waterfowl from using the site for foraging and roosting.

The results of the wintering bird survey carried out within the Proposed Development Area/ Wider Survey Area by Catley (2017) support this conclusion, because no SPA/ Ramsar bird species were recorded. Indirect effects are also unlikely, but would need to be screened in detail with regard to other relevant information (particularly in respect of noise, hydrogeology, water quality and air quality). Natural England may advise that the Proposed Development is located in an area where industrial developments would need to be assessed for their potential to impact the designations.

Given the above, further wintering and passage bird surveys on the Proposed Development Area/ Wider Survey Area are not recommended or necessary. However, the breeding bird surveys recommended in Section 5.4 along with previous survey data for the Proposed Development Area/ Wider Survey Area will provide data that allows the ornithological context of the Proposed Development to be further defined and potential impacts on birds to be assessed in detail in the EcIA.

6.2.2 Non-Statutory Designations

There are three non-statutory nature conservation designations within approximately 1 km radius of the Proposed Development Area. It is considered unlikely that the construction and operation of the proposed development would directly impact these designations at the distance concerned. However, there is the potential for indirect impacts in respect of noise, hydrogeology, water quality and air quality.

6.3 Constraints and Requirements for Further Survey: Habitats and Protected Species

Table 6.2 identifies those protected species that are likely to be specific constraints to the Proposed Development and require specific action to inform planning/ design of the Proposed Development (including mitigation and habitat restoration), to support a planning application, and/ or during operation of the Proposed Development.

See Table 6.3 for those surveys considered necessary for the purposes of Ecological Impact Assessment (EcIA) and to support a planning application for the Proposed Development.

The constraints outlined here will need to be reassessed if there is a significant change to the type or scale of development proposed, or if there are any significant changes in the use or management of the land that would affect the habitats and species. If a planning application is made two years or more after a PEA it would be advisable to review the available survey data and update this where the baseline conditions or risks may have changed over time.

Table 6.2. Summary of Likely Relevant Ecological Constraints and High Level Recommendations for Further Action

Receptor	Scale of Constraint	Further Requirements, Including Potential Mitigation Requirements	Driver	When is Action Likely to be Required		
				To Inform Design	Before Planning Application	Site Mobilisation onwards
Ephemeral/short perennial habitat, OMH and associated habitats	Medium	Retain where practical. Demonstrate a scheme consistent with policy for No Net Loss and Net Gain.	NERC Act S41 NPFF, Local Policies CS5, CS16, CS17, CS21, LC4, LC6	✓	✓	✓
Great Crested Newt	Medium (potential for a small population)	Determine potential impacts with reference to survey data. Design/ specify/ implement appropriate species and habitat mitigation, where necessary.	WCA, NERC Act S41, NPFF, Local Policies CS21, LC5, Standing Advice	✓	✓	✓
Reptiles	Medium (potential for a small population based on habitat quality)	Determine potential impacts with reference to survey data. Design/ specify/ implement appropriate species and habitat mitigation, where necessary.	WCA, NERC Act S41, NPFF, Local Policies CS21, LC5, Standing Advice	✓	✓	✓
Breeding Birds	Medium	Determine potential impacts with reference to survey data. If breeding birds are found to be present then to ensure legal compliance, site clearance works should be phased to occur outside the breeding bird season (March-August for most bird species). Implement necessary species mitigation.	WCA, NERC Act S41, NPFF, Local Policies CS21, LC5, Standing Advice	✓	✓	✓
Butterflies and other terrestrial invertebrates	Medium	Determine potential impacts with reference to survey data.	NERC Act S41, NPFF, Local Policies CS21, LC5, Standing	✓	✓	✓

Receptor	Scale of Constraint	Further Requirements, Including Potential Mitigation Requirements	Driver	When is Action Likely to be Required		
				To Inform Design	Before Planning Application	Site Mobilisation onwards
		Design/ specify/ implement appropriate habitat mitigation, where necessary.	Advice			

Table 6.3. Requirements for Further Survey

Survey	Season	Why required	When required		
			To Inform Design	Before Planning Application	Site mobilisation onwards
Ephemeral/short perennial habitat, OMH and associated habitats	Early June	Required for EcIA and to determine mitigation requirement. The north-western compartment of the Proposed Development Area was not subject to field survey (refer to Section 3.3.2 – Limitations)	✓	✓	-
Great Crested Newt	March to June HSI assessment of all waterbodies within 500 m. Ponds 1 & 2 - either presence/ absence survey (minimum of 4 visits); and/ or environmental DNA (eDNA) sampling [15th April to the 30th June]	Required for EcIA and to determine mitigation requirement	✓	✓	-
Reptiles	April/ May and/ or September, subject to suitable conditions for	Required for EcIA and to determine mitigation	✓	✓	-

Survey	Season	Why required	When required		
			To Inform Design	Before Planning Application	Site mobilisation onwards
	survey. Minimum of 7 visits using artificial refuges to determine likely presence/ absence.	requirement			
Breeding Birds	April to June (5 survey visits)	Required for EcIA and to determine mitigation requirement	✓	✓	-
Terrestrial Invertebrates (Preliminary Appraisal)	Single visit in April	Required for EcIA and to determine mitigation requirement	✓	✓	-

6.4 Opportunities for Ecological Enhancement

As part of the master planning process, consideration should be given to the identification of suitable options for achieving significant ecological enhancement, in accordance with the requirements of the NPPF and supporting policy.

It is considered that the potential likely relevant ecological constraints could be the basis for the development of plans for ecological enhancement. The following potential opportunities are identified:

- Maintain the continuity of the soils and OMH vegetation environmental character within a 'Wildlife Buffer Zone', which is protected during the construction phase, at the southern periphery of the Proposed Development Area. This habitat could be enhanced for invertebrates by creating spoil mounds with steep slopes and shallow cliff faces;
- Wildlife ponds could be created within the aforementioned Wildlife Buffer Zone of the Proposed Development Area with the purpose of providing habitat for breeding amphibians and also in terms of complementing the OMH terrestrial habitat.

7. References

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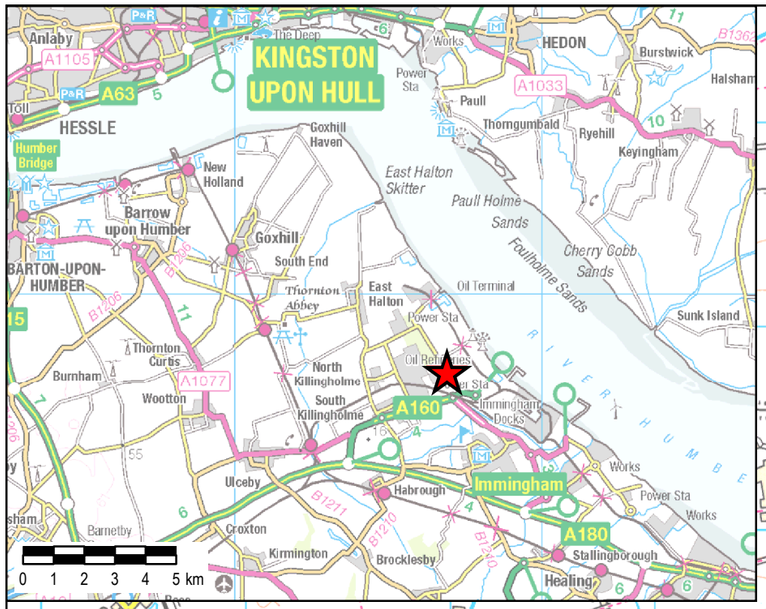
SLR (2017). VPI Immingham: Site Walkover – Phase 3 Consultancy Services. Prepared for VPI Immingham Ltd. SLR Ref. No.: 414:06745.00001

Annex A: Figures



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LEGEND

Proposed Development Area

Purpose of Issue: FOR INFORMATION

Client: VPI IMMINGHAM

Project Title: VPI IMMINGHAM ENERGY PARK 'A' PRELIMINARY ENVIRONMENTAL ASSESSMENT

Drawing Title: SITE LOCATION

Drawn	Checked	Approved	Date
JW	BB	MS	01/05/2018

AECOM Internal Project No.	Scale @ A3	Inset Map
60547702	1:30,000	/ 1:200,000

AECOM
Midpoint
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number: FIGURE 1

Rev:

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Ecology - Updated PEA Appended to ES\Figure 1 Site Location.mxd

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

Legend

- Proposed Development Area
- Local Wildlife Site
- Special Area of Conservation - Humber Estuary
- Special Protection Area - Humber Estuary
- Site of Special Scientific Interest - Humber Estuary

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
DESIGNATED SITES

Drawn	Checked	Approved	Date
EC	JW	HW	08/05/2018

AECOM Internal Project No. 60547702
Scale @ A3 1:20,000

AECOM
2 City Walk
Leeds
LS11 9AR
T +44-133-391-6800
http://www.aecom.com/

Drawing Number
FIGURE 2

Rev

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Ecology - Updated PEA Appended to ES\Figure 2 Designated Sites.mxd

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Proposed Development Area
- Scattered scrub
- Target note
- Dry ditch
- Wet ditch
- Bare ground
- Buildings
- Built-up area
- Cultivated/disturbed land - ephemeral/short perennial
- Hardstanding
- SI — Neutral grassland - semi-improved
- Other tall herb and fern - ruderal
- Scrub - dense/continuous
- Standing water
- E — Standing water - eutrophic
- Swamp

Purpose of Issue: FINAL

Client: VPI IMMINGHAM

Project Title: PRELIMINARY ECOLOGICAL ASSESSMENT

Drawing Title: PHASE 1 HABITAT SURVEY

Drawn	Checked	Approved	Date
JW	BB	MS	01/05/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:1,750

AECOM
Midpoint
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number: FIGURE 3

Rev:

20 0 20 40 60 80 100 m

N

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Ecology - Updated PEA Appended to ES\Figure 3 Phase 1 Habitat Survey.mxd

Annex B: Overview of Relevant Legislation

The Conservation of Habitats & Species Regulations 2017

The Habitats Regulations consolidate all the various amendments made to the Conservation (Natural Habitats, &c.) Regulations 1994 in respect of England and Wales. The 1994 Regulations transposed Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) into national law. The Regulations came into force on 30th October 1994. In Scotland the Habitats Directive is transposed through a combination of the Habitats Regulations 2017 (in relation to reserved matters) and the 1994 Regulations. The Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) transpose the Habitats Directive in relation to Northern Ireland.

The Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.

Under the Regulations, competent authorities i.e. any Minister, Government department, public body, or person holding public office, have a general duty, in the exercise of any of their functions, to have regard to the EC Habitats Directive.

The Regulations place a duty on the Secretary of State to propose a list of sites which are important for either habitats or species (listed in Annexes I and II of the Habitats Directive respectively) to the European Commission. Once the Commission and EU Member States have agreed that the sites submitted are worthy of designation, they are identified as Sites of Community Importance (SCIs). The EU Member States must then designate these sites as Special Areas of Conservation (SACs) within six years. The Regulations also require the compilation and maintenance of a register of European sites, to include SACs and Special Protection Areas (SPAs) classified under Council Directive 79/409/EEC on the Conservation of Wild Birds (the Birds Directive). These sites form a network termed Natura 2000.

The Regulations enable the country agencies to enter into management agreements on land within or adjacent to a European site, in order to secure its conservation. If the agency is unable to conclude such an agreement, or if an agreement is breached, it may acquire the interest in the land compulsorily. The agency may also use its powers to make byelaws to protect European sites. The Regulations also provide for the control of potentially damaging operations, whereby consent from the country agency may only be granted once it has been shown through Appropriate Assessment that the proposed operation will not adversely affect the integrity of the site. When considering potentially damaging operations, the country agencies apply the precautionary principle' i.e. consent cannot be given unless it is ascertained that there will be no adverse effect on the integrity of the site.

In instances where damage could occur, the appropriate Minister may, if necessary, make special nature conservation orders, prohibiting any person from carrying out the operation. However, an operation may proceed where it is or forms part of a plan or project with no alternative solutions, which must be carried out for reasons of overriding public interest. In such instances the Secretary of State must secure compensation to ensure the overall integrity of the Natura 2000 system. The country agencies are required to review consents previously granted under the Wildlife and Countryside Act 1981 for land within a European site, and may modify or withdraw those that are incompatible with the conservation objectives of the site.

The Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. Licenses may be granted for a number of purposes (such as science and education, conservation, preserving public health and safety), but only after the appropriate authority is satisfied that there are no satisfactory alternatives and that such actions will have no detrimental effect on wild population of the species concerned.

The Regulations make special provisions for the protection of European marine sites, requiring the country agencies to advise other authorities of the conservation objectives for a site, and also of the operations which may affect its integrity. The Regulations also enable the establishment of management schemes and byelaws by the relevant authorities and country agencies respectively, for the management and protection of European marine sites.

Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 is the major domestic legal instrument for wildlife protection in the UK, and is the primary means by which the following are implemented:

- The Convention on the Conservation of European Wildlife and Natural Habitats ('the Bern Convention'); and
- The Council Directive 79/409/EEC on the Conservation of Wild birds (the 'Bird Directive')

Wild Birds

The Act makes it an offence (with exception to species listed in Schedule 2) to intentionally:

- Kill, injure, or take any wild bird,
- Take, damage or destroy the nest of any wild bird while that nest is in use or being built (also [take, damage or destroy the nest of a wild bird included in Schedule ZA1] under the Natural Environment and Rural Communities Act 2006), or
- Take or destroy an egg of any wild bird.

Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young. The Secretary of State may also designate Areas of Special Protection (subject to exceptions) to provide further protection to birds. The Act also prohibits certain methods of killing, injuring, or taking birds, restricts the sale and possession of captive bred birds, and sets standards for keeping birds in captivity.

Other Animals

The Act makes it an offence (subject to exceptions) to intentionally kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places. The Act also prohibits certain methods of killing, injuring, or taking wild animals.

Flora, Fungi and Lichens

The Act makes it an offence (subject to exceptions) to:

- Intentionally) pick, uproot or destroy Any wild plant listed in Schedule 8'
- Unless an authorised person, to intentionally uproot any wild plant not included in Schedule 8; or
- Sell, offer or expose for sale, or possess (for the purposes of trade), any live or dead wild plant included in Schedule 8, or any part of, or anything derived from, such a plant.

Non-native Species

The Act contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, prohibiting the release of animals and planting of plants listed in Schedule 9 in England and Wales. It also provides a mechanism making any of the above offences legal through the granting of licences by the appropriate authorities.

Countryside and Rights of Way (CRoW) Act 2000

The Countryside and Rights of Way Act 2000 applies to England and Wales only. Part III of the Act deals specifically with wildlife protection and nature conservation.

The Act places a duty on Government Departments and the National Assembly for Wales to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

Schedule 9 of the Act amends the SSSI provisions of the Wildlife and Countryside Act 1981, including increased powers for their protection and management of SSSIs. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increase penalties on conviction where the provisions are breached; and include an offence whereby third parties can be convicted for damaging SSSIs.

Schedule 12 of the Act amends the species provisions of the Wildlife and Countryside Act 1981, strengthening the legal protection for threatened species. The provisions make certain offences 'arrestable', include an offence of reckless disturbance, confer greater powers to police and wildlife inspectors for entering premises and obtaining wildlife tissue samples for DNA analysis, and enable heavier penalties on conviction of wildlife offences.

Natural Environment and Rural Communities (NERC) Act 2006

The Natural Environment and Rural Communities (NERC) Act came into force on 1st October 2006. Section 41 (S41) of the Act required the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list was drawn up in consultation with Natural England, as required by the Act.

The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006, to have regard to the conservation of biodiversity in England, when carrying out their normal functions.

Fifty-six habitats of principal importance are included on the S41 list. These are all the habitats in England that were identified as requiring action in the (now withdrawn) UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework. They include terrestrial habitats such as upland hay meadows to lowland mixed deciduous woodland, and freshwater and marine habitats such as ponds and subtidal sands and gravels.

There are 943 species of principal importance included on the S41 list. These are the species found in England which were identified as requiring action under the (now withdrawn) UK BAP and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework. In addition, the hen harrier has also been included on the list because without continued conservation action it is unlikely that the hen harrier population will increase from its current very low levels in England.

Protection of Badgers Act 1992

Badgers and their setts (burrows) are protected under the Act. This makes it an offence to kill or take a badger, to cruelly ill-treat a badger, or to interfere with a badger sett, including disturbing a badger while it is occupying a sett.

Licences to permit otherwise prohibited actions can be granted under section 10 of the Act for various purposes. This includes licences to interfere with a badger sett for the purpose of development as defined by section 55(1) of the Town and Country Planning Act 1990.

Licences may be granted in order to close down setts, or parts of setts, prior to development or to permit activities close to a badger sett that might result in disturbance. A licence will be required if a sett is likely to be damaged or destroyed in the course of development or if the badger(s) occupying the sett will be disturbed.

Licences can be applied for at any time, but a licence for development will not normally be issued unless full planning permission has been granted. The closure of setts under licence is normally only permitted during July to November, inclusive.

Water Framework Directive 2000

The Water Framework Directive (EC Directive 2000/60/EC) came into force in 2000. At the heart of the WFD is the philosophy to "make waterbodies better" through sustainable development for the joint benefits of aquatic habitats and the human environment.

The WFD requires members states achieve "good status" for all groundwater and surface waters (rivers, lakes, transitional waters, and coastal waters). For surface water, overall status comprises two elements: "good ecological status" and "good chemical status". Ecological status is defined by the biological condition or health of a watercourse, in combination with water quality and physical conditions that underpin biological conditions. The classification of ecological status considers biological elements (the abundance of aquatic flora and fauna), physical habitat availability (hydromorphology), and water quality factors such as the availability of nutrients, salinity, temperature and pollution by key chemical pollutants. The biological elements used as indicators of ecological quality include fish, macroinvertebrates, macrophytes and diatoms.

Any proposed developments or activities that have the potential to affect the water environment require a WFD Assessment (WFDa). Compliance with the WFD means attainment of good ecological status, prevention of deterioration in status, and prevention of failure to achieve future attainment of good status where it is not already achieved within waterbodies. However, WFD Article 4.7 provides legislation for exemption conditions that could allow implementation of schemes that cause deterioration in ecological status, for example for reasons of overriding public interest.

Annex C: Target Notes

Target Note	Description
	Wider Survey Area
1	A shallow pond with a high emergent cover of spike rush (*Eleocharis* sp.) with frequent bulrush (*Typha latifolia*) and rare grey club-rush (*Schoenoplectus tabernaemontani*)
2	Abundant bulrush indicating a wet ponded area
3	The raised areas of the bunds and spoil heaps are represented by a stand of hemlock (*Conium maculatum*), creeping thistle and great willowherb (*Epilobium hirsutum*)
4	Abundant creeping cinquefoil (*Potentilla reptans*) and colt's-foot (*Dactylis glomerata*) with frequent bristly ox-tongue (*Picris echioides*), fleabane, willowherbs (*Epilobium spp*.) species and ribwort plantain (*Plantago lanceolata*). There is occasional scentless mayweed (*Tripleurospermum inodorum*), yellow-wort (*Blackstonia perfoliata*), common century (*Centaurium erythraea*), and ragwort (*Senecio jacobaea*) and rare knapweed (*Centauria nigra* agg.) and blue fleabane (*Erigeron acer*).
5	This is a transitional habitat located immediately adjacent to the Wider Survey Area resulting from colonisation of bare ground by ruderal plant species and grasses [for example *Holcus lanatus*]. Forb species include locally frequent bird-foot trefoil (*Lotus corniculatus*) and occasional yellow-wort, common centuary, scarlet pimpernel (*Anagallis arvensis*) and rare blue fleabane. There are localised areas dominated by creeping thistle.
6	The area is dissected by two short sections of drain with dominant emergent bulrush.
7	Inaccessible settling lagoons with stagnant water with no emerging macrophyte vegetation and appeared to be of negligible importance for wildlife

Annex D: Photographs

	
Photo1 (Wider Survey Area): Linear stand of unmanaged semi-improved neutral grassland in the background, adjacent to the car park	Photo 2 (Wider Survey Area): Abundant sea club-rush (*Bolboschoenus maritimus*) with some bulrush (*Typha latifolia*) indicating waterlogged ground conditions
	
Photo 3: (Wider Survey Area): Bulrush growing in shallow pond	Photo 4 (Wider Survey Area): Shallow pond with abundant spike rush (*Eleocharis* sp.)
	
Photo 5 (Wider Survey Area): Ephemeral/ short perennial vegetation with the linear stand of semi-improved neutral grassland in the background adjacent to the car park.	Photo 6: (Wider Survey Area): Localised patches of abundant tufted hair grass (*Deschampsia cespitosa*) amongst ephemeral/ short perennial vegetation. Indicates impeded drainage.

	
Photo 7 (Wider Survey Area): Yellow-wort (*Blackstonia perfoliata*) and colt's-foot (*Tussilgo farfara*) growing amongst various types of bare industrial substrates	Photo 8 (Wider Survey Area): Ephemeral/ short perennial vegetation growing on undulating spoil mounds
	
Photo 9 (Wider Survey Area): Ephemeral/ short perennial vegetation growing on varied topography	Photo 10 (Wider Survey Area): Shallow cliff faces and steep slopes can provide high quality habitats for invertebrates when found in Open Mosaic Habitat
	
Photo 11(Wider Survey Area): Flat area of Ephemeral/ short perennial vegetation surrounded by scattered scrub and steep slopes	Photo 12 (Wider Survey Area): Blue Fleabane (*Erigeron acer*)

	
Photo 13 (Wider Survey Area): Ephemeral/ short perennial vegetation	Photo 14 (Wider Survey Area): Tall ruderal vegetation with the dead stems of hemlock (*Conium maculatum*)
	
Photo 15 (land adjacent to the western boundary of the Wider Survey Area: Settling Lagoons with negligible wildlife potential	Photo 16 (land adjacent to the western boundary of the Wider Survey Area): Ephemeral/ short perennial vegetation, with bird's-foot trefoil (*Lotus corniculatus*) in the foreground

Appendix 10B – Habitats Regulation Assessment Signposting Report

VPI-Immingham Energy Park 'A'

Appendix 10B: Habitats Regulations Assessment Signposting

VPI Immingham

Project Number: 60547702

May 2018

Quality information

Prepared by	Checked by	Approved by
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Revision History

Revision	Revision date	Details	Authorized	Name	Position
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Table of Contents

1 Introduction

1.1.1 This Appendix of the Environmental Statement (ES) represents a 'Habitats Regulations Assessment (HRA) Signposting Document' for the Proposed Development. The terms of reference used in this report are consistent with those defined within the main chapters of the ES (Volume 1). References are included, under relevant subject headings, to those chapters, technical appendices and/ or paragraphs within the ES that contain the information required by the competent authority to undertake an "appropriate assessment" under the terms of Regulation 61 of the Conservation of Habitats and Species Regulations 2017 (commonly referred to as the 'Habitats Regulations'). It is designed to serve two key functions:

- to assist the competent authority by making it easier to undertake and consult on a Habitats Regulations Assessment; and
- to act as a confirmatory checklist that can be used to ensure that the relevant information needed for a Habitats Regulations Assessment is adequately presented within this ES.

Rationale for Scoping

1.1.2 It is a requirement of the EC Habitats Directive 1992 and the Habitats Regulations (Box 1.1) that plans and projects are subject to an 'appropriate assessment' if it is likely that they will lead to significant adverse effects on a Natura 2000 site (the collective name for European designated sites). It is the duty of the 'competent authority' to determine if significant adverse effects are likely and, if necessary, to then undertake the appropriate assessment, but the proponent of the scheme can be asked to supply sufficient data/ reports to enable such a decision to be reached.

1.1.3 In the past, the term 'appropriate assessment' has been used to describe both the overall process and a particular stage of that process (see below). The term Habitats Regulations Assessment (HRA) has come into use in order to refer to the process that leads to an "Appropriate Assessment", thus avoiding confusion. Throughout this report, HRA is used to refer to the overall procedure required by the Habitats Regulations. The Habitats Regulations set out a stepwise process, including an 'appropriate assessment' to consider the impacts and effects of the Proposed Development on the Natura 2000 site. Although the necessity for an Appropriate Assessment has not been established, this document has been prepared on the assumption that the competent authority will conclude that one is not required.

1.1.4 For statutory designated nature conservation sites subject to the provisions of the Habitats Regulations, it is usual to consider a search radius of 10 km when examining the potential pathways for air quality impacts on the sites.

1.1.5 One European designated site has been identified within this radius; this is the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site, which is approximately 1.4 km north-east of the Proposed Development. The SAC supports qualifying Annex I habitats that are potentially susceptible to the effects of emissions to air from the Proposed Development.

1.1.6 Surface water pathways to the designated habitats (and thus the qualifying species they support) have also been considered because the surrounding surface water drainage network, into which surface water from the construction and operation of the Proposed Development will outfall, drains in the Humber Estuary.

Box 1.1: The legislative basis for determining Likely Significant Effect and for subsequent Appropriate Assessment, if required

Habitats Directive 1992

"*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives*."

Article 6 (3)

Conservation of Habitats and Species Regulations 2017

"*A competent authority, before deciding to … give any consent for a plan or project which is likely to have a significant effect on a European site or a European Offshore Marine Site (either alone or in combination with other plans or projects) … must make an appropriate assessment of the implications for the site in view of that sites conservation objectives … The authority shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site …*".

Regulation 61

Overview of HRA Procedure and Context

1.1.7 Office of Deputy Prime Minister (ODPM) Circular 06/2005 (Biodiversity and Geological Conservation - Statutory Obligations and Their Impact Within the Planning System) provides guidance on how the Regulations should be implemented. This is interpreted and summarised as follows:

- determination of whether the proposal is likely to have a significant effect, either alone or cumulatively (referred to as 'in-combination' in HRA terms) with other plans or projects, on a European site;
- if a significant effect is likely, the competent authority must conduct an Appropriate Assessment of the implications for the site in view of the site's conservation objectives (Natural England, 2008);
- in considering the project's effects on the site's conservation objectives, the competent authority must determine whether it can ascertain that the proposal will not adversely affect the integrity of the site;
- taking account of the way in which works are proposed to be carried-out, and the site conditions or other restrictions;
- being satisfied that there are no alternative solutions which would have a lesser effect on site integrity;
- considering whether there are Imperative Reasons of Overriding Public Interest (IROPI) to justify granting of permission for the development despite a potentially negative effect on site integrity; and
- in the absence of alternatives, and where the importance of the development outweighs the harm to a European site, consideration of proposed compensatory measures (to ensure that the overall coherence of the network of Natura 2000 sites is protected).

1.1.8 A flow chart of the HRA process (showing the decisions that are required at each stage) is provided as Plate 1.1 (below). A four-stage methodology for HRA would therefore include:

- HRA Stage 1: Screening (including a 'likely significant effect' judgement);
- HRA Stage 2: Appropriate Assessment;

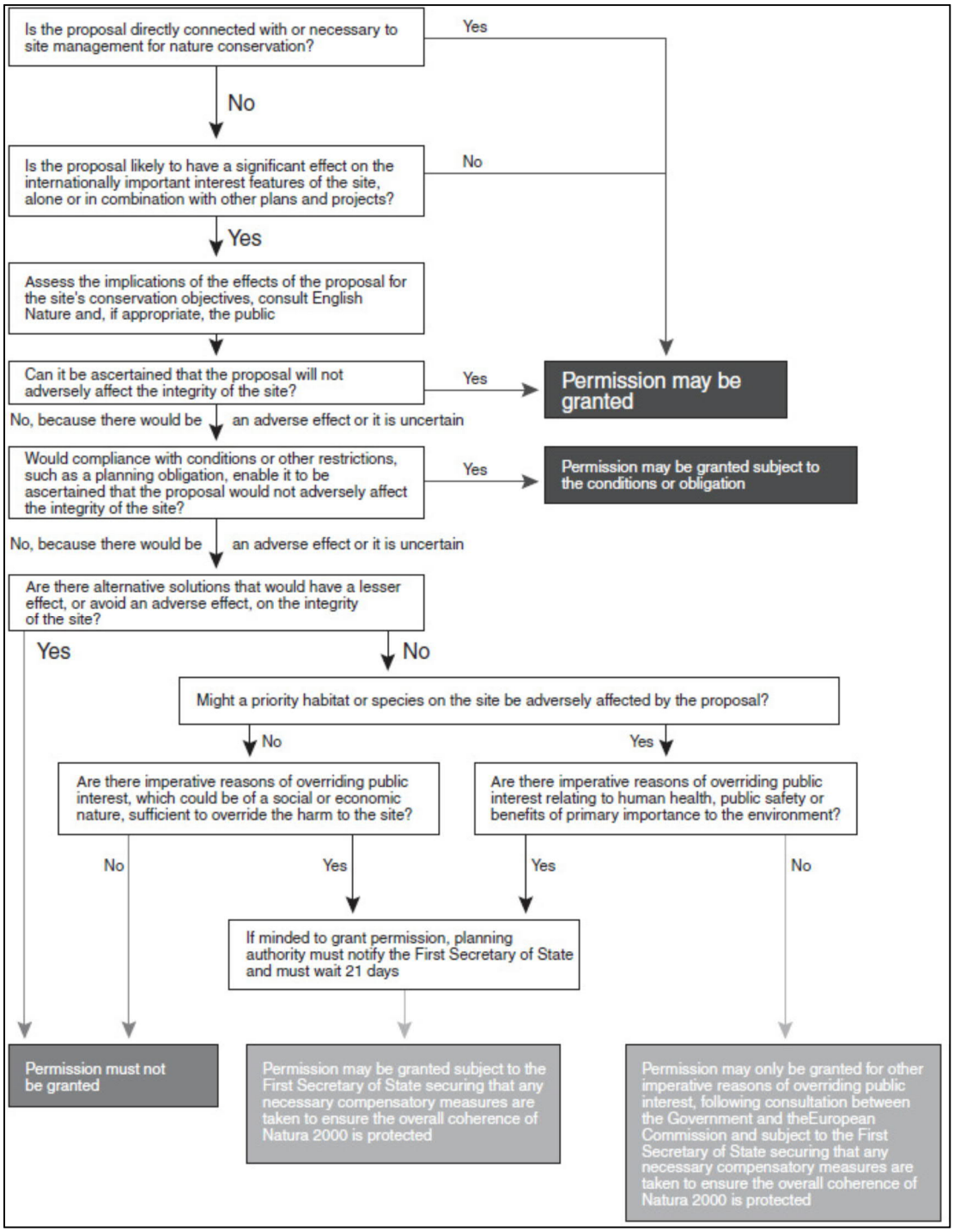
- HRA Stage 3: Assessment of Alternative Solutions; and
- HRA Stage 4: Assessment where no alternative solutions exist and where adverse effects remain.

1.1.9 Whilst the Appropriate Assessment and any subsequent assessments are undertaken by a competent authority, the information needed to undertake the assessments is generally provided by the applicant. For the Proposed Development the necessary information is presented within Chapter 7: Air Quality and Chapter 10: Ecology of ES Volume 1. Information on the Proposed Development is presented in Chapter 4: The Proposed Development in ES Volume 1.

1.1.10 ES Volume 1 (Chapters 7: Air Quality and 10: Ecology) concludes that the Proposed Development will not result in any significant adverse effects on the statutory designated sites identified above. It should be appreciated that the mechanism for Environmental Impact Assessment (EIA) used in the ES (including how terminology is used, and how the importance of receptors is evaluated) differs from that adopted for HRA. Consequently, whilst it is considered that all the information necessary to undertake an HRA is contained within the main chapters of the ES (Volume I), a separate process is still required to address the specific obligations of the Habitats Regulations. This is the role that this document seeks to bridge by assisting the competent authority in directing them to the necessary topics within the ES Volume 1 chapters.

1.1.11 One primary difference between EIA and HRA relates to the context of the assessments. HRA is specifically designed to consider the effects of a plan of project on the integrity of a Natura 2000 site, including its designated features (regardless of whether or not they are geographically located within the site at the time). It considers the whole of the Natura 2000 site in some detail, and by definition focuses on a site acknowledged to be of international importance. EIA, on the other hand, adopts a different perspective. It considers the impacts resulting from a development, and whether they have the potential to affect different receptors. The significance of the effect on any receptor is measured by combining the magnitude of the impact, and the importance and sensitivity of the receptor itself. EIA therefore seeks to establish the level at which significant effects occur, which may include Natura 2000 receptors at less than an international (possibly just at a local) level. All readers should be aware of this distinction when applying this signposting document.

Plate 1.1: Consideration of development proposals affecting Internationally Designated Nature Conservation Sites (ODPM, 2005)



Consideration of *People Over Wind, Peter Sweetman v Coillte Teoranta* ECJ Ruling

1.1.12 This report has been prepared having regard to all relevant case law relating to the Habitats Regulations. In particular, the recent ruling by the European Court of Justice (ECJ) in the case of *People Over Wind, Peter Sweetman v Coillte Teoranta* (C-323/17) has been taken into account, because it influences the approach to HRA Screening Stage 1.

1.1.13 This case held that "*it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site*" (paragraph 40). This establishes that 'mitigation measures' cannot be taken into account at the screening stage, but it is important to note that not all mitigation measures are excluded from consideration – only those "*intended to avoid or reduce the harmful effects of the… project on that site*". Mitigation measures which are, for example, intended to avoid effects on a local watercourse outside the European site designated boundary but which outfalls into the European designated site, can be taken into account.

1.1.14 Where mitigation measures are mentioned in this report, they are therefore ones which may reduce or avoid harmful effects on certain (local) habitats or species, but they are not relied on to directly avoid or reduce harmful effects on the European sites that are the subject of this signposting report.

1.1.15 This represents a deviation from the approach usually adopted in the EcIA, which considers embedded mitigation (even those measures that are included to directly avoid or reduce harmful effects on a European designated site) to form a part of the Proposed Development, and takes these measures into account when assessing the potential impacts on qualifying habitats and species.

2 Baseline Evidence Gathering

Proposed Development Description and Alternatives

2.1.1 A detailed description of the Proposed Development is provided in Chapter 3: Site Description of the Site and Chapter 4: The Proposed Development, in ES Volume 1.

2.1.2 The Proposed Development comprises a gas-fired power station with a gross electrical output of up to 49.9 megawatts (MWe). The Proposed Development is intended to supply electricity when required by the National Grid, typically to meet short term periods of high demand, to address shortfalls in supply from intermittent sources or to meet technical demands of the network. This is expected to be weighted towards the winter period, for a few hours at a time.

2.1.3 Consideration of the different alternatives to the Proposed Development is provided in Chapter 6: Need and Alternatives in ES Volume 1.

The Need for the Proposed Development

2.1.4 A comprehensive description of the project's rationale is presented in Chapter 6: Need and Alternatives in ES Volume 1.

Designated Sites Scoped in to HRA Screening

2.1.5 Three European designations associated with the Humber Estuary have been scoped into the impact assessment in ES Chapter 10: Ecology.

2.1.6 A summary of the qualifying features for each of the three Natura 2000 sites and their distance from the Proposed Development is summarised in Table 10B.1 below.

Table 10B.1: Natura 2000 Sites Scoped into HRA Screening

Site	Approx. Distance from Site	Total Area (ha)	Summary of Primary Reasons for Site Selection	Summary of Qualifying Features
Humber Estuary SAC	1.4 km NE	36,657.15	Estuaries Mudflats and sandflats not covered by seawater at low tide	Sandbanks which are slightly covered by sea water all the time Coastal lagoons Salicornia and other annuals colonizing mud and sand Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Embryonic shifting dunes Shifting dunes along the shoreline with European marram grass (*Ammophila arenaria*) (white dunes) Fixed coastal dunes with herbaceous vegetation (grey dunes) Dunes with common sea buckthorn (*Hippophae rhamnoides*) River lamprey (Lampetra fluviatilis) Sea lamprey (*Petromyzon marnius*) Grey seal (*Halichoerus grypus*)
Humber Estuary SPA	1.4 km NE	37,630.24	Populations of European importance of Annex I and Annex II over-wintering	N/A

Site	Approx. Distance from Site	Total Area (ha)	Summary of Primary Reasons for Site Selection	Summary of Qualifying Features
			wildfowl and wading birds. Internationally important assemblage of migratory and wintering birds.	
Humber Estuary Ramsar	1.4 km NE	37,987.8	Estuarine habitats including dune systems, intertidal mud and sand flats, saltmarshes and brackish lagoons. Grey seal Internationally important populations of passage wildfowl and waders.	N/A

Conservation Objectives

2.1.7 The conservation objectives for each relevant Natura 2000 site are summarised in Table 10B.2 below.

Table 10B.2: Conservation Objectives for Relevant Natura 2000 Sites

Site	Conservation Objectives
Humber Estuary SAC	Ensure that the integrity of the qualifying natural habitat is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; the extent and distribution of qualifying natural habitats and habitats of qualifying species; the structure and function (including typical species) of the qualifying natural habitats; the structure and function of the habitats of qualifying species; the supporting processes on which qualifying natural habitats and habitats of qualifying species rely; the populations of qualifying species, and the distribution of qualifying species within the site.
Humber Estuary SPA	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring; the extent and distribution of the habitats of the qualifying features the structure and function of the qualifying features the supporting processes on which the habitats of the qualifying features rely the populations of each of the qualifying features, and the distribution of the qualifying features within the site
Humber Estuary Ramsar	Not specifically listed. Assumed as for Humber Estuary SAC and SPA.

3 Potential Impacts on Natura 2000 Sites

Identification of Potential Impacts

3.1.1 The potential source-receptor pathways by which the Proposed Development could impact the qualifying features of each Natura 2000 site, and which were scoped into the ecological impact assessment are as follows:

- surface water quality – potential pathways for the surface water pollution to the adjacent drainage network, and ultimately to the Humber Estuary SAC/ SPA/ Ramsar into which the surface water drainage flows during the construction phase of the Proposed Development e.g. sedimentation, vehicle fuel spill; and
- air quality - potential pathways identified through emissions to air during the operational phase of Proposed Development resulting in nitrogen and acid deposition to susceptible habitats within the Humber Estuary SAC/ SPA/ Ramsar.

3.1.2 No pathways by which noise and visual disturbance could give rise to likely significant effects on the important bird assemblage feeding on the intertidal mudflats of the Humber Estuary SPA/ Ramsar have been identified. The Proposed Development is in excess of 1 km from the nearest intertidal mudflat areas used by feeding birds, and at this distance it is reasonable to conclude that there would be no disturbance to birds as a result of noise and visual impacts during construction and operation. These pathways are therefore scoped out.

3.1.3 No pathways by which underwater noise could give rise to likely significant effects on marine mammals and fish that are part of the Humber Estuary SPA/ SAC/ Ramsar/ SSSI have been identified, given that any works associated with the Proposed Development will be 1.4 km from the nearest part of the designated site. Over this distance it is reasonable to conclude that there would be no propagation of underwater noise such that the qualifying features could be affected. This pathway is therefore scoped out.

3.1.4 Given the distance between the Natura 2000 sites and the Proposed Development there is no pathway that could result in direct habitat loss or direct physical damage to any of the designated habitats. Similarly, there are no groundwater pathways over this distance through which the Proposed Development could give rise to any effects on the groundwater dependent terrestrial ecosystems (GWTEs) of the Natura 2000 sites. These pathways are therefore scoped out.

3.1.5 Fields to the east of the Proposed Development between Rosper Road and the Estuary have been allocated for development as part of the consented Able Marine Energy Park (AMEP) Development Consent Order (DCO) for which enabling works have commenced. Mitigation for the loss of these fields has been agreed and is proposed to be delivered in fields further to the south (AMEP 'Mitigation Area A') between Rosper Road and the Estuary. There is a further planning application for the construction of a Car Storage area on Mitigation Area A, which will result in the shifting of the mitigation habitat delivery north to East Halton Marshes. This application is currently under consideration by North Lincolnshire Council. The mitigation forms part of the South Humber Gateway (SHG) strategic mitigation as part of the Local Development Framework (LDF) allocation.

3.1.6 No pathways by which noise disturbance could give rise to likely significant effects on the important bird assemblage of the Humber Estuary SPA/ Ramsar feeding, roosting and loafing in fields surrounding the Estuary (that are outside the boundary of the designated site but which are considered to be 'functionally linked' to the SPA/ Ramsar) at high tide have been identified. The fields to the east of the Proposed Development, between Rosper

Road and the Estuary have been allocated for other developments including Able's Marine Energy Park (MEP) and a car storage area. Consequently, mitigation for the loss of high tide feeding, roosting and loafing habitat for SPA/ Ramsar birds is being delivered as part of those development (and through the LDF process). Any temporary displacement of birds from these habitats as a result of noise from the Proposed Development would therefore not be considered significant, because the complete loss of the fields as functional habitat for waterbirds is assumed by the consenting of them for development (with the agreement of appropriate mitigation).

Summary of HRA Signposting

3.1.7 Table 10B.3 below presents the signposting to the relevant ES Volume 1 chapters in which detailed assessment of the relevant potential source-receptor pathways identified above can be found. The main source-receptor pathway identified was in respect of operational emissions to air from the new stack. Chapter 7: Air Quality has assessed a range of scenarios for acid and nitrogen deposition based on the 'Rochdale Envelope' approach, which takes into account the various options being considered for the type and final layout of the Proposed Power Plant.

3.1.8 For all potential source-receptor pathways identified, the ecological impact assessment reported in ES Volume 1 concluded that the Proposed Development will not result in any significant effects on designated sites. When considered in HRA terms, the technical assessments undertaken are considered to present sufficient evidence for a conclusion of no likely significant effect on any Natura 2000 site.

Table 10B.3: HRA Signposting for Relevant Natura 2000 Sites

Qualifying Feature	Potential Impact	Potential Pathway for Effects	Summary of Evidence Presented in ES	ES Volume 1 Reference	Likely Significant Effect Predicted?
Humber Estuary SAC					
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Embryonic shifting dunes Shifting dunes along the shoreline with European marram grass (*Ammophila arenaria*) (white dunes)	Changes in air quality during operational phase	NOx deposition from Proposed Power Plant stack resulting in changes to critical levels and potential effects on vegetation assemblage.	Annual mean NOx change is very low; c. 1% of critical level and is not significant. This does not exceed the 1% screening threshold beyond which the effects should be considered in more detail.	Chapter 7:Air Quality Paragraphs 7.6.11 - 7.6.18 Chapter 10: Ecology Paragraphs 10.6.26 – 10.6.34	No
Fixed coastal dunes with herbaceous vegetation (grey dunes) Dunes with common sea buckthorn (*Hippophae rhamnoides*)		Nutrient nitrogen deposition from Proposed Power Plant stack resulting in changes to critical loads and potential effects on vegetation assemblage.	Change is assumed as imperceptible; <1% of critical load and is not significant. This does not exceed the 1% screening threshold beyond which the effects should be considered in more detail.	Chapter 7:Air Quality Paragraphs 7.6.11 - 7.6.18 Chapter 10: Ecology Paragraphs 10.6.26 – 10.6.34	No
Estuaries Mudflats and sandflats not covered by seawater at low tide Sandbanks which are slightly covered by seawater all the time Coastal lagoons *Salicornia* and other annuals colonising mud and sand Atlantic salt meadows (*Glauco-*	Surface water pollution during construction phase	Pollution/ siltation of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution to the drain during construction phase will adequately minimise risk.	Chapter 10: Ecology Paragraphs 10.6.9 – 10.6.10 Chapter 13: Surface Water, Flood Risk and Drainage Paragraphs 13.5.4 – 13.5.21	No

Qualifying Feature	Potential Impact	Potential Pathway for Effects	Summary of Evidence Presented in ES	ES Volume 1 Reference	Likely Significant Effect Predicted?
Puccinellietalia maritimae)					
	Surface water pollution during operational phase	Pollution of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution to the drain during operational phase will adequately minimise risk.	Chapter 10: Ecology Paragraphs 10.6.35 – 10.6.36 Chapter 13: Surface Water, Flood Risk and Drainage Paragraphs 13.5.22 – 13.5.36	No
Humber Estuary SPA					
Populations of European importance of Annex I and Annex II over-wintering wildfowl and wading birds. Internationally important assemblage of migratory and wintering birds.	Surface water pollution during construction phase to habitats supporting internationally important bird populations	Pollution/ siltation of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution during construction phase will adequately minimise risk.	Chapter 10: Ecology Paragraphs 10.6.9 – 10.6.10 Chapter 13: Surface Water, Flood Risk and Drainage Paragraphs 13.5.4 – 13.5.21	No
	Surface water pollution during operational phase to habitats supporting internationally important bird populations	Pollution of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution during operational phase will adequately minimise risk.	Chapter 10: Ecology Paragraphs 10.6.35 – 10.6.36 Chapter 13: Surface Water, Flood Risk and Drainage Paragraphs 13.5.22 – 13.5.36	No

Qualifying Feature	Potential Impact	Potential Pathway for Effects	Summary of Evidence Presented in ES	ES Volume 1 Reference	Likely Significant Effect Predicted?
	Noise and visual impacts during construction to fields east of Rosper Road	Disturbance/ displacement of birds from fields that are outside the SPA but are 'functionally linked' by providing high tide roosting, feeding and loafing habitat. This may result in reduced feeding times, increased energy expenditure and reduced survival rates.	Construction noise and visual impacts would be within the context of industrial activities already surrounding the fields on the east side of Rosper Road, to which it is reasonable to assume that waterbirds in the Estuary would be habituated. The nature and scale of the Proposed Development is similar to the surrounding areas.	Chapter 8: Noise and Vibration Paragraphs 8.6.9 – 8.6.17 Chapter 10: Ecology Paragraphs 10.6.7 – 10.6.8	No
	Noise and visual impacts during operation to fields east of Rosper Road	Disturbance/ displacement of birds from fields that are outside the SPA but are 'functionally linked' by providing high tide roosting, feeding and loafing habitat. This may result in reduced feeding times, increased energy expenditure and reduced survival rates.	Operational noise and visual disturbance would be within the context of industrial activities already surrounding the fields on the east side of Rosper Road, to which it is reasonable to assume that waterbirds in the Estuary would be habituated. The nature and scale of the Proposed Development is similar to the surrounding areas.	Chapter 8: Noise and Vibration Paragraphs 8.6.18 – 8.2.28 Chapter 10: Ecology Paragraph 10.6.37	No
Humber Estuary Ramsar					
Estuarine habitats including dune systems, intertidal mud and sand flats, saltmarshes and brackish lagoons.	Surface water pollution during construction phase to habitats	Pollution/ siltation of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution during construction phase will adequately minimise risk.	Chapter 10: Ecology Paragraphs 10.6.9 – 10.6.10 Chapter 13: Surface Water, Flood Risk and Drainage Paragraphs 13.5.4 – 13.5.21	No
	Surface water pollution during operational phase to habitats	Pollution of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution during operational phase will adequately minimise risk.	Chapter 10: Ecology Paragraphs 10.6.35 – 10.6.36 Chapter 13: Surface Water, Flood Risk and	No

Qualifying Feature	Potential Impact	Potential Pathway for Effects	Summary of Evidence Presented in ES	ES Volume 1 Reference	Likely Significant Effect Predicted?
				Drainage Paragraphs 13.5.22 – 13.5.36	
Grey seal	Surface water pollution during construction phase to habitats supporting breeding grey seal	Pollution/ siltation of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution during construction phase will adequately minimise risk. Nearest breeding grey seal colony is at Donna Nook, approximately 30 km south-east, and any pollution would have significantly diluted by the point at which it enters the estuary.	Chapter 10: Ecology Paragraphs 10.6.9 – 10.6.10 Chapter 13: Surface Water, Flood Risk and Drainage Paragraphs 13.5.4 – 13.5.21	No
	Surface water pollution during operational phase to habitats supporting breeding grey seal	Pollution of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution during operational phase will adequately minimise risk. Nearest breeding grey seal colony is at Donna Nook, approximately 30 km south-east, and any pollution would have significantly diluted by the point at which it enters the estuary.	Chapter 10: Ecology Paragraphs 10.6.35 – 10.6.36 Chapter 13: Surface Water, Flood Risk and Drainage Paragraphs 13.5.22 – 13.5.36	No
Internationally important populations of passage wildfowl and waders.	Surface water pollution during construction phase to habitats supporting internationally important bird populations	Pollution/ siltation of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution during construction phase will adequately minimise risk.	Chapter 10: Ecology Paragraphs 10.6.9 – 10.6.10 Chapter 13: Surface Water, Flood Risk and Drainage Paragraphs 13.5.4 – 13.5.21	No
	Surface water pollution during operational phase to habitats supporting internationally important bird populations	Pollution of Humber Estuary via adjacent surface water drain, into which surface water run-off from the Proposed Development will outfall.	Standard environmental measures to control pollution during operational phase will adequately minimise risk.	Chapter 10: Ecology Paragraphs 10.6.35 – 10.6.36 Chapter 13: Surface Water, Flood Risk and	No

Qualifying Feature	Potential Impact	Potential Pathway for Effects	Summary of Evidence Presented in ES	ES Volume 1 Reference	Likely Significant Effect Predicted?
				Drainage Paragraphs 13.5.22 – 13.5.36	
	Noise and visual impacts during construction to fields east of Rosper Road	Disturbance/ displacement of birds from fields that are outside the Ramsar but are 'functionally linked' by providing high tide roosting, feeding and loafing habitat. This may result in reduced feeding times, increased energy expenditure and reduced survival rates.	Construction noise and visual impacts would be within the context of industrial activities already surrounding the fields on the east side of Rosper Road, to which it is reasonable to assume that waterbirds in the Estuary would be habituated. The nature and scale of the Proposed Development is similar to the surrounding areas.	Chapter 8: Noise and Vibration Paragraphs 8.6.9 – 8.6.17 Chapter 10: Ecology Paragraphs 10.6.7 – 10.6.8	No
	Noise and visual impacts during operation to fields east of Rosper Road	Disturbance/ displacement of birds from fields that are outside the Ramsar but are 'functionally linked' by providing high tide roosting, feeding and loafing habitat. This may result in reduced feeding times, increased energy expenditure and reduced survival rates.	Operational noise and visual disturbance would be within the context of industrial activities already surrounding the fields on the east side of Rosper Road, to which it is reasonable to assume that waterbirds in the Estuary would be habituated. The nature and scale of the Proposed Development is similar to the surrounding areas.	Chapter 8: Noise and Vibration Paragraphs 8.6.18 – 8.2.28 Chapter 10: Ecology Paragraph 10.6.37	No

4 Mitigation

4.1.1 Measures will be implemented throughout the construction phase of the Proposed Development to ensure legislative compliance with regards to surface water run-off, and these measures will be detailed in the Construction Environmental Management Plan (CEMP). This includes a plan to deal with accidental pollution to be agreed with the Environment Agency. However, such measures are not considered to represent mitigation, as they are provided as a matter of course as 'best practice' for construction regardless of potential effects. Further details are provided in Chapter 11: Surface Water, Flood Risk and Drainage. This embedded mitigation will ensure that there is no adverse effect on the adjacent drainage ditch, and thus a negligible risk of pollution affecting downstream habitats within the Humber Estuary SAC/ SPA/ Ramsar.

5 In-Combination Effects with Other Plans or Projects

Introduction

5.1.1 Relevant projects considered as part of the cumulative effects assessment undertaken for the ecological impact assessment, along with potential cumulative effect topics of relevance to the HRA in-combination assessment are summarised in Table 10B.4 below, along with the relevant signposting to ES Volume 1 chapters.

5.1.2 The majority of the plans or projects identified in Chapter 14: Cumulative and Combined Effects of the ES Volume 1 have been screened out of potential cumulative likely significant ecological effects on the basis that there are no pathways by which the schemes could adversely affect ecological receptors within the zone of influence of the Proposed Development, either alone or in-combination. Only those schemes that could potentially affect the European site through changes in air quality (e.g. power plant and energy from waste schemes) or disturbance/ displacement to waterbirds feeding, roosting and loafing in fields outside the boundary of the European site that could be considered functionally linked to the SPA/ Ramsar.

Potential Cumulative Effects Pathways Scoped Out

5.1.3 No pathways by which the Proposed Development could give rise to noise or visual disturbance to waterbirds within the boundary of the European site, i.e. feeding at the nearest part of the designated area at North Killingholme mudflats, were identified. There is therefore no potential for cumulative noise or visual disturbance impacts with other plans or projects in the North Killingholme area. This topic is therefore not considered in the cumulative effects assessment.

5.1.4 Cumulative surface water quality pathways are also not considered, on the basis that Environmental Permitting regulations for the operation of the Proposed Development require appropriate controls for surface water drainage such that the likelihood of a pollution event is minimal. Construction drainage will be managed through the adoption of industry best practice (as set out in a CEMP for the Proposed Development), and therefore it is also concluded that there is no potential for cumulative surface water quality impacts with any other plans or projects.

Potential Cumulative Air Quality Effects

5.1.5 The cumulative impact assessment for air quality (also presented in Chapter 14: Cumulative and Combined Effects) has confirmed that there will be no cumulative effects on any of the Natura 2000 sites as a result of NOx emissions, and acid and nitrogen deposition resulting from emissions to air. It can therefore be concluded that the Proposed Development will not result in likely significant effects on any Natura 2000 site, in-combination with other plans or projects. However, the projects

scoped into the cumulative air quality assessment have been considered in the HRA screening process for completeness, with relevant signposting to the technical information contained within Chapter 7: Air Quality.

5.1.6 It should be noted that the in terms of the N-depositional impacts on the Humber Estuary receptor, the habitat type closest to the Proposed Development is saltmarsh, which is located approximately 1.5 km from the Proposed Development. It is considered that the APIS critical load of a minimum figure of 20.0 kgN/ha/yr is not based on very relevant research and is potentially excessively precautionary. The existing nitrogen deposition rate at the closest area of saltmarsh according to APIS is be 15.0 kgN/ha/yr, and the process contribution from the Proposed Development represents 0.2% of the lower end of the critical load at the worst case location. Given that the size of the other developments in the Site's vicinity are of a similar scale, and therefore are likely to have a similar level of impact at their worst case points, it is considered highly unlikely that the 'in combination' increase in nitrogen deposition would push the baseline above the minimum critical load. Also considering the locations of the other developments, and the prevailing wind direction, the worst case impacts for all the developments will occur at different locations and therefore the in combination impacts of the other developments would be lower at the point of worst case impact for the Proposed Development. Moreover, twice daily tidal inundation will bring much more nitrogen than would ever deposit from atmosphere, therefore the process of tidal inundation will have a much greater role influencing vegetation composition.

5.1.7 The most sensitive habitat designation for the Humber Estuary is sand dunes, however, there is no sand dune within 10 km of the Proposed Development and therefore this habitat is considered to be outside the zone of influence of the Proposed Development.

Potential Cumulative Disturbance/ Displacement Impacts

5.1.8 Potential cumulative disturbance to the fields to the east of the Proposed Development (between Rosper Road and the Estuary) has been scoped into the cumulative effects assessment. This is on the basis that there are several other projects either proposed, consented or under construction around this part of the Estuary. Cumulative disturbance/ displacement therefore has the potential to result in adverse effects on waterbirds in high tide feeding, roosting and loafing habitat in fields bordering the Estuary.

5.1.9 The AMEP development will result in the loss of large areas of farmland at North Killingholme adjacent to the North Killingholme mudflats, which support important assemblages of black-tailed godwits and other wintering/ passage bird species. This project has not yet been constructed; however a substantial package of mitigation was agreed with North Lincolnshire Council and Natural England to create alternative high tide feeding, roosting and loafing bird waterbird habitat at Killingholme Marshes (referred to as Mitigation Area A). There is currently a separate planning application under consideration by North Lincolnshire Council to shift Mitigation Area A further north to East Halton Skitter (referred to as the 'Halton Marshes Wet Grassland Scheme (HMWGS)'), to accommodate the development of that area into car storage (Marsh Lane Car Storage Area). The delivery of mitigation at North Killingholme (or Halton) is part of the South Humber Gateway (SHG) mitigation strategy, that has developed requirements for a package of 80 ha of wet grassland mitigation for waterbirds (four 20 ha blocks with 150m 'buffers') to facilitate development in the South Humber Gateway region that is HRA compliant.

5.1.10 It is therefore concluded that there will be no likely significant cumulative disturbance/ displacement effects with the Proposed Development.

Table 10B.4: Summary of Projects Considered in Cumulative Effects Assessment in ES

Project or Plan	Type of Project/ Plan	Potential Cumulative Effects on Natura 2000 Sites	ES Volume 1 Reference(s)	Likely Significant Effects In-combination with Proposed Development?
Killingholme Power Station (consented) PA/2016/1240	14 gas reciprocating engine generators with electrical output of 23Mwe	**Potential Cumulative Air Quality Impacts** The power station gas engines would be approximately 1.5 km north of the Proposed Development, and would be of a similar nature and scale to the Proposed Development. There is therefore the potential for cumulative air quality impacts resulting from acid and nitrogen deposition to the European site. The Air Quality impact assessment for Killingholme Power Station concluded that for all designated sites, the mean annual PC from NOx deposition was well below the screening threshold of 1% of the critical level. Similarly, for nitrogen deposition the mean annual PC was well below the screening threshold of 1% of the critical load. The prevailing south-westerly wind direction means that peak emissions from both developments operating together would not impact upon the same parts of the European site. There is therefore no reasonable pathway by which cumulative impacts could occur.	Chapter 7: Air Quality Paragraphs 7.9.8 – 7.9.12	No
North Killingholme Power Project (consented)	Combined Cycle Gas Turbine (CCGT) power plant with 470MWe output	**Potential Cumulative Air Quality Impacts** The CCGT would be approximately 2 km north of the Proposed Development. There is therefore the potential for cumulative air quality impacts resulting from acid and nitrogen deposition to the European site. As above, the prevailing wind and much higher stack than the Proposed Development means that any changes in NOx emissions, acid and nitrogen deposition would be imperceptible. There is therefore no reasonable pathway by which cumulative impacts could occur.	Chapter 7: Air Quality Paragraphs 7.9.8 – 7.9.12	No
Reserve Power Plant at Land South Side of Queens May 2018	12 gas reciprocating engine generators	**Potential Cumulative Air Quality Impacts** This development is approximately 5 km from the Proposed	Chapter 7: Air Quality Paragraphs 7.9.8 – 7.9.12	No

Project or Plan	Type of Project/ Plan	Potential Cumulative Effects on Natura 2000 Sites	ES Volume 1 Reference(s)	Likely Significant Effects In-combination with Proposed Development?
Road, Immingham (decision pending) DM/0100/18/FUL		Development, and the air quality impact assessment has concluded that cumulative effects would be minimal based on distance. It is therefore reasonable to conclude that there is no potential for likely significant cumulative effects on the Humber Estuary SPA/ SAC/ Ramsar as a result of changes in air quality.		
Energy Recovery Facility at Land South of Queens Road, Immingham (decision pending) DM/0026/18/FUL	Energy recovery facility	**Potential Cumulative Air Quality Impacts** This development is approximately 5 km from the Proposed Development, and the air quality impact assessment has concluded that cumulative effects would be minimal based on distance. It is therefore reasonable to conclude that there is no potential for likely significant cumulative effects on the Humber Estuary SPA/ SAC/ Ramsar as a result of changes in air quality.	Chapter 7: Air Quality Paragraphs 7.9.8 – 7.9.12	No
Able Marine Energy Park (AMEP) Development Consent Order (consented)	New deepwater quay and terrestrial facilities	**Potential Cumulative Disturbance/ Displacement Impacts** The AMEP development will result in the loss of large areas of farmland at North Killingholme adjacent to the North Killingholme mudflats, which support important assemblages of black-tailed godwits and other wintering/ passage bird species. The delivery of mitigation at North Killingholme (or Halton) is part of the South Humber Gateway (SHG) mitigation strategy, that has developed requirements for a package of 80 ha of wet grassland mitigation for waterbirds (four 20 ha blocks with 150m 'buffers') to facilitate development in the South Humber Gateway region that is HRA compliant. An HRA for the development concluded that there would be no adverse effects on the integrity of the European site. There is therefore no potential for cumulative effects with the Proposed Development as a result of disturbance/ displacement of waterbirds from functionally linked habitat in fields to the east of Rosper Road.	Chapter 10: Ecology Paragraphs 10.4.27 – 10.4.31	No

Project or Plan	Type of Project/ Plan	Potential Cumulative Effects on Natura 2000 Sites	ES Volume 1 Reference(s)	Likely Significant Effects In-combination with Proposed Development?
Marsh Lane Car Storage Area for Able UK (pending decision) PA/2017/141	Car storage and distribution facility, port related storage	**Potential Cumulative Disturbance/ Displacement Impacts** This development would result in the loss of fields currently proposed for the delivery of AMEP's Mitigation Area A i.e. which are mitigating for the loss of high tide feeding, roosting and loafing habitat within the AMEP footprint at North Killingholme. As part of the development, AMEP Mitigation Area A would be moved north to Halton Marshes (HMWGS). With the relocation and delivery of wet grassland habitat mitigation, the EcIA concluded that there would be no significant residual effects on the European site. It is therefore reasonable to conclude that there is no potential for cumulative effects with the Proposed Development.	Chapter 10: Ecology Paragraphs 10.4.27 – 10.4.31	No
Land off Marsh Lane – Change of Use for Temporary Car Storage (pending decision) PA/2018/114	Application for change of use from that previously consented under AMEP DCO (and enabling works, which have been implemented) to temporary car storage, construction & operation of electricity substation and new junction off Rosper Road.	**Potential Cumulative Disturbance/ Displacement Impacts** This development would result in the loss of fields between Rosper Road and the Estuary. However, all of the land is within the boundary of the consented DCO, and the application relates only to a change of use. Given that the loss of these fields to high tide feeding, roosting and loafing waterbirds has already been assessed (as part of the consented AMEP DCO), and mitigation agreed with Natural England and North Lincolnshire Council, there is no potential for cumulative effects with the Proposed Development.	Chapter 10: Ecology Paragraphs 10.4.27 – 10.4.31	No
Land east of Rosper Road – Change of Use for Temporary Car Storage PA/2017/27 (consented)	Application for change of use from that previously consented under AMEP DCO (and enabling works, which have been implemented) to temporary car storage.	**Potential Cumulative Disturbance/ Displacement Impacts** This development would result in the loss of fields between Rosper Road and the Estuary. However, all of the land is within the boundary of the consented DCO, and the application relates only to a change of use. Given that the loss of these fields to high tide feeding, roosting and loafing waterbirds has already been assessed (as part of the consented AMEP DCO), and mitigation agreed with Natural England and North Lincolnshire Council, there is no potential for cumulative effects with the Proposed Development.	Chapter 10: Ecology Paragraphs 10.4.27 – 10.4.31	No

Project or Plan	Type of Project/ Plan	Potential Cumulative Effects on Natura 2000 Sites	ES Volume 1 Reference(s)	Likely Significant Effects In-combination with Proposed Development?
Fields north of Chase Hill Road, fields west of East Field Road and land east and west of Top Road, South Killingholme (consented) PA/2018/155	Surface water storage lagoons (associated with the dewatering of cable trenches for the Hornsea Project One Offshore Windfarm Project)	**Potential Cumulative Disturbance/ Displacement Impacts** This development will extend the DCO area for the Hornsea One Offshore Windfarm Project (currently under construction) to include small temporary water storage lagoons for dewatering purposes. All works will be located on the west side of LOR and therefore there is no potential for cumulative noise and visual impacts with the Proposed Development.	N/A	No
Land north of Chase Hill road (consented) PA/2017/1745 PA/2017/1927	Two applications for an minor extension to the Hornsea Project One Offshore Windfarm DCO area	**Potential Cumulative Disturbance/ Displacement Impacts** Both extension areas are >1 km from the Proposed Development, and on the western side of the LOR. There is therefore no potential for cumulative noise and visual disturbance to waterbirds with the Proposed Development. The developments are also	N/A	No
Demolition of North Killingholme A Power Station (consented) PA/2017/189	Power station demolition	**Potential Cumulative Disturbance/ Displacement Impacts** HRA report concluded that there would be noise increases to the North Killingholme Haven Pits (NKHP) SSSI, which is an important high tide roost site for black-tailed godwits, and is within the SPA/ Ramsar boundary. However, given that no pathways for noise and visual disturbance to NKHP as a result of the Proposed Development have been identified, there is no potential for cumulative effects on qualifying bird species as a result of noise and visual impacts.	N/A	No

6 References

European Commission (2007) Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Published on the internet at:

http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/guidance_art6_4_en.pdf

European Commission (2001) Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.

Office of the Deputy Prime Minister (ODPM) (2005) Government circular: Biodiversity and geological conservation – statutory obligations and their impact within the planning system

Appendix 10C – Great Crested Newts Survey Report

VPI-Immingham Energy Park 'A'

Appendix 10C: Great Crested Newt Survey

VPI Immingham

Project Number: 60547702

May 2018

Quality information

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Table of Contents

1 Introduction

Purpose of Report

This report describes the approach and findings of great crested newt (GCN) (*Triturus cristatus*) surveys undertaken in support of the Ecological Impact Assessment (EcIA) of the Proposed Development Area (referred to as 'the Site' herein). The terms of reference used in this report are consistent with those defined within the Preliminary Ecological Appraisal (PEA), which forms Appendix 10A to the Chapter 10: Ecology in Volume 1 of the Environmental Statement (ES).

AECOM was commissioned to undertake surveys of relevant ponds for great crested newt (GCN) in April 2018. This precluded the undertaking of great crested newt presence/absence field surveys using traditional techniques (as defined in English Nature, 2001), as a proportion of these need to be completed in the peak newt breeding period between mid-April and mid-May. Instead a survey was undertaken using the environmental DNA (eDNA) approach (Ref: 10C-1). This is an approved valid method for great crested newt presence/absence survey.

Surveys using the eDNA method have a benefit over traditional surveys in that they can be validly completed within a single visit to each relevant waterbody between mid-April and the end of June. Therefore, they can be programmed and completed later in the newt survey season when surveys using traditional methods are not possible. However, it has the limitation that it cannot be extended to make an estimate of the population size class of any great crested newt populations identified as present using the eDNA method. In addition, the method cannot currently be used to record the presence or absence of other species of amphibian present in the surveyed waterbodies.

Scope of Works

The Study Area for great crested newts incorporated all land within the and within 250 m of the Site boundary; this is the typical terrestrial range of great crested newts from their breeding ponds (Ref: 10C-2), and is widely accepted as an appropriate search area for the species representing the potential zone of influence of a particular development. Natural England (Ref: 10C-3) guidance states that requirements for great crested newt survey should be proportionate and risk based, and that surveys of ponds of greater than 250 m distance (up to a maximum survey radius of 500 m) are only likely to required where a specific combination of circumstances are met. Following review of this guidance, it was concluded that the Proposed Development was of a type whereby surveys of more distant ponds were not necessary or proportionate.

The scope of works for the great crested newt survey was as follows:

- Identify all ponds within the Site and within 250 m of the Site boundary (collectively referred to as the 'Study Area') through a combination of review of aerial photographs and 1:25,000 Ordnance Survey maps, and field survey;
- Complete Habitat Suitability Index (HSI) assessment of all potentially suitable ponds within the Study Area to indicate their likely suitability for great crested newts; and
- Undertake eDNA survey of all ponds with potential to support great crested newts in the Study Area to determine likely presence or absence.

The methods and results of the great crested newt survey are reported in this Appendix, along with an evaluation of the results to inform the EcIA. Because of the limitations associated with the eDNA method it was not possible to collect data on other species of amphibian during the survey, so the remit of this report is restricted to great crested newt and other species of amphibian are not considered further.

Relevant Legislation

The great crested newt is listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2017. This legislation, when taken together, results in a level of protection that prohibits the intentional, deliberate or reckless:

- Killing, injuring, taking or disturbance of great crested newts;
- Damaging, destroying or obstructing any place used by great crested newts for the purposes of breeding, sheltering or protection; and
- Selling and/or advertising for sale a great crested newt or any part thereof.

The great crested newt is listed as a species of principal importance for nature conservation in England in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Section 40 of the same Act requires that local and regional authorities have regard to the conservation of biodiversity in England, when carrying out their normal functions.

2 Survey Methods

Habitat Suitability Index (HSI) Assessment

Six waterbodies were identified as present within the Study Area (Ponds 1 – 6). One of these waterbodies (Pond 3) was scoped out from any further survey as information from the client and desk study data showed the pond is a concrete-lined process lagoon with potential contaminants that are part of the Lindsey Oil Refinery (LOR) site.

The remaining five potentially suitable ponds for GCN (Ponds 1, 2, 4, 5 and 6) were assessed for their potential to support great crested newt using the Habitat Suitability Index (HSI) in accordance with standard methodology (Ref: 10C-4). The assessments were undertaken during April 2018.

The HSI assessment considers the following ten habitat attributes that are considered to influence the suitability of a pond for breeding great crested newts:

- Location – within a UK-wide context reflecting the differences in national distribution of this species;
- Area – waterbodies between 100 and 300 m^2 in size are considered to represent the most suitable habitat for great crested newt;
- Drying – the number of years in which a pond dries over a ten year period. Occasional drying kills fish which is beneficial for great crested newt, but the species predominantly favours ponds that do not dry out every year.
- Water quality – qualitative evidence-based assessment to infer good (diverse aquatic invertebrate assemblage), moderate (moderate invertebrate diversity), poor (low invertebrate diversity, few submerged plants) or bad (clearly polluted) water quality.
- Shade – percentage of pond perimeter shaded to at least 1 m from the shore. Great crested newt favours lightly shaded waterbodies;
- Waterfowl – qualitative evidence-based assessment of presence or absence and numbers is made. Large numbers of waterfowl can result in nutrient enrichment of the water and habitat damage, which is less favourable for great crested newt;
- Fish – qualitative evidence-based assessment of likely presence or absence is made. Great crested newt favour breeding ponds that do not support fish because their open-water swimming larvae are vulnerable to fish predation;
- Number of waterbodies within 1 km – Great crested newt populations are typically best developed where they have access to a network of ponds, and therefore the species is more likely to be found where there are several ponds within 1 km that are linked by suitable terrestrial habitat; and
- Macrophyte cover – percentage of pond surface area occupied by macrophyte cover. Female great crested newts require aquatic vegetation for egg-laying.

Environmental DNA (eDNA) Survey

Water samples were collected by an AECOM ecologist holding a Natural England GCN survey licence from the five suitable ponds within the Study Area on 16th April 2018 and sent to ADAS for analysis for eDNA in accordance with approved field and laboratory protocols (Ref: 10F-1). Waterbodies were not entered by surveyors during sample collection, and new sterile equipment supplied by ADAS was used to collect each water sample, to prevent contamination between samples.

The presence or absence of great crested newt from each of the surveyed waterbodies was determined based on the results of the eDNA analysis. If eDNA is detected this provides confirmation of presence and

the relevant waterbodies are likely to represent a development constraint that requires further consideration. If eDNA is not detected then this provides high confidence that there is no reasonable likelihood of great crested newt being present in the relevant waterbodies, and they require no further assessment with regard to this species.

Limitations

The eDNA sampling technique does not enable an estimate of population size class; rather it provides confirmation of presence or likely absence of great crested newts in the waterbody concerned. In some circumstances, further survey is needed to allow estimation of the population size class, particularly where a European Protected Species Mitigation (EPSM) licence may subsequently need to be obtained.

Based on Natural England's standing advice on great crested newts, the window for collecting eDNA samples is 15th April to 30th June. The samples for the five ponds were collected on 16th April 2018, within the approved window.

Due to access restrictions into the operational area of Lindsey Oil Refinery (LOR) the process lagoon (Pond 3) was not visited for the purposes of HSI or eDNA survey. However, given that the lagoon is part of the operational process for the LOR it is considered unsuitable habitat for great crested newts.

3 Survey Results

Habitat Suitability Index (HSI) Assessment

Pond 1

Location: TA 16780 17471

Distance from Site: 70 m

This was a medium-size pond approximately 30 x 40m with stands of abundant emergent bulrush *(Typha latifolia*) marking its extent. The south-eastern pond margin is bordered by an earthen cliff on two levels, the first being 2 m high and climbing steeply to 5 m high at its tallest point. The pond margins were not clearly defined at the time of eDNA sampling, but a newly-dug access track borders the pond to the south-west and marshy grassland/tall ruderal vegetation immediately surrounds the pond, with neutral semi-improved grassland further afield. Approximately 40% of the pond was accessible for eDNA sampling along the south-west margin as the steep cliff to the south-east and marshy ground from the north-west to the east prevented safe access.

Photograph 1: Pond 1 (September 2017)

Photograph 2: Pond 1 (March 2018)

Suitability Index	Habitat Attribute	Field Score	SI Score
SI1	Location	A	1
SI2	Pond Area	350 m²	0.7
SI3	Pond Drying	Sometimes	0.5
SI4	Water Quality	Moderate	0.67
SI5	Shade	0%	1
SI6	Fowl	Absent	1
SI7	Fish	Absent	1
SI8	Ponds per km^2	3.82	0.98
SI9	Terrestrial Habitat	Moderate	0.67
SI10	Macrophyte cover	60%	0.9
HSI SCORE			**0.82 = Excellent Suitability**

Pond 2

Location: TA 16774 17499

Distance from Site: 40 m

This pond is an irregular shaped, medium-sized natural pond approximately 15 x 10 m, typified by marginal and emergent bulrush and rushes (*Juncus* spp.). The water level was relatively low at the time of eDNA sampling. Beyond the extent of the pond the habitat was surrounding by semi-improved neutral grassland and tall ruderal vegetation, with patches of scrub and saplings to the east of the pond.

Photograph 3: Pond 2 (March 2018)

Suitability Index	Habitat Attribute	Field Score	SI Score
SI1	Location	A	1
SI2	Pond Area	150 m²	0.3
SI3	Pond Drying	Sometimes	0.5
SI4	Water Quality	Moderate	0.67
SI5	Shade	0%	1
SI6	Fowl	Absent	1
SI7	Fish	Absent	1
SI8	Ponds per km^2	3.82	0.98
SI9	Terrestrial Habitat	Moderate	0.67
SI10	Macrophyte cover	50%	0.8
HSI SCORE			**0.75 = Good Suitability**

Pond 4

Location: TA 16669 17451

Distance from Site: 10 m

This was a medium-sized irregularly shaped pond with plentiful aquatic refugia from emergent aquatic vegetation and macrophytes. The pond had earth banks to the south and west, marshy grassland with scattered rushes to the east and north, and neutral semi-improved grassland further to the south and east. The northern bank of the pond was not accessible for taking eDNA samples as it was densely covered in bramble (*Rubus fruticosus* agg.) scrub. The pond margins contained plentiful egg-laying plants for newts, including water forget-me-not *(Myosotis scorpiodes).* A female smooth newt was seen in this pond during eDNA sampling.

Photograph 4: Pond 4 (March 2018)

Suitability Index	Habitat Attribute	Field Score	SI Score
SI1	Location	A	1
SI2	Pond Area	350 m²	0.7
SI3	Pond Drying	Annually	0.1
SI4	Water Quality	Moderate	0.67
SI5	Shade	0%	1
SI6	Fowl	Absent	1
SI7	Fish	Absent	1
SI8	Ponds per km^2	3.5	0.97
SI9	Terrestrial Habitat	Moderate	0.67
SI10	Macrophyte cover	10%	0.4
HSI SCORE			**0.64 = Average Suitability**

Pond 5

Location: TA16649 17405

Distance from Site: 40 m

This pond has developed in a former archaeological trial trench (50 m x 2 m), which is likely to dry annually. The northern section of the pond was marshy and had too low a water level to sample for eDNA. The bank was largely accessible but had dense hawthorn scrub on the eastern bank in places. The primary habitat surrounding the pond was neutral semi-improved grassland with areas of tall ruderal e.g. teasel (*Dipsacus fullonum)*. Areas of standing water in the trench supported some emergent vegetation and overall low macrophyte cover.

Photograph 5: Pond 5 (March 2018)

Suitability Index	Habitat Attribute	Field Score	SI Score
SI1	Location	A	1
SI2	Pond Area	40 m²	0.08
SI3	Pond Drying	Annually	0.1
SI4	Water Quality	Moderate	0.67
SI5	Shade	0%	1
SI6	Fowl	Absent	1
SI7	Fish	Absent	1
SI8	Ponds per km^2	3.5	0.97
SI9	Terrestrial Habitat	Moderate	0.67
SI10	Macrophyte cover	5%	0.35
HSI SCORE			**0.51 = Below Average Suitability**

Pond 6

Location: TA 16572 17340

Distance from Site: 0 m (within the Proposed Development Area)

This is a rectangular former archaeological trench approximately 50m x 2m in area that holds standing water along most of its length. Small stands of emergent vegetation were present within the pond. The northern bank was largely inaccessible during eDNA due to dense hawthorn scrub *(Crataegus monogyna)*, while patches of this species were also present on the southern bank as well as bramble *(Rubus fruticosus agg.)* to a lesser degree. The primary habitat surrounding the pond was neutral semi-improved grassland with stands of scrub and tall ruderal vegetation also present.

No photograph is available for this pond as this location is within Lindsey Oil Refinery where restrictions relating to photography apply.

Suitability Index	Habitat Attribute	Field Score	SI Score
SI1	Location	A	1
SI2	Pond Area	25 m²	0.05
SI3	Pond Drying	Annually	0.1
SI4	Water Quality	Moderate	0.67
SI5	Shade	0%	1
SI6	Fowl	Absent	1
SI7	Fish	Absent	1
SI8	Ponds per km^2	3.5	0.97
SI9	Terrestrial Habitat	Moderate	0.67
SI10	Macrophyte cover	0%	0.3
HSI SCORE			**0.47 = Poor Suitability**

A summary of the pond descriptions and HSI assessments is provided in Table 3.1 below.

Table 3.1. Summary of Pond HSI Assessment

Pond Reference	Pond Type	Approx. Distance and from the Proposed Development Area	HSI Score	Scoped in to eDNA Survey	Rationale for Scoping Out of eDNA survey
1	Medium-sized irregularly shaped natural pond	70 m south	Excellent	✓	-
2	Medium-sized irregularly shaped natural pond	40 m south	Good	✓	-
3	Process lagoon within LOR	Refinery	Not assessed[1]	×	Process lagoon in LOR with likely contaminants.
4	Medium-sized irregularly shaped natural pond	10 m south	Average	✓	-
5	Flooded archaeological trial trench	40 m south	Below Average	✓	-
6	Flooded archaeological trial trench	Within Proposed Development Area	Poor	✓	-

Environmental (eDNA) Survey

All five suitable ponds within the Study Area were sampled for eDNA as justified in Table 3.1. Of the ponds sampled, none returned a positive result for great crested newt eDNA. The full eDNA results from the laboratory are provided in Annex A and are summarised in Table 3.2 below.

Table 3.2. Summary of Pond eDNA Survey

Pond Reference	Pond Type	Grid Reference	Approx Distance from the Site	eDNA Positive for GCN?	ADAS Reference
1	Medium-sized irregularly shaped natural pond	TA 16780 17471	70 m south	×	E 2018 -0145
2	Medium-sized irregularly shaped natural pond	TA 16774 17499	40 m south	×	D 2018 - 0143
4	Medium-sized irregularly shaped natural pond	TA 16669 17451	10 m south	×	C 2018 - 0147
5	Flooded archaeological trial trench	TA 16649 17405	40 m south	×	B 2018 - 0144
6	Flooded archaeological trial trench	TA 16572 17340	Within Proposed Development Area	×	A 2018 - 0146

[1] Due to restrictions regarding access into the operational areas of the LOR the lagoon was not accessible for survey.

4 References

Ref 10C-1 Briggs, J., Ewald, N., Valentini, A., Gaboriaund, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. & Dunn, F. (2014) *Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt* (Triturus cristatus) *environmental DNA*. Freshwater Habitats Trust, Oxford

Ref 10C-2 English Nature (2001) *Great Crested Newt Mitigation Guidelines*. English Nature, Peterborough

Ref 10C-3 Natural England (2016) *Great Crested Newt Method Statement for EPS Licence Application*. https://www.gov.uk/government/publications/great-crested-newts-apply-for-a-mitigation-licence

Ref 10C-4 Oldham, R.S., Keeble, J., Swan, M.J.S. & Jeffcote, M. (2000) *Evaluating the suitability of habitat for the Great Crested Newt* (Triturus cristatus). Herpetological Journal 10 (4): 143 – 155

Annex A: ADAS eDNA Results Sheet

Client: Jo Atkinson,
AECOM Infrastructure and Environment Ltd,
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LS11 9AR

ADAS
Spring Lodge
172 Chester Road
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Sample ID: 2018-0143	Condition on Receipt: Low Sediment	Volume: Passed
Client Identifier: D	Description: pond water samples in preservative	
Date of Receipt: 18/04/2018	Material Tested: eDNA from pond water samples	

Determinant	**Result**	**Method**	**Date of Analysis**
Inhibition Control[†]	2 of 2	Real Time PCR	19/04/2018
Degradation Control[§]	Within Limits	Real Time PCR	19/04/2018
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	19/04/2018
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10^{-4} ng/µL)[#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by:	Dr Helen Rees	Report Issued by:	Dr Ben Maddison
Signed:		Signed:	
Position:	Director: Biotechnology	Position:	MD: Biotechnology
Date of preparation:	19/04/2018	Date of issue:	19/04/2018

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#]Additional positive controls (10^{-1}, 10^{-2}, 10^{-3} ng/µL) are also routinely run, results not shown here.

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Sample ID: 2018-0144	Condition on Receipt: Low Sediment	Volume: Passed
Client Identifier: B	Description: pond water samples in preservative	
Date of Receipt: 18/04/2018	Material Tested: eDNA from pond water samples	

Determinant	**Result**	**Method**	**Date of Analysis**
Inhibition Control[†]	2 of 2	Real Time PCR	19/04/2018
Degradation Control[§]	Within Limits	Real Time PCR	19/04/2018
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	19/04/2018
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10^{-4} ng/µL)[#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by:	Dr Helen Rees	Report Issued by:	Dr Ben Maddison
Signed:		Signed:	
Position:	Director: Biotechnology	Position:	MD: Biotechnology
Date of preparation:	19/04/2018	Date of issue:	19/04/2018

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

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[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#]Additional positive controls (10^{-1}, 10^{-2}, 10^{-3} ng/µL) are also routinely run, results not shown here.

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Sample ID: 2018-0145	Condition on Receipt: Good	Volume: Passed
Client Identifier: E	Description: pond water samples in preservative	
Date of Receipt: 18/04/2018	Material Tested: eDNA from pond water samples	

Determinant	**Result**	**Method**	**Date of Analysis**
Inhibition Control[†]	2 of 2	Real Time PCR	19/04/2018
Degradation Control[§]	Within Limits	Real Time PCR	19/04/2018
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	19/04/2018
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10^{-4} ng/µL)[#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by:	Dr Helen Rees	Report Issued by:	Dr Ben Maddison
Signed:		Signed:	
Position:	Director: Biotechnology	Position:	MD: Biotechnology
Date of preparation:	19/04/2018	Date of issue:	19/04/2018

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#]Additional positive controls (10^{-1}, 10^{-2}, 10^{-3} ng/µL) are also routinely run, results not shown here.

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Sample ID: 2018-0146	Condition on Receipt: White Precipitate	Volume: Passed
Client Identifier: A	Description: pond water samples in preservative	
Date of Receipt: 18/04/2018	Material Tested: eDNA from pond water samples	

Determinant	**Result**	**Method**	**Date of Analysis**
Inhibition Control[†]	0 of 2	Real Time PCR	19/04/2018
Degradation Control[§]	Within Limits	Real Time PCR	19/04/2018
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	19/04/2018
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10^{-4} ng/µL)[#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by:	Dr Helen Rees	Report Issued by:	Dr Ben Maddison
Signed:		Signed:	
Position:	Director: Biotechnology	Position:	MD: Biotechnology
Date of preparation:	19/04/2018	Date of issue:	19/04/2018

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#]Additional positive controls (10^{-1}, 10^{-2}, 10^{-3} ng/µL) are also routinely run, results not shown here.

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Sample ID: 2018-0147	Condition on Receipt: Good	Volume: Passed
Client Identifier: C	Description: pond water samples in preservative	
Date of Receipt: 18/04/2018	Material Tested: eDNA from pond water samples	

Determinant	**Result**	**Method**	**Date of Analysis**
Inhibition Control[†]	1 of 2	Real Time PCR	19/04/2018
Degradation Control[§]	Within Limits	Real Time PCR	19/04/2018
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	19/04/2018
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10^{-4} ng/µL)[#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by:	Dr Helen Rees	Report Issued by:	Dr Ben Maddison
Signed:		Signed:	
Position:	Director: Biotechnology	Position:	MD: Biotechnology
Date of preparation:	19/04/2018	Date of issue:	19/04/2018

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#]Additional positive controls (10^{-1}, 10^{-2}, 10^{-3} ng/µL) are also routinely run, results not shown here.

Appendix 1: Interpretation of results

Sample Condition

Upon sample receipt we score your samples according to quality: good, low sediment, medium sediment, high sediment, white precipitate, and presence of algae.

There are three reasons as to why sediment should be avoided:

1. It is possible for DNA to persist within the sediment for longer than it would if it was floating in the water which could lead to a false positive result i.e. in this case GCN not recently present but present a long time ago
2. In some cases sediment can cause inhibition of the PCR analysis used to detect GCN eDNA within samples which could lead to an indeterminate result.
3. In some cases sediment can interfere with the DNA extraction procedure resulting in poor recovery of the eDNA which in turn can lead to an indeterminate result.

Algae can make the DNA extraction more difficult to perform so if it can be avoided then this is helpful.

Sometimes samples contain a white precipitate which we have found makes the recovery of eDNA very difficult. This precipitate can be present in such high amounts that it interferes with the eDNA extraction process meaning that we cannot recover the degradation control (nor most likely the eDNA itself) at sufficient levels for the control to be within the acceptable limits for the assay, therefore we have to classify these type of samples as indeterminate.

What do my results mean?

A positive result means that great crested newts are present in the water or have been present in the water in the recent past (eDNA degrades over around 7-21 days).

A negative result means that DNA from the great crested newt has not been detected in your sample.

On occasion an inconclusive result will be issued. This occurs where the DNA from the great crested newt has not been detected but the controls have indicated that either: the sample has been degraded and/or the eDNA was not fully extracted (poor recovery); or the PCR inhibited in some way. This may be due to the water chemistry or may be due to the presence of high levels of sediment in samples which can interfere with the DNA extraction process. A re-test could be performed but a fresh sample would need to be obtained. We have successfully performed re-tests on samples which have had high sediment content on the first collection and low sediment content (through improved sample collection) on the re-test. If water chemistry was the cause of the indeterminate then a re-test would most likely also return an inconclusive result.

The results will be recorded as indeterminate if the GCN result is negative and the degradation result is recorded as:

1. evidence of decay - meaning that the degradation control was outside of accepted limits
2. evidence of degradation or residual inhibition - meaning that the degradation control was outside of accepted limits but that this could have been due to inhibitors not being removed sufficiently by the dilution of inhibited samples (according to the technical advice note)

Appendix 10D – Winter Bird Survey

Winter bird survey of designated land at North Killingholme
January - March 2017

G P Catley BSc Env,

Contents:

Below boundary of survey area in red

Above one of the wet pools at the eastern end of the survey area

Below Common Snipe faeces in favoured wet grass in on of the eastern pools Janaury 2017

Above and below general view of the survey site with mounds of concrete and soil covered in moss and vegetation January 2017

Introduction:
The site comprises an undulating roughly rectangular area 240m x 125m with dumped concrete and soil in heaps and mounds and intervening hollows some of which retained water through the survey period. The elevation of the site varies by up to 5m with mounds of soil and rubble raising parts of the site above sea level. At the eastern end of the site are two shallow water pools surrounded by sedge and with some greater reedmace. Most of the area was covered in a rich growth of various grasses, willow herb, thistles, bramble and other low growing vegetation. A few small trees, mainly Willow, Sallow, Sycamore and Hawthorn were scattered across the site. A selection of photographs produced in this report give an impression of the appearance of the site in the winter period.

Methodology:
A total of six survey visits were undertaken between January and March 2017 inclusive. All of the survey site was walked to within 10m of any one location and all birds located were recorded and their locations marked on a large scale map with behaviour, where relevant, also being noted. The locations of the individual birds on each survey were then plotted against each other to attempt to ascertain how many individuals were likely to have been present during the survey period. The maps from each survey visit are attached at the end of this report.

Results:
A total of 15 species was recorded on six survey visits between January and March 2017.

January 17th 2017
Wind south-west force 3 -4 with eight octas cloud cover and temperature of 5C.
Sunrise 08:09

The site was generally rather wet with two obvious permanent water pools at the east end that held a total of five Common Snipe. A single Woodcock was flushed from a clump of bramble at the western end of the site and six species of passerine were recorded, Blackbird, Song Thrush, Dunnock, Wren, Robin and Magpie. The location of each individual is shown on the attached map.

January 26th 2017
Wind south-east force three to four with eight octas cloud cover and some mist at 400m with a temperature of 1C and a light snow flurry at the start of the survey.
Sunrise 07:57

The site was in identical condition to the previous survey with standing water in some of the lower parts and particularly at the eastern end where the two pools again attracted a small group of Common Snipe. In addition two Common Snipe were flushed from another smaller wet area in the middle of the site. What is presumed to be the same Woodcock was again flushed from a bramble thicket the western end of the site. This is clearly its roost area and the bird presumably feeds at night in some of the permanent pasture fields to the east of the adjacent Rosper Road.

February 2nd 2017
Wind force four from the south with eight octas cloud cover and an exceptionally mild temperature of 11C, most unseasonable for early February.
Sunrise 07:46

The site was in identical condition to the previous survey with standing water in some of the lower parts and particularly at the eastern end where the two pools again attracted a small group of Common Snipe. In addition two Common Snipe were flushed from another smaller wet area in the middle of the site.

February 17th 2017
Wind west force four with four octas cloud cover and a temperatures of 7C.
Sunrise 07:17

The site was even wetter than on previous surveys following two days of persistent rain over the previous weekend. The floodwater pools at the eastern end of the site were more extensive and deeper than n the previous surveys but held a similar number of Common Snipe.

March 2nd 2017
Wind was a fresh westerly up to force four with occasional showers in the early morning but these cleared the area by 08:45 hrs. Cloud cover varied from four to seven octas and the temperatures rose gradually from 4C to 7C.
Sunrise 06:48

Following further periods of rain the site was probably even wetter than on the previous visit with the depth of water in the pools at the eastern end of the site being in places over 40 cms.

March 9th 2017
Wind fresh from the west at force four with an almost clear sky, just one octa cloud cover, and mild with temperatures of 10C.
Sunrise 06:32

The site remained very wet underfoot with the pools still flooded to depths recorded in the previous week.

Species	**17.1**	**26.1**	**2.2**	**17.2**	**2.03**	**9.03**
Kestrel *Falco tinnunculus*	0	1	1	0	0	0
Common Snipe *Gallinago gallinago*	6	8	7	7	6	7
Woodcock *Scolopax rusticola*	1	1	0	0	0	0
Magpie *Pica pica*	1	1	0	0	0	0
Wren *Troglodytes troglodytes*	1	2	2	1	1	2
Blackbird *Turdus merula*	6	5	4	2	0	2
Song Thrush *Turdus philomelos*	3	3	2	1	2	2
Dunnock *Prunella modularis*	4	3	2	4	1	3
Robin *Erithacus rubecula*	2	2	0	1	1	1
Blue Tit *Cyanistes caeruleus*	0	0	1	1	2	1
Great Tit *Parus major*	0	0	1	0	0	0
Goldcrest *Regulus regulas*	0	0	1	0	1	0
Chaffinch *Carduelis coelebs*	0	0	0	0	1	1
Goldfinch *Carduelis carduelis*	0	10	0	0	3	0
Reed Bunting *Emberiza schoeniclus*	0	0	0	0	1	0

Species comments:

Kestrel *Falco tinnunculus*
One was hunting the site on January 26th and February 1st and on the latter date a second bird flew over the site. The species is known to nest on the pylons and buildings within the refinery area.

Common Snipe *Gallinago gallinago*
Common Snipe were found in two parts of the survey area; the two open water pools at the eastern end of the site and in a series of wet hollows and ditches in the middle of the area. Birds clearly used the eastern pools regularly as there were several faeces on some of the favoured grass areas (see photo). Between six and eight birds were recorded on each survey suggesting that this was a stable wintering population. Common Snipe are opportunistic birds and will seek out suitable feeding and roosting areas in the winter months as the amount of seasonal rainfall will determine the areas that the species is able to exploit. Common Snipe is Amber listed in the most recent Birds of Conservation Concern due to declines in both the British breeding population and the wintering population but even so the latter is numbered at one million individuals and thus the number of birds recorded on this survey is particularly insignificant even on a regional basis.

Woodcock *Scolopax rusticola*
A single bird was flushed from the bramble scrub at the south-west of the survey area on January 17th and 26th and this was assumed to be the same bird using a daytime roost area. The survey area is not really suitable for feeding and it is assumed that this bird was feeding nocturnally in the permanent pasture fields to the eats of Rosper Road. Woodcock has recently joined the list of Red Listed species due to dramatic declines in the British breeding population but it is thought that 1.4 million birds are found in Britain in the winter months. The fact that this particular bird was only recorded on two survey visits possibly suggest that it was relatively newly arrived in the area, as birds can cross the North Sea at any time during October – January, and that it probably moved on from its first resting location as the roost site was not typical for the species.

Magpie *Pica pica*
Single birds were noted flying over the site and perching for short periods but there was no sign of actual feeding on the survey area during survey visits though birds were feeding on the mown grass on the north of the car park area.

Wren *Troglodytes troglodytes*
There were two different Wrens on the survey area but only one was recorded on three of the visits as the bird at the western end of the site appeared to be holding a territory that also extended in to the compound beyond the survey area. Wren is a Green Listed species of least concern with an estimated British breeding population of 7.7 million occupied territories in 2009.

Blackbird *Turdus merula*
Up to six Blackbirds were recorded around the survey area but with a British breeding population of 4.9 million pairs that is probably doubled with the addition of winter visitors from Scandinavia and the Baltic states the number of birds recorded is of no obvious significance.

Song Thrush *Turdus philomelos*
Song Thrush is a Red Listed species due to declines in the British breeding populations and also declines in wintering numbers but the maximum of three birds located during the survey work would not be considered of local or regional significance.

Dunnock *Prunella modularis*
Dunnock is another widespread but Amber Listed species due to declines breeding and wintering populations but there are still considered to be 2.3 million breeding pairs in Britain and the peak of four birds on the survey area would not merit local significance.

Robin *Erithacus rubecula*
Two Robins were holding winter territories on the survey area but by February one had moved across Rosper Road into the mature hedgerow to the east and it was not recorded again from the survey area though it was heard in song on March visits. There are considered to be in the region of 6 million occupies territories in summer in Britain with additional birds arriving from further east in winter.

Blue Tit *Cyanistes caeruleus*
One or two Blue Tits were recorded on the last four surveys. Blue Tit is a very widespread species with an increasing British breeding population estimated at 3.4 million pairs and is Green Listed of least conservation concern.

Great Tit *Parus major*

A single Great Tit was noted on February 2nd. Like Blue Tit it is a widespread and increasing Green Listed species.

Goldcrest *Regulus regulas*
One was present in the low scrub on February 2nd and one in the hedge by the side of the VPI site on March 2nd. Wandering Goldcrests in winter may well be of continental origin and there was a notable arrival in autumn 2016, forming the most likely source of this individual, or could be local breeding birds from the woodlands in the area.

Chaffinch *Carduelis coelebs*
A singing male was located in the hawthorn hedge between the site and the VPI compound on March 2nd and 9th. Chaffinch is a widespread and common breeding species of woodlands, parks, gardens and hedgerows within farmland with a British breeding population of 5.8 million pairs.

Goldfinch *Carduelis carduelis*
Charms of ten January 26th and three March 2nd were feeding on teasel seeds at the western end of the survey site. This is an increasingly common species in winter with a British breeding population of 1.2 million pairs. Birds are highly mobile in the autumn and winter moving over large areas of the countryside to exploit available rich seed bearing plants.

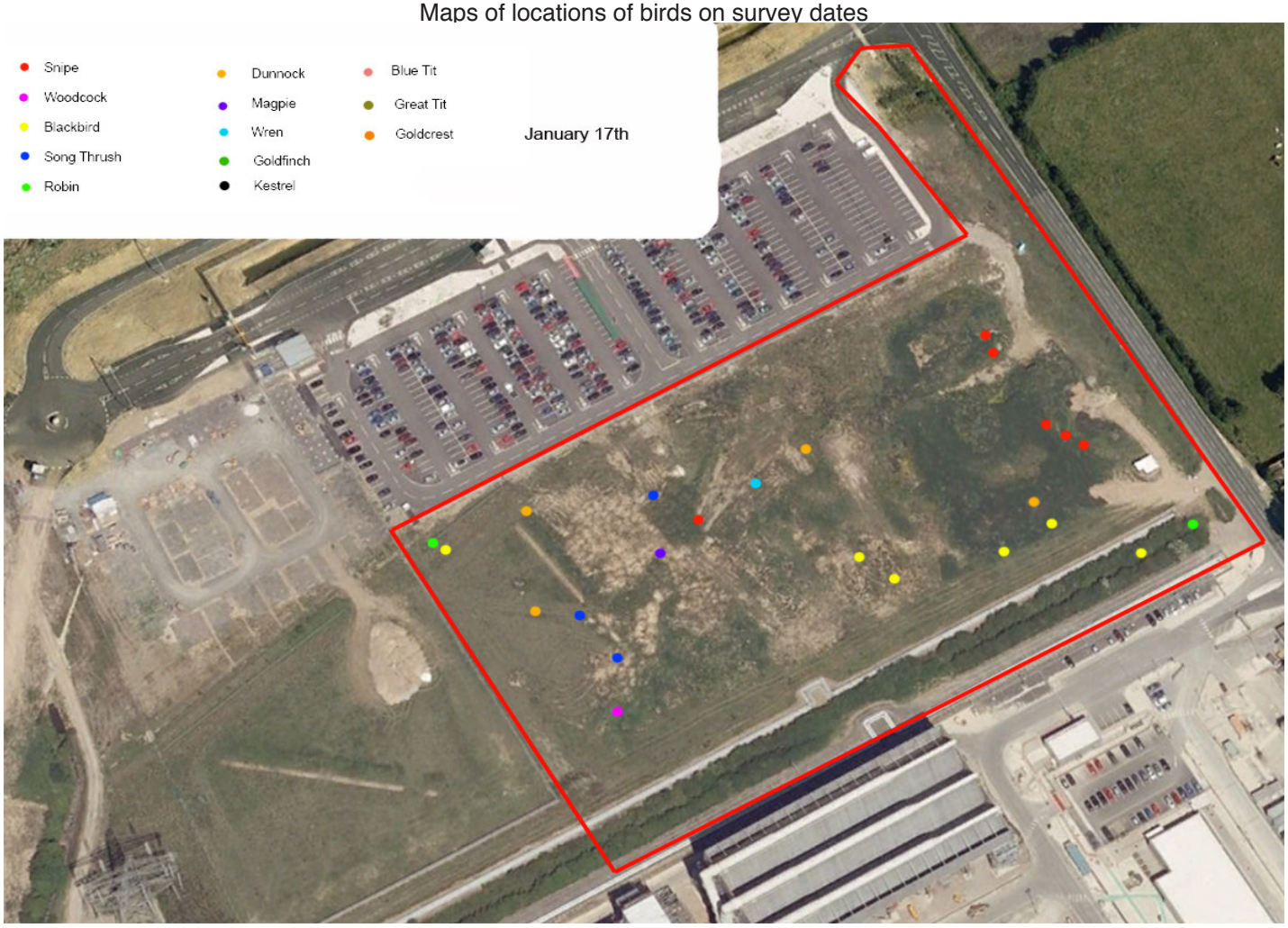
Reed Bunting *Emberiza schoeniclus*
There were no records of this species until March 2nd when a singing male had moved onto the site and set up a potential breeding territory in the wet area at the eastern end of the site. This is typical habitat for breeding Reed Bunting and the area as a whole is within the size of territory typically occupied by a single pair.

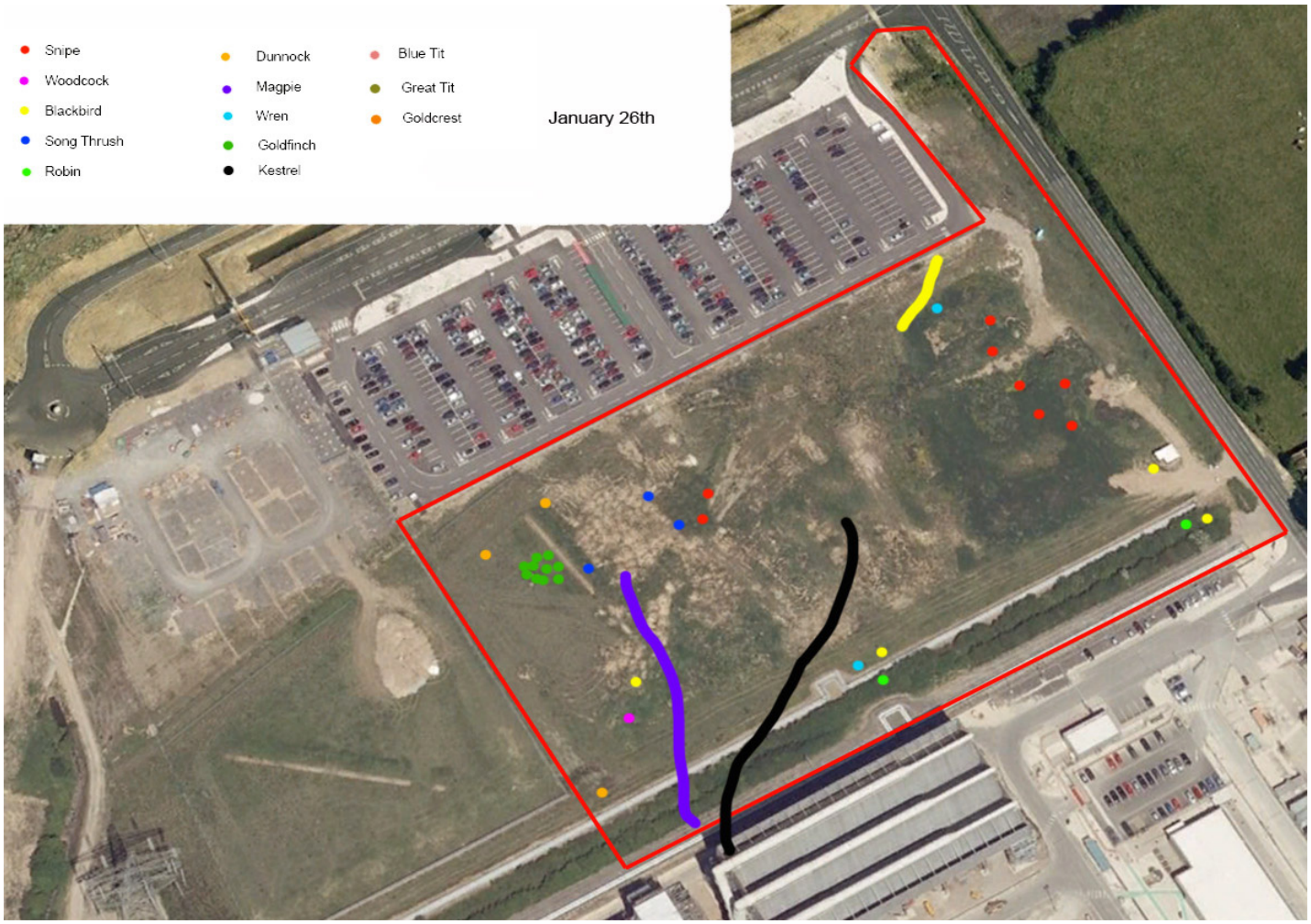
Summary:
The limited number of bird species recorded in the survey area, 15 species, was fairly typical of the habitat and size of the survey area in the winter months. Clearly feeding and roosting opportunities are limited in this small area of habitat and its location on the edge of active industrial sites is not likely to attract large numbers of any species or those that are sensitive to human disturbance.
All of the passerine species recorded were in very low numbers and of no local significance. The most interesting species located on all survey counts was Common Snipe. Up to eight birds were located on each survey with six to eight birds clearly representing a regular wintering flock taking advantage of a small area of suitable roosting and feeding habitat represented by the flooded pools at the eastern end of the site. Common Snipe are particularly adaptable on passage and in winter taking advantage of temporal wetlands as well as permanently suitable sites. The 2016 – 2017 autumn and winter saw a major arrival of Common Snipe on the Humber relating to Scandinavian birds and it seems likely that the birds wintering on the site were from a similar location. As such the birds are not certain to return to the same area in future winters and the species is adapted to exploiting temporal wetlands throughout its winter range. There is no likelihood of the species breeding in this small area of habitat and it is likely that the birds will have departed by the first week in April.
A lone Woodcock that was roosting on the site in January was presumed to be day roosting and feeding in the wet grass fields to the east of the site. Again this is a wintering bird that would be unlikely to return to the same roost site in successive years.

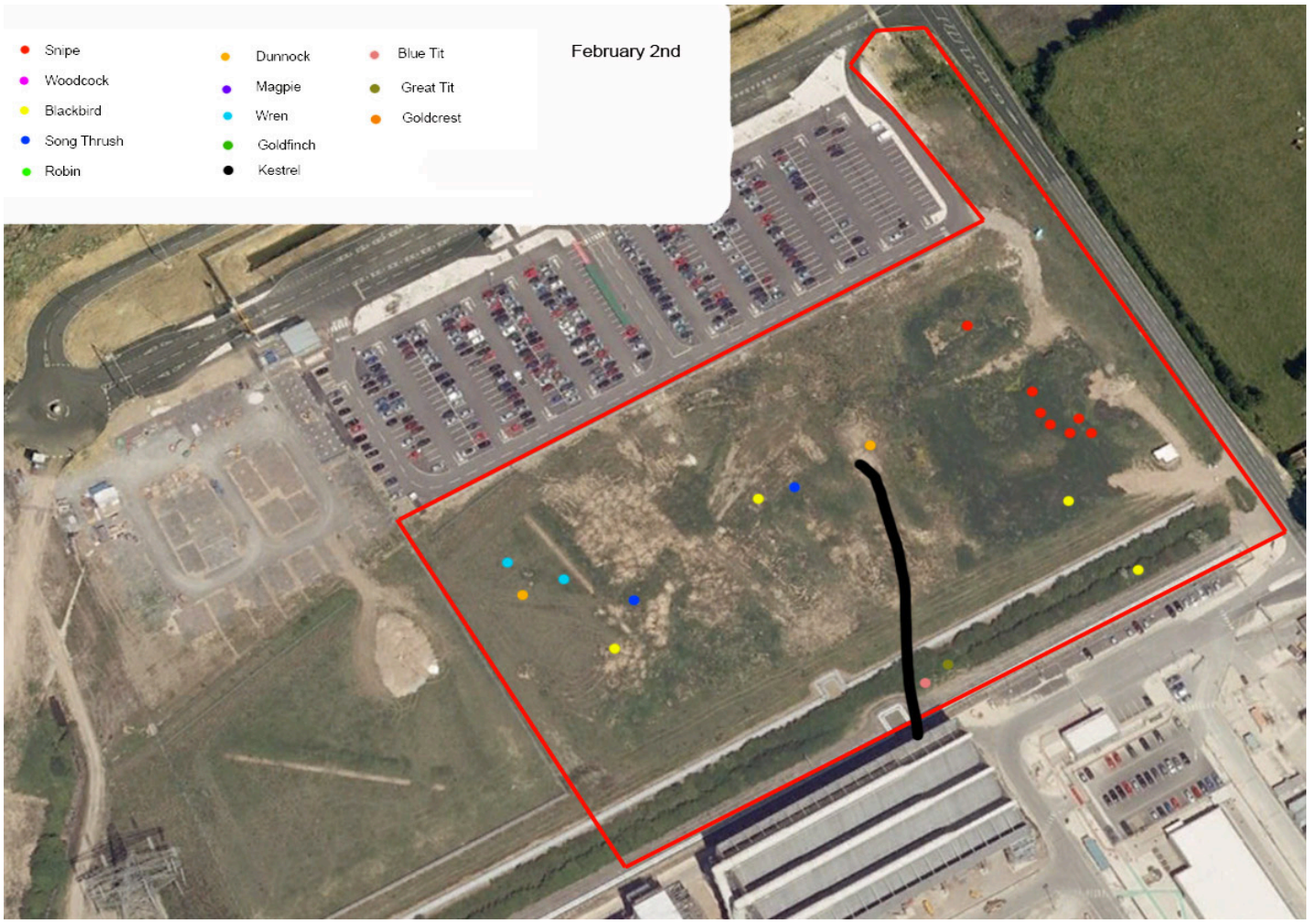
Conclusions:
The species of bird located on the survey area and the low numbers involved would not be likely to be considered prohibitive to future development of the site and the permanent loss of the habitats, which are temporary in an ecological succession.

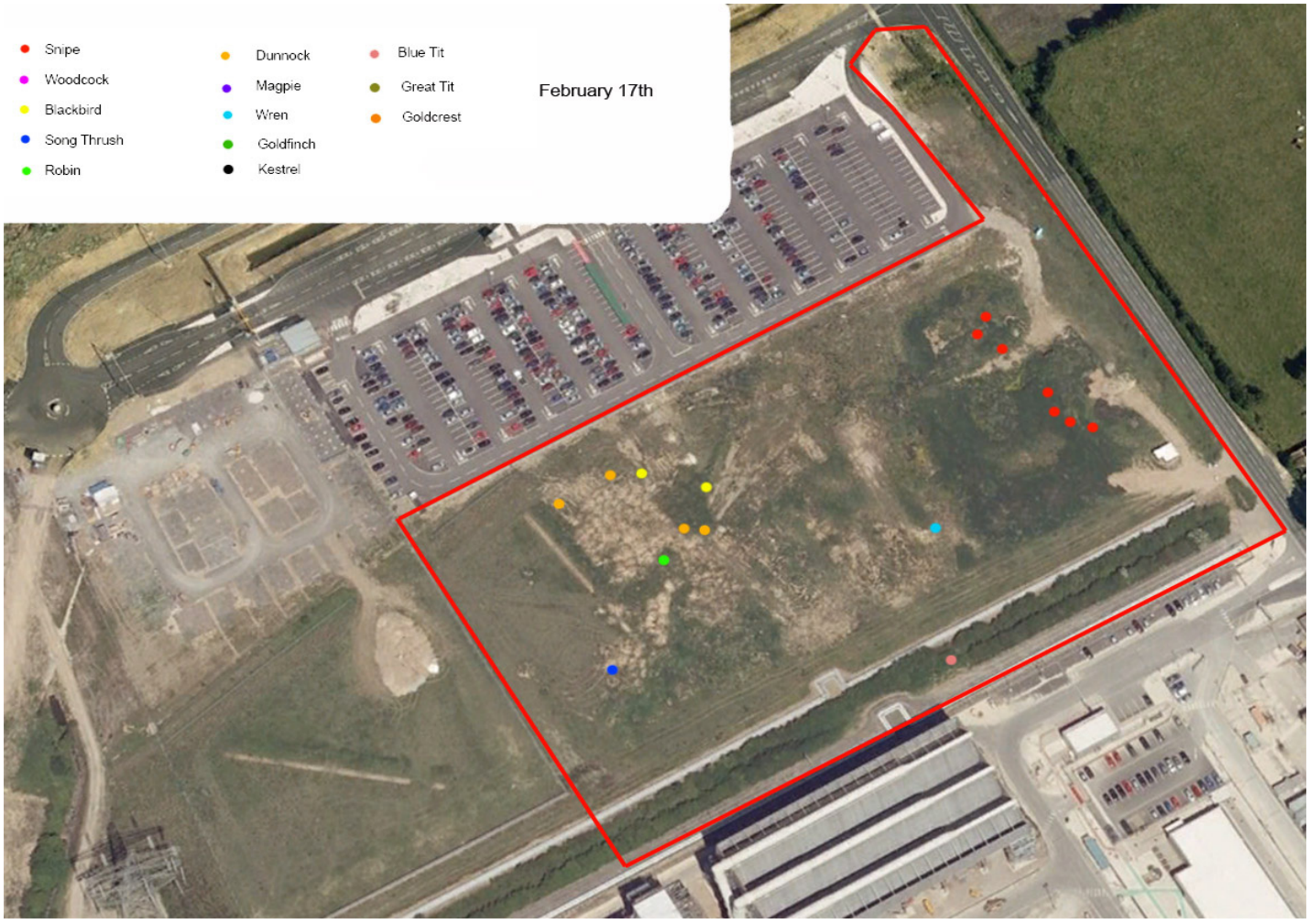
Graham P Catley BSc Env
March 2017

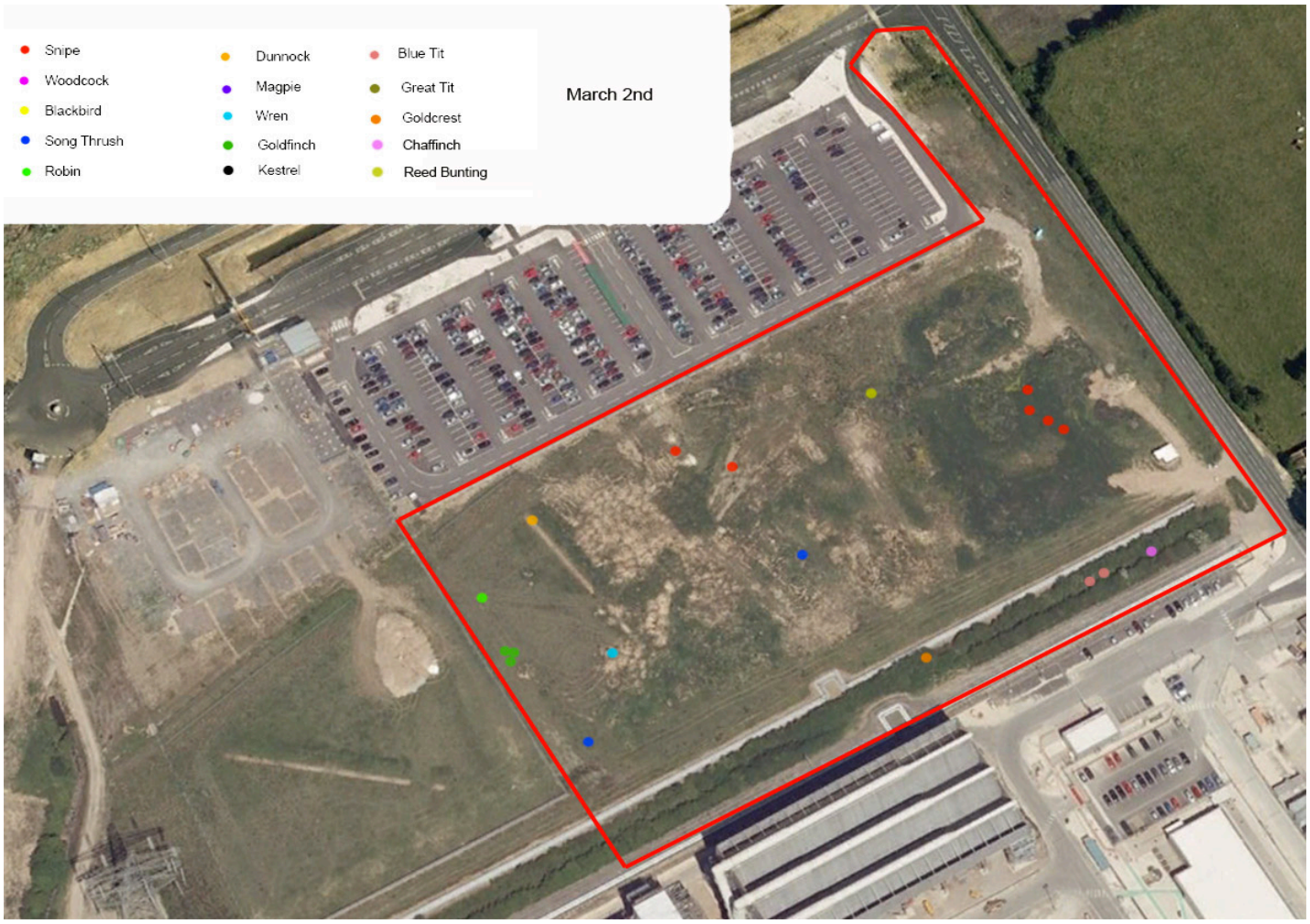
Maps of locations of birds on survey dates






Snipe
Woodcock
Blackbird
Song Thrush
Robin
Dunnock
Magpie
Wren
Goldfinch
Kestrel
Blue Tit
Great Tit
Goldcrest
February 2nd


Snipe
Woodcock
Blackbird
Song Thrush
Robin
Dunnock
Magpie
Wren
Goldfinch
Kestrel
Blue Tit
Great Tit
Goldcrest
February 17th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Woodcock
Blackbird
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Robin
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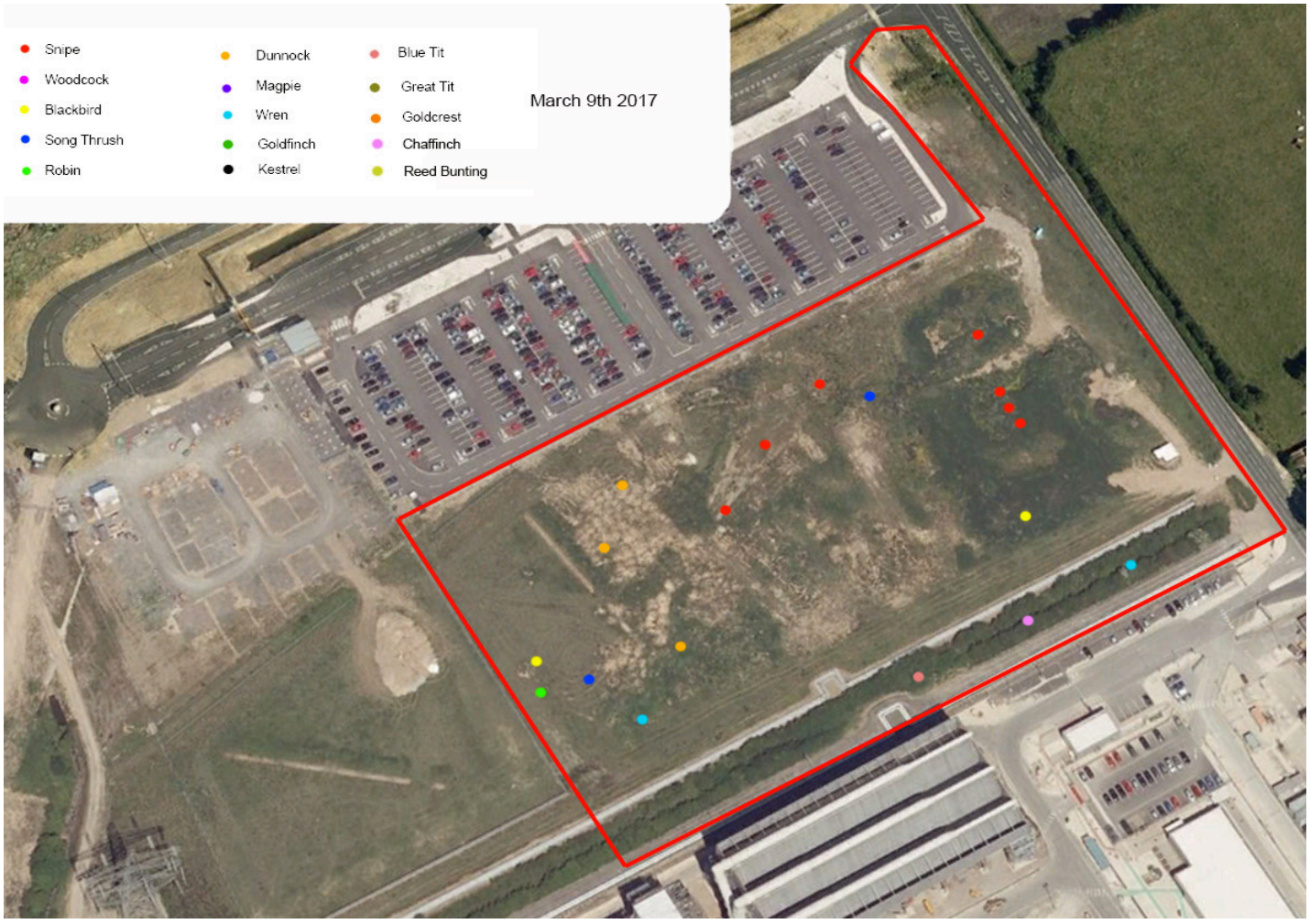
Magpie
Wren
Goldfinch
Kestrel
Blue Tit
Great Tit
Goldcrest
Chaffinch
Reed Bunting
March 2nd


Snipe
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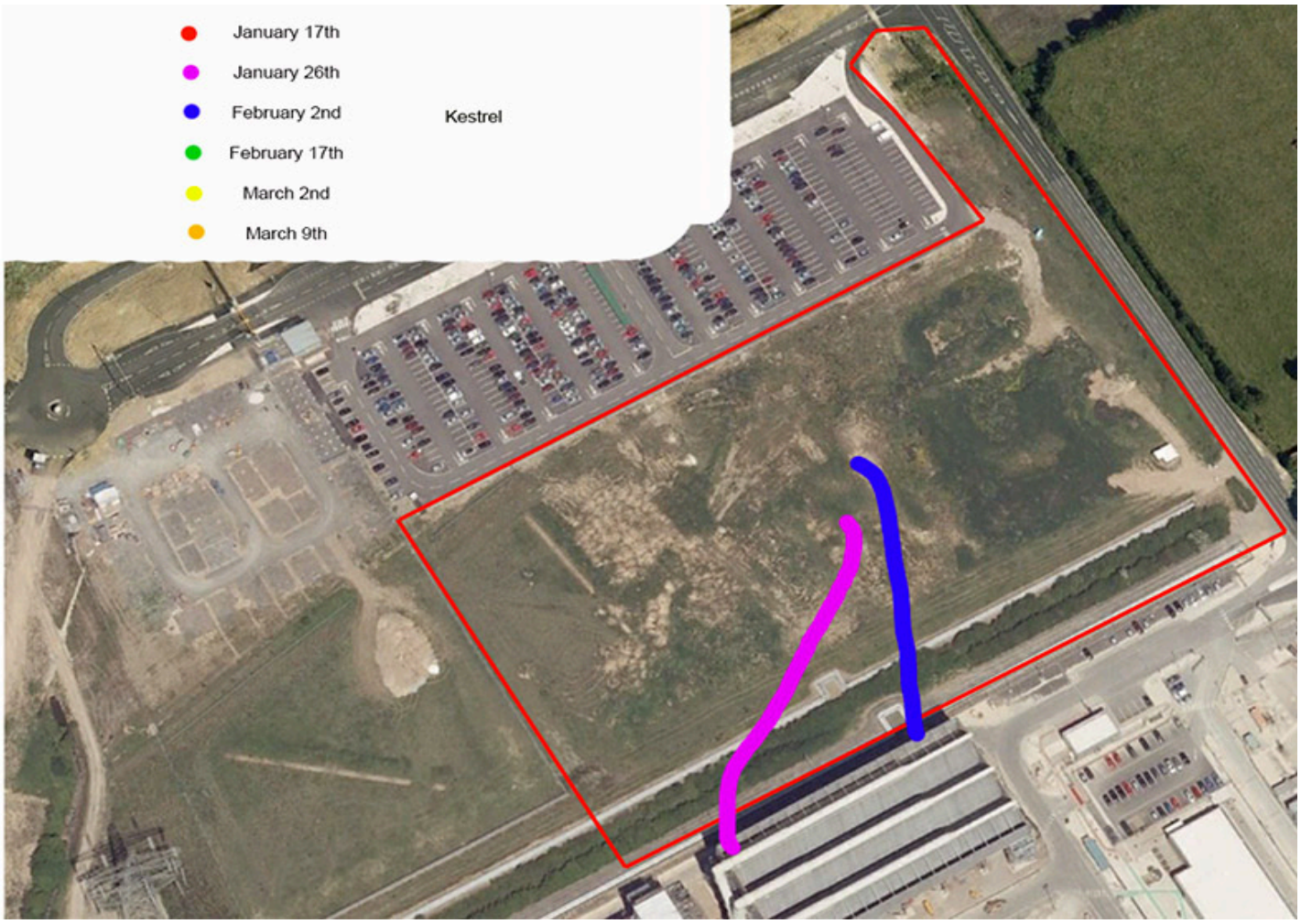
Goldcrest
Chaffinch
Reed Bunting
March 9th 2017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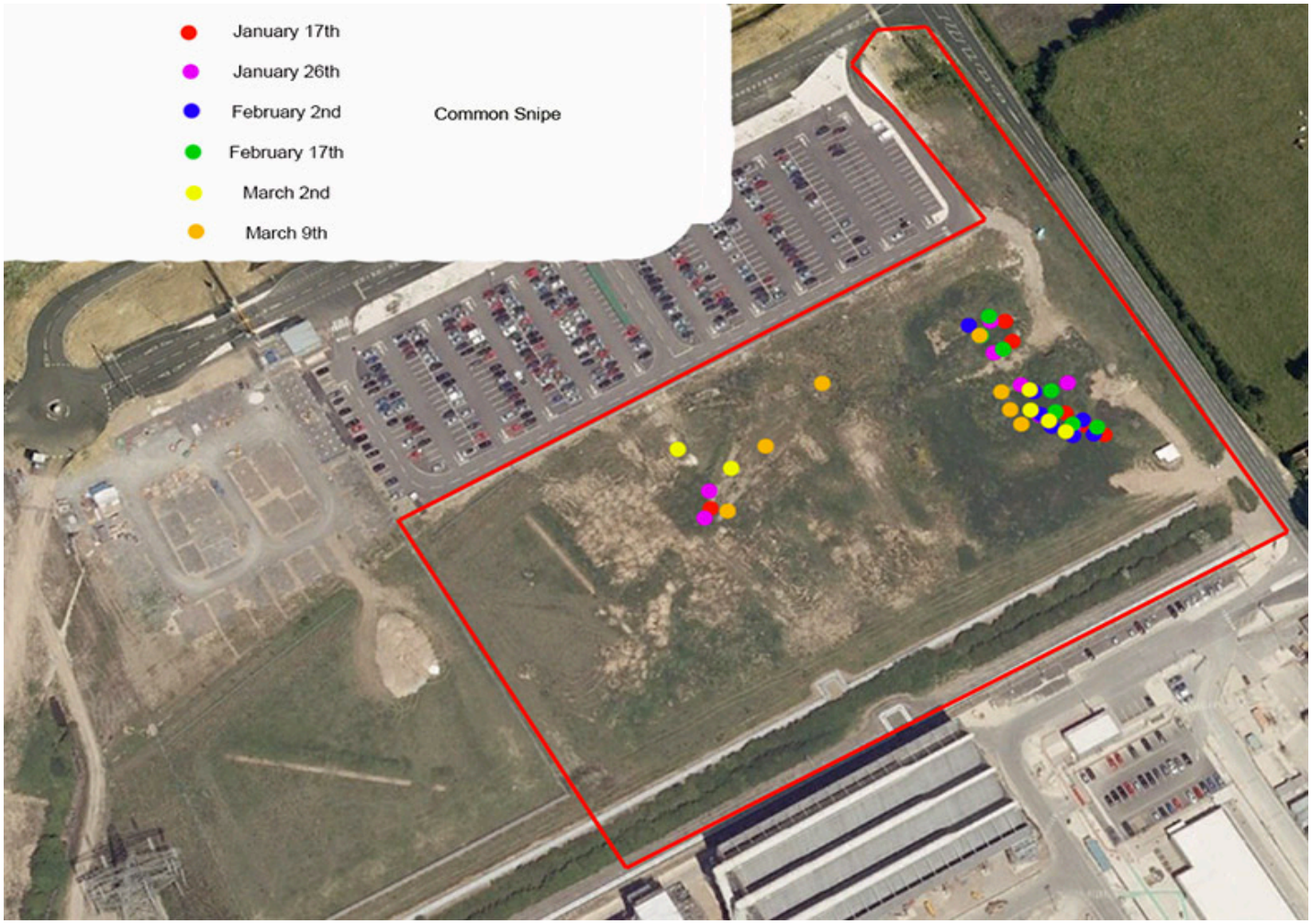
January 26th
February 2nd
February 17th
March 2nd
March 9th
Kestrel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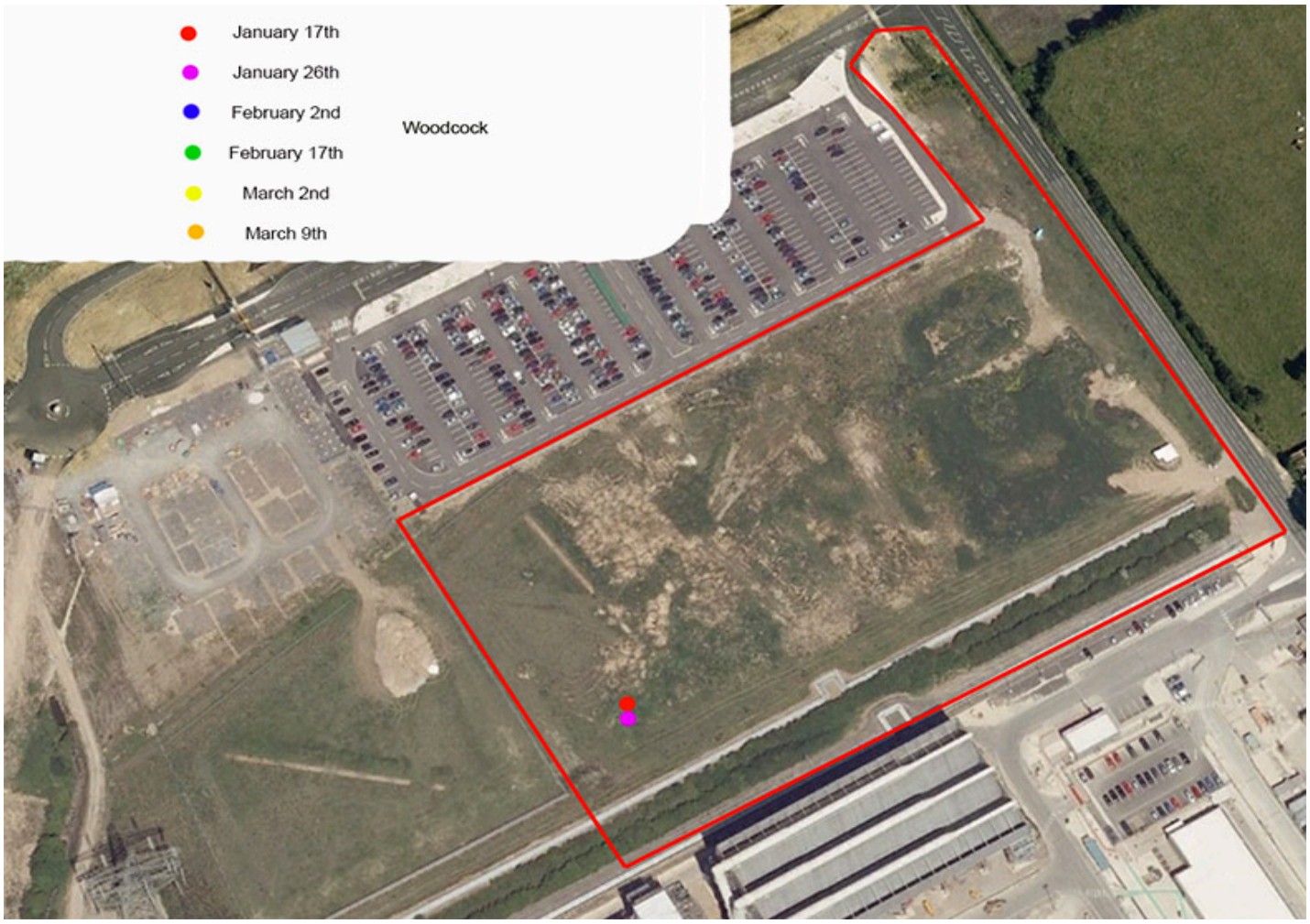
February 17th
March 2nd
March 9th
Common Snipe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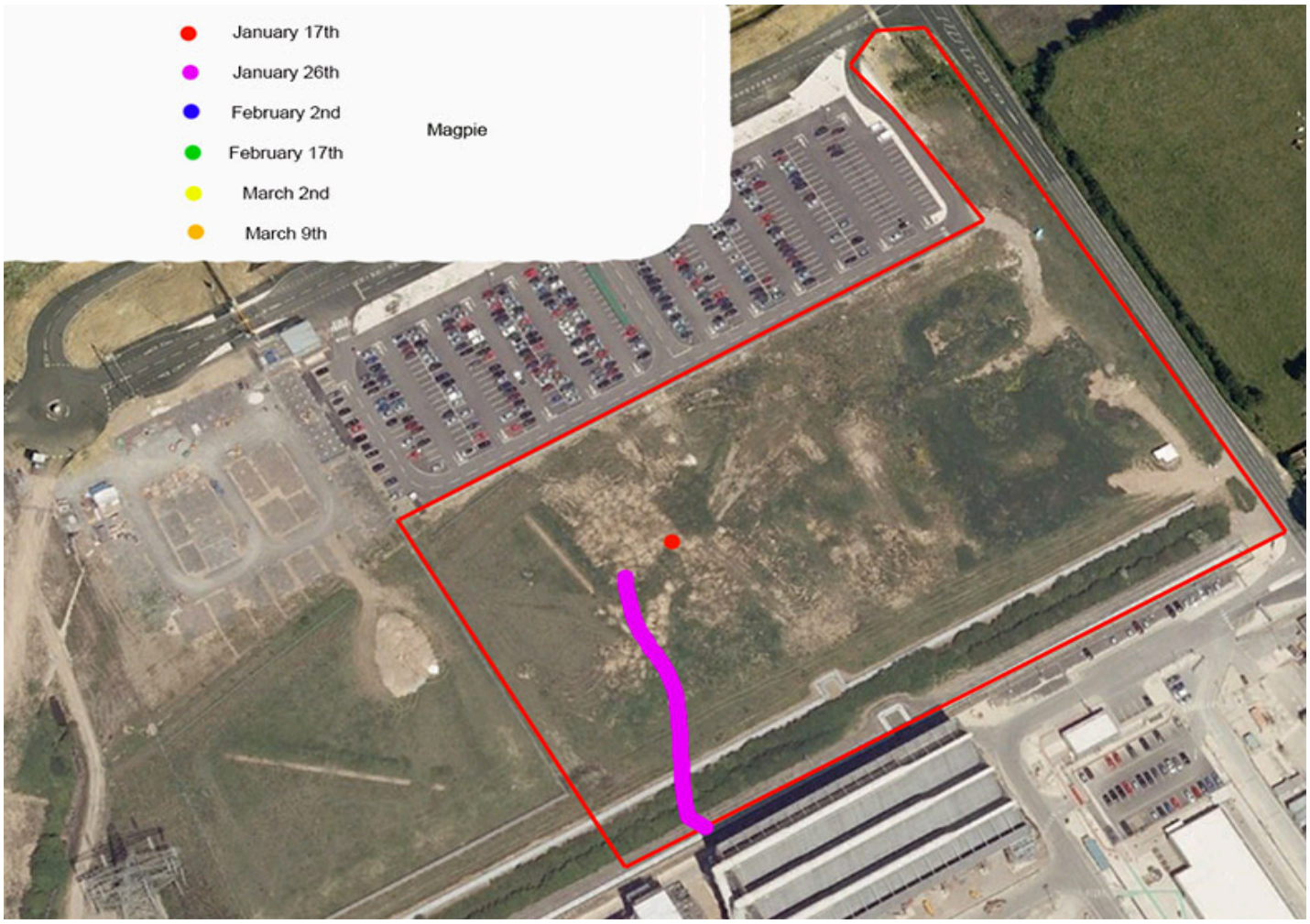
February 2nd
February 17th
March 2nd
March 9th
Woodcock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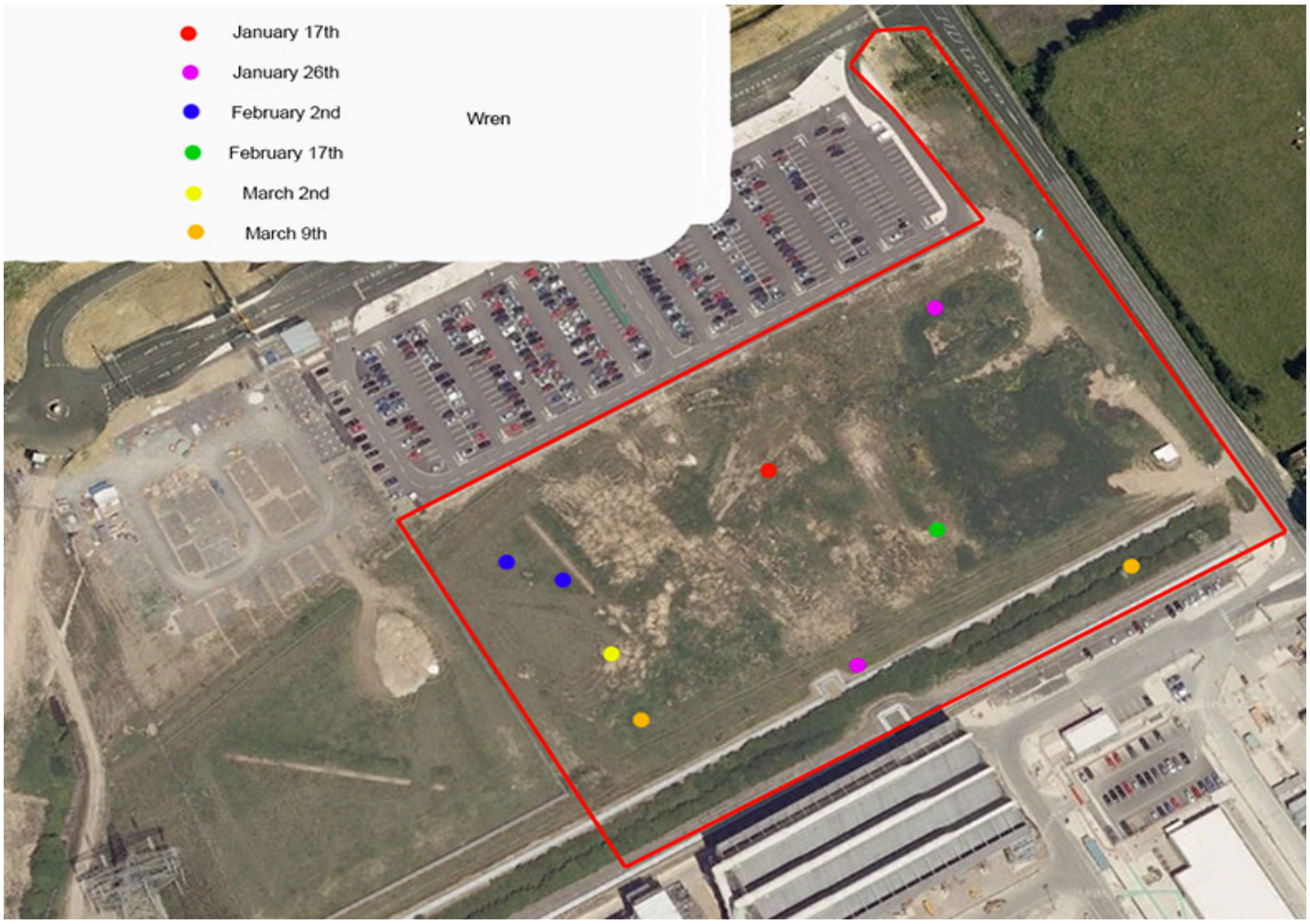
February 2nd
February 17th
March 2nd
March 9th
Magpie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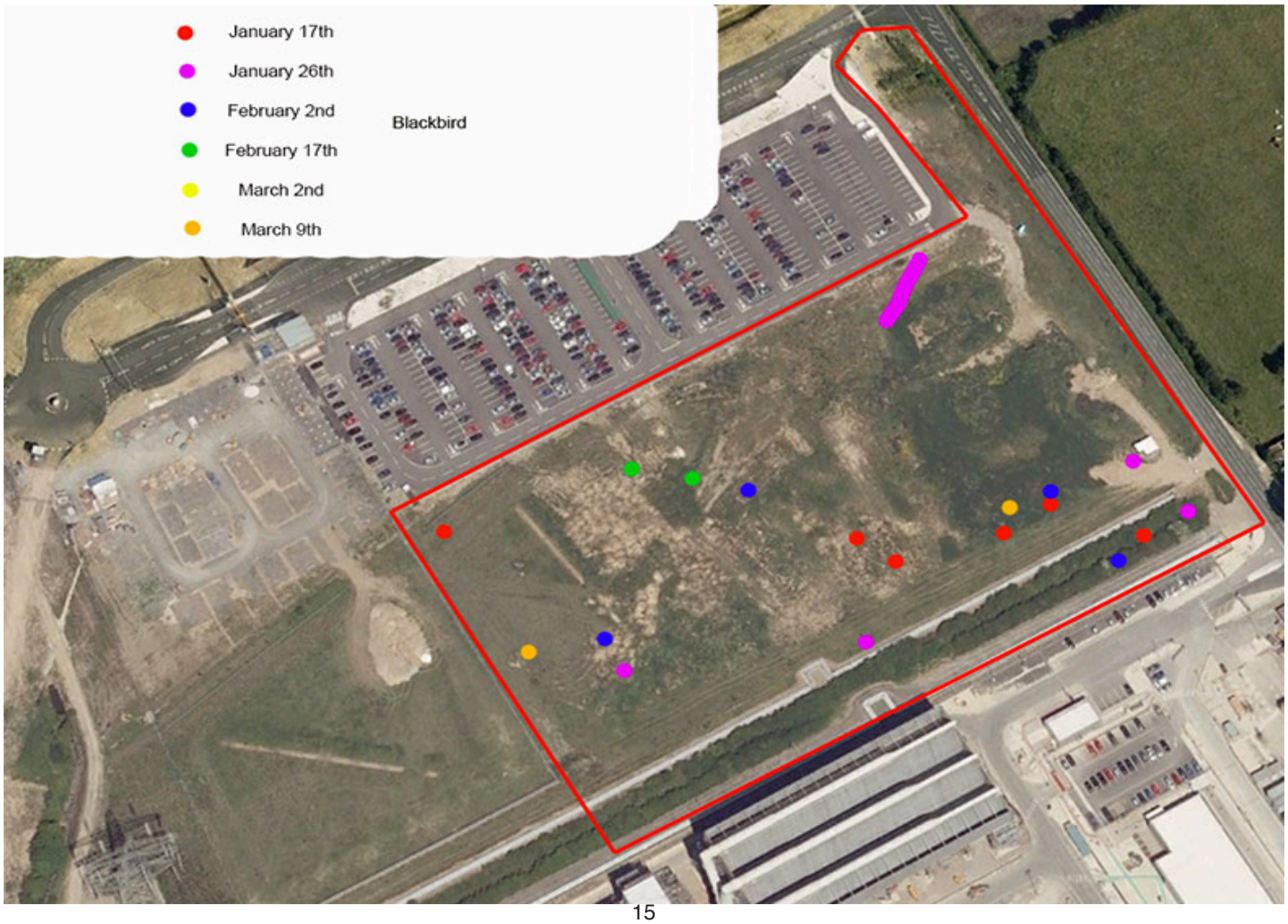
February 2nd
February 17th
March 2nd
March 9th
Wren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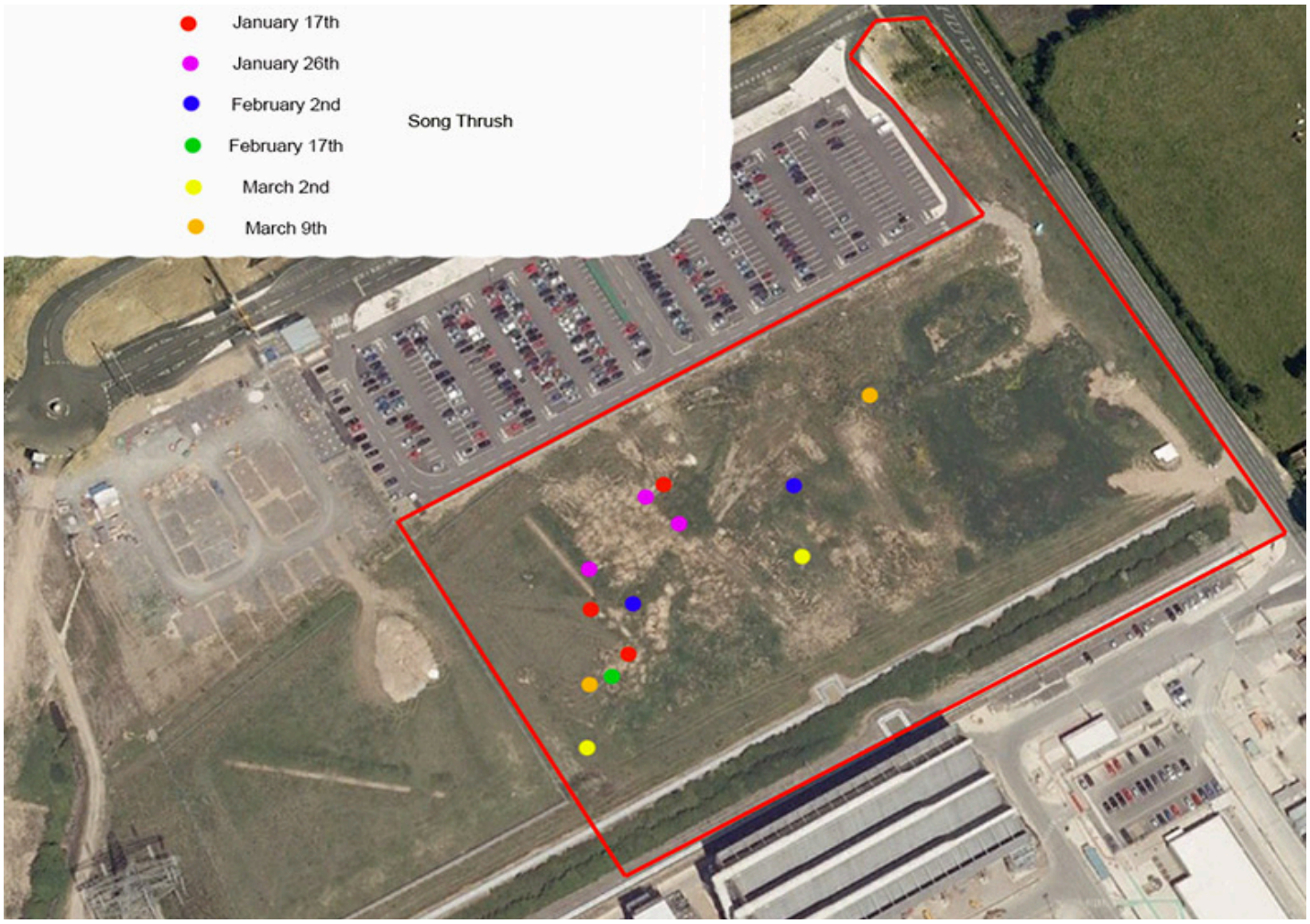
February 17th
March 2nd
March 9th
Blackbird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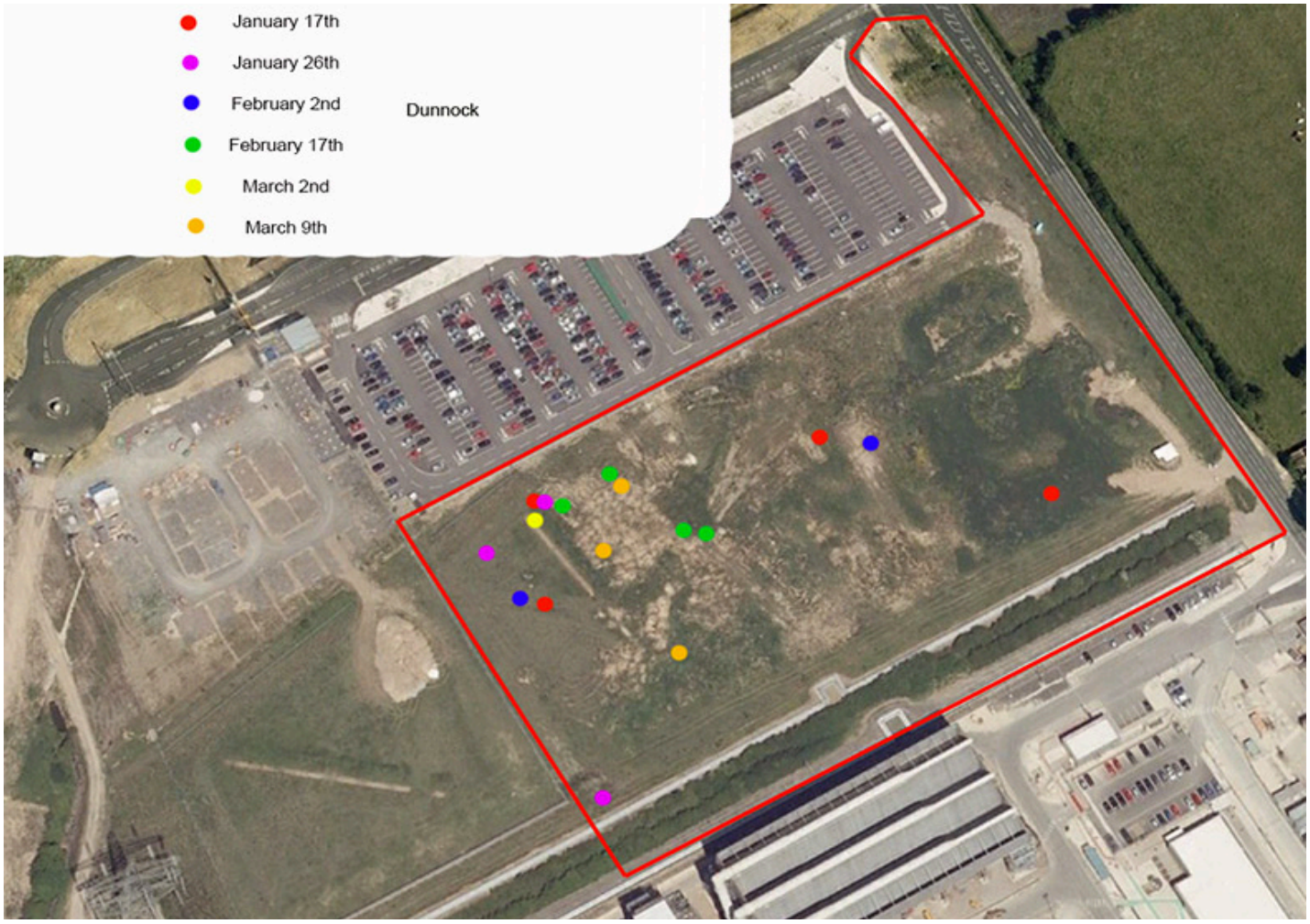
February 2nd
February 17th
March 2nd
March 9th
Song Thrush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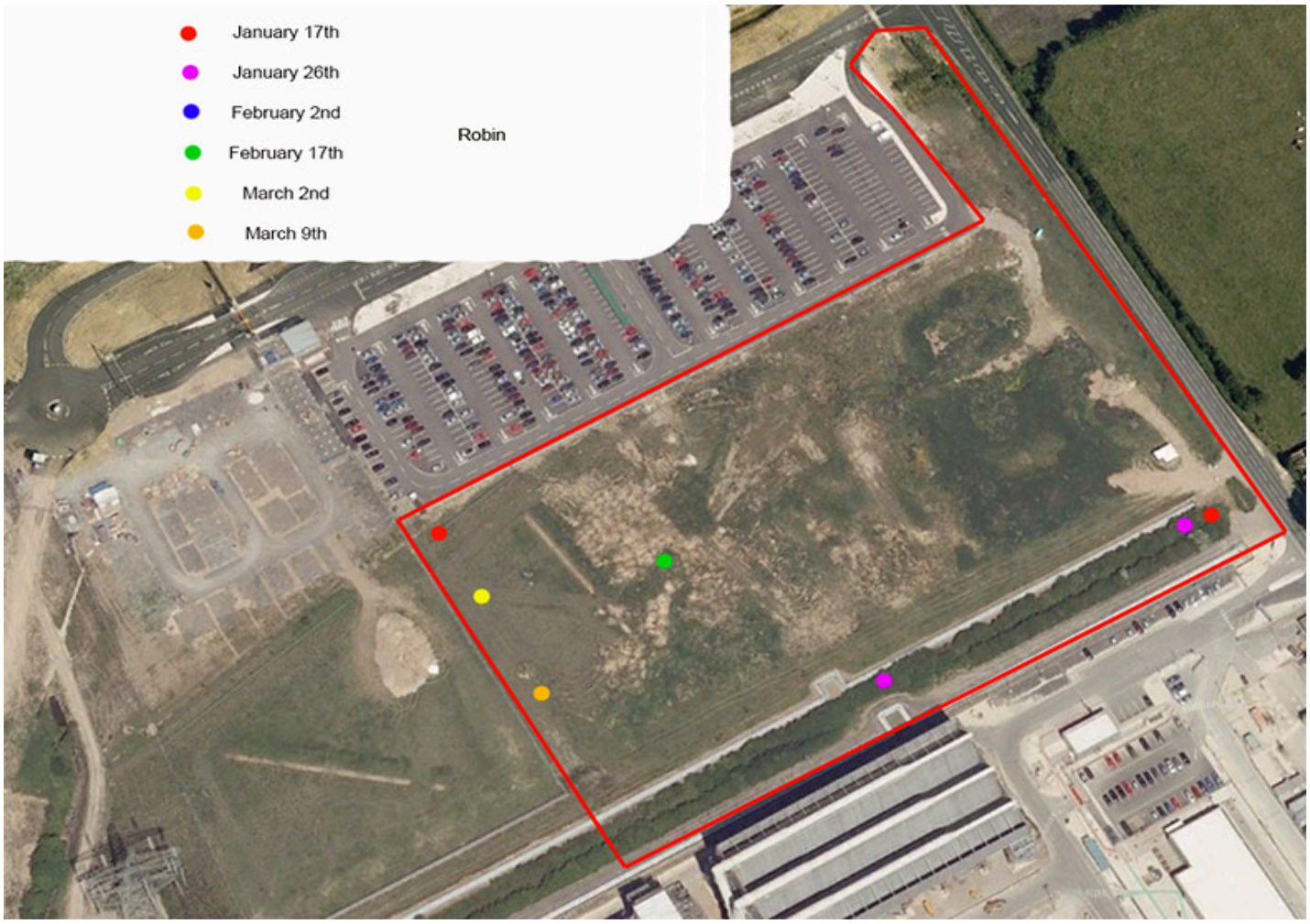
January 26th
February 2nd
February 17th
March 2nd
March 9th
Dunnock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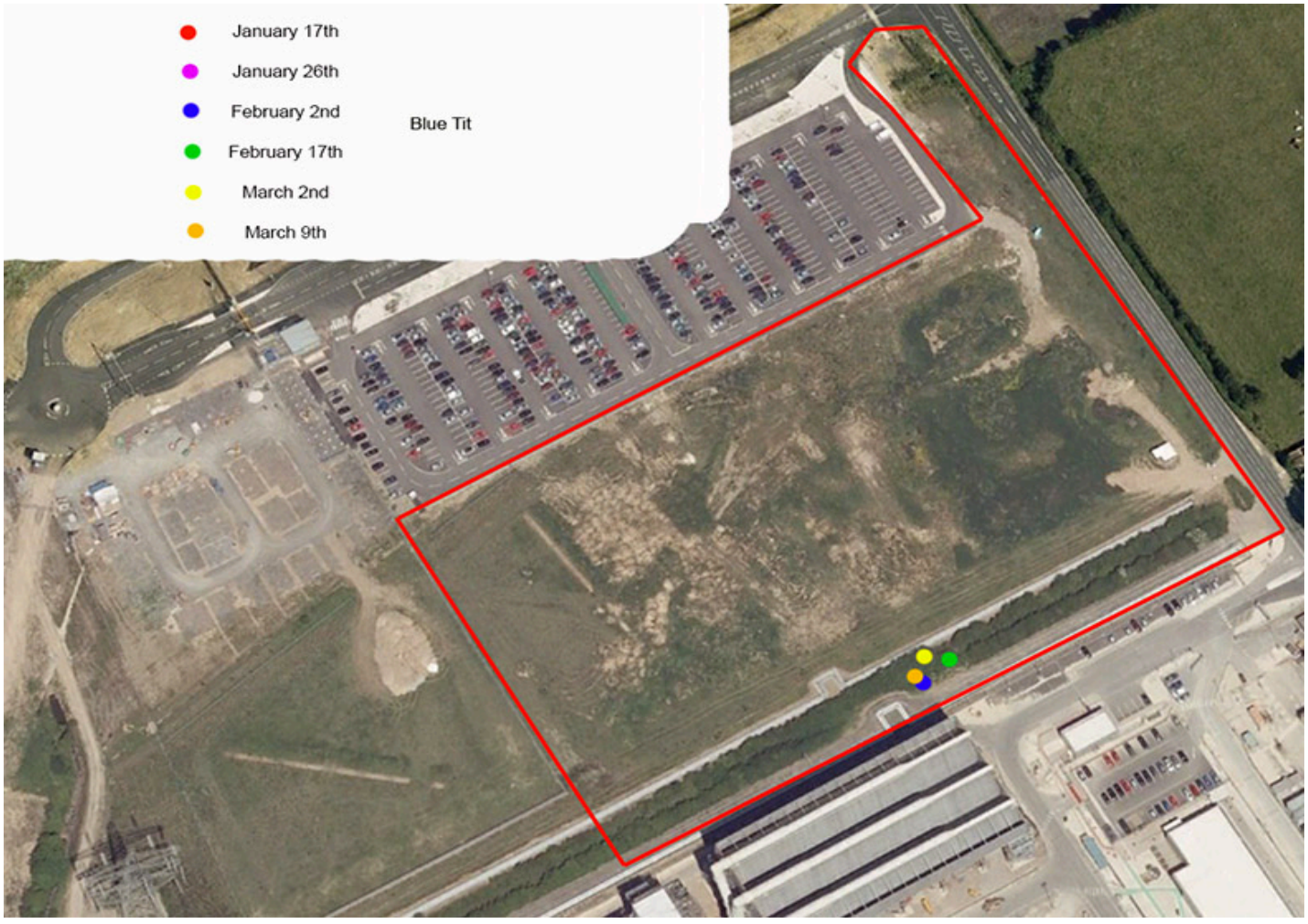
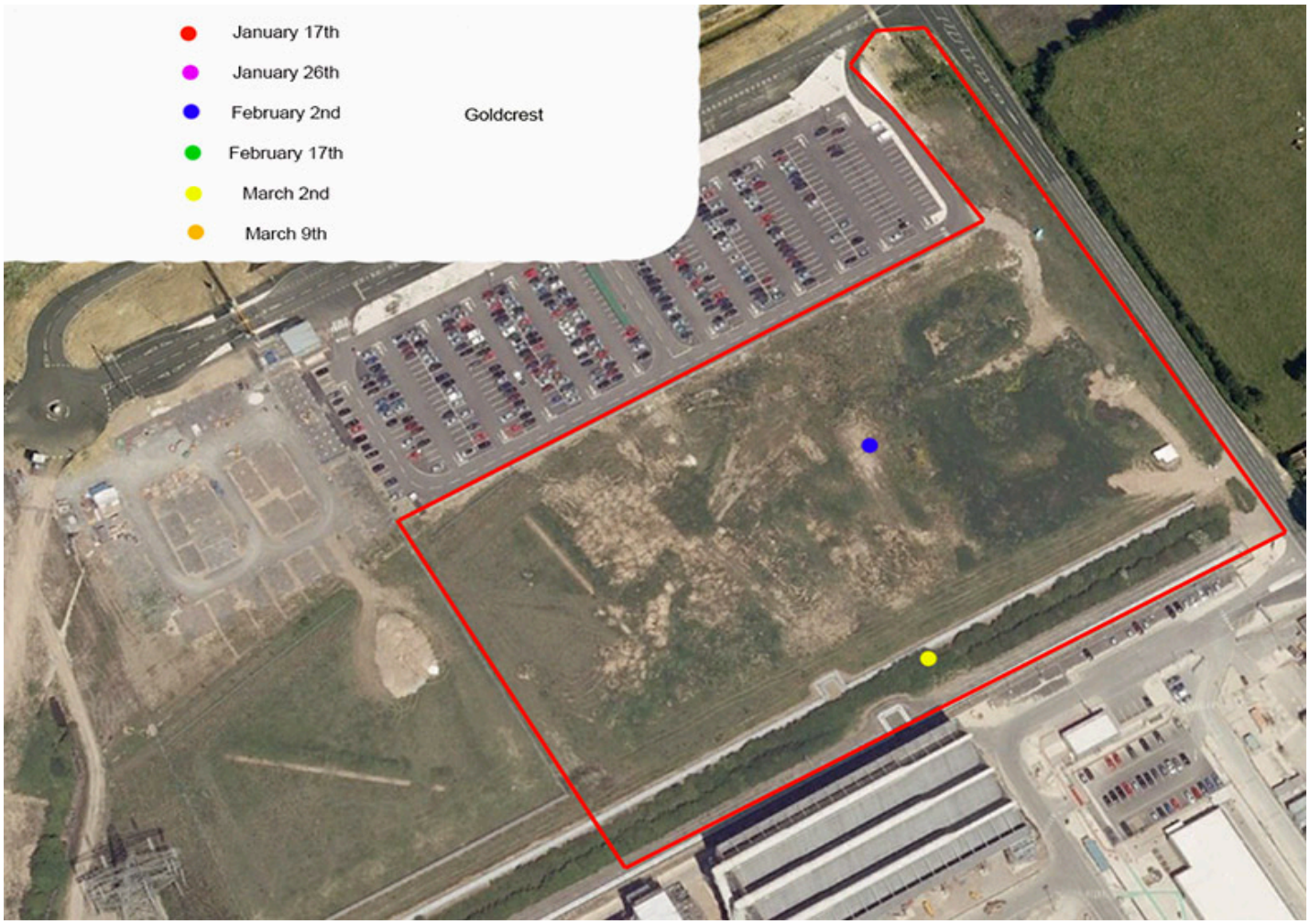
January 26th
February 2nd
February 17th
March 2nd
March 9th
Robin


January 17th
January 26th
February 2nd
February 17th
March 2nd
March 9th
Blue Tit


January 17th
January 26th
February 2nd
February 17th
March 2nd
March 9th
Great Tit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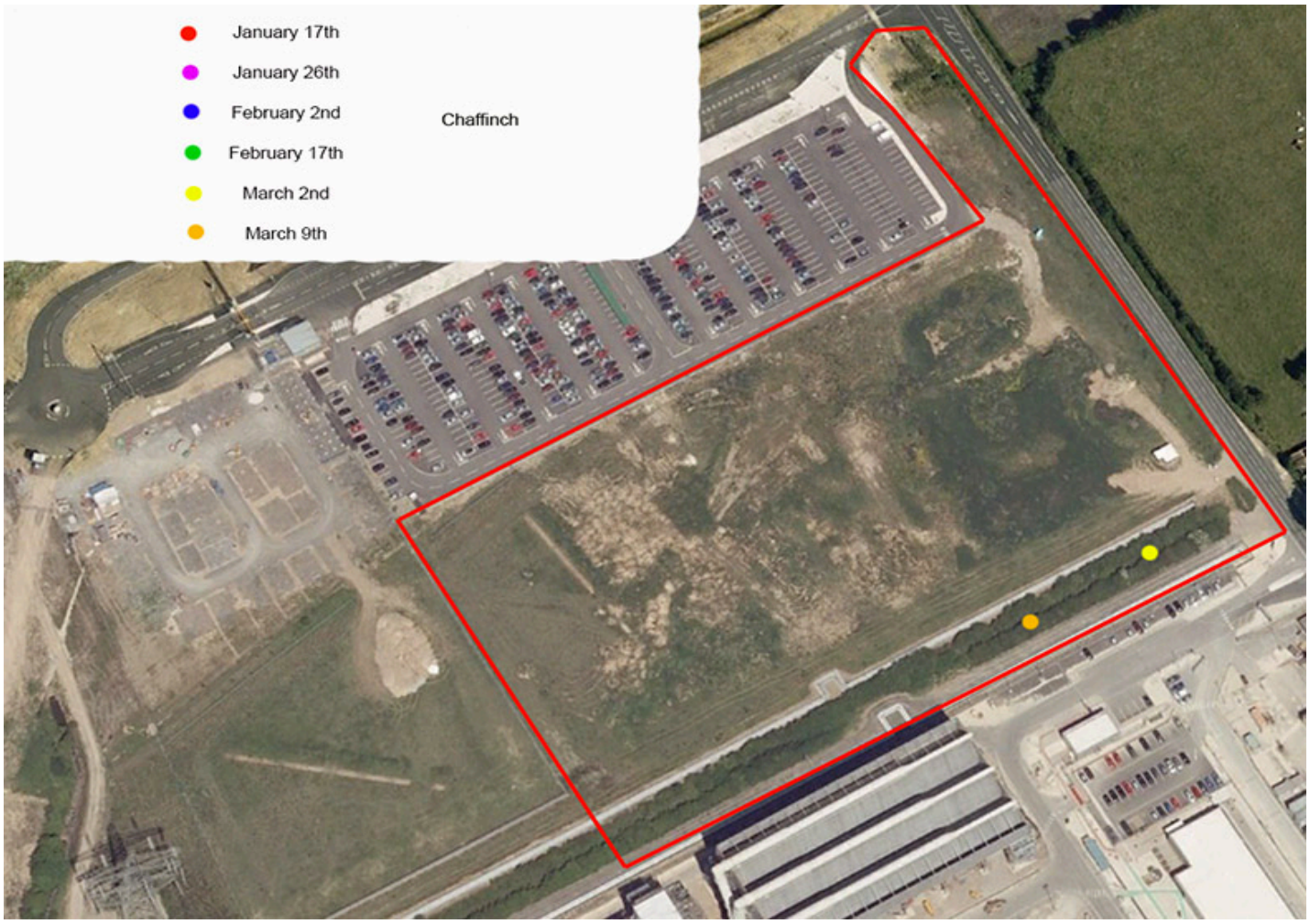
January 26th
February 2nd
February 17th
March 2nd
March 9th
Goldcrest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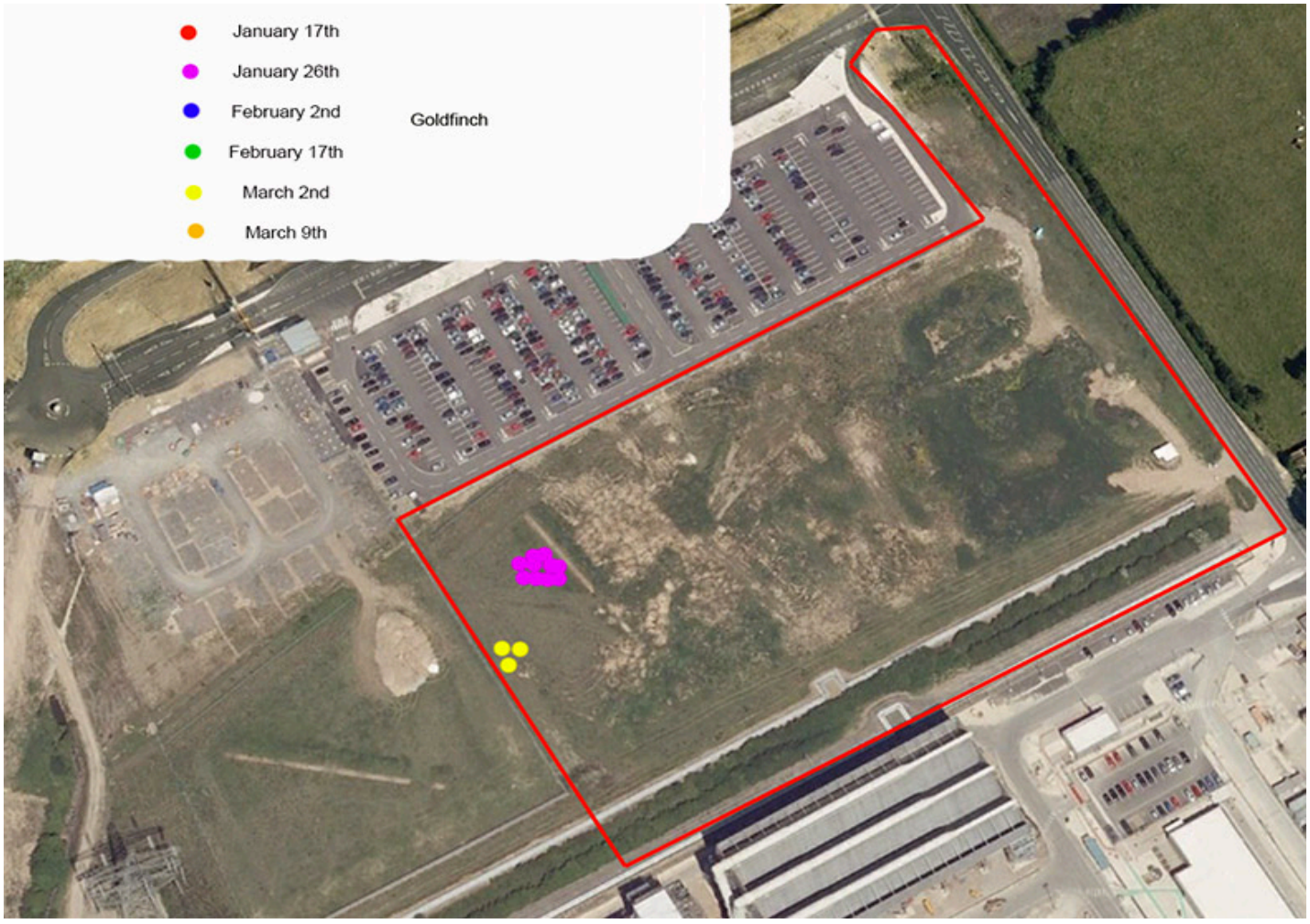
February 2nd
February 17th
March 2nd
March 9th
Chaffinch


January 17th
January 26th
February 2nd
February 17th
March 2nd
March 9th
Goldfinch


January 17th
January 26th
February 2nd
February 17th
March 2nd
March 9th
Reed Bunting

Appendix 11A – Known Heritage Assets

Table 11A. Known Heritage Assets

Reference	Grid Reference	Period	Description	No. on Fig 11.1 (ES Vol.2)
1614	TA 1608 1662	Bronze Age; Roman	Cropmarks consisting of a linear feature and enclosure, with a Bronze Age flint knife and Roman grey ware pottery discovered within.	A1
1630	TA 165 178	Roman	Roman greyware sherds dated to the 3rd-4th century AD were found at a site to the east of the Lindsey oil refinery.	A2
4635	TA 164 176	Unknown	A linear and series of circular and sub-circular features cropmark site east of the Lindsey oil refinery.	A3
19726	TA 1685 1791	Prehistoric	Late Mesolithic core and three flakes, two of which are likely of Bronze Age date. These were found near Killingholme Marshes.	A4
19727	TA 168 182	Prehistoric	A scatter of Neolithic artefacts, including a scraper, two cores and nine flakes. Found to the north of station road.	A5
19771	TA 167 171	Iron Age/ Roman	An Iron Age and Roman settlement site on the site of Conoco CHP plant. There appeared to be an early Iron Age settlement on the site, followed by a late Iron Age/ Roman settlement. Most of the pottery found dates from the 2nd-4th centuries AD. There was also evidence of both iron and salt production in the Iron Age at the site from briquetage fragments of ceramic trays.	A6
19803	TA 1638 1847	Prehistoric	A single flint flake, dated to Mesolithic/Neolithic was found to the east of Rosper Road.	A7
19806	TA 1666 1823	Roman	A single greyware sherd found to the north of Station Road.	A8
19807	TA 1672 1796	Roman	A single greyware sherd found to the south of Station Road.	A9
20078	TA 161 167	Iron Age/ Roman	A cropmark of a rectilinear enclosure, measuring c.30m by 20m, and a small L-shaped feature was recorded on 1958 aerial photos. It has been partially or totally destroyed by the construction of the oil refinery at South Killingholme.	A10
20098	TA 15 18	Medieval	Medieval ridge and furrow recorded through geophysical and walkover surveys. The ridge and furrow system measured 122m aligned north-east to south-west.	A11
20103	TA 1674 1754	Modern	A linear anomaly recorded on geophysical survey, identified as a modern survey trench during evaluation.	A12
20104	TA 159 166	Medieval	North south oriented ridge and furrow, located to the west of Rosper Road, detected by geophysical survey.	A13
20121	TA 16505 17943	Medieval	A hedgerow which forms the parish boundary between North and South Killingholme. It is shown on enclosure maps.	A14
20124	TA 1655 1759	Iron Age; Unknown	Cropmark ditches and sub-circular features were recorded on aerial photographs. One of the sites identified Iron Age ditches but the others found no traces of archaeological features.	A15

Reference	Grid Reference	Period	Description	No. on Fig 11.1 (ES Vol.2)
20141	TA 17 17	Unknown	A system of creeks was detected by geophysical surveys and the deposits were thought to represent a former shoreline.	A16
20422	TA 166 176	Iron Age	A ditch running parallel to Rosper Road for over 400m recorded in 9 trial trenches. A small drainage or boundary features was also identified on the site with nine sherds of early-middle Iron Age pottery.	A17
20423	TA 1653 1776	Roman	Eight sherds of Roman greyware pottery, found in an un-stratified context on land west of Rosper Road.	A18
20424	TA 1657 1733	Medieval	A ditch containing a 13-15th century Toynton ware pottery sherd was found to the west of Rosper Road. The ditch was 1m wide by 0.15m deep and aligned north west-south east.	A19
20569	TA 16 18	Post-medieval	Historically important hedgerows in North Killingholme Parish. The boundaries shown on maps are pre 1840.	A20
20570	TA 17 17	Post-medieval	Historically important hedgerows in South Killingholme Parish. The boundaries shown on maps are pre 1840.	A21
20789	TA 1737 1781	Unknown	An ovoid enclosure with a double ditch trackway to the east. The enclosure measures approximately 94 by 42m and the trackway varies in width from 7m to 10m. Geophysical survey on the site did not detect either of these.	A22
21101	TA 1684 1698	Post-medieval	Cropmark of a field boundary visible on aerial photography. It measures approximately 83m, and shown on 1st edition OS map, 1887.	A23
21225	TA 1724 1821	Modern	The site of a barrage balloon anchorage, operated by 942 Squadron Balloon Command during WWII. Two shelters remain and have both been modified for use as cattle byre, and main and secondary anchorages are still in place.	A24
21315	TA 1714 1685	Unknown	An L shaped magnetic anomaly was identified by geophysical survey, although trial trenching revealed only natural deposits.	A25
21321	TA 1683 1703	Unknown	A small square enclosure visible as a cropmark on aerial photography. The site is now masked by the southern edge of the Immingham CHP plant.	A26
21322	TA 173 170	Modern	World War II Aircraft obstructions. These were shown through a T-shaped arrangement of ditches visible on wartime aerial photography. Four further sections of ditch were located to the east of Rosper Road.	A27
21323	TA 1744 1737	Modern	The site of a row of c.16 terraced houses was built on the south side of Marsh Lane in the early 20th century. They had been demolished by 1975.	A28
21324	TA 1763 1750	Post-medieval	Site of Marsh Farm, shown on 1887 OS map, recorded as a group of four buildings. The farm is shown on mapping up to 1983. Aerial photography in 2009 records a parchmark in the grass showing the outline of one of the farm buildings.	A29
21326	TA 148 169	Modern	The Humber Commercial Railway, constructed in 1912 to link the eastern jetty at Immingham Dock with the main Grimsby-New Holland line at Ulceby.	A30
21544	TA 169 170	Prehistoric	A scatter of flint was found during field walking, west of Rosper Road. A total of 223 pieces of flint were found, mostly undiagnostic flakes and chunks. There was also a bladelet was late Mesolithic and a bladelike flake was late Mesolithic or early Neolithic, two possibly Neolithic cores, and a single Bronze Age scraper. Further worked flints found during excavation.	A31
21553	TA 1745 1678	Prehistoric	A deposit of burnt stone and charcoal flakes, radiocarbon dated to the Late Bronze Age. The feature was curvilinear and 0.02m deep.	A32

Reference	Grid Reference	Period	Description	No. on Fig 11.1 (ES Vol.2)
21554	TA 1741 1682	Prehistoric	A probable ditch recorded during evaluation, charcoal was recorded from within the feature and radiocarbon dated to the early Bronze Age.	A33
21556	TA 1750 1676	Iron Age/ Roman	An Iron Age/ Roman settlement, located to the north of Humber Road on the edge of the Humber estuary. Evidence of salt making and iron smelting may have been occurring near the settlement.	A34
21567	TA 167 183	Iron Age/ Roman	An Iron Age/ Roman settlement recorded through geophysical survey, north of Station Road. 112 sherds of Roman pottery and 5 fragments of tile were collected during field walking and trial trenching. A number of ditches and enclosures were identified, several of the latter with possible hearths or kilns. Finds from the site include a copper alloy armlet, a coin, as well as plant and animal remains.	A35
21568	TA 1698 1830	Roman	Geophysical survey recorded a possible enclosure, north of Station Road. Two substantial ditches were recorded, one containing early Roman pottery.	A36
21569	TA 1702 1785	Iron Age/ Roman	Iron Age and Roman enclosures, to the south of Station Road, identified through geophysical survey. Trial trenches recorded ditches, mid-late Iron Age pottery and 1st-2nd century Roman pottery.	A37
21570	TA 1729 1826	Unknown	A geophysical survey recorded magnetic anomalies in a field to the south of Station Road. Trial trenching only revealed natural deposits.	A38
21571	TA 1745 1802	Prehistoric; Roman	An undated pit identified during excavations to the south of Station Road. Its fill consisted of a late Neolithic or Early Bronze Age flint scraper and a single Roman sherd.	A39
21553	TA 1745 1678	Prehistoric	A deposit of burnt stone and charcoal flakes, radiocarbon dated to the Late Bronze Age. The feature was curvilinear and 0.02m deep.	A32
21554	TA 1741 1682	Prehistoric	A probable ditch recorded during evaluation, charcoal was recorded from within the feature and radiocarbon dated to the early Bronze Age.	A33
21556	TA 1750 1676	Iron Age/ Roman	An Iron Age/ Roman settlement, located to the north of Humber Road on the edge of the Humber estuary. Evidence of salt making and iron smelting may have been occurring near the settlement.	A34
21567	TA 167 183	Iron Age/ Roman	An Iron Age/ Roman settlement recorded through geophysical survey, north of Station Road. 112 sherds of Roman pottery and 5 fragments of tile were collected during field walking and trial trenching. A number of ditches and enclosures were identified, several of the latter with possible hearths or kilns. Finds from the site include a copper alloy armlet, a coin, as well as plant and animal remains.	A35
21568	TA 1698 1830	Roman	Geophysical survey recorded a possible enclosure, north of Station Road. Two substantial ditches were recorded, one containing early Roman pottery.	A36
21569	TA 1702 1785	Iron Age/ Roman	Iron Age and Roman enclosures, to the south of Station Road, identified through geophysical survey. Trial trenches recorded ditches, mid-late Iron Age pottery and 1st-2nd century Roman pottery.	A37
21570	TA 1729 1826	Unknown	A geophysical survey recorded magnetic anomalies in a field to the south of Station Road. Trial trenching only revealed natural deposits.	A38
21571	TA 1745 1802	Prehistoric; Roman	An undated pit identified during excavations to the south of Station Road. Its fill consisted of a late Neolithic or Early Bronze Age flint scraper and a single Roman sherd.	A39

Reference	Grid Reference	Period	Description	No. on Fig 11.1 (ES Vol.2)
21959	TA 143 189	Modern	The Barton and Immingham Light Railway opened in 1910-1911. The passenger service ran until 1963, although the section between Immingham and Killingholme was still used for oil traffic.	A40
22428	TA 1708 1678	Iron Age	Two late Iron Age ditches, to the west of Rosper Road. Both ditches contained Iron Age pottery These may have been part of an occupied enclosure.	A41
22487	TA 164 179	Neolithic	A fragment of Neolithic polished stone axe was found at Burkinshaw's Covert.	A42
22497	TA 1716 1702	Modern	Site of a mission room, shown on the OS 1945 map. The building was L shaped and is shown set back from the road approximately 13m. The building originally contained a stable and a vestry was added in 1923. The building contained a date stone of 1910.	A43
22489	TA 1722 1691	Modern	Site of a day school and associated school house, shown on the OS 1945 map. It is roughly rectangular with the school house situated to the NE.	A44
22499	TA 1715 1704	Modern	Site of Myrtle Villas House, located on the east side of Rosper Road. Consisted of a rectangular building with an outbuilding to the NE, shown on OS 1945 map.	A45
22569	TA 1737 1829	Modern	Killingholme Railway Station on the Barton and Immingham Light Railway, opened in 1910 and closed in 1965.	A46
22570	TA 173 183	Modern	The former station master's house, Station Road, near the site of Killingholme railway station shown on the post 1945 OS maps.	A47
22737	TA 165 183	Prehistoric	Seven pieces of Neolithic-Bronze Age worked flint were collected in two adjoining fields during field walking. Six of these were struck flints and one was a flint nodule with some flake removal.	A48
22743	TA 1701 1740	Roman	A group of later Roman ditches, north of Marsh Lane was recorded during trial excavations. The fill contained 4th century pottery.	A49
22851	TA 1780 1763	Mesolithic	A thin deposit of peat was recorded within a borehole at Marsh Lane. Organic samples were dated to 4651-4451 Cal BC.	A50
24999	TA 1587 1810	Post-medieval	The site of an unnamed 19th century farmstead, North Killingholme, with a regular courtyard of U plan. It was later demolished.	A51
25000	TA 1594 1749	Post-medieval	Site of Cawber Farm, South Killingholme, a 19th century farmstead. It consisted of a regular courtyard with multiple regular yards and the farmhouse is attached to a range of working buildings. Now demolished.	A52
25012	TA 1760 1748	Post-medieval	Site of Marsh Farm, South Killingholme, a 19th century farmstead. It consisted of a regular courtyard of L plan; the farmhouse is detached from the main working complex. Now demolished.	A53
25013	TA 1687 1745	Post-medieval	Site of an unnamed 19th century farmstead, South Killingholme. It comprised a regular courtyard with linked working buildings to all four sides of the yard with the farmhouse detached from the main working complex. Now demolished.	A54
25014	TA 1673 1768	Post-medieval	Site of an unnamed 19th century farm, Killingholme. It was of regular courtyard of U shaped plan, and has now been demolished.	A55
25015	TA 1594 1801	Post-medieval	Site of Woodlands, North Killingholme, a 19th century farmstead. The farmhouse had an attached range of working buildings, and is now demolished.	A56

Reference	Grid Reference	Period	Description	No. on Fig 11.1 (ES Vol.2)
26104	TA 1701 1714	Modern	Site of a chapel, shown on the OS 1945 map. It was in use in the 20th century, forming part of the former settlement of South Killingholme haven. Now demolished.	A57
26105	TA 1623 1639	Post-medieval	The site of a former 19th century farmstead, South Killingholme. It was shown on the 1887 OS map, and is now demolished.	A58

Appendix 11B – Designated Assets within 3km of Site

Table 11B Designated Assets within 3km of site

List Entry Number	Name of Asset	Type of Asset	Significance (Heritage Value)	Description	Setting
1008044	Manor Farm Moated Site, North Killingholme	Scheduled Monument	High	The scheduled monument at Manor Farm includes two moated sites, a smaller one located in the north-western corner of the larger one, and other associated features. The original function of Manor Farm would have been as a high status domestic dwelling and a potential administrative centre surrounded by a moat.	The Manor Farm moated site is viewed in context with the Manor Farm complex which comprises of a house, stables and granaries. The site is partially surrounded by hedgerows and trees with an open aspect to the south and views towards the existing industrial development in the east.
1007813	Moated Site and associated earthworks at Baysgarth Farm	Scheduled Monument	High	The site includes a large sub-rectangular moat with a second smaller moated enclosure and earthwork features. Modern farming and installation of drains have caused damage to part of the moat. From East Halton Road/Townside, the site appears as an open field with earthworks. It is used for grazing.	A hedgerow separates the moated site from East Halton Road/Townside. To the north, there is another hedgerow and buildings which face onto Townside and Scrub Lane to the north. The eastern boundary of the moated site is also defined by a hedgerow. The setting of Baysgarth is considered to be limited to the surrounding site due to the enclosed situation of the site.
1007815	North Garth moated site and associated enclosures	Scheduled Monument	High	Moated site which comprises of a series of dry ditches enclosing a moated site and enclosures. The northern moat has been affected by a modern road.	The scheduled monument is bounded by tall hedgerows which result in a sense of enclosure. There are buildings and trees to the east and woodland to the north-east. Due to the enclosed site, the setting is considered to be its immediate surroundings with limited views to the adjacent countryside.
1310011	Church of St. Andrew, Immingham	Grade I Listed Building	High	The parish church dates from the 11th century. The clerestory and tower have been constructed from limestone ashlar with sandstone rubble, squared masonry and coursed limestone being used for the construction of the transept aisles, and chancel. The roof is of Welsh slate to the chancel and transept aisles with copper sheeting to the nave. The 3-stage tower is situated to the west end of the church and crenelated with crocheted pinnacles The arched south door incorporates a dogtooth hood mould, a style relating to the Norman period of architecture.	The setting of the church is the town of Immingham which is situated to the south. As the village developed into a town and prospered so did the church through the addition of a tower, making the church more visible in the landscape. The church has a link with St Denys Church, North Killingholme; the residents of Immingham assisted with the building of St. Denys but the residents of North Killingholme did not reciprocate the Christian gesture, therefore a gargoyle on top of the tower facing towards North Killingholme.

List Entry Number	Name of Asset	Type of Asset	Significance (Heritage Value)	Description	Setting
1103701	Church of St Denys, North Killingholme	Grade I Listed Building	High	The tower is constructed from ashlar faced limestone and sandstone with brick and rubble buttresses. The tower is topped with four crocheted pinnacles. The south porch is constructed from ashlar limestone and sandstone blocks with the upper section being constructed from red brick, suggesting the porch was altered during the 18th century. The south side of the chancel retains a semi-circular Norman doorway and two Norman windows to the east end. The roofs are covered with slate.	The church is set in its own grounds surrounded by open agricultural farmland to the west and north while to the east and south modern housing developments have enclosed the setting of the church. The context of the setting for the church is the villages of North and South Killingholme.
1103729	Church of St Peter, East Halton	Grade I Listed Building	High	The chancel dates from the 13th century and the remainder of the church is 14th century. The 2-stage tower is constructed from sandstone and limestone ashlar, the chancel; nave and transom aisles are constructed from sandstone, limestone, chalk, and flint At the east end of the chancel, 3 Norman styled windows of differing widths have been inserted.	The church is set in its own grounds surrounded by dwellings. To the east and south there are modern housing developments which have resulted in an enclosed setting for the church. Its setting is considered to be the churchyard and the surrounding village of North Killingholme. There are existing views of the tall chimneys, cranes and pylons of the oil refinery and Immingham Docks to the east.
1346854	Manor Farmhouse	Grade II* Listed Building	High	Dating from the 16th century, the property is two storeys with an attic and is five bays wide. It is built of brick with a pantile roof.	The building is located within the manor farm moated site which is a scheduled monument. Its setting is considered to be the surrounding grounds including the moated site, associated stables and granaries. There are existing views of the tall chimneys and pylons of the oil refinery to the south-east.
1161630	Churchfield Manor	Grade II Listed Building	Medium	Two storey brick house with pitched roof covered in pantiles. Frontage faces south towards Church Lane.	Set to the northern limit of Immingham, Churchfield Manor is located within a group of buildings off Church Lane, it is on the outskirts of Immingham and has a relatively rural setting with a golf range to the west and open fields to the north and east which forms its setting. There are existing glimpses of the oil refinery to the north but a limited by the hedge and trees to the rear of the building.
1214966	The Old Vicarage	Grade II Listed Building	Medium	Two storey house built from yellow brick and a slate hipped roof. Former vicarage. Its significance lies in its historical relationship to St. Denys Church to the north and its historic and aesthetic interest.	Located to within the village of North Killingholme, it is situated on a spacious plot with dwellings to the east and west. The main part of the village is built to the north-west. Its setting is considered to be its immediate curtilage. Due to the built up surroundings, this reduces the views towards the oil refinery.

List Entry Number	Name of Asset	Type of Asset	Significance (Heritage Value)	Description	Setting
1214980	Stables/Granary 50m east of Manor Farmhouse	Grade II Listed Building	Medium	Dating to the middle of the 18th century, the brick structures are two storeys in height. Significance lies in its relationship with the buildings on the manor farm complex.	Associated with the Grade II* Manor Farmhouse and scheduled moated site. Its setting is considered to be the moated site. There are existing views of the tall chimneys and pylons of the oil refinery to the south-east.
1346858	Baptist Chapel, Baptist Chapel Lane, South Killingholme	Grade II Listed Building	Medium	Dated 1792, small structure built from brick with pantile roof. Alterations carried out in the 19th and 20th centuries. Site is enclosed and surrounded by tall trees.	It is located in the southern end of South Killingholme. Relatively isolated from the main settlement, its setting is considered to be its grounds and the farmland to the south. It is viewed in context with the properties to the north and east. There are existing views towards the oil refinery in the north-east but are limited due to the existing dense trees and built forms around the chapel.
1103707	Killingholme North Low Lighthouse	Grade II Listed Building	Medium	Built in 1851 by William Foale and comprises of a lighthouse and adjoining lighthouse keeper's cottage. Most northern lighthouse within the group of three lighthouses and only one with its adjacent lightkeeper's cottage. Four storeys, constructed from brick, rendered and whitewashed. Splayed tower and roof with ribbed dome and scalloped eaves. The adjacent house is to the south and of two storeys in whitewashed brick. The significance of the lighthouse is enhanced when viewed as a group of three lighthouses. Individually it is of architectural and historic interest; however, their significance is increased by their group value. The function of the lighthouse, alongside its counterparts, was to direct traffic using the estuary, to the north of the Humber. As such they represented significant landmark structures, enhanced by the low lying landscape.	The setting of this lighthouse is considered to be its relationship with the estuary and the neighbouring lighthouses. Its visibility within the landscape contributes to its significance. There are existing views of the oil refinery to the west and Immingham Docks to the south. The extent of modern industrial development within the setting means that its visibility from inland is restricted and limited to Rosper Road. From Rosper Road, the lighthouse is visible and is viewed within its industrial surroundings.
1103706	Killingholme High Lighthouse	Grade II Listed Building	Medium	Established 1831 and rebuilt in 1876 after the original was struck by lightning. It is built of brick and render, 6 storeys and 30 metres tall. It has a projecting balcony to the top floor with iron railings. The roof is a ribbed dome with scalloped eaves. The original function of the lighthouse was to direct boats using the Humber estuary. As such it is a significant landmark feature. The lighthouse is of architectural and historic interest and its significance is increased when viewed as a group with the other two listed lighthouses.	The lighthouse is a navigational aid on the Humber. It is viewed in context with two other lighthouses, the estuary and the surrounding industrial development. The modern industrial development to the south and west form part of the setting of the asset and the extent of this modern development limits the visibility of the lighthouses from inland to the west. There are views of the asset from Rosper Road. From the edge of the Humber, the view of the lighthouse is dominant and stands out from the industrial landscape of the oil refinery and Immingham Docks to the south

List Entry Number	Name of Asset	Type of Asset	Significance (Heritage Value)	Description	Setting
1161628	Cross base located 8m south of Church of St Andrew	Grade II Listed Building	Medium	Medieval cross base built from limestone. Reset on a late 18th century brick base.	Its setting is the church yard and Church to the north. It is viewed in context with the church and surrounding dwellings.
1215113	The Nook, School Road, South Killingholme	Grade II Listed Building	Medium	17th century house, timber framed with brick infill as well as areas of mud and stud. Central lobby entry. Its interest lies in the retention of historic fabric.	Located within South Killingholme, the setting of this listed building is considered to be the urban setting and surrounding streetscape. The structure is viewed in context with the structures which surround it.
1215093	Killingholme South Low Lighthouse	Grade II Listed Building	Medium	Killingholme South Low Lighthouse was built in 1836, it is 4 storeys in height and constructed of brick which has been rendered and coloured. To the top floor there is a projecting balcony, The roof is domed. The windows face towards the estuary. The chimney is the only remains of the lightkeeper's cottage which was located at the base of the lighthouse. The lighthouse is of architectural and historic interest and its significance is increased when viewed as a group with the other two listed lighthouses.	Killingholme South Low Lighthouse is viewed in context with its neighbouring lighthouse, Killingholme High Lighthouse. They are both still used as visual guides for boats on the Humber. Its setting is defined by its relationship with the other lighthouses and the estuary. There are existing views of the oil refinery to the west and Immingham Docks to the south. There are limited views of the lighthouse from inland due to the existing industrial developments, it is predominantly viewed from Rosper Road and from the estuary.
1161631	Belmont Cottage, 21 Church Lane, Immingham	Grade II Listed Building	Medium	19th century house, single storey with attic, built from yellow red brick with a pantile roof.	Viewed in context with neighbouring properties and church to the north. Its setting is urban and it contributes to the streetscape. There are existing views of the oil refinery to the north.

Appendix 11C – Archaeology Watching Brief Report

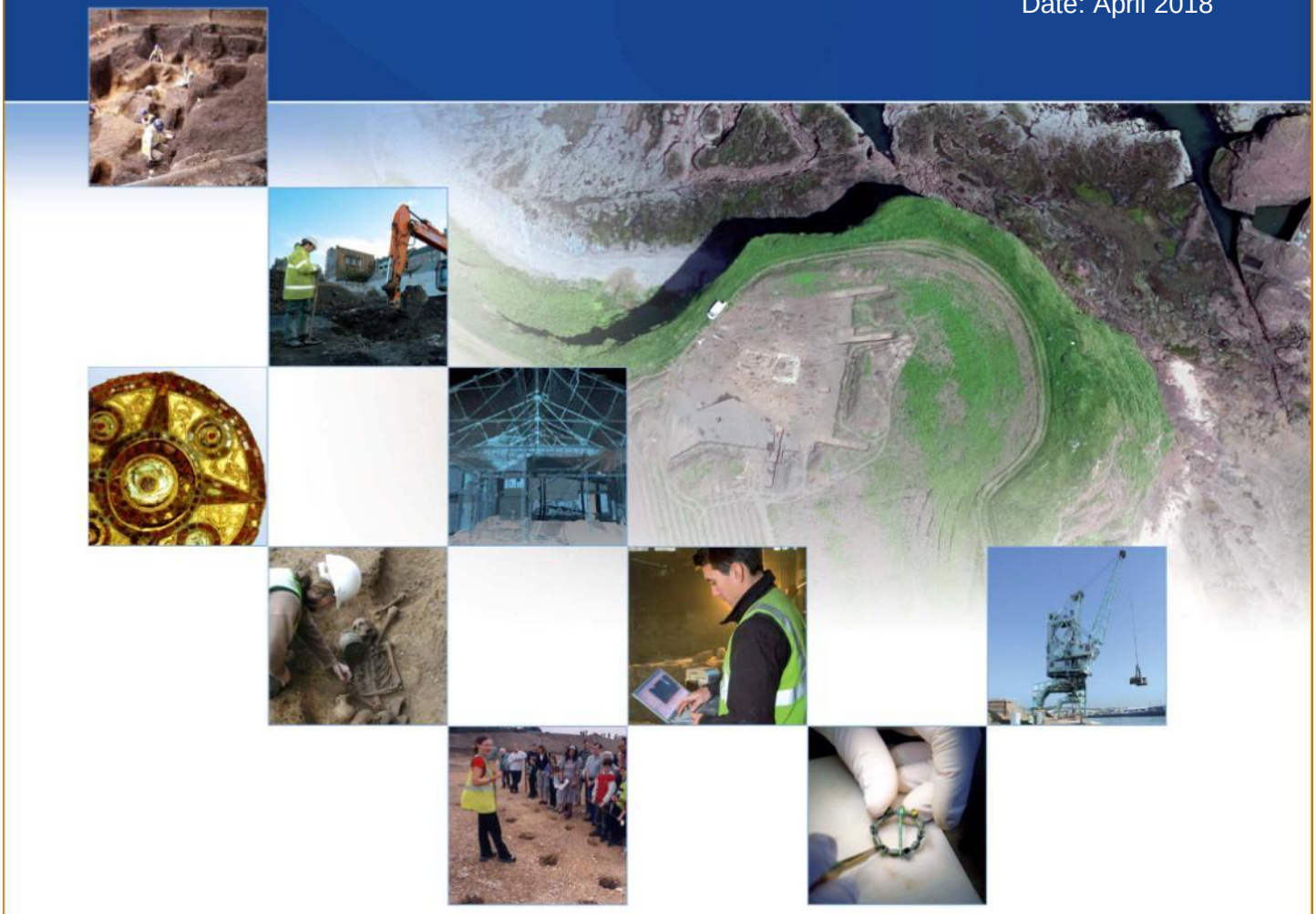
VPI Immingham Power Station
North Lincolnshire

Archaeological Watching Brief Report

National Grid Reference Number: TA 16678 17462

AOC Project No: 51938

Date: April 2018



AOC Archaeology Group

ARCHAEOLOGY | HERITAGE | CONSERVATION

VPI Immingham Power Station, North Lincolnshire
Archaeological Watching Brief Report

On Behalf of:	**AECOM infrastructure & Environment UK** **5th Floor** **2 City Walk** **Leeds** **LS11 9AR**
Principal Contractor:	**Socotec**
National Grid References (NGR):	**TA 16678 17462**
AOC Project No:	**51938**
Fieldwork by:	**George Beardow**
Date of fieldwork:	**05 April to 12 April 2018**
Prepared by:	**George Beardow and Stephen Potten**
Illustrations by:	**Stephen Potten**
Date:	**April 2018**

This document has been prepared in accordance with AOC standard operating procedures.

Author: George Beardow and Stephen Potten	**Date: April 2018**
Approved by: Stephen Potten	**Date: April 2018**
Draft Report Stage: First draft	**Date: April 2018**

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Non-Technical Summary

AOC Archaeology Group was commissioned by AECOM to undertake a watching brief at VPI Immingham, Rosper Road, North Lincolnshire, during intrusive Ground Investigation (GI) works. The monitored GI works comprised the excavation of ten test pits, three trial trenches, two access trackways and hand-excavated interventions prior to borehole drilling. No archaeological features, deposits or structures were encountered, but a number of field drains were noted. Natural subsoil was present at the bases of trenches sealed by deposits of made ground or topsoil.

1 Introduction

1.1 AOC Archaeology Group was commissioned by AECOM Infrastructure & Environment to undertake an archaeological watching brief at VPI Immingham during GI works ahead of the proposed construction of a new power station immediately to the north of the VPI power station. The watching brief monitored the excavation of ten test pits, three trial trenches, two access trackways, eight window samples and hand-excavated interventions prior to borehole drilling.

1.2 The archaeological watching brief was undertaken in accordance with a Written Scheme of Investigation (WSI) produced by AECOM (AECOM 2018). The work also met the requirements of nationally recognised guidance for archaeological excavations, including the professional standards published by the Chartered Institute for Archaeologists (specifically, the *Standard and Guidance for an Archaeological Watching Brief* (CIfA, 2014a)).

1.3 The archaeological watching brief was managed to the standards laid down in the Historic England guideline publication *Management of Research Projects in the Historic Environment (MoRPHE): Project Managers Guide* (2006a), and the *MoRPHE: Project Planning Note 3: Archaeological Excavation (PPN3)* (2008). It also met the requirements of the National Planning Policy Framework (NPPF; Chapter 12: 'Conserving and enhancing the historic environment'; DCLG 2012).

2 Site Location and Description

2.1 The site is located immediately to the north of the VPI Power Station and east of the Lindsey Oil Refinery in North Killingholme, Lincolnshire (Figures 1 and 2). The site comprises an undeveloped parcel of land approximately 8.5 ha in size. Immediately to the north of the site is a car park and a number of single storey structures associated with access to the Lindsey Oil Refinery. The site is currently wasteland covered with rough scrub, shrubs and grass, and it contains areas where material from elsewhere has been dumped. It is centred at NGR: TA 16678 17462.

2.2 The bedrock geology within the site comprises the Burnham Chalk Foundation (BGS 2018). The superficial deposits comprise Devensian Till (Diamicton) and Tidal Flat Deposits (BGS 2018).

3 Archaeological and Historical Background

3.1 An archaeological desk-based assessment of the proposed development site and a 1km study area around it is currently being produced. The following information is derived from that study, as outlined in the WSI (AECOM 2018).

Early Prehistoric (10,000 BC to 800 BC)

3.2 The earliest recorded evidence from the study area dates from the Mesolithic period and consists of various flint artefacts and organic remains preserved in peat deposits. Further flint artefacts have been recorded from the Neolithic and Bronze Age periods, as well as features from these periods including two ditches with charcoal evidence and cropmarks of a linear feature and enclosure.

Iron Age and Roman (800 BC to AD 410)

3.3 There is evidence for a developed Iron Age and Roman landscape in the area, a range of assets having been recorded in the locality including settlement evidence and individual finds. Three settlements from these periods have been identified in the study area. These are located on the site of the Conoco CHP plant, to the north of Station Road, and to the north of Humber Road.

3.4 Further evidence from the Iron Age/Roman periods comprises cropmark evidence for Iron Age ditches and sub-rectangular features, finds of Roman grey ware pottery sherds and two ditches associated with a possible enclosure and 4th century pottery.

Early Medieval – Medieval (AD 410 to 1500)

3.5 While there are no assets of early medieval (AD410-1066) date recorded within the study area, there are four of medieval (AD1066-1500) date. These comprise evidence of agricultural activity and include ridge and furrow features, a hedgerow recorded on enclosure maps and a ditch. A shallow ditch containing a sherd of late medieval pottery was found during the evaluation within the site boundary.

Post-Medieval (AD 1500 to 1900)

3.6 There are 11 assets of post-medieval date recorded within the study area. There are two historically important hedgerows in North and South Killingholme, thought to pre-date 1840, and a cropmark representing a previous field boundary which was shown on the 1887 Ordnance Survey map. The remaining eight assets are sites of 19th century farmsteads that were also recorded on the 1887 Ordnance Survey map. Most of the farmsteads comprise a regular courtyard with associated outbuildings and are now demolished.

Modern (AD 1900 to present)

3.7 There are 12 assets of modern date recorded within the study area. These mostly consist of assets recorded on previous Ordnance Survey maps, and assets associated with the railways. There are also two assets relating to the Second World War: the site of a barrage balloon anchorage and aircraft obstructions which are recorded on wartime aerial photography.

Previous archaeological investigations

3.8 The area of the proposed development has previously been investigated by a program of trial trenching. The subsequent report (APS 2006) records the features identified as part of an Iron Age field system truncated by later field boundaries and drains of modern date. The proposed development site formed the southern end of the area subject to trial trenching, eleven full trenches and two part trenches having been located within the current site boundary. A number of these were devoid of archaeological features (TR29, TR31, TR 38-TR40).

3.9 Trenches 17, 30 and 61 contained modern linear features identified as land drains or small field boundaries. Modern CBM was recovered from the fill of the linear feature in TR30. TR61 also contained a shallow NW-SE aligned ditch which contained a single sherd of late medieval pottery in its fill. This feature was interpreted as a possible precursor to the modern system of land drainage or a small field boundary. Trench 54 contained a small north-south aligned linear feature that did not contain any finds. It was interpreted as a small drainage or field boundary.

3.10 Trench 28 contained a large linear ditch, aligned NW-SE, with an irregular profile. A second ditch was identified as a recut of the first. The largest number of pottery sherds recovered during the evaluation came from these two ditches. The report suggests that this was due to their proximity to the identified Iron Age settlement to the south of the development area. The sherds were of early or middle Iron Age date. Trench 55 was excavated to establish the trajectory of these ditches, both of which continued on their alignments.

3.11 The report concluded that *"The investigations revealed evidence of Iron Age cultivation of the area. This evidence was concentrated towards the north-west of the* [area subject to trial trenching and outside of the red line boundary] *and was probably the remains of a field drainage system."*

4 Aims and Objectives

4.1 The aim of the archaeological evaluation was to gather sufficient information to establish the presence/absence, character, extent, state of preservation and date of any archaeological remains within the areas to be impacted by the development.

4.2 The specific objectives of the archaeological fieldwork were to:

- Locate, record, characterise, and determine the extent of any surviving sub-surface archaeological remains
- Excavate and record identified archaeological features and deposits to a level appropriate to their extent and significance
- Report the results of the fieldwork and place them within their local and national context
- Produce a comprehensive site archive and a descriptive and interpretive report

4.3 The work was intended to mitigate the destruction of any buried archaeological remains that were revealed or disturbed through preservation by record.

5 Methodology

5.1 The trial pits and trenches were excavated by the Principal / GI Contractor using an appropriate mechanical excavator. Excavation was undertaken with a smooth toothless ditching bucket under direct archaeological supervision, in level spits, until either the top of the first archaeological horizon or undisturbed natural deposits were encountered (the top of the sterile non-alluvial natural geological deposits).

5.2 The GI works methodology allowed for trial pits to be widened to 1m if archaeological deposits or features were encountered, to allow the resulting surface to be inspected and cleaned, if necessary, practicable and safe to do so.

5.3 Archaeological recording, where not precluded by health and safety considerations, and only where required, consisted of:

- Limited hand cleaning of archaeological sections and surfaces sufficient to establish the stratigraphic sequence exposed;
- The collection of dating evidence from *in situ* deposits and visual scanning of spoil heaps for dateable artefacts;
- A scaled drawn record of representative exposed sections and surfaces;
- Photographs of exposed deposits within the trial pits, with an appropriate scale, and sufficient further photographs to establish the setting of the groundworks undertaken; and
- A record of the datum (either aOD or m b.g.l.) levels of the archaeological deposits.

5.4 The Principal / GI Contractor was required to allow the archaeologist a reasonable amount of time to undertake any inspection or recording as required. However, the primary aim of the monitoring was to record the location of archaeological remains and to allow the test pit to be extended in order to avoid the remains whilst still allowing the geotechnical investigation to continue. Provision was made for excavation of features, where practicable and safe to do so, if it proved impossible to avoid them by extending the excavation area. Any excavation was to be limited to sufficient samples of the features to understand the sequence of deposition. This would include a minimum of 20% of any linear features

and 25% of discrete features, such as post-holes or pits, subject to access. All archaeological recording was restricted to the limits of the trial pit.

5.5 Provision was made to relocate trial pits if significant archaeological remains were discovered, subject to liaison with the Historic Environment Officer for North Lincolnshire.

5.6 Where no archaeological remains were encountered, a photographic record was taken of the trial pit and a written description with sketch section produced.

Variations to the methodology

5.7 With the agreement of AECOM, and following widespread negative results at the site, the observation of window samples WS09 and WS10, and boreholes BH04 and BH05, was abandoned.

6 Results

Natural deposits

Natural subsoil was encountered in Test Pits 1-10, Trenches 1-3, Trackway 1, Window Samples WS02, WS04 and WS08, and Borehole BH06. It varied in nature across the site, comprising deposits of greyish/yellowish brown clay, reddish brown clay and gravel, and yellowish brown coarse sand and gravels.

Test Pit 1

6.1 The natural (context 1004) was encountered at 1.6m below current ground level (see Figure 3 for schematic sections of Test Pits 1-10). It was sealed by a deposit of black silty clay that was heavily contaminated with oil (context 1003; 0.7m deep). Deposit (1003) was sealed by a made ground layer of yellowish brown silty clay containing occasional stones (context 1002; 0.6m deep). The made ground was sealed by 0.3m of modern hardcore (context 1001). No archaeological features were encountered.

Test Pit 2

6.2 The natural (context 2003) was encountered at 0.9m below current ground level. In this test pit the natural subsoil was subdivided into three distinct units. At 0.9m below ground level it comprised yellowish brown sandy clay and gravel (context 2001); below this lay mottled greyish brown clay and gravel (context 2004; 2m deep), and below this lay coarse, yellow/grey sand and gravels (context 2005; 1m+ deep).

6.3 The uppermost unit of natural subsoil was sealed by a deposit of black silty clay that was heavily contaminated with oil (context 2002; 0.4m deep). This, in turn, was sealed by 0.5m of modern hardcore (context 2001). No archaeological features were encountered.

Test Pit 3

6.4 The natural (context 3003) was encountered at 0.8m below current ground level. It was subdivided into three distinct units. At 0.8m below ground level it comprised mottled bluish grey and brown clay and gravel (context 3003; 2.2m deep); below this lay reddish brown clay (context 3004; 0.8m deep), and below this lay coarse, yellowish grey sand and gravel (context 3005; 0.7m+ deep).

6.5 The uppermost unit of natural subsoil was sealed by a deposit of yellowish brown sandy clay which contained gravel (context 3002; 0.5m deep). This deposit is interpreted as a subsoil and was sealed by 0.3m of topsoil. No archaeological features were encountered.

Test Pit 4

6.6 The natural (context 4003) was encountered at 0.8m below current ground level. It was subdivided into three units. At 0.8m below ground level it comprised mottled bluish grey and brown clay and gravel (context 4003; 2m deep); below this lay reddish brown clay (context 4004; 0.6m deep), and below this lay coarse, yellowish grey sand and gravel (context 4005; 1m+ deep).

6.7 The uppermost unit of natural subsoil was sealed by a deposit of yellowish brown sandy clay which contained gravel (context 4002; 0.4m deep). This deposit is interpreted as a subsoil and was sealed by 0.4m of topsoil. No archaeological features were encountered.

Test Pit 5

6.8 The natural (context 5003) was encountered at 0.6m below current ground level. It was subdivided into two units: at 0.6m below ground level it comprised mottled bluish grey and brown clay (context 5003; 1.9m deep) and below this lay coarse, yellowish grey sand and gravel (context 5004; 0.5m+ deep).

6.9 The uppermost unit of natural subsoil was sealed by a deposit of yellowish brown sandy clay which contained gravel (context 5002; 0.4m deep). This deposit is interpreted as a subsoil and was sealed by 0.2m of topsoil. No archaeological features were encountered.

Test Pit 6

6.10 The natural (context 6004) was encountered at 1m below current ground level. It was subdivided into three separate units. At 1m below ground level it comprised yellowish brown sandy clay and gravels (context 6004; 0.9m deep); below this lay mottled bluish grey and clay and gravels (context 6005; 1.8m deep), and below this lay coarse, yellowish grey sand and gravel (context 6006; 0.8m+ deep).

6.11 The uppermost unit of natural subsoil was sealed by a made ground deposit of greyish brown sandy clay which contained fragments of plastic (context 6003; 0.5m deep). This, in turn, was sealed by another deposit of made ground which consisted of greyish brown sandy clay, also with plastic inclusions (context 6002; 0.3m deep). Made ground (6002) was sealed by 0.2m topsoil. A land drain was encountered in this test pit (context 6007).

Test Pit 7

6.12 The natural (context 7003) was encountered at 0.8m below current ground level. It was subdivided into three units. At 0.8m below ground level it comprised mottled bluish grey and brown clay and gravel (context 7003; 2.8m deep); below this lay coarse, yellowish grey sand and gravel (context 7004; 0.5m deep), and below this lay greyish brown clay silt (context 7005; 0.1m+ deep).

6.13 The uppermost unit of natural subsoil was sealed by a deposit of yellowish brown sandy clay which contained gravel (context 7002; 0.5m deep). This deposit is interpreted as a subsoil and was sealed by 0.3m of topsoil. No archaeological features were encountered.

Test Pit 8

6.14 The natural (context 8003) was encountered at 0.6m below current ground level. It was subdivided into four units. At 0.6m below ground level it comprised brown sandy clay and gravel (context 8003; 0.8m deep); below this lay mottled greyish brown clay and gravel (context 8004; 0.9m deep); below this lay reddish brown clay (context 8005; 1.2m deep), and below this lay coarse grey sand and gravel (context 8006; 1m+ deep).

6.15 The uppermost unit of natural subsoil was sealed by a deposit of yellowish brown sandy silty clay which contained gravel (context 8002; 0.4m deep). This deposit is interpreted as a subsoil and was sealed by 0.2m of topsoil. No archaeological features were encountered.

Test Pit 9

6.16 The natural (context 9003) was encountered at 1.2m below current ground level. It was subdivided into two units: at 1.2m below ground level it comprised brown sandy clay and gravel (context 9003; 1.2m deep) and below this lay mottled grey and brown clay and gravel (context 9004; 1.9m+ deep).

6.17 The uppermost unit of natural subsoil was sealed by a deposit of coarse yellow sand and gravel (context 9002; 1m deep). This deposit is interpreted as made ground and it formed a small earthwork in the location of the test pit. It was sealed by 0.2m of topsoil. No archaeological features were encountered.

Test Pit 10

6.18 The natural (context 10002) was encountered at 0.3m below current ground level. It was subdivided into four units. At 0.3m below ground level it comprised mottled yellow, brown and grey sand (context 10002; 0.7m deep); below this lay brown clay which contained flecks of chalk and gravel (context 10003; 2m deep); below this lay reddish brown clay (context 10004; 1m deep), and below this lay grey clay and yellow sand and gravel (context 10005; 0.5m+ deep).

6.19 The uppermost unit of natural subsoil was sealed by a deposit of yellowish brown clay, sand and gravel (context 10001; 0.3m deep). This deposit is interpreted as made ground. No archaeological features were encountered.

Trial Trench 1

6.20 The natural (context TT1003) was encountered at 2.2m below current ground level. It was sealed by a deposit of grey sandy silty clay which is interpreted as a buried topsoil horizon (context TT1002; 0.2m deep). This, in turn, was sealed by a substantial deposit of made ground comprising brown sandy clay which contained chalk fragments (context TT1001; 2m deep). No archaeological features were encountered.

Trial Trench 2

6.21 The natural (context TT2003) was encountered at 3m below current ground level. It was sealed by a deposit of orange and grey sandy clay which contained some organic material (context TT002; 0.3m deep). This is interpreted as a waterlogged buried topsoil horizon. It was sealed by a substantial deposit of made ground comprising orangey brown sandy clay and gravel (context TT2001; 2.7m deep). A land drain was encountered in this trench (context TT2004).

Trial Trench 3

6.22 The natural (context TT3003) was encountered at 2.3m below current ground level. It was sealed by a deposit of grey silty clay which contained some organic material (context TT3002; 0.7m deep). This, in turn, was sealed by a substantial deposit of made ground comprising brown sandy clay (context TT3001; 1.6m deep). No archaeological features were encountered.

Trackway 1

6.23 Trackway 1, which extended for approximately 60m, was only excavated to a depth of 0.2m. This removed overburden (greyish brown sandy clay and vegetation; context ET001) and exposed natural

subsoil (yellowish brown sandy clay and gravel; context ET002). This area flooded rapidly and archaeological visibility was poor. No archaeological features were observed.

Trackway 2

6.24 Trackway 2 was excavated to a depth of approximately 1m. This partially removed a deep deposit of made ground (yellowish brown clay and gravel containing modern detritus; context CT001). No archaeological features were observed.

Window Sample WS01

6.25 Borehole WS01 was excavated to a depth of 1.2m below current ground level. This revealed 0.6m of made ground (brown sandy silt containing modern inclusions; context WS01001) above a second deposit of made ground (greyish brown sandy clay; context WS01002; 0.6m+ deep). No archaeological features were encountered.

Window Sample WS02

6.26 Borehole WS02 was excavated to a depth of 1.2m below current ground level. This revealed 0.5m of topsoil and modern hardcore (context WS01001) above natural subsoil (yellowish brown sandy clay; context WS02002; 0.7m+ deep). No archaeological features were encountered.

Window Sample WS03

6.27 Borehole WS03 was excavated to a depth of 1.2m below current ground level. This revealed three made ground deposits. The uppermost deposit comprised brown sandy silt containing chalk fragments (context WS03001; 0.3m deep); below this lay greyish brown sandy clay containing plastic fragments (context WS03002; 0.5m deep); and below this lay another deposit of greyish brown sandy (context WS03003; 0.4m+ deep). No archaeological features were encountered.

Window Sample WS04

6.28 Borehole WS04 was excavated to a depth of 1.2m below current ground level. This revealed 0.4m of topsoil (context WS04001) above natural subsoil (yellowish brown sandy clay; context WS02002; 0.8m+ deep). No archaeological features were encountered.

Window Sample WS05

6.29 Borehole WS05 was excavated to a depth of 1.2m below current ground level. This revealed 0.4m of topsoil (context WS05001) above a made ground deposit of brown silty sand which contained plastic fragments (context WS05002; 0.8m+ deep). No archaeological features were encountered.

Window Sample WS06

6.30 Borehole WS06 was excavated to a depth of 1.2m below current ground level. This revealed 0.2m of topsoil (context WS06001) above a made ground deposit of yellowish brown sandy clay (context WS06002; 1m+ deep). No archaeological features were encountered.

Window Sample WS07

6.31 Borehole WS07 was excavated to a depth of 1.2m below current ground level. This revealed 0.1m of topsoil (context WS07001) above a deposit of modern hardcore (context WS07002; 1.1m+ deep). No archaeological features were encountered.

Window Sample WS08

6.32 Borehole WS08 was excavated to a depth of 1.2m below current ground level. This revealed 0.2m of topsoil (context WS08001) above natural subsoil (yellowish brown sandy clay; context WS08002; 1m+ deep). No archaeological features were encountered.

Borehole BH01

6.33 Borehole BH01 was excavated to a depth of 1.2m below current ground level. This revealed two made ground deposits. The uppermost deposit comprised a mix of gravel and sand (BH01001; 0.5m deep); below this lay yellowish brown sandy clay (context BH01002; 0.7m+ deep). No archaeological features were encountered.

Borehole BH02

6.34 Borehole BH02 was excavated to a depth of 1.2m below current ground level. This revealed 0.3m of topsoil (context BH02001) above two made ground deposits. The uppermost deposit comprised greyish brown sandy clay (context BH02002; 0.3m deep), and the lower comprised lighter grey/brown sandy clay (context BH02003; 0.6m+ deep). No archaeological features were encountered.

Borehole BH03

6.35 Borehole BH03 was excavated to a depth of 1.2m below current ground level. This revealed 0.2m of topsoil (context BH03001) above a deposit of modern hardcore (context BH03002; 1m+ deep). No archaeological features were encountered.

Borehole BH06

6.36 Borehole BH06 was excavated to a depth of 1.6m below current ground level. This revealed 0.8m of topsoil (context BH06001) above natural subsoil (yellowish brown sandy clay; context BH06002; 0.8m+ deep). No archaeological features were encountered.

7 Conclusion

7.1 No archaeological features or deposits were encountered during the groundworks at the site. In many of the interventions modern made ground deposits were encountered, particularly on the eastern half of the site (see tables below). The excavation of three trial trenches demonstrated that earthwork mounds on the eastern part of the site consisted of deep deposits of relatively recent made ground that lay directly above an earlier topsoil horizon.

7.2 Parts of the proposed development site have clearly been used as storage / dumping areas in the relatively recent past. In some instances, the dumped deposits lay directly above the natural subsoil, suggesting the prior removal of topsoil and possibly other groundworks that will have truncated archaeological remains (Test Pits 6, 9, 10). In other cases, a buried topsoil horizon survived beneath the made ground (Trial Trenches 1, 2 and 3). In Test Pits 1 and 2 it was not possible to determine whether the oil-contaminated deposit that lay between natural and the made ground was a remnant topsoil or a dumped deposit. An apparently undisturbed subsoil/topsoil sequence survived above the natural subsoil in Test Pits 3, 4, 5, 7 and 8, and WS04, WS08 and BH06.

7.3 It should be noted that the interventions at the site were generally small-scale (narrow strip trenches and hand-dug, small-diameter borehole pits) and covered only a small proportion of the site area. Further, the larger-scale interventions (the trackways) were shallow and subject to immediate flooding, limiting archaeological visibility. These factors may, in part, account for the negative results. Indeed,

the presence of archaeological features in the earlier evaluation trenches suggests that the proposed development site has some archaeological potential.

Eastern half of the site	Depth of overburden above natural (b.g.l.)	Notes
TP08	0.6m	No made ground
TP09	1.2m	1m of made ground
TP10	0.3m	0.3m of made ground
TT01	2.2m	2m of made ground
TT02	3m	2.7m of made ground
TT03	2.3m	1.6m of made ground
WS06	1.2m+	1m+ of made ground
WS07	1.2m+	1.1m+ of made ground
WS08	0.2m	No made ground
BH03	1.2m+	1m+ of made ground
BH06	0.8m	No made ground

Table 1: Depth of overburden: Eastern half of site

Western half of the site	Depth of overburden above natural (b.g.l.)	Notes
TP01	1.6m	1.6m made ground
TP02	0.9m	0.9m of made ground
TP03	0.8m	No made ground
TP04	0.8m	No made ground
TP05	0.6m	No made ground
TP06	1m	0.8m of made ground
TP07	0.8m	No made ground
WS01	1.2m+	1.2m+ of made ground
WS02	0.5m	No made ground
WS03	1.2m+	1.2m+ made ground
WS04	0.4m	No made ground

WS05	1.2m+	0.8m+ of made ground
BH01	1.2m+	1.2m+ of made ground
BH02	1.2m+	0.9m+ of made ground

Table 2: Depth of overburden: Western half of site

8 Archiving

8.1 A full site archive will be produced which will contain all the data collected during the archaeological works, including the finds (if required by the receiving institution). The archive will be quantified, ordered, indexed and internally consistent, and will be deposited at the appropriate local museum. The archive is listed in Appendix 2.

8.2 The archive will be assembled in line with the recommendations provided in Historic England's *MoRPHE Project Planning Note 3: Archaeological Excavation* (PPN3) (2008), and in accordance with the *Guidelines for the preparation of Excavation Archives for long–term storage* (United Kingdom Institute for Conservation, 1990) and *Standards in the museum care of archaeological collections* (Museums and Galleries Commission 1994).

8.3 An OASIS form has been completed and uploaded for this project and a copy of this is provided in Appendix 3.

9 Bibliography

AECOM 2018, *VPI Immingham Power Station: Written Scheme of Investigation – Ground Invetigations Monitoring*, unpublished document

APS 2006, *Archaeological Evaluation on Land at Rosper Road, North Killingholme, North Lincolnshire*, unpublished report (report ref: 159/06)

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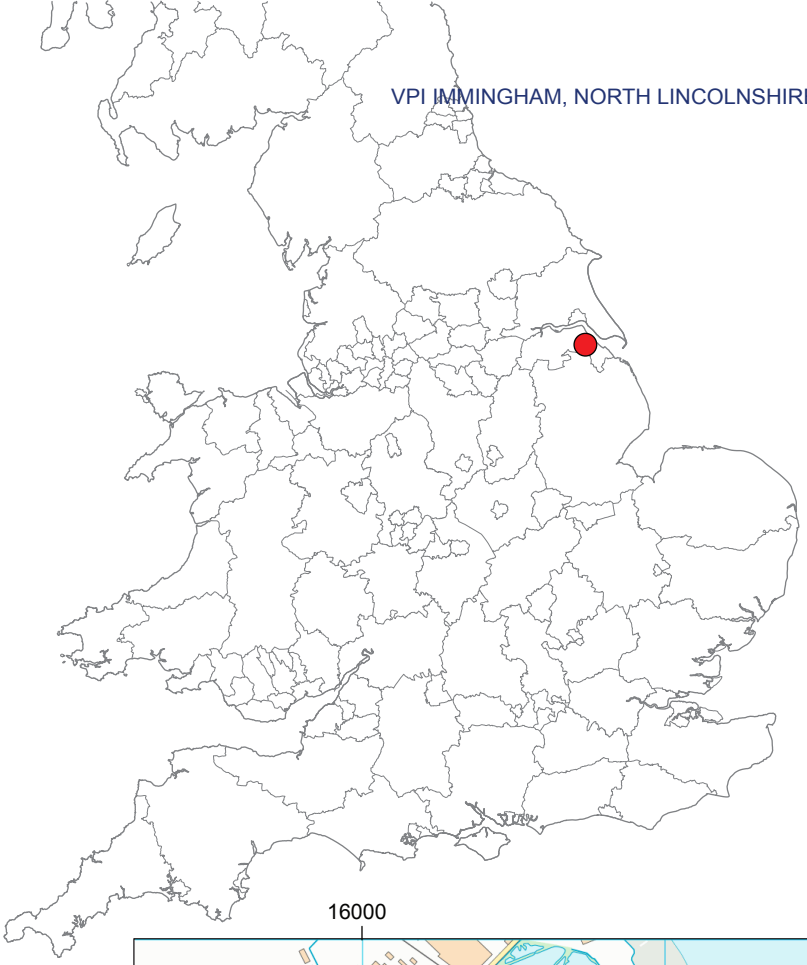


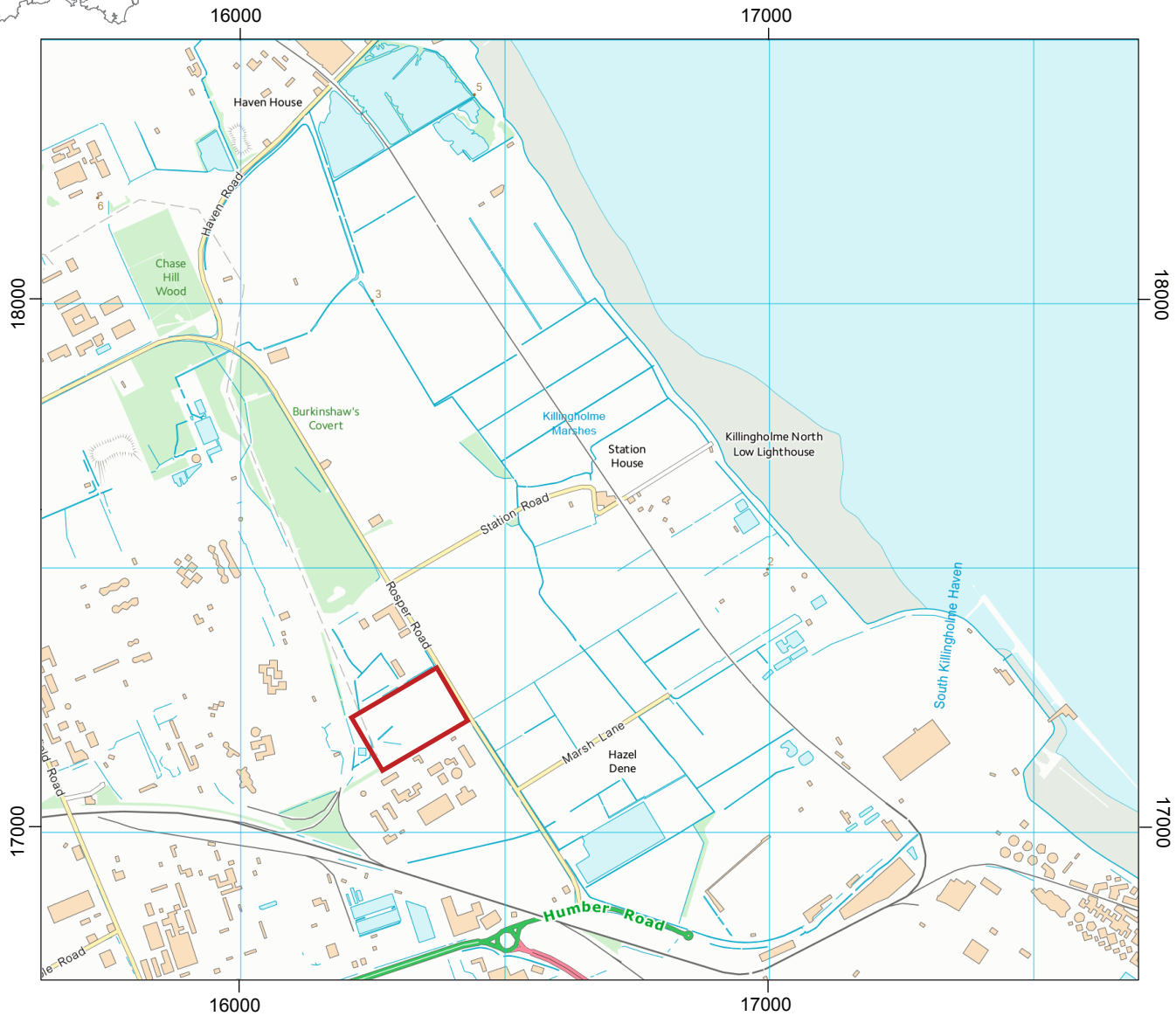
Figure 1

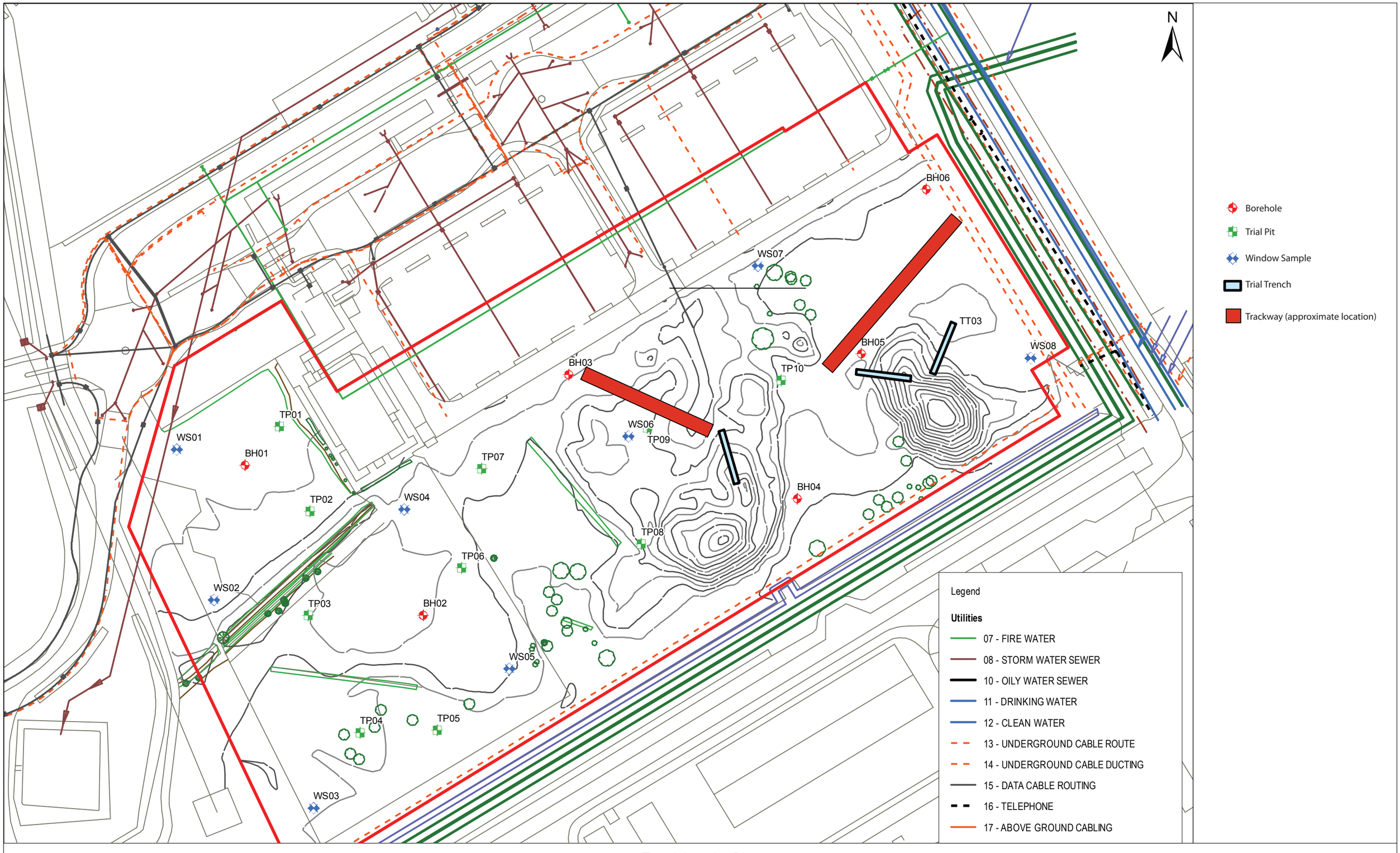
N

Site location

0 500m

AOC Archaeology Group





Trench Location Plan

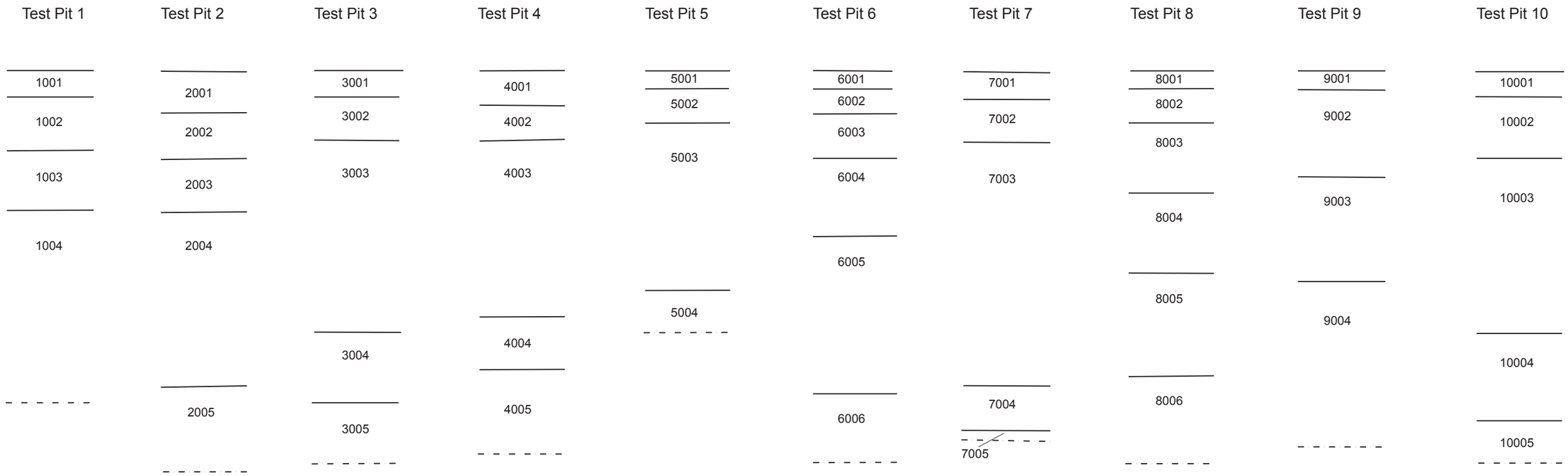
Figure 2

N

0 50m

1:1250 at A3

AOC Archaeology Group



Test Pits 1-10: Schematic Sections

Figure 3

0 2m

1:50 at A3

AOC Archaeology Group

Plate 1: Test Pit 1, facing west

Plate 2: Test Pit 4, facing west

Plate 3: Test Pit 6, facing northeast

Plate 4: Test Pit 7, facing north

Plate 5: Test Pit 8, facing north

Plate 6: Test Pit 9, facing northwest

Plate 7: Test Pit 10, facing northeast

Plate 8: Trial Trench 1, facing northwest

Plate 9: Trial Trench 1, facing southwest

Plate 10: Trial Trench 3, facing southwest

Plate 11: Trackway 1, facing northeast

Plate 12: Trackway 1, facing northeast

Appendix 1

Context Summary Table

Context	Description	Depth
TP01		
1001	Mix of coarse sand, gravel and concrete. Modern hardcore	0.3m
1002	Yellowish brown silty clay. Made ground	0.6m
1003	Black oil contaminated silty clay	0.7m
1004	Light grey brown clay and gravel. Natural at base of test pit	
TP02		
2001	Mix of coarse sand, gravel and concrete. Modern hardcore	0.5m
2002	Black oil contaminated silty clay	0.4m
2003	Yellowish brown sandy clay and gravel. Natural	0.6m
2004	Mottled grey brown clay with gravel. Natural	2.00m
2005	Yellowish grey coarse sand and gravel. Natural	1.00m
TP03		
3001	Pale grey brown silty clay. Topsoil	0.3m
3002	Yellow brown sandy clay and gravel. Subsoil	0.5m
3003	Mottled grey brown clay with gravel. Natural	2.2m
3004	Red brown clay. Natural	0.8m
3005	Yellowish grey coarse sand and gravel. Natural	0.7m
TP04		
4001	Dark grey brown clay silt. Topsoil	0.4m
4002	Yellow brown sandy clay with gravel. Nubsoil	0.4m
4003	Mixed blue grey to brown clay with gravel. Natural	2.00m
4004	Red brown clay. Natural	0.6m
4005	Yellowish grey coarse sand and gravel. Natural	1.00m
TP05		
5001	Yellow brown silty clay. Topsoil	0.2m
5002	Yellow brown sandy clay with gravel. Subsoil	0.4m
5003	Blueish grey brown clay. Natural	1.9m
5004	Dark greyish yellow coarse sand. Natural	0.5m+
TP06		
6001	Dark brown silty sand. Topsoil	0.2m
6002	Dark grey brown sandy clay with modern plastic inclusions. Made ground	0.3m
6003	Light grey brown sandy clay. Natural	0.5m
6004	Yellow brown sandy clay with gravel. Natural	0.9m
6005	Mottled grey blue brown clay with gravel. Natural	1.8m
6006	Yellowish grey clay sand and gravel. Natural	0.8m
6007	Land drain	0.1m
TP07		
7001	Pale grey brown sandy clay. Topsoil	0.3m
7002	Yellowish brown sandy clay with gravel. Subsoil	0.5m
7003	Mottled grey brown clay with gravel. Natural	2.3
7004	Yellow brown sand. Natural	0.5m

7005	Dark grey brown clay silt. Natural	0.1m
TP08		
8001	Mid yellowish brown silty clay. Topsoil	0.2m
8002	Yellowish brown silty sandy clay. Subsoil	0.4m
8003	Mid brown clay sand and gravel. Natural	0.3m
8004	Mottled dark greyish brown clay and gravel. Natural	0.9m
8005	Red brown clay. Natural	1.2m
8006	Grey coarse sand and gravel. Natural	1.00m+
TP09		
9001	Dark brown organic sandy silt. Topsoil	0.2m
9002	Dark yellow coarse sand and gravel. Made ground	1.00m
9003	Mid brown sandy clay and gravel. Natural	1.2m
9004	Mottled grey to dark brown clay and gravel. Natural	1.9m
TP10		
10001	Yellow brown clay sand and gravel. Made ground	0.3m
10002	Mottled yellow grey brown sand. Natural	0.7m
10003	Mid brown clay with chalk flecking and gravel. Natural	2.00m
10004	Red brown clay. Natural	1.00m
10005	Greyish yellow sand and gravel. Natural	0.5m
TT01		
TT01001	Mid brown sandy clay with chalk and cobbles. Made ground	2.1m
TT01002	Dark grey sandy silt. Original topsoil	0.2m
TT01003	Mottled grey brown clay with gravel. Natural	2.2m
TT02		
TT02001	Orange brown sandy clay and gravel. Made ground	2.7m
TT02002	Dark orange to grey brown sandy clay. Waterlogged soil	0.3m
TT02003	Yellow brown sandy clay and gravel. Natural	0.1m+
TT02004	Field drain	N/A
TT03		
TT03001	Dark brown sandy clay. Made ground	1.6m
TT03002	Dark grey silty clay. Buried waterlogged soil	0.7m
TT03003	Yellow brown sandy clay. Natural	0.3m
Trackway 1		
ET001	Grey brown sandy clay and vegetation. Modern surface	0.2m
ET002	Light yellow brown sandy clay and gravel. Natural	N/A
Trackway 2		
CT001	Light brown clay and gravel with plastic and modern inclusions. Made ground	1.00m+
WS01		
WS01001	Dark brown sandy silt with modern inclusions. Made ground	0.6m
WS01002	Grey brown sandy clay with modern plastic inclusions. Made ground	0.6m
WS02		
WS02001	Mid brown silty clay with gravel. Topsoil and hardcore	0.5m
WSO2002	Yellow brown sandy clay. Natural	0.7m
WS03		
WS03001	Dark brown sandy silt and chalk. Made ground	0.3m

WS03002	Dar grey brown sandy clay with plastic inclusions. Made ground	0.5m
WS03003	Light grey brown sandy clay with plastic inclusions. Made ground	0.4m
WS04		
WS04001	Grey brown clay silt. Topsoil	0.4m
WS04002	Yellow brown sandy clay. Natural	0.8m
WS05		
WS05001	Grey brown silty clay. Topsoil	0.4m
WS05002	Dark brown silty sand with plastic. Made ground	0.8m
WS06		
WS06001	Grey brown silty clay. Topsoil	0.2m
WS06002	Yellow brown sandy clay. Made ground	1.00m
WS07		
WS07001	Grey brown clay silt. Topsoil	0.1m
WS07002	Pale yellow brown hardcore and gravel. Hardcore	1.1m
WS08		
WS08001	Grey brown clay silt. Topsoil	0.2m
WS08002	Yellow brown sandy clay. Natural	1.00m
BH01		
BH01001	Dark grey mixed gravel and sand. Made ground	0.5m
BH01002	Yellow brown sandy clay. Made ground	0.7m
BH02		
BH02001	Dark brown silty sand. Topsoil	0.3m
BH02002	Dark grey brown sand and clay. Made ground	0.3m
BH02003	Light grey brown sandy clay. Made ground	0.4m
BH03		
BH03001	Grey brown clay silt. Topsoil	0.2m
Bh03002	Pale yellow brown gravel and sand. Hardcore	1.00m
BH06		
BH06001	Coarse sand and gravel. Hardcore	0.8m
BH06002	Yellow brown sandy clay and gravel. Natural	0.8m

Appendix 2

Archive Listing

Record Sheets	Quantity	Description
Trench Record Sheets	29	
Watching Brief Record Sheets	6	
Registers		
Photographic Registers	2	Digital shots 2167-2231
Photographs		
Digital	38	Frames 2167-2231

Appendix 3

OASIS Form

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: aocarcha1-316087

Project details

Project name	VPI Immingham Power Station: Watching Brief
Short description of the project	AOC Archaeology Group was commissioned to undertake a watching brief at VPI Immingham, Rosper Road, North Lincolnshire, during intrusive Ground Investigation (GI) works. The monitored GI works comprised the excavation of ten test pits, three trial trenches, two access trackways and hand-excavated interventions prior to borehole drilling. No archaeological features, deposits or structures were encountered, but a number of field drains were noted. Natural subsoil was present at the bases of trenches sealed by deposits of made ground or topsoil.
Project dates	Start: 05-04-2018 End: 12-04-2018
Previous/future work	Yes / Not known
Any associated project reference codes	51938 - Contracting Unit No.
Type of project	Recording project
Site status	None
Current Land use	Vacant Land 2 - Vacant land not previously developed
Investigation type	"Watching Brief"
Prompt	National Planning Policy Framework - NPPF

Project location

Country	England
Site location	NORTH LINCOLNSHIRE NORTH LINCOLNSHIRE SOUTH KILLINGHOLME VPI Immingham Power Station, North Lincolnshire
Postcode	DN40 3EA
Study area	8.5 Hectares
Site coordinates	TA 16678 17462 53.640399929882 -0.234923690159 53 38 25 N 000 14 05 W Point

Project creators

Name of Organisation	AOC Archaeology Group
Project brief originator	No formal brief issued

Project design originator	AECOM
Project director/manager	Charlie Morris
Project supervisor	George Beardow
Type of sponsor/funding body	Developer
Name of sponsor/funding body	VPI Immingham LLP

Project archives

Physical Archive Exists?	No
Physical Archive recipient	To be confirmed
Digital Archive recipient	To be confirmed
Digital Contents	"other"
Digital Media available	"Images raster / digital photography"
Paper Archive recipient	To be confirmed
Paper Contents	"Stratigraphic"
Paper Media available	"Context sheet","Photograph","Plan","Report","Section"

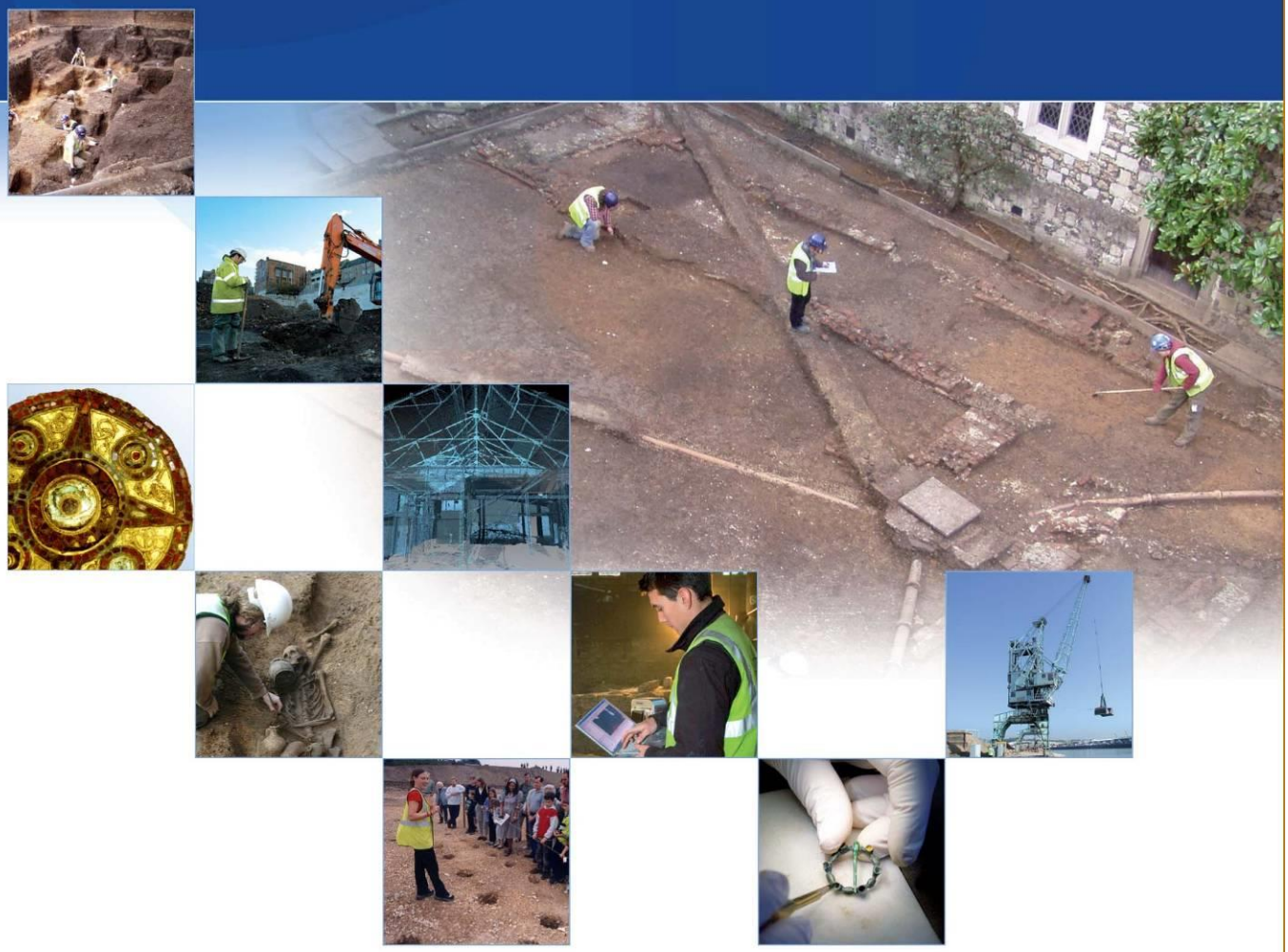
Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	VPI Immingham Power Station, North Lincolnshire: Archaeological Watching Brief Report
Author(s)/Editor(s)	Beardow, G.
Author(s)/Editor(s)	Potten, S.
Date	2018
Issuer or publisher	AOC Archaeology Group
Place of issue or publication	York
Description	A4 bound report

Entered by	Stephen Potten (stephen.potten@aocarchaeology.com)
Entered on	2 May 2018

OASIS:

Please e-mail Historic England for OASIS help and advice
 Created by Jo Gilham and Jen Mitcham, email Last modified Wednesday 9 May 2012
Cite only: http://www.oasis.ac.uk/form/print.cfm for this page



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Appendix 12A – Phase I Environmental Assessment

VPI Immingham Phase I Geo-environmental Assessment

AECOM Environment & Infrastructure

VPI Immingham

Project Reference: 60547702

31 January 2018

Quality information

Prepared by	Checked by	Approved by
Jon Craggs Graduate Environmental Engineer	Alex Freeman Associate	David Cragg Technical Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

# Hard Copies	PDF Required	Association / Company Name

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LS11 9AR

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The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by AECOM has not been independently verified by AECOM, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this Report. The work described in this Report was undertaken in January 2018 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

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Table of Contents

Tables

1. Introduction

AECOM Infrastructure & Environment UK Ltd (hereafter referred to as AECOM) was commissioned by Vitol Power International (VPI) Immingham to undertake a Phase 1 Geo-environmental Site Assessment of an area of land located to the north of the current power station, referred to hereafter as the 'site'. A site location plan is provided as Figure 1.

1.1 Project Background

The current VPI Immingham CHP plant has been operational since 2004. The CHP power plant is understood to produce steam which is supplied to nearby Humber and Lindsey Oil Refineries. It is understood that the proposed development includes the addition of a new CCGT plant to the VPI Immingham site, intended to increase export from 1320 MWe to 1800 MWe. It is understood by AECOM that Vitol have proposed an expansion of the CHP to the north of the current site. The land is partly occupied by both a car park and an area of open, hummocky land occupied by several vegetated mounds.

1.2 Objectives and Aims

The objective of this Phase 1 Environmental Desk Study was to determine the likely ground conditions beneath the proposed development site and the potential for ground contamination arising from historical or current on-site or off-site activities. This risk assessment also aimed to determine the presence of contamination sources and potential pathways to sensitive receptors located both on and offsite.

Based on the results of this assessment, AECOM has included recommendations for a future ground investigation to investigate potential pathways, and

1.3 Scope of Works

The scope of services for this study included:

- Commissioning and review of a Groundsure® report (including a regulatory database search, Coal Authority Report and historical Ordnance Survey (OS) maps);
- Review of publically available web-based sources, including the Environment Agency (EA) website and British Geological Survey (BGS);
- Review of relevant previous site investigation reports;
- Assessment of anticipated ground conditions and identification of potential development constraints; and
- Development of a preliminary Conceptual Site Model (CSM), identifying potential contaminants of concern, sources, pathways and receptors.

1.4 Information Sources

The following information sources were used in the completion of this geo-environmental assessment:

- Environment Agency (EA) website (www.environment-agency.gov.uk), including the 'What's in Your Back Yard' tool, accessed May 2017;
- Government Service website (https://flood-map-for-planning-service.gov.uk/), accessed June 2017;
- British Geological Survey (BGS) website (www.bgs.ac.uk) including the 'GeoIndex' tool, accessed May 2017;
- The Coal Authority Interactive Map Viewer (http://mapapps2.bgs.ac.uk/coalauthority/home.html), accessed May 2017;
- Groundsure® Reports; EnviroInsight (ref. GS-3982430), GeoInsight (ref. GS-3982431), UXO report and MapInsight (ref. GS- 3982432), dated 13th June 2017;
- The British Geological Survey (BGS) 1:50,000 solid and drift geology map No. 81;
- Highways Agency Geotechnical Data Management System Report (No 25153), A160 Improvements Ground Investigation Report, August 2010;
- Highways Agency Geotechnical Data Management System Report (No. 24109), A160/A180 Improvements – Immingham, Preliminary Sources Study Report, January 2010;
- Soil Mechanics (ref. A6032): Interpretive Report on Ground Investigation for Total Oil Limited, April 2006; and
- ABB (ref. PPC199): Total Lindsey Oil Refinery Site Landfarm, Completion Report- Surrender of Waste Management Licence, April 2006.

2. Site Description

2.1 Site Location

The site is located off Rosper Road, Immingham, North East Lincolnshire (see Figure 1), and is approximately 2 km east of South Killingholme. The site is centred on National Grid Reference (NGR) TA 516641 618468.

The site is surrounded by a mix of industrial and agricultural land use, namely the Lindsey Oil Refinery to the North West, which is operated by Total Ltd. To the South West is the Phillips 66 Humber refinery. Directly to the east is agricultural land and the River Humber is located approximately 1km from the site. The current VPI Immingham site is located directly to the south of the proposed development site.

2.2 Site Layout:

The site occupies a total area of approximately 5 ha. The northern area of the site is currently occupied by a car park and canteen building present in the northwest. The southern half of site is covered in shrubbery/grassland and contains various stockpiles of unknown origin. The site is bounded to the east by Rosper Road and to the south by the current VPI Immingham CHP plant. Immingham Port is located approximately 2.5km to the South East and the River Humber is located approximately 1.3km to the east.

With the exceptions of the various stockpiles on site the elevation of the site is <10m above ordnance datum (aOD).

2.3 Surrounding Land Use

Based on a review of maps, the land use immediately surrounding the site was assessed and is summarised below:

- North: Directly north of the site there is an access road which links the Lindsey Oil Refinery and Rosper Road. Beyond this, various utility buildings belonging to the Oil Refinery as well as unoccupied parcels of land are present.
- East: An unnamed drain and Rosper Road are directly east of the site, beyond which there are agricultural fields.
- West: To the west of the site mapping shows a settling tank, pond, electricity pylon as well as a railway track linking into the Lindsey Oil Refinery
- South: A utility line containing gas pipes is present to the south, separating the site and the current VPI Immingham CHP plant.

3. Environmental Setting

3.1 Geology

The Groundsure® reports (**Appendix A**), and data from publically available nearby BGS borehole records as well as historic reports associated with the site and nearby A160 improvements, have been reviewed to identify the likely geological sequence at the site. The anticipated sequence is detailed below:

3.1.1 Made Ground

The Groundsure® Geoinsight report records that the northwestern part of the site lays within an area of historic surface ground workings associated with the disposal of liquid sludge from the Lindsey Oil Refinery. Anecdotal information from discussions with TLOR site staff indicates that the area where the liquid waste was deposited was confined to the former field to the north of the site, and no liquid sludge was directly deposited on the site.

Made ground encountered in TP1, excavated as part of the 2006 Soil Mechanics ground investigation, was described as "*Soft to firm brown slightly sandy slightly gravelly clay with bands of soft black slightly sandy slightly gravelly clay. Gravel is subangular to subrounded fine to medium of various lithologies including chalk and potter. Very strong hydrocarbon odour"*.

Aerial imagery and topographical surveys show the eastern portion of the site to be occupied with stockpiles. Discussions with TLOR staff indicate that the stockpiles originated from topsoil and subsoil generated during reprofilingand construction of the car park in the northern portion of the site.

3.1.2 Glacial deposits

The Groundsure® Geoinsight report indicates that superficial drift deposits on the site are likely to comprise glacial deposits, comprising glacial till and glacial sands and gravels. More recent tidal flats alluvial deposits are shown to be present to the south of the site, but not extending onto the site.

The 2006 Soil Mechanics Interpretative Report describes the glacial deposits as comprising "*slightly sandy, slightly gravelly clay. The sand and gravel component comprises subangular to subrounded chalk, occasionally sandstone and shell fragments."*

Borehole logs from the 2006 Soil Mechanics Interpretative Report record glacial deposits are typically 16m to 20m thick near the northern area of site. This thickness is indicated by the 2006 ABB report to increase to 26m in BH7 (centre of the site). No data is available beyond the central area of site however considering that the bedrock surface was found to be lying as deep as 45m bgl in BGS borehole logs approximately 1km south of the site, it is possible that the thickness of these deposits increases further in the southern half of the site.

3.1.3 Bedrock

Published geological maps and memoirs indicate that the site is underlain by the Burnham Chalk Formation of the Upper Cretaceous period. The BGS Lexicon describes the Burnham Chalk Formation as *"White, thinly-bedded chalk with common tabular and discontinuous flint bands; sporadic marl seams"*. The upper 10m to 20m of the bedrock is frequently described as "soft chalk", overlying "hard chalk and flints", indicating that the upper part of the Chalk is extensively weathered.

3.2 Hydrology

A review of Ordnance Survey maps indicated that the site is located approximately 1.5km south west of the River Humber, which flows north west to south east. Drains run along the southern and western site boundaries, and a small water storage pond is located approximately 80m west of the site. The Humber River is a designated Ramsar site.

The site is located within an area whereby the Environment Agency issue flood warnings, and flood risk zone 3, meaning there is a high (greater than 1 in 100) annual probability of flooding. Flood defences are located along

the banks of the River Humber and the area falls under the jurisdiction of North East Lindsey Internal Drainage Board.

3.3 Hydrogeology

Consultation with the Environment Agency Aquifer Maps indicates that:

- The superficial glacial deposits are classified as a 'Secondary Aquifer (undifferentiated)', defined either as 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers', or 'lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, tin permeable horizons and weathering'.
- The bedrock, Burnham Chalk Formation, is classified as a Principal Aquifer, defined as 'highly permeable formations usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes.

The 2006 Soil Mechanics ground investigation showed water was encountered within the more granular horizons within the glacial deposits in BH5 (located north of the site). An initial water strike at 4.3m bgl subsequently rose slightly to give a resting water level of 3.9m bgl after 20 minutes, confirming shallow groundwater is expected to be sub-artesian in nature.

Additionally, during the 2009-2010 Highways England ground investigation , groundwater was encountered within the thicker granular glacial deposits, and in thin granular horizons within the glacial till, between depths of 2.4m and 15m bgl (-4.7 to -11.9m AOD). Again sub-artesian groundwater conditions were noted in several locations where groundwater was encountered, with borehole water level rises of up to 8.3m.

3.4 Radon

Public Health England's interactive Radon map indicates that the site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

4. Site History

4.1 Introduction

AECOM has reviewed historical Ordnance Survey (OS) maps dating from 1886 to present obtained as part of the Groundsure® report in order to assess potential historical uses of the site and the surrounding land. The summary provided below identifies key historical land uses and features which are considered to have the potential to have impacted the soil and groundwater beneath the subject site. The historical maps included within the Groundsure® report are provided in **Appendix B**.

4.2 History of the Site and Surrounding Land Use

AECOM has reviewed historical Ordnance Survey (OS) maps (**Appendix B**) and aerial imagery dating from 1886 to present obtained as part of the Groundsure® report in order to assess potential historical uses of the site and the surrounding land. Table 3 5 identifies the key historical land uses of the site and surrounding areas some of which are considered to have had the potential to impact the soil and groundwater beneath the site.

Table 1 - Summary of Site History

Year	On Site	Offsite
1886-1887	Marsh land; Rosper Road present; East Middle Mere Road present;	Cawber Farm – north east (450m); Marsh Farm – south east (750m);
1906-1910	No significant change;	No significant change;
1930-1947	No significant change;	Goxhill and Immingham Line/ Killingholme Station present – east (850m); School present – south (650m); Ulceby-Immingham railway line present (100m south west);
1951	Drainage system in place;	Municipal buildings present – south east (500m); Railway depot present – east (850m);
1968	No significant change;	No significant change;
1974	Railway sidings present (west);	Vast industrial expansion inc. oil refinery west and east of site;
1983	No significant change;	No significant change;
2002	Drainage ditches now shown (inferred to have been constructed in 1986 during the landfarm preparation); Pipe line on southern border of site.	Expansion of road system to south (A180/A160/A1173) (750m);
2007 aerial image (Google Earth)	A car park is now present in the northern half of site and the fields contain several stockpiles; Evidence of significant groundworks in the area;	Construction of various utility buildings in the north, as with the proposed development site, there is evidence of significant groundworks in the area;
2009 aerial image (Google Earth)	Construction laydown area present in area to the west of the recently built carpark; An additional stockpile below this construction laydown area is also present;	No significant change;
2010	No significant change;	Immingham West Fire Station approximately 750m south of site (date built is unknown);
2014	No significant change;	New road system throughout oil refinery, directly west of site.
2017 aerial image (Google Earth)	Construction of Canteen building adjacent to the carpark; Construction laydown area now mostly empty; Changes to stockpile layouts across the site.	No significant change;

5. Regulatory Database Search

5.1 Introduction

AECOM commissioned Groundsure® Limited to conduct a database search of available regulatory agency records to evaluate whether activities on or near the subject site have the potential to create a significant adverse impact. Groundsure® reviews databases compiled by national and local governmental agencies. The Groundsure® Report essentially relates to operational activities for which licences or authorisations are required and have been obtained pursuant to environmental laws. It is therefore possible that there are unauthorised activities being carried out in the vicinity of the subject site that are not detailed. It is noted that the database is not updated regularly and more recent unlisted or otherwise unregistered activities may therefore be present in the surrounding area.

It should be noted that this information is reported as AECOM received it from Groundsure®, which in turn reports information as it is provided in various government databases. It is not possible for either AECOM or Groundsure® to verify the accuracy or completeness of information contained in these databases. However, the use of this information is a generally accepted practice in the conduct of Phase 1 environmental assessments.

Sites identified within the study radius are evaluated to assess if they are likely to have had an adverse impact on the subject property or could be adversely affected by the subject property. The criteria used to evaluate sites within the study radius include distance from the subject property, expected depth and direction of groundwater and surface water flow, likely storm water flow direction and the presence / absence of documented contaminant releases at the identified sites.

The approximate distances to features described in this section have been estimated from the closest boundary of the site and may be subject to error.

5.2 Database Review

Key information from the Groundsure® Report that is considered pertinent to the subject site (within a radius of 500m), is summarised in **Table 2** below:

Table 2 – Summary of Database Review

CATEGORY	SUMMARY OF INFORMATION (<500m)
Part A(1) and IPPC Authorised Activities	1 effective: 270m south east; and 8 superseded: 270m south east all relating to Immingham CHP
List 1 Dangerous Substances Inventory Sites	1 inactive: 470m south east for Mercury and Cadmium relating to the Phillips 66 Humber Refinery site;
List 2 Dangerous Substance Inventory Sites	1 active: 470m south east for arsenic, chromium, copper, lead, nickel and zinc relating to the Phillips 66 Humber Refinery site;
Licensed Discharge Consents	3 revoked: one 51m south (relating to the Lindsey oil refinery oil interceptor) and two other unspecified trade discharges 470m south; and 1 effective: 50m north east; relating to sewage discharge from Lindsey oil refinery.
Planning Hazardous Substance Consents and Enforcements	1 approved active consents: 130m south relating to VPI Immingham – Consent to store 3050 tonnes of petroleum gas oil.
Dangerous or Hazardous Sites	1 on site current COMAH site (lower tier) relating to VPI Immingham CHP 2 off site current COMAH sites (both upper tier) relating to the Total Lindsey Oil Refinery (100m north east) and Phillips 66 Humber refinery (370m south) 1 off site historic NIHHS site (430m south relating to Conoco

CATEGORY	SUMMARY OF INFORMATION (<500m)
	Manufacturing Ltd) 1 off site historic COMAH site relating to Humber LPG terminal Ltd (450 m east)
EA Recorded Pollution Incidents List 2	2 recorded: 140m south east – minor impact to air (atmospheric pollutants and effects) 400m south – minor impact to land & air (Oils and Fuels).
EA Recorded Pollution Incidents List 1	1 recorded 400m south of site relating to major persistent and extensive impacts to water (East Halton Beck).
Environment Agency/Natural Resources Wales historic landfill sites	1 historic landfill licence relating to liquid sludge from the Lindsey Oil Refinery.
Environment Agency/Natural Resources Wales licensed waste sites	1 surrendered license 40m north west of the site relating to a biological treatment facility operated by the Lindsey Oil Refinery

No other database entries were identified within 500m of the site boundary. Database listings reviewed included: Historic IPC Authorisations, Red List Discharge Consent Register Part A(2) and Part B Activities and Enforcements, Category 3 or 4 Radioactive Substances Authorisations, Water Industry Referrals, Sites Determined as Contaminated land (Part 2a) or Petrol & fuel sites.

5.3 UXO

A Preliminary Unexploded Ordnance Risk Assessment (UXO) was conducted for the proposed development site and this is presented in **Appendix C**. Detailed findings are as follows:

- Indicative British/Allied UXO Risk: **Negligible**
- Indicative German UXO Risk: **Low**

According to the UXO report, the site in question does NOT require further research to clarify the unexploded ordnance (UXO) risk to future ground works.

6. Previous Reports

6.1 Introduction

AECOM reviewed previous environmental reports for the site by various others, as listed in Section 1.6. Pertinent information considered relevant to this assessment is summarised in the following sections.

6.2 Interpretive Report on Ground Investigation (Soil Mechanics, 2006)

Soil Mechanics were commissioned to undertake a ground investigation on the land east of Lindsey oil refinery, formerly used as a sludge landfarm. The investigation involved the advancement of 6 cable percussion boreholes (BH1 to 6) to a maximum depth of 25 m and 10 trial pits (TP1-3, CBR2, 3, 5, 7,9,10 &13) to a maximum depth of 2 m. Of the area assessed during this investigation a number of intrusive locations were observed as being close to site (TP1, BH5 and CBR7 &10). These locations are displayed in **Figure 2** and the summary of the strata depths encountered listed in Table 3 below

Table 3 – Summary of borehole log strata depths (m bgl)

Location	Topsoil	Made Ground	Glacial deposits (Clay)	Bedrock (Chalk)
TP1	-	0 – 0.70	0.70 – 2.00	-
CBR7	-	0 – 0.30	0.30 – 2.00	-
CBR10	-	0 – 0.90	0.90 – 2.00	-
BH5	0 – 0.40	0.40 – 1.00	1.00 – 16.20	16.20 – 16.30

From the investigation it is apparent that made ground is likely to extend to close to 1m with glacial deposits to at least 16 m, although evidence from the ABB report (see section 6.3) suggests these deposits to go down to at least 27m on site. Environmental testing was not undertaken in any of the aforementioned intrusive locations with the exception of BH5, which was done in conjunction with the ABB investigation, the data from this is summarised in section 6.3 below.

6.3 Surrender of Waste Management Licence (ABB, 2006)

Purpose of the report was to support the surrender of the waste management licence which covered activities associated with the disposal/treatment of refinery derived sludge. The application of this sludge extended into part of the north western area of the current proposed development site boundary (see **Figure 2**)

The report provided a summary of the site history stating that the sludge was applied to the land, over the course of 17 years (1986-2003), by tilling it into the top 0.3m of soil in order to encourage degradation.

The site investigation undertaken in the ABB report was undertaken in conjunction with the geotechnical work in the aforementioned Soil Mechanics report. The investigation involved the advancement of 13 trial pits (TP4-16) and drilling of 3 boreholes (done by Soil Mechanics; BH3-BH5). Groundwater sampling was also taken from existing monitoring wells (BH7 & BH8) installed in 1991. And surface water sampling was taken from the perimeter drains. Borehole logs for the investigation were not made available to AECOM.

In the context of the proposed development site a number of soil samples from intrusive locations (TP15, 16 & BH5) located near to the site (see **Figure 2**) were taken. Furthermore several surface and groundwater samples (SW3, 4 and BH7) were also taken near to the proposed development site. The results of which are displayed below:

Table 4 – Summary of chemicals within soil samples (all displayed in mg/kg)

Location	Depth (m)	Arsenic	Barium	Chromium	Copper	Lead	Vanadium	Zinc	Total TPH	PAH Total	Chloro-benzene
TP15*	0.3	5	126	32	35	39	67	235	15,573	130.8	-
TP15	1.2	5	110	29	13	18	36	63	2.6	3.5	-
TP16*	0.3	8	269	63	110	93	185	650	14,447	72.3	-
TP16	1.5	2	118	28	13	18	35	77	137.5	0.5	-
BH5*	0.1	13.5	-	50	107.4	98.9	-	751.2	20,700	5,360	-
BH5	3.0	9.3	-	17.5	12.1	12.1	-	53.3	270	33	-
BH5	4.0	9.6	-	13.8	12.2	12.7	-	53.4	130	16	-
BH5	8.0	6.2	-	13.7	9.1	9.9	-	39.4	24	14	0.034

*Samples noted as being 1 to 2% oil by weight

Table 5 – Summary of chemicals within water samples (all displayed in µg/l)

Location	Arsenic	Barium	Chromium	Copper	Lead	Selenium	Vanadium	Zinc	TPH Total	PAH Total
SW3	3	172	11	13	<1	2	4	28	20	0.146
SW4	4	195	11	13	<1	2	21	33	<10	<0.01
BH7**	<1	117	6	7	<1	2	<1	16	<10	<0.01

**Borehole drilled in 1991. No log was available for the borehole; however Figure 6 (ABB conceptual site model) shows the monitoring well installed into the Burnham formation chalk bedrock at 27 m bgl.

The report stated that following a comparison of soil sampling analytical results from trial pits at different depths the concentrations of hydrocarbons at the base of the trial pits in comparison to the samples collected at the surface were several orders of magnitudes lower. Moreover groundwater samples from BH7 indicated that the downward migration of contaminants has not taken place (owning to the low permeability of the glacial drift). On this basis it was considered that there were no current plausible source-pathway-receptor linkages.

7. Conceptual Site Model

7.1 Introduction

AECOM has developed a preliminary conceptual site model (CSM) based on a qualitative "Source → Pathway → Receptor" (SPR) risk assessment. The following sections consider the identified potential sources, pathways and receptors.

7.2 Assessment Framework

The site, in terms of potential land contamination, will be regulated by the local authority (Lincolnshire County Council) under the Town and Country Planning Act 1990 (as amended), taking account of the National Planning Policy Framework 2012, with the Environment Agency, Natural England and English Heritage acting as statutory consultees.

The 'suitable for use' approach is adopted for the assessment of contaminated land where remedial measures are only undertaken where unacceptable risks to human health or the environment are realised taking into account the use (or proposed use) of the land in question and the environmental setting. Additional environmental liabilities can arise through provisions contained within statutory legislation including Part 2A of the EPA 1990, the Water Resources Act 1991, the Groundwater Regulations 2009 and the Water Act 2003.

Current best practice recommends that the determination of health hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Statutory Guidance to Part 2A (2012) and CLR11.

The risk assessment process for environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

- Source: hazardous substance that has the potential to cause adverse impacts;
- Pathway: route whereby a hazardous substance may come into contact with the receptor: examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and
- Receptor: target that may be affected by contamination: examples include human occupants / users of site, water resources (surface waters or groundwater), or structures.

For a risk to be present there must be a relevant pollutant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway resulting in potentially significant harm.

Further details on the risk assessment process and methodology are provided in **Appendix D**.

7.3 Potential Sources of Contamination

Based upon the available information, potential sources of contamination include:

7.3.1 On Site

- Made ground within infilled areas of land (e.g. the former sludge landfarm) as well as within stockpiles and mounds (thought to be associated with previous construction activities in the area)

7.3.2 Offsite

- Lindsey Crude Oil Refinery & Phillips 66 Humber Refinery (operations and spills/leaks);
- Made ground within infilled land associated with the former sludge landfarm and construction activities in the area
- Railway line and railway sidings; and,
- Surrounding agricultural land use.

7.4 Contaminants of Concern

Identified potential sources of contamination are summarised in **Table 6**, below.

Table 6 – Summary of Contaminants of Concern

Land use	Contaminant Grouping	Specific Contaminants
Made ground within landfarm and infilled land/ stockpiles (on site)	Organic	- Hydrocarbons e.g. diesel, lubricating oils, petrol - Polychlorinated Biphenyls (PCBs) - Polycyclic Aromatic Hydrocarbons (PAHs)
	Inorganic	- Metals including arsenic, zinc, lead, copper, manganese and cadmium
	Other	- Ground gases including carbon dioxide, methane and hydrogen sulphide. - Asbestos
Oil refinery operations and VPI power plant operations (off site)	Organic	- Hydrocarbons e.g. crude oil, motor oils, petrol, diesel, kerosene, lubricants, waxes, bitumen, aviation fuel - Other organics e.g. alcohols, PCBs, MTBE, TAME, solvents, aliphatic and aromatic compounds
	Inorganic	- Mineral acids, alkalis, cyanides, sulphur and sulphide - Metals e.g. aluminium, cobalt, copper, iron, lead, molybdenum, nickel and vanadium
	Other	- Asbestos
Railway line and former railway sidings (off site)	Organic	- Hydrocarbons e.g. diesel, lubricating oils, paraffin - Polychlorinated Biphenyls (PCBs) - Polycyclic Aromatic Hydrocarbons (PAHs) - Solvents - Ethylene glycol - Creosote (contains PAHs) - Herbicides (e.g. atrazine, simazine, sodium chlorate, dalapon, diuron, borax, paraquat, picloram)
	Inorganic	- Ferrous residues - Metal fines
	Other	- Asbestos - Ash and fill (possibly containing metals, phenols, sulphates and PAHs)
Agricultural land (on site)	Organic	- Insecticides/pesticides/ herbicides including organophosphates, Diazinon, Alphacypermethrin, Oxfendazole, Ivermectin, Glyphosate

Information included in the above table is based upon information from the Department of Environment (DoE) 1995 Industry Profiles for “Oil refineries and bulk storage of crude oil and petroleum products” and “Railway land”, the Health and Safety Executive database on pesticides, the Veterinary Medicines Directorate Defra website as well as industry experience

Whilst **Table 6** generally reflects contaminants that are associated with the specified land uses, it is not an exhaustive list, nor should it be interpreted as a list of chemicals that are present at site. It should also be noted that unrecorded land uses (which can significantly impact ground conditions on site) may have occurred; consequently uncertainty remains as to the exact nature and extent of potential contamination on site.

7.5 Potential Receptors

7.5.1 Human Health:

- On site construction workers;
- Future employees at the new development; and
- Off-site workers e.g. Lindsey Oil refinery.

7.5.2 Controlled Waters:

- Surface waters including the River Humber (RAMSAR site) and nearby drains;
- Shallow groundwater within the superficial deposits (Secondary A Aquifer); and,
- Groundwater within the bedrock (Principal Aquifer).

7.5.3 Infrastructure:

- Underground services e.g. buried pipes; and,
- Proposed future on site buildings.

7.5.4 Ecology:

- Flora and Fauna.

7.6 Potential Pathways

7.6.1 Human Health:

- Direct dermal contact with substances in shallow soil and/or groundwater during potential groundworks;
- Inhalation of substances from the partitioning of vapours from soil and / or shallow groundwater; and,
- Accidental ingestion and/or inhalation of substances in soil/dust and/or shallow groundwater during potential groundworks.

7.6.2 Controlled Waters:

- Vertical migration through unsurfaced areas, vegetated areas and hard-standing, and drains / pipework into Made Ground / shallow soils;
- Lateral and vertical migration within the made ground and superficial deposits (Secondary A Aquifer), e.g. leaching from made ground vertically into shallow soil layers, including into deeper groundwater;
- Preferential lateral and vertical migration along routes of underground services, pipelines and associated trenches;
- Lateral overland flow, including via drains, to nearby surface waters; and
- Lateral and vertical migration within deeper groundwater with the chalk aquifer.

7.6.3 Ecology:

- Plant uptake and subsequent ingestion by fauna.

7.6.4 Infrastructure:

- Migration of ground gases and accumulation in confined spaces associated with the future development of the site (e.g. basements, service ducts).
- Piling foundations associated with future development of the site.

7.7 Summary of Potential Pollutant Linkages (CSM)

A summary of the potential pollutant linkages and the related initial qualitative assessment of risk is summarised in **Table 7**, below. The risk rankings assume that the current ground and groundwater conditions prevail, prior to any mitigation measures such as further intrusive investigation, quantitative risk assessment or remediation. The risk rankings for each of the pollutant linkages are derived from a combination of the magnitude of the potential consequence (i.e. severity) of the exposure of the receptor to the contaminant; and the magnitude of probability (i.e. likelihood) that the pollutant linkage is present or will occur.

Table 7 – Summary of Pollutant Linkages

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	LEVEL OF RISK	DISCUSSION AND POSSIBLE MITIGATION
Made ground within areas of potentially infilled land/ stockpiles	Direct contact and/or ingestion of contaminated material	On site construction workers and future logistics site employees	Moderate	Possible	Medium	Direct contact and ingestion of contaminated particulates and dust is possible during site works, and as such there should be appropriate safety and mitigation measure (e.g. the use of PPE) put in place to minimise occupational risks to human health should areas of suspected contamination be encountered. Considering the proposed commercial use of the site it is unlikely that future employees would come in to any significant contact with site soils.
	Inhalation of particulates/dusts/ vapours / gases	On site construction workers/ employees	Moderate	Possible	Medium	As with the direction contact/ingestion pathway there is a possibility for vapours/gases/dusts and/or particulates to be inhaled as a consequence of disturbing the ground during site work. This can be mitigated with appropriate safety measures e.g. the presence of respirators and in the case of future site employees within proposed buildings, gas protection membranes.
	Migration of ground gases (e.g. methane and carbon dioxide) through permeable made ground strata	Newly constructed infrastructure	Minor	Possible	Low	Due to the proximity of the site to potentially in filled land an assessment of risks from ground gases may be required. Should ground gasses be considered a risk, this can be mitigated using gas protection membranes within newly constructed buildings.
	Leaching/l surface runoff of substances from any newly exposed/ excavated ground	Surface waters	Moderate	Unlikely	Low	Because site works might generate stockpiles of site won material and disturb soils there is the potential for leaching/surface run off and migration of substances from these newly exposed materials into surface waters (e.g. drains) and subsequently into contact with flora and fauna within said surface waters. Mitigation measures e.g. making sure any suspected contaminated material is contained and/ or appropriately disposed of, any plant machinery is thoroughly decontaminated and intrusive works minimised to reduce the disturbance of soils and fuel spills are rapidly dealt with is likely to be required for any construction works that take place.
		Flora and fauna	Moderate	Unlikely	Low	

Impacted shallow groundwater below site	Vertical migration of impacted groundwater from within the made ground superficial deposits	Deeper groundwater in the bedrock	Moderate	Unlikely	Low	Considering the low porosity of the superficial deposits it is unlikely that contaminants will be able to migrate to significant depths towards the bedrock. Despite this low risk it is still advised that good construction work practices are implemented.
Impacted shallow groundwater below site	Vertical migration of impacted groundwater from within the made ground and superficial deposits via enhanced pathways e.g. during foundation piling or drilling of boreholes	Deeper groundwater in the bedrock	Major	Possible	Considerable	The low permeable superficial deposits are likely acting as a protective layer above the Burnham formation chalk bedrock. Considering that this bedrock is listed as a principal aquifer any piling design or intrusive construction works which are likely to go beyond the superficial deposits may require preparation of a piling risk assessment, completed in accordance with the EA's 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention'.

8. Conclusions and Data Gaps

8.1 Conclusions

This Phase 1 Geo-environmental assessment comprises a review of available geo-environmental information for the VPI Immingham site in order to assess the likely ground conditions beneath the site and the potential for ground contamination arising from historical or current on-site or off-site activities.

Key findings of the assessment included:

- The geology underlying the site is anticipated to comprise variable depths of Made Ground, superficial deposits (Glacial till and Glacial sands and gravels) and weathered bedrock consisting of the Burnham Chalk Formation;
- The superficial deposits are classified as being of Secondary A (undifferentiated) Aquifer potential. The Burnham Chalk Formation is classified as a Principal Aquifer;
- The largest and most proximal surface water course is the River Humber, located ~1.5km directly to the east of the site. A number of other drains and tributaries of the River Humber are also present in close proximity to the site;
- Prior to its current use as a carpark and stockpile dumping area the site has been used primarily as agricultural land with the exception of the north west of site which was part of the sludge landfarm area. A limited number of other potential sources of contamination were identified from historical maps including a railway and oil refineries;
- There are significant data gaps relating to the contents of the stockpiles/mounds located on site, as well as the presence of potential contamination originating from the historic sludge landfarm located in the north west section of the site; and
- The main risks identified by the CSM pertained to the direct contact and inhalation of contaminants by construction workers as well as the potential for impacted shallow groundwater to migrate into the deeper groundwater via enhanced pathways e.g. piling foundations and boreholes. Thus it is advised that appropriate PPE is worn by those likely to come into contact with site soils and particular care is taken during the design and construction if works are required to go beyond the superficial deposits.

8.2 Data Gaps

Whilst the information from secondary datasets and previous ground investigation reports are able to provide a general idea of expected ground conditions, unrecorded land uses (which can significantly impact ground conditions on site) may have occurred. Furthermore coverage from previous ground investigations is poor for the proposed development site. Consequently large uncertainty remains as to the exact nature of the ground conditions present at the site, particularly in regards to the nature and contents of stockpiles as well as the potentially infilled land associated with the historic landfarm in the north western area of site.

8.3 Recommendations

Based upon the above data gaps, it is recommended that intrusive ground investigations, (potentially with further phases of additional ground investigation to delineate contamination hotspots, if identified), are undertaken in order to further assess potential risks posed to the proposed development (associated with ground conditions at the site) and establish an accurate environmental baseline of the site prior to the proposed development.

The ground investigations should include the installation of gas and groundwater monitoring wells across the site and around its perimeter to allow collection of soil and groundwater samples for laboratory analysis of contaminants based on the potential sources identified in Section 7.4. A programme of periodic gas and groundwater monitoring events may also need to be undertaken in order to identify changes in site conditions in response to weather and seasonal changes.

Filename: \\ukIds2pfpsw001\LE_Projects\Newproje\60_____ - VPI Immingham\Geo-Env\Updated Phase 1 Report\CAD\Figure 1- Site boundary.mxd

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Project Title:

VPI IMMINGHAM

Client:

VPI IMMINGHAM

Location Inset:

LEGEND

Site

Copyright:

AECOM Internal Project No:

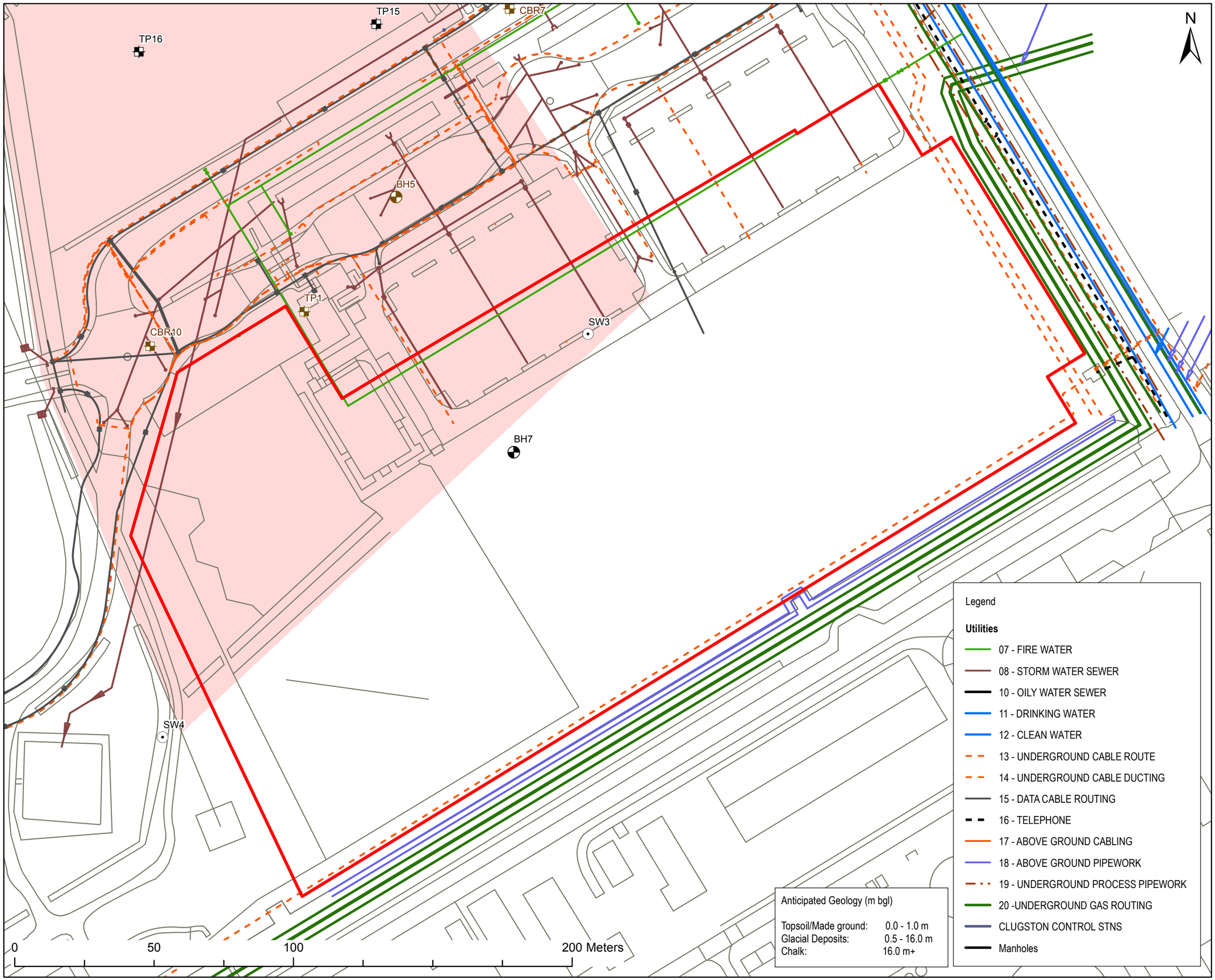
60547702

Drawing Title:

SITE LOCATION PLAN

Scale at A3: 1:1,250

Drawing No:			Rev:
FIGURE 1			01
Drawn:	**Chk'd:**	**App'd:**	**Date:**
JC	DM	AF	01/02/18



Filename: \\ukds2pfpsw001\LE_Projects\Newproje\60_____ - VPI Immingham\Geo-Env\Updated Phase 1 Report\CAD\Figure 2- previous GI.mxd

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Project Title:

VPI IMMINGHAM

Client:

VPI IMMINGHAM

Location Inset:

LEGEND

Site Boundary

Approximate Former Sludge Landfarm Boundary

ABB Hole Locations 2006 (Approximate)

Borehole

Surface Water Sample

Trial Pit

Soil Mechanics Hole Locations 2006 (Approximate)

Borehole

Trial Pit

AECOM Internal Project No:

60547702

Drawing Title:

PREVIOUS GI & WATER SAMPLING LOCATIONS

Scale at A3: 1:1,250

Drawing No:			Rev:
FIGURE 2			01
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GB	DR	AF	05/02/18

Appendix A: Groundsure® Reports

AECOM

AECOM LTD,2, CITY WALK,
LEEDS, LS11 9AR

Groundsure Reference:	GS-3982430
Your Reference:	Oil_Refinery
Report Date	13 Jun 2017
Report Delivery Method:	Email - pdf

Enviro Insight

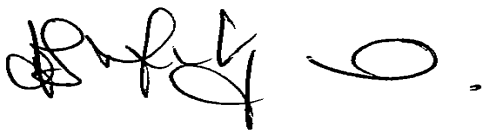
Address: TOTAL LINDSEY OIL REFINERY LTD, EASTFIELD ROAD, IMMINGHAM, DN40 3LW

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviro Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,



Managing Director
Groundsure Limited

Enc.
Groundsure Enviroinsight

Enviro Insight

Address:	**TOTAL LINDSEY OIL REFINERY LTD, EASTFIELD ROAD, IMMINGHAM, DN40 3LW**
Date:	**13 Jun 2017**
Reference:	**GS-3982430**
Client:	**AECOM**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	27-Sep-2014
Grid Reference:	516613,417411
Site Size:	8.16ha

Report Reference: GS-3982430
Client Reference: Oil_Refinery

Contents Page

Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	4	0	11	32
1.2 Additional Information – Historical Tank Database	0	0	8	30
1.3 Additional Information – Historical Energy Features Database	0	0	0	0
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	0	0
1.6 Potentially Infilled Land	0	0	2	7

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	9
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	1
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	1
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	0
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	2	2
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	1	0
2.2 Records of COMAH and NIHHS sites	2	0	0	3
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	1	1
2.3.2 National Incidents Recording System, List 1	0	0	0	1
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites	1	0	0	0	4	9
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites	0	1	0	0	0	6

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	1	1	19	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	0
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No
5.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	Yes
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology	0-500m
6.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	Yes
6.2 Are there any records of Strata Classification in the Bedrock Geology within 500m of the study site?	Yes

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	10	5
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	1	0	0	1	Not searched	Not searched

Section 6: Hydrogeology and Hydrology

	0-500m					
	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site?	No	No	No	No	No	No
6.10 Detailed River Network entries within 500m of the site	0	0	0	4	Not searched	Not searched
6.11 Surface water features within 250m of the study site	Yes	Yes	Yes	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Are there any Enviroment Agency Zone 2 floodplains within 250m of the study site?	Yes
7.2 Are there any Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	Yes
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	High
7.4 Are there any Flood Defences within 250m of the study site?	No
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
7.6 Are there any areas used for Flood Storage within 250m of the study site?	No
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Potential at Surface
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	High

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	6
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	1
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	3
8.5 Records of Ramsar sites	0	0	0	0	0	3
8.6 Records of Ancient Woodlands	0	0	0	0	0	0
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	2	0	0	1	0	1
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 What is the maximum risk of natural ground subsidence?	Moderate
9.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Low
9.1.2 What is the maximum Landslides hazard rating identified on the study site?	Very Low
9.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Negligible
9.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	Moderate
9.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Very Low
9.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Moderate
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

Section 10: Mining

10.1 Are there any coal mining areas within 75m of the study site?	No
10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?	No
10.3 Are there any brine affected areas within 75m of the study site?	No

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

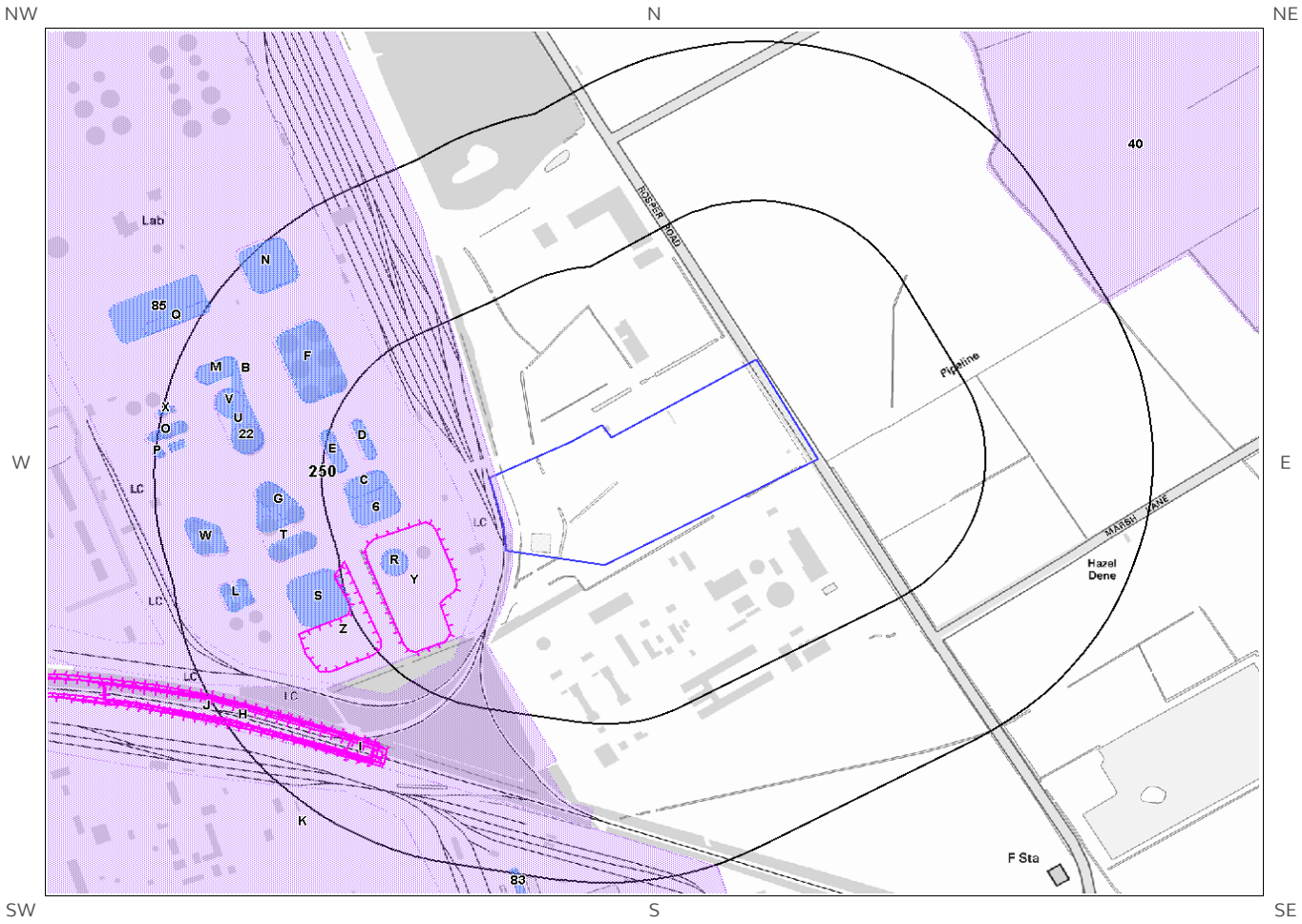
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Historical Land Use



Site Outline

250
500
Search Buffers (m)

Historical 1:10,000 and 1:10,560 scale mapping

Industrial Land Use

Potentially Infilled Land

Historical 1:2,500, 1:1,250 and 1:500 scale mapping

Energy Features

Petrol Stations

Tanks

Garages

1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 47

ID	Distance [m]	Direction	Use	Date
1A	0	On Site	Railway Sidings	1974
2A	0	On Site	Railway Sidings	1983
3B	0	On Site	Oil Refinery	1983
4B	0	On Site	Oil Refinery	1974
5Y	86	W	Unspecified Heap	1983
6	138	W	Unspecified Tanks	1983
7R	148	W	Unspecified Tank	1983
8C	156	W	Unspecified Tanks	1974
9C	156	W	Unspecified Tanks	1983
10D	176	W	Unspecified Tanks	1974
11D	176	W	Unspecified Tanks	1983
12E	215	W	Unspecified Tanks	1974
13E	215	W	Unspecified Tanks	1983
14Z	229	SW	Unspecified Heap	1983
15S	248	W	Unspecified Tanks	1983
16F	265	NW	Unspecified Tanks	1974
17F	265	NW	Unspecified Tanks	1983
18T	275	W	Unspecified Tanks	1983
19G	286	W	Unspecified Tanks	1983
20G	286	W	Unspecified Tanks	1974
21U	343	W	Unspecified Tanks	1983
22	345	W	Unspecified Tank	1974
23J	359	SW	Cuttings	1947
24H	360	SW	Cuttings	1930
25H	362	SW	Cuttings	1947
26I	364	SW	Cuttings	1983
27I	364	SW	Cuttings	1974
28J	364	SW	Cuttings	1968
29J	367	SW	Cuttings	1951
30K	381	S	Unspecified Commercial/Industrial	1983
31K	381	S	Unspecified Commercial/Industrial	1974
32V	384	W	Unspecified Tank	1974
33L	388	W	Unspecified Tanks	1983

34L	388	W	Unspecified Tanks	1974
35W	407	W	Unspecified Tanks	1983
36M	415	NW	Unspecified Tanks	1974
37M	415	NW	Unspecified Tanks	1983
38N	430	NW	Unspecified Tanks	1974
39N	430	NW	Unspecified Tanks	1983
40	457	NE	Marshes	1887
41O	462	W	Unspecified Tanks	1974
42O	462	W	Unspecified Tanks	1983
43X	481	W	Unspecified Tanks	1983
44P	490	W	Unspecified Tank	1974
45P	490	W	Unspecified Tank	1983
46Q	497	NW	Unspecified Tanks	1974
47Q	497	NW	Unspecified Tanks	1983

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary: 38

ID	Distance (m)	Direction	Use	Date
48C	138	W	Tanks	1985
49R	148	W	Unspecified Tank	1985
50C	153	W	Tanks	1970
51D	172	W	Tanks	1985
52D	174	W	Tanks	1970
53E	212	W	Tanks	1985
54E	213	W	Tanks	1970
55S	245	W	Tanks	1985
56F	258	NW	Tanks	1985
57F	260	NW	Tanks	1970
58T	275	W	Tanks	1985
59G	282	W	Tanks	1985
60G	283	W	Tanks	1970
61U	342	W	Tanks	1985
62V	342	W	Tanks	1970
63L	385	W	Tanks	1985
64L	385	W	Tanks	1970
65L	392	W	Tanks	1970
66V	395	W	Tanks	1969
67V	396	W	Unspecified Tank	1983
68W	405	W	Tanks	1983

69L	409	W	Tanks	1970
70L	416	W	Tanks	1969
71M	417	NW	Tanks	1969
72L	417	W	Tanks	1983
73M	417	NW	Tanks	1983
74N	424	NW	Tanks	1985
75N	427	NW	Tanks	1970
76O	456	W	Tanks	1983
77O	458	W	Tanks	1969
78O	459	W	Tanks	1969
79O	459	W	Tanks	1983
80X	483	W	Tanks	1983
81P	487	W	Unspecified Tank	1969
82P	488	W	Unspecified Tank	1983
83	491	S	Tanks	1972
84Q	495	NW	Tanks	1969
85	495	NW	Tanks	1983

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary: 0

Database searched and no data found.

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 0

Database searched and no data found.

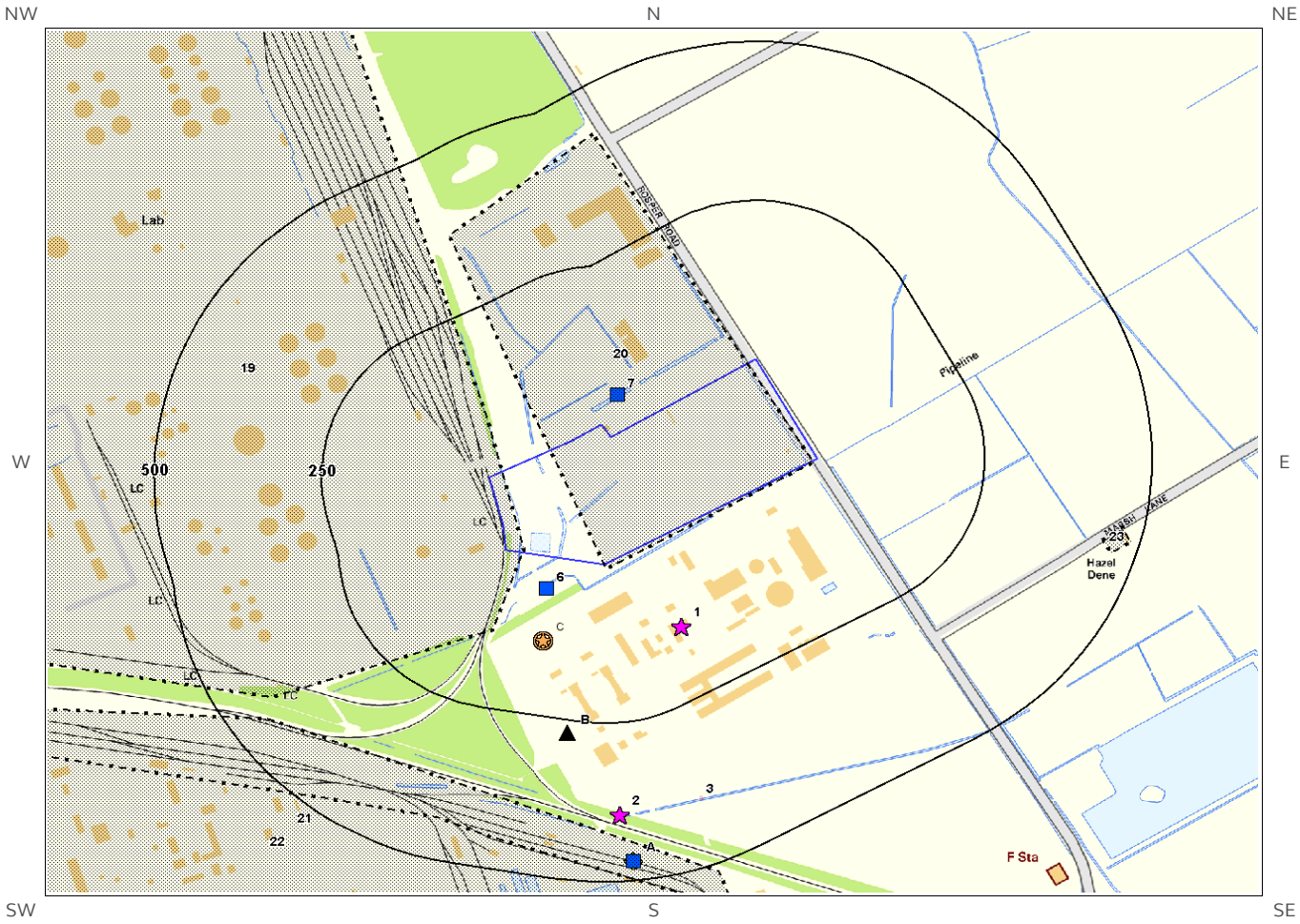
1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 9

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
86Y	86	W	Unspecified Heap	1983
87Z	229	SW	Unspecified Heap	1983
88J	359	SW	Cuttings	1947
89H	360	SW	Cuttings	1930
90H	362	SW	Cuttings	1947
91I	364	SW	Cuttings	1974
92I	364	SW	Cuttings	1983
93J	364	SW	Cuttings	1968
94J	367	SW	Cuttings	1951

2. Environmental Permits, Incidents and Registers Map



Site Outline

250
500
Search Buffers (m)

Recorded Pollution Incident

Dangerous Substances (List 1)

Dangerous Substances (List 2)

Water Industry Referrals

Licenced Discharge Consents

Red List Discharge Consents

RAS 3 & 4 Authorisations

Part A(1) Authorised Processes and Historic IPC Authorisations

Part A(2) and Part B Authorised Processes

COMAH / NIHHS Sites

Sites Determined as Contaminated Land

Hazardous Substance Consents and Enforcements

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

9

The following Part A(1) and IPPC Authorised Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
25B	273	S	516500 417000	Operator: Immingham Chp Llp Installation Name: Immingham Chp Power Station Epr/bj8022iz Process: COMBUSTION; ANY FUEL =>50MW	Permit Number: NP3130BP Original Permit Number: BJ8022IZ EPR Reference: - Issue Date: 28/10/2004 Effective Date: 28/10/2004 Last date noted as effective: 2017-04-01 Status: Superceded
26B	273	S	516500 417000	Operator: Immingham Chp Llp Installation Name: - Process: COMBUSTION; ANY FUEL =>50MW	Permit Number: BJ8022 Original Permit Number: BJ8022 EPR Reference: - Issue Date: 16-8-2001 Effective Date: 16-8-2001 Last date noted as effective: 2005-10-03 Status: Superseded By Variation
27B	273	S	516500 417000	Operator: Immingham Chp Llp Installation Name: Immingham Chp Power Station Epr/bj8022iz Process: COMBUSTION; ANY FUEL =>50MW	Permit Number: BU6140IT Original Permit Number: BJ8022IZ EPR Reference: - Issue Date: 1/5/2003 Effective Date: 1/5/2003 Last date noted as effective: 2017-04-01 Status: Superceded

ID	Distance (m)	Direction	NGR	Details	
28B	273	S	516500 417000	Operator: Vpi Immingham Llp Installation Name: Immingham Chp Power Station Epr/bj8022iz Process: COMBUSTION; ANY FUEL =>50MW	Permit Number: YP3837GD Original Permit Number: BJ8022IZ EPR Reference: EA/EPR/BJ8022IZ/V002 Issue Date: 4/6/2009 Effective Date: 4/6/2009 Last date noted as effective: 2017-04-01 Status: Superceded
29B	273	S	516500 417000	Operator: Immingham Chp Llp Installation Name: Immingham Chp Power Station Epr/bj8022iz Process: COMBUSTION; ANY FUEL =>50MW	Permit Number: BJ8022IZ Original Permit Number: BJ8022IZ EPR Reference: - Issue Date: 16/8/2001 Effective Date: 16/8/2001 Last date noted as effective: 2017-04-01 Status: Superceded
30B	273	S	516500 417000	Operator: Vpi Immingham Llp Installation Name: Immingham Chp Power Station Epr/bj8022iz Process: COMBUSTION; ANY FUEL =>50MW	Permit Number: XP3732RA Original Permit Number: BJ8022IZ EPR Reference: - Issue Date: 29/12/2015 Effective Date: 1/1/2016 Last date noted as effective: 2017-04-01 Status: Effective
31B	273	S	516500 417000	Operator: Vpi Immingham Llp Installation Name: Immingham Chp Power Station Epr/bj8022iz Process: COMBUSTION; ANY FUEL =>50MW	Permit Number: PP3432WT Original Permit Number: BJ8022IZ EPR Reference: - Issue Date: 14/11/2014 Effective Date: 14/11/2014 Last date noted as effective: 2017-04-01 Status: Superceded
32B	273	S	516500 417000	Operator: Immingham Chp Llp Installation Name: - Process: COMBUSTION; ANY FUEL =>50MW	Permit Number: BU6140 Original Permit Number: BJ8022 EPR Reference: - Issue Date: 1-5-2003 Effective Date: 1-5-2003 Last date noted as effective: 2004-10-01 Status: Superseded By Pas
33B	273	S	516500 417000	Operator: Immingham Chp Llp Installation Name: Immingham Chp Power Station Epr/bj8022iz Process: COMBUSTION; ANY FUEL =>50MW	Permit Number: NP3339LK Original Permit Number: BJ8022IZ EPR Reference: - Issue Date: 30/4/2007 Effective Date: 30/4/2007 Last date noted as effective: 2017-04-01 Status: Superceded

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

1

The following List 1 Dangerous Substance Inventory Site records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
4A	470	S	516600 416800	Name: Conoco Main O/f Killingholme Status: Not Active Receiving Water: River Humber, South Killingholme Drain, R. Humber	Authorised Substances: Mercury (other), Cadmium

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

1

The following List 2 Dangerous Substance Inventory Site records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
5A	470	S	516600 416800	Name: Conoco Main O/f Killingholme Status: Active Receiving Water: S Kill.drn.rosper Road	Authorised Substances: Arsenic, Chromium, Copper, Lead, Nickel, Zinc

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

4

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
6	51	S	516470 417230	Address: THE INTERCEPTOR, LINDSEY OIL REFINERY, KILLINGHOLME, GRIMSBY. Effluent Type: TRADE DISCHARGES - UNSPECIFIED Permit Number: PR3NFF1242 Permit Version: 1	Receiving Water: South Killingholme Main Drain Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 06/11/1979 Effective Date: 06-Nov-1979 Revocation Date: 10/01/1994
7	52	NE	516576 417535	Address: LINDSEY OIL REFINERY, LINDSEY OIL REFINERY, NORTH KILLINGHOLME, IMMINGHAM, NORTH LINCOLNSHIRE, DN40 3LW Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: EPRVP3424XR Permit Version: 1	Receiving Water: TRIB OF RIVER HUMBER Status: NEW ISSUED UNDER EPR 2010 Issue date: 05/09/2012 Effective Date: 05-Sep-2012 Revocation Date: -
8A	470	S	516600 416800	Address: AT HUMBER REFINERY, SOUTH KILLINGHOLME, SOUTH HUMBERSIDE Effluent Type: TRADE DISCHARGES - UNSPECIFIED Permit Number: PR3NFF855B Permit Version: 1	Receiving Water: Trib South Killingholme Drain Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 16/11/1983 Effective Date: 16-Nov-1983 Revocation Date: 07/05/1991
9A	470	S	516600 416800	Address: AT HUMBER REFINERY, SOUTH KILLINGHOLME, SOUTH HUMBERSIDE Effluent Type: TRADE DISCHARGES - UNSPECIFIED Permit Number: PR3NFF855B Permit Version: 2	Receiving Water: South Killingholme Main Drain Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 08/05/1991 Effective Date: 08-May-1991 Revocation Date: 24/03/1994

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

1

The following records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	Application Reference Number	NGR	Application Status	Application Date	Address	Details	Details of Enforcement Action
34C	134	S	PA/2008/1704	516464 417147	Approved	02/03/2009	VPI Immingham LLP (PKA Immingham CHP Plant) Combined Heat & Power Plant, Rosper Road, South Killingholme, DN40 3DZ	Hazardous Substances Consent to store 3050 tonnes of petroleum gas oil.	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 5

The following COMAH & NIHHS Authorisation records provided by the Health and Safety Executive are represented as polygons or buffered points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	Company	Address	Operational Status	Tier
19	0	On Site	Total Lindsey Oil Refinery Limited	Total Lindsey Oil Refinery Limited, Lindsey Oil Refinery, HQ/Total Lindsey, Eastfield Road, Immingham, North East Lincolnshire, DN40 3LW	Current COMAH Site	COMAH Upper Tier Operator
20	0	On Site	VPA Immingham LLP	VPI Immingham LLP, Immingham CHP LLP, Rosper Road, Immingham, Grimsby, North East Lincolnshire, DN40 3DZ	Current COMAH Site	COMAH Lower Tier Operator
21	370	S	Phillips 66 Limited	Phillips 66 Limited, Humber Refinery, Humber Refinery, Eastfield Road, Grimsby, North Lincolnshire, DN40 3DW	Current COMAH Site	COMAH Upper Tier Operator
22	433	S	Conoco Manufacturing Ltd	Conoco Manufacturing Ltd, South Tank Farm, South Killingholme, Immingham	Historical NIHHS Site	-
23	445	E	Humber Lpg Terminal Ltd	Humber Lpg Terminal Ltd, Marsh Lane, South Killingholme, DN40 3ED	Historical COMAH Site	-

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

2

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1	139	SE	516670 417170	Incident Date: 03-Oct-2002 Incident Identification: 112451 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
2	396	S	516579 416873	Incident Date: 13-Dec-2004 Incident Identification: 282826 Pollutant: Oils and Fuel Pollutant Description: Crude Oil	Water Impact: Category 2 (Significant) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

1

The following NIRS List 1 records are represented as points on the Environmental Permits, Incidents and Registers Map:

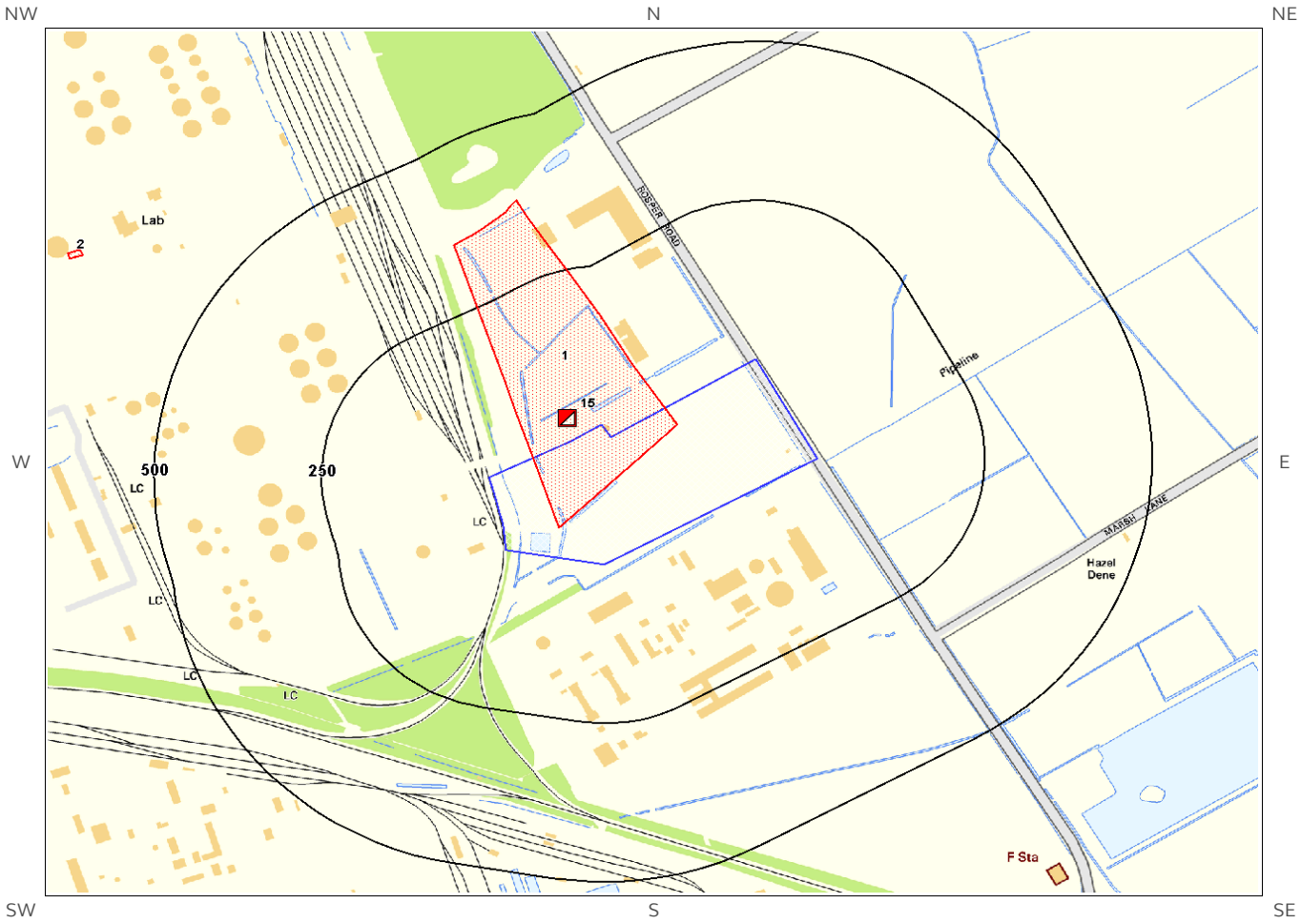
ID	Distance(m)	Direction	NGR	Details	
3	395	S		Incident Date: 29-Jul-2000 Incident Identification: 7235.0 Catchments Name: SKITTER BECK (IMMINGHAM) Water Description: RIVER STRETCH (FRESHWATER) Water Course: EAST HALTON BECK Incident Substantiated: Yes	Priority Description: Immediate (2 Hours) Waste Description: Not Available Water Impact: Major (Persistent, Extensive) Impact Land Impact: Minor Impact Air Impact: No Impact Action Taken: Prosecution

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? 0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



Site Outline

250
500
Search Buffers (m)

EA/NRW Active Landfill

EA/NRW Historic Landfill

BGS / DoE Survey Landfill

Historic and Planned Waste Sites

EA/NRW Licensed Waste Site

Local Authority/Historical Mapping Landfill Records

3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site:

0

Database searched and no data found.

3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site:

14

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
1	0	On Site	516400 417500	Site Address: Lindsey Oil Refinery, Rosper Road Waste Licence: Yes Site Reference: 55/19/0767, 2000/5298 Waste Type: Liquid, sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 06-Nov-1985 Licence Surrendered: Licence Holder Address: - Operator: Lindsey Oils Licence Holder: - First Recorded: 31-Dec-1986 Last Recorded: -
2	701	NW	515700 417700	Site Address: Lindsey Oils Site C, North Killingholme, North Lincolnshire Waste Licence: - Site Reference: 55/26/790 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: Lindsey Oils Licence Holder: - First Recorded: - Last Recorded: -
Not shown	903	E	517900 417200	Site Address: Marsh Lane, South Killingholme Waste Licence: Yes Site Reference: A553, 55/19/0553 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 23-Oct-1984 Licence Surrendered: 31-Dec-1987 Licence Holder Address: Arundel Howe, Stakesby Road, Whitby Operator: Geostore Limited Licence Holder: Geostore Limited First Recorded: 31-Dec-1985 Last Recorded: 31-Dec-1987

ID	Distance (m)	Direction	NGR	Details	
Not shown	927	SE	517600 416500	Site Address: Landfill Site - South Killingholme, Humber Road, Grimsby, Lincolnshire Waste Licence: Yes Site Reference: - Waste Type: Industrial Environmental Permitting Regulations (Waste) Reference: YP2/L/POR001	Licence Issue: 08-Oct-1991 Licence Surrendered: 06-Nov-2007 Licence Holder Address: Moody Lane, Grimsby, Lincolnshire Operator: Landfill Site - South Killingholme Licence Holder: Landfill Site - South Killingholme First Recorded: - Last Recorded: -
Not shown	955	SW	515700 416500	Site Address: South Killingholme Conoco, South Killingholme, North Lincolnshire Waste Licence: - Site Reference: 55/26/809 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: Conoco Licence Holder: - First Recorded: - Last Recorded: -
Not shown	1011	SE	516900 416200	Site Address: Conoco, Killingholme Waste Licence: Yes Site Reference: 55/19/0148, 1480, 2000/5296 Waste Type: Industrial, Liquid, sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 10-Dec-1987 Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: 31-Jul-1975 Last Recorded: -
Not shown	1077	W	515100 416800	Site Address: Eastfield Road Landfill Site, Eastfield Road, South Killingholme Waste Licence: Yes Site Reference: A023, 55/17/0023 Waste Type: Inert, Industrial, Commercial, Household, Special, Liquid, sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 01-Dec-1980 Licence Surrendered: 19-Oct-1989 Licence Holder Address: - Operator: Humberside County Council Licence Holder: J W Stanley First Recorded: 01-Dec-1975 Last Recorded: 01-Mar-1988
Not shown	1123	NW	515200 418000	Site Address: Lindsey Oil Refinery Site A and C, Station Road, Thurlby, Bourne Waste Licence: Yes Site Reference: A147, 55/19/0147 Waste Type: Inert, Industrial, Household, Special, Liquid, sludge Environmental Permitting Regulations (Waste) Reference: AY1/L/LIN014	Licence Issue: 14-Jun-1977 Licence Surrendered: 15-Jul-1990 Licence Holder Address: - Operator: Lindsey Oil Refinery Licence Holder: Lindsey Oil Refinery Limited First Recorded: 31-Dec-1960 Last Recorded: 31-Dec-1989
Not shown	1151	E	518100 417600	Site Address: Killigholme Haven, Immingham, South Humberside Waste Licence: Yes Site Reference: A553, 55/19/0553 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 23-Oct-1984 Licence Surrendered: 31-Dec-1987 Licence Holder Address: Arundel Howe, Stakesby Road, Whitby Operator: Geostore Limited Licence Holder: Geostore Limited First Recorded: 31-Dec-1985 Last Recorded: 31-Dec-1987
Not shown	1215	NW	515500 418400	Site Address: Lindsey Oil Site C, Killingholme Waste Licence: - Site Reference: 55/16/0424 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: - Last Recorded: -
Not shown	1261	SE	517000 416000	Site Address: Conoco, Killingholme Waste Licence: Yes Site Reference: 55/19/0148, 1480, 2000/5295 Waste Type: Industrial, Liquid, sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 18-Dec-1987 Licence Surrendered: Licence Holder Address: - Operator: Conoco Licence Holder: - First Recorded: 30-Jun-1975 Last Recorded: -

ID	Distance (m)	Direction	NGR	Details	
Not shown	1313	E	518200 417400	Site Address: Marsh Lane, Killingholme Waste Licence: - Site Reference: 55/19/0553 Waste Type: Liquid, sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: Geostore Limited Licence Holder: - First Recorded: - Last Recorded: -
Not shown	1361	E	518200 417600	Site Address: Tioxide, South Killingholme Waste Licence: Yes Site Reference: A105, 55/19/0105 Waste Type: Inert, Industrial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 29-Jun-1977 Licence Surrendered: 24-Feb-1992 Licence Holder Address: Billingham, Cleveland Operator: BTP Tioxide Limited Licence Holder: BTP Tioxide Limited First Recorded: 31-Dec-1961 Last Recorded: 24-Feb-1992
Not shown	1443	E	518400 417300	Site Address: Immingham Dock, West Of South Killingholme Haven Waste Licence: Yes Site Reference: A646, 55/19/0646 Waste Type: Inert, Industrial, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 20-Jan-1978 Licence Surrendered: 26-Jan-1990 Licence Holder Address: - Operator: British Transport Docks Board Licence Holder: ABP First Recorded: 01-Feb-1978 Last Recorded: 31-Dec-1990

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

0

Database searched and no data found.

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

Database searched and no data found.

3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

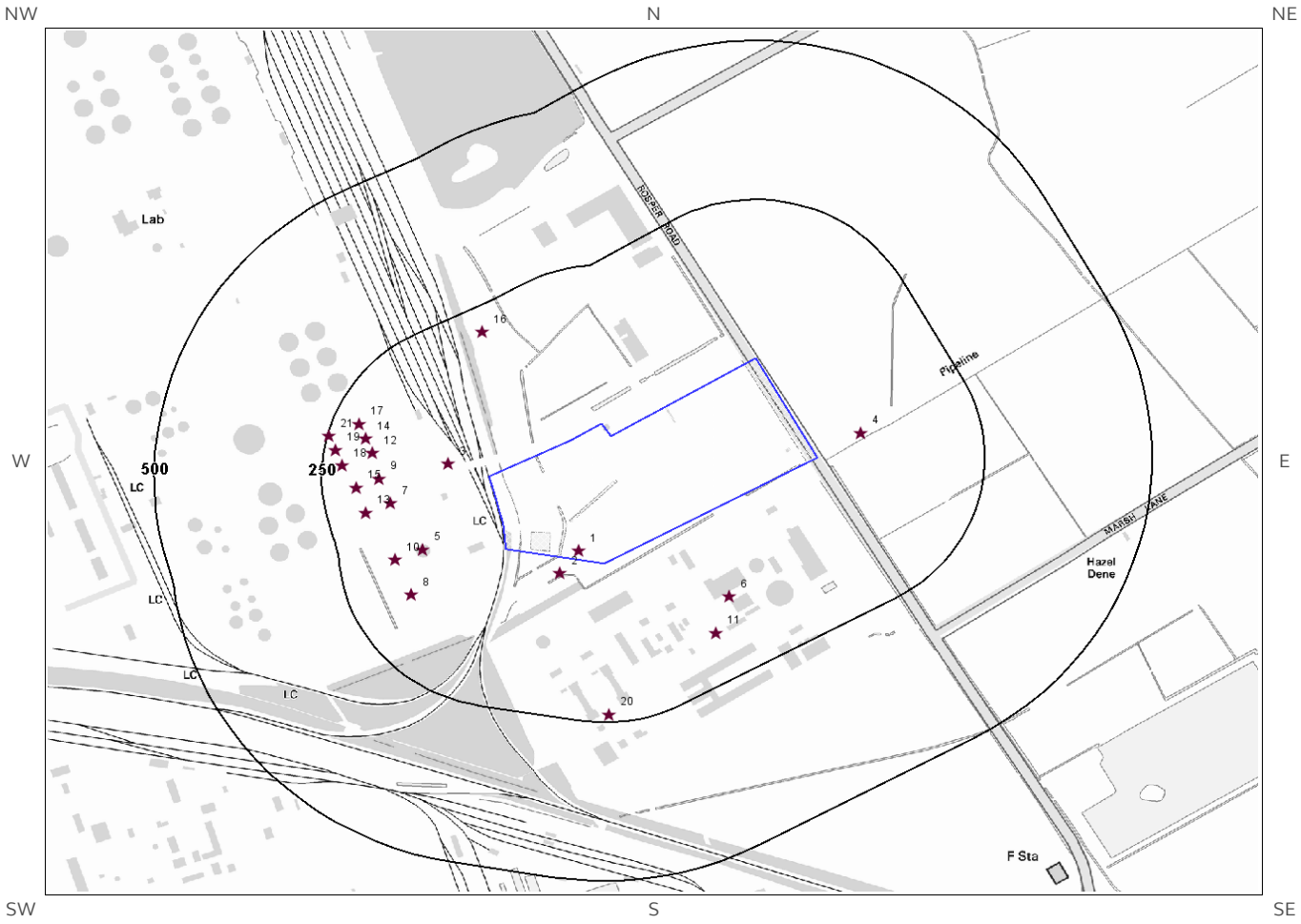
7

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
15	36	NW	516500 417500	Site Address: Lindsey Oil Refinery Ltd, Lindsey Oil Refinery, South Killingholme, Grimsby, N E Lincs, DN40 3LW Type: Biological Treatment Facility Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LIN013 EPR reference: EA/EPR/YP3695NB/S002 Operator: Lindsey Oil Refinery Ltd Waste Management licence No: 70828 Annual Tonnage: 3000.0	Issue Date: 06/11/1985 Effective Date: - Modified: - Surrendered Date: 18/10/2006 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Licensed Facility At Lindsey Oil Refinery Correspondence Address: -
Not shown	1066	NW	515500 418000	Site Address: Lindsey Oil Refinery, North Killingholme, Immingham, N E Lincs, DN40 3LW Type: Industrial Waste Landfill (Factory curtilage) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LIN014 EPR reference: EA/EPR/YP3095NZ/A001 Operator: Lindsey Oil Refinery Ltd Waste Management licence No: 70817 Annual Tonnage: 25000.0	Issue Date: 14/06/1977 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Total Lindsey Oil Refinery Correspondence Address: -
Not shown	1066	NW	515500 418000	Site Address: Lindsey Oil Refinery, North Killingholme, Immingham, N E Lincs, DN40 3LW Type: Industrial Waste Landfill (Factory curtilage) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LIN014 EPR reference: EA/EPR/YP3095NZ/V004 Operator: Total Lindsey Oil Refinery Ltd Waste Management licence No: 70817 Annual Tonnage: 24999.0	Issue Date: 14/06/1977 Effective Date: - Modified: 03/11/2015 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Total Lindsey Oil Refinery Correspondence Address: -
Not shown	1066	NW	515500 418000	Site Address: Lindsey Oil Refinery, North Killingholme, N Lincolnshire, DN40 3LW Type: Household, Commercial & Industrial Waste Landfill Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: IPC024 EPR reference: EA/EPR/CP3892NB/A001 Operator: Lindsey Oil Refinery Ltd Waste Management licence No: 73223 Annual Tonnage: 250000.0	Issue Date: 14/06/1977 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: To PPC Site Name: Lindsey Oil Refinery Site A & C (bw2994in) Correspondence Address: -

ID	Distance (m)	Direction	NGR	Details	
Not shown	1147	W	515300 417000	Site Address: Wastewise Waste Man. Svcs. Ltd, Eastfield Road, South Killingholme, Grimsby, N E Lincs, DN40 3NB Type: Household Waste Amenity Site Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: WAS004 EPR reference: EA/EPR/RP3394NH/S002 Operator: Wastewise Waste Management Services Ltd Waste Management licence No: 72061 Annual Tonnage: 20000.0	Issue Date: 07/12/1992 Effective Date: - Modified: - Surrendered Date: 20/03/2000 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: South Killingholme C A Site Correspondence Address: -
Not shown	1183	SE	517600 416500	Site Address: Tioxide Europe Ltd, Humber Road, Grimsby, N E Lincs Type: Industrial Waste Landfill (Factory curtilage) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: TIO003 EPR reference: EA/EPR/JP3095NJ/A001 Operator: Tioxide Europe Ltd Waste Management licence No: 70833 Annual Tonnage: 475000.0	Issue Date: 08/10/1991 Effective Date: - Modified: - Surrendered Date: 06/11/2007 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Landfill Site - South Killingholme Correspondence Address: -
Not shown	1183	SE	517600 416500	Site Address: Tioxide Europe Ltd, Humber Road, Grimsby, N E Lincs, DN31 2SW Type: Industrial Waste Landfill (Factory curtilage) Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: TIO003 EPR reference: - Operator: Tioxide Europe Ltd Waste Management licence No: 70833 Annual Tonnage: 25000.0	Issue Date: 08/10/1991 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Landfill Site - South Killingholme Correspondence Address: Tioxide Europe Ltd, Moody Lane, Grimsby, N E Lincs, DN31 2SW

4. Current Land Use Map



Site Outline

Search Buffers (m)

Current Industrial Sites

Petrol & Fuel Sites

Electricity Transmission Cables

Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 21

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	0	On Site	Pylon	516517 417289	Pylon, DN40	Electrical Features	Infrastructure and Facilities
2	24	S	Settling Tank	516489 417254	Settling Tank, DN40	Waste Storage, Processing and Disposal	Infrastructure and Facilities
3	64	W	Oil Refinery	516323 417426	Oil Refinery, DN40	Oil and Gas Extraction, Refinery and Product Manufacture	Extractive Industries
4	76	NE	Pipeline	516939 417475	Pipeline, DN40	Pipelines	Industrial Features
5	124	W	Tank	516285 417291	Tank, DN40	Tanks (Generic)	Industrial Features
6	132	SE	Pipeline	516743 417217	Pipeline, DN40	Pipelines	Industrial Features
7	154	W	Tank	516236 417364	Tank, DN40	Tanks (Generic)	Industrial Features
8	160	SW	Tank	516267 417220	Tank, DN40	Tanks (Generic)	Industrial Features
9	164	W	Tank	516220 417403	Tank, DN40	Tanks (Generic)	Industrial Features
10	168	W	Tank	516243 417275	Tank, DN40	Tanks (Generic)	Industrial Features
11	173	SE	Chimney	516723 417160	Chimney, DN40	Chimneys	Industrial Features
12	179	W	Tank	516209 417443	Tank, DN40	Tanks (Generic)	Industrial Features
13	193	W	Tank	516199 417349	Tank, DN40	Tanks (Generic)	Industrial Features
14	195	W	Tank	516199 417466	Tank, DN40	Tanks (Generic)	Industrial Features
15	200	W	Tank	516185 417389	Tank, DN40	Tanks (Generic)	Industrial Features
16	212	NW	Pylon	516374 417634	Pylon, DN40	Electrical Features	Infrastructure and Facilities
17	212	NW	Tank	516189 417489	Tank, DN40	Tanks (Generic)	Industrial Features
18	221	W	Tank	516164 417423	Tank, DN40	Tanks (Generic)	Industrial Features
19	233	W	Tank	516155 417448	Tank, DN40	Tanks (Generic)	Industrial Features

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
20	237	S	Chimney	516563 417031	Chimney, DN40	Chimneys	Industrial Features
21	249	W	Tank	516144 417470	Tank, DN40	Tanks (Generic)	Industrial Features

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 0

Database searched and no data found.

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
TFD-XCZ	TIDAL FLAT DEPOSITS	CLAY AND SILT

5.3 Bedrock and Solid Geology

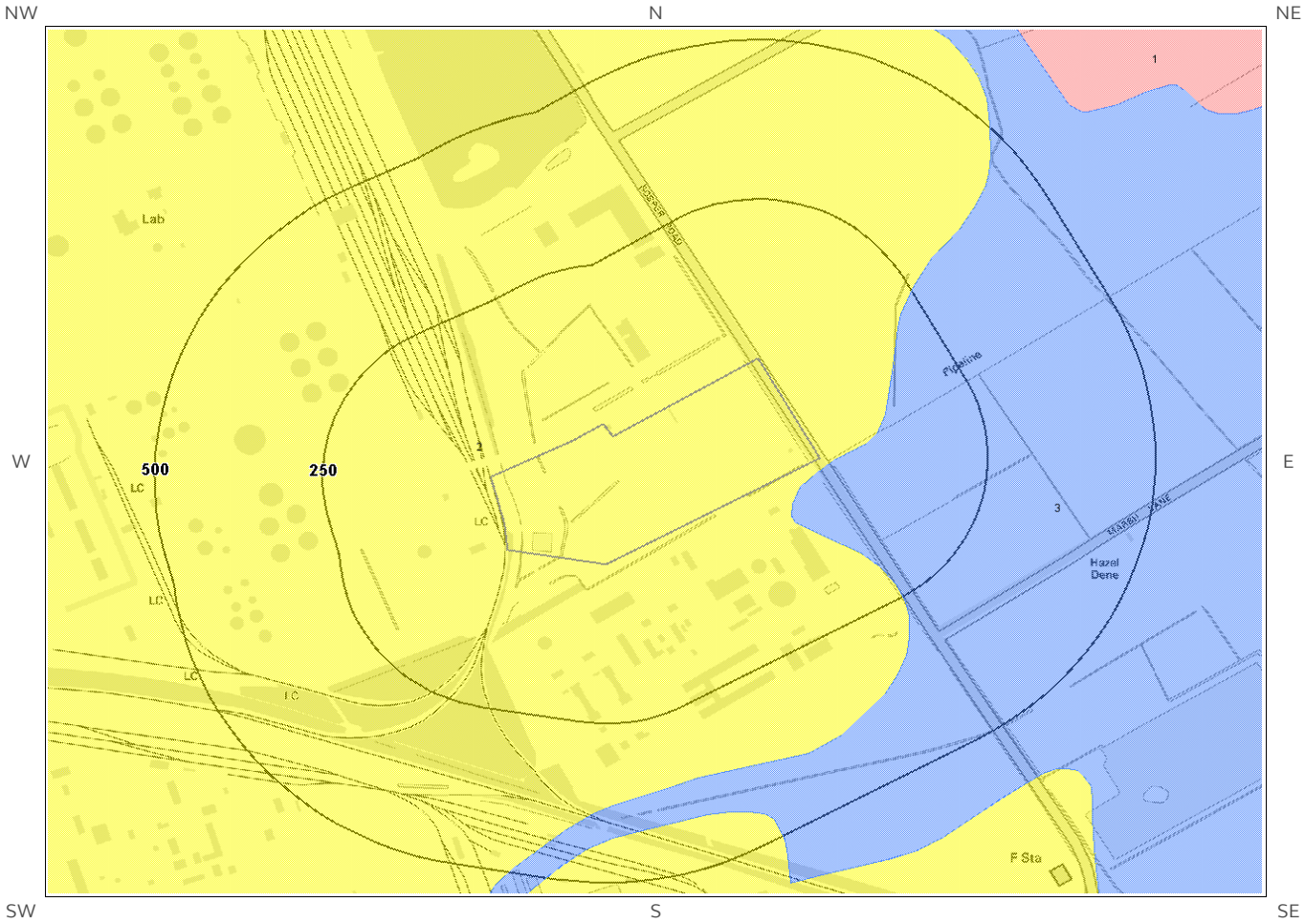
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
BCK-CHLK	BURNHAM CHALK FORMATION	CHALK

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

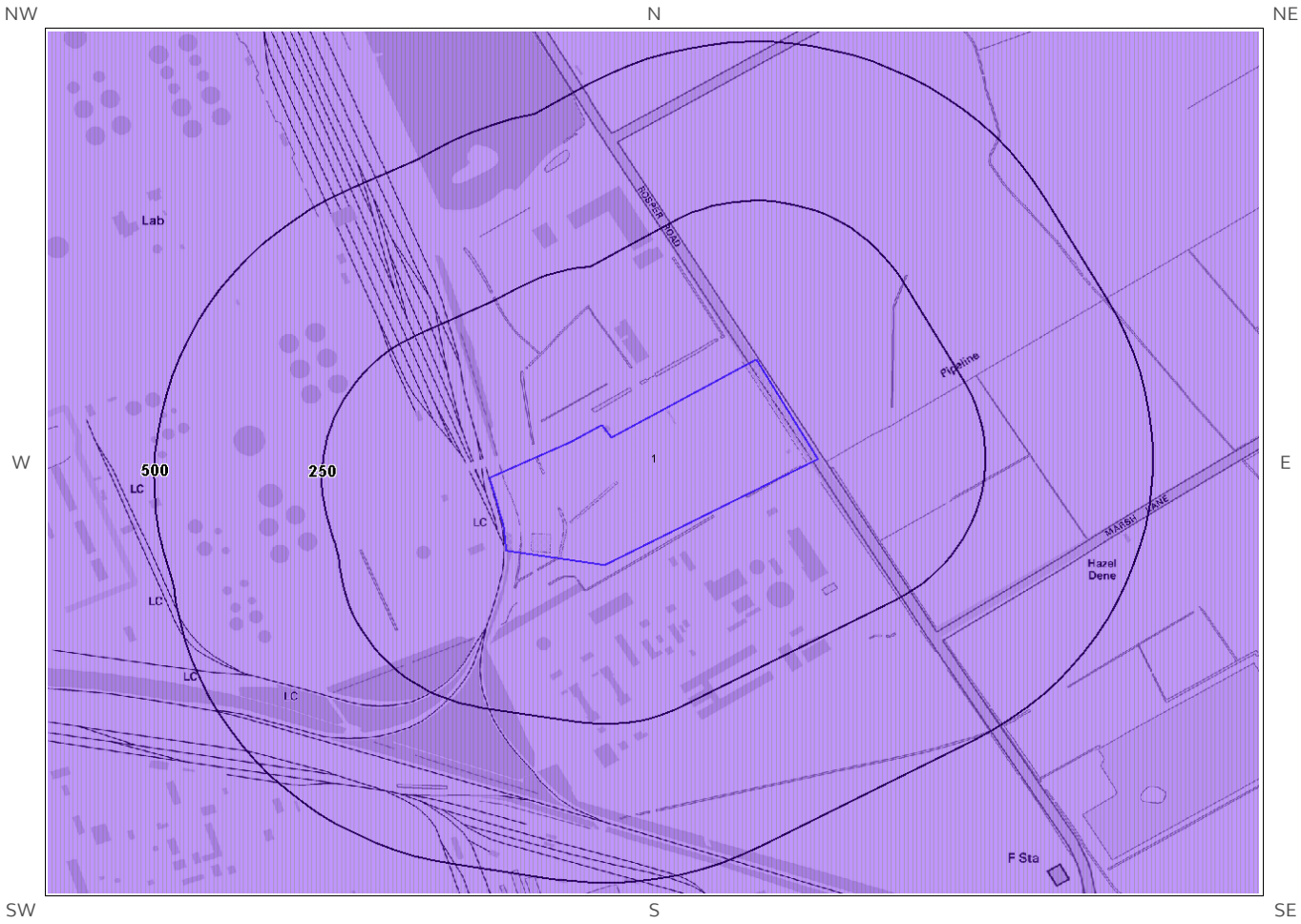
Secondary (B) Aquifer - Lower Permeability Layers

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

6b. Aquifer Within Bedrock Geology and Abstraction Licenses



Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Groundwater Abstraction Licence

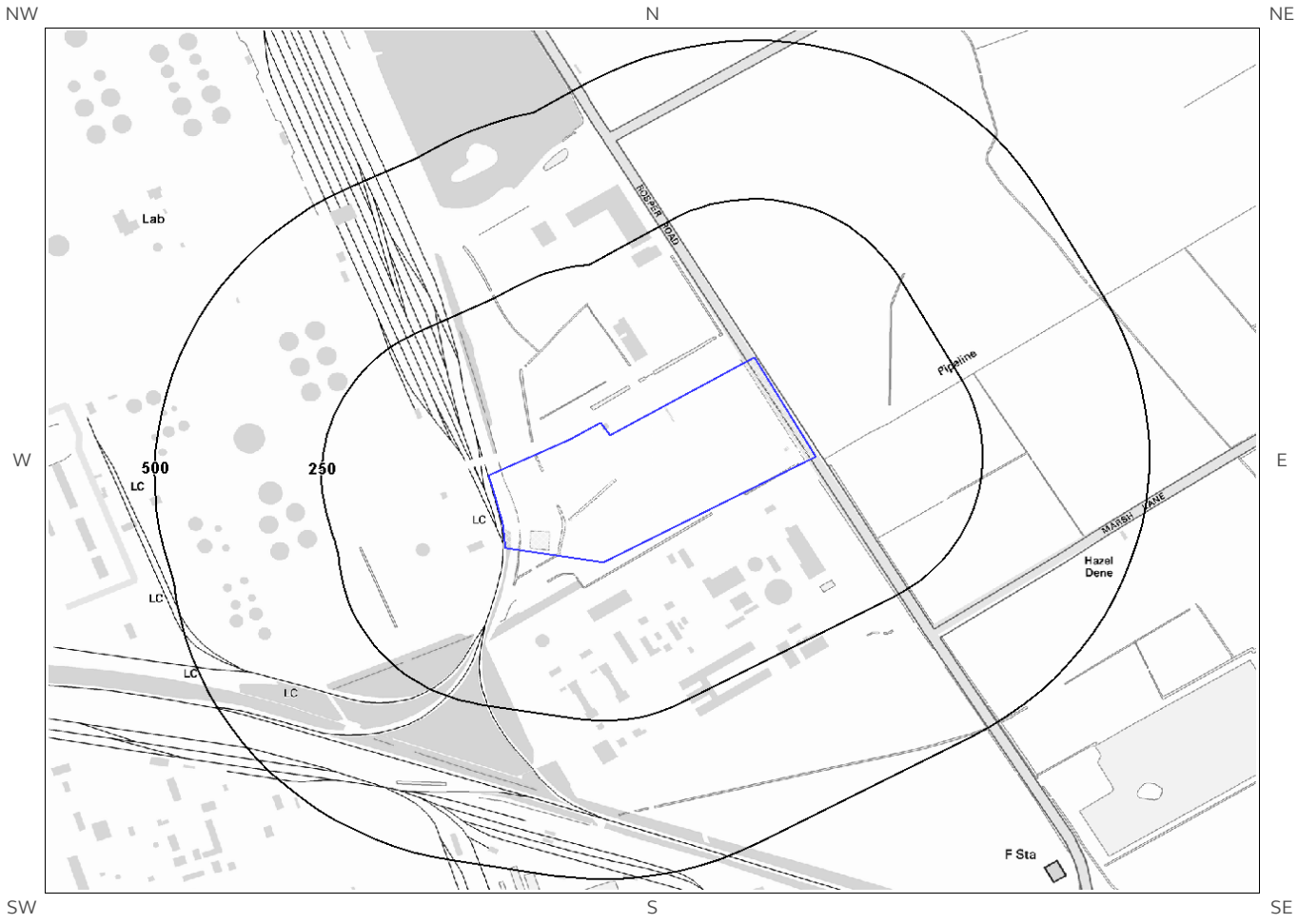
Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

Surface Water Abstraction Licence

6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



Site Outline

250
500
Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

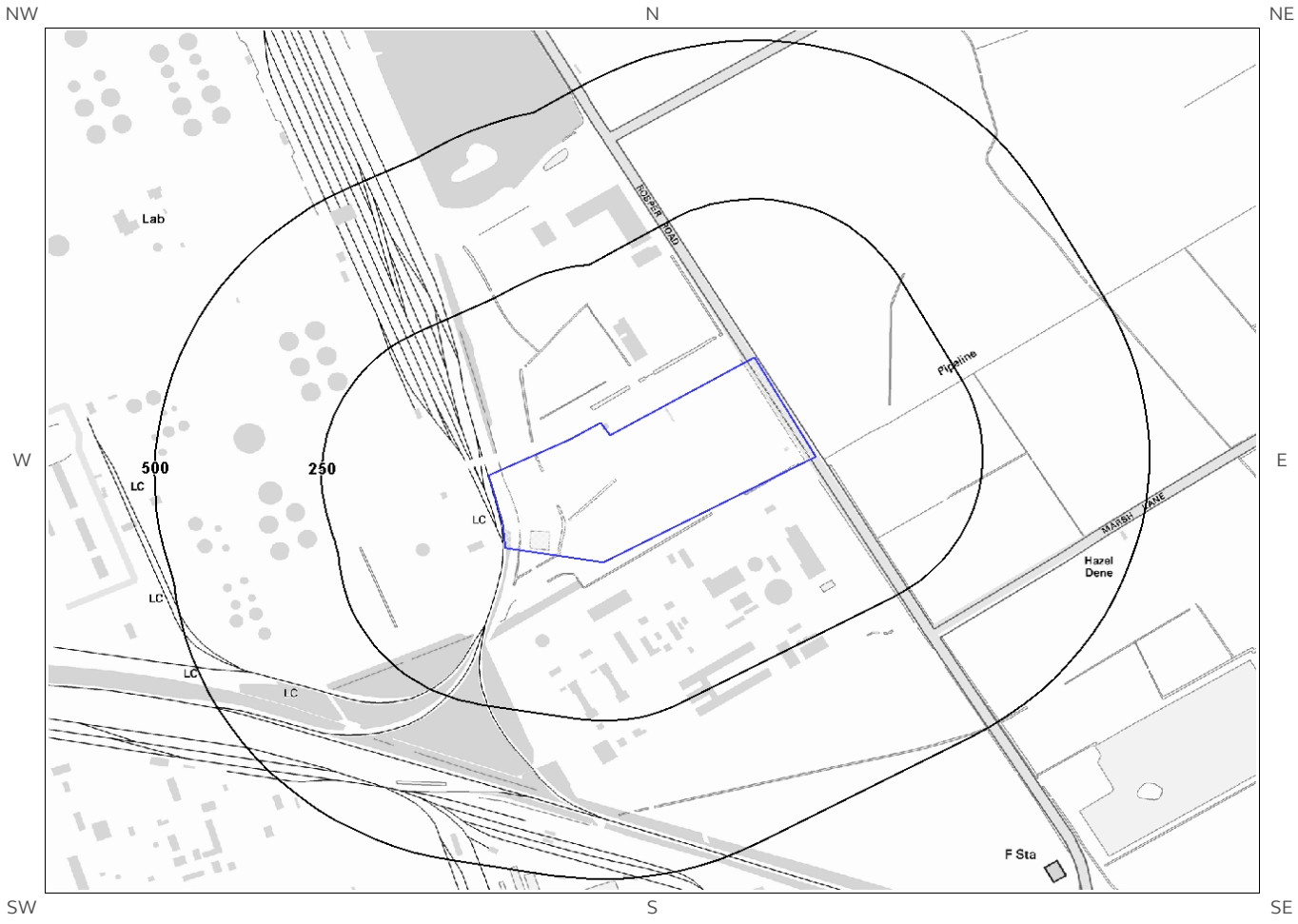
Source Protection Zone 2 - Outer Catchment

Source Protection Zone 3 - Total Catchment

Source Protection Zone 4 - Zone of Special Interest

Potable Water Abstraction Licence

6d. Hydrogeology – Source Protection Zones within confined aquifer



Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2C - Outer Catchment within Confined Aquifer

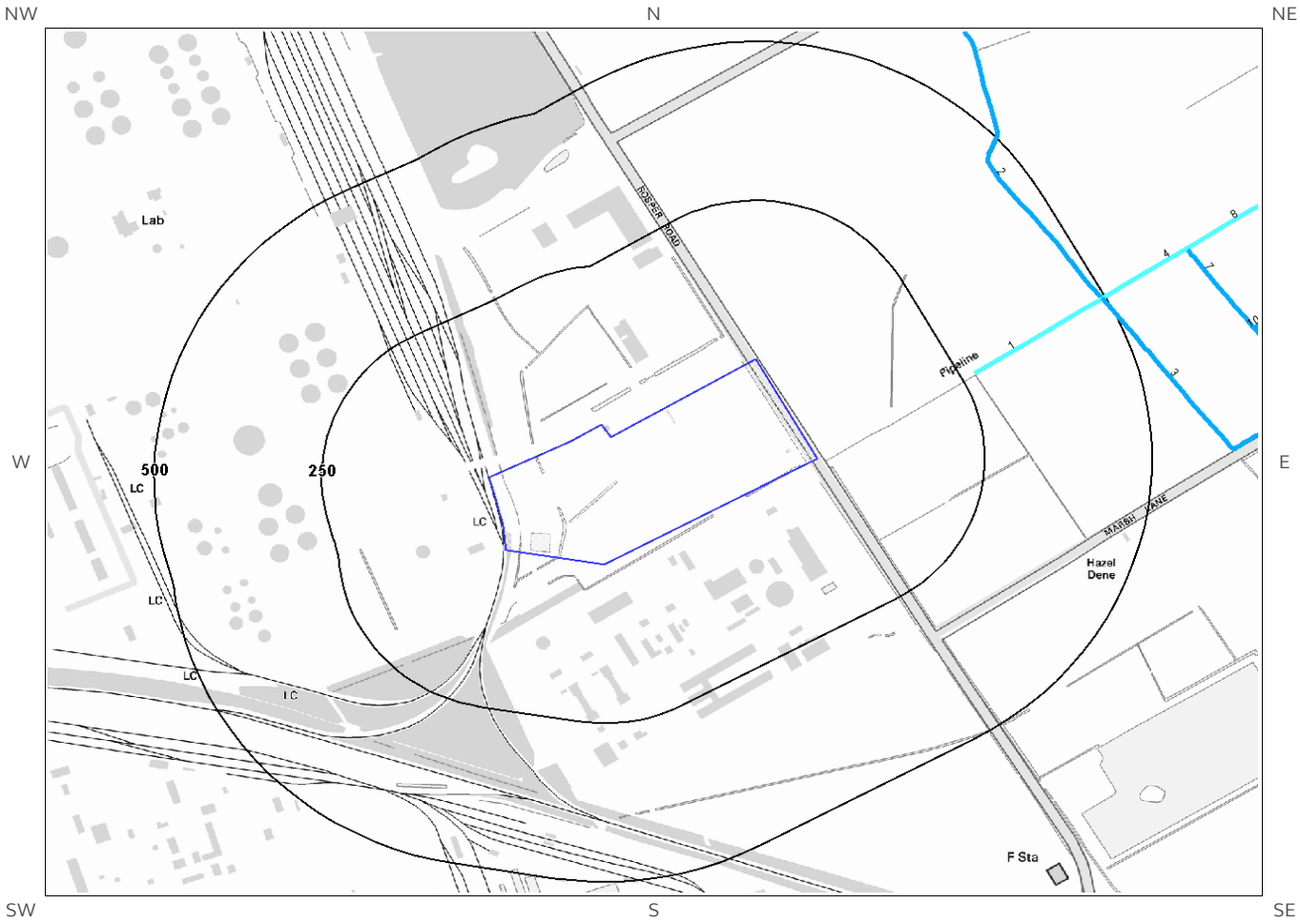
Source Protection Zone 3C - Total Catchment within Confined Aquifer

Potable Water Abstraction Licence

Site Outline

250
500
Search Buffers (m)

6e. Hydrology – Detailed River Network and River Quality



Site Outline

250
500
Search Buffers (m)

Primary River
Secondary River
Tertiary River
Lake/Reservoir
Underground River (inferred)
General Quality Assessment: Biology
General Quality Assessment: Chemistry

Canal
Canal Tunnel
Culvert
Multiple Channel Culvert
Underground River (Potential Sewer)
Underground River (local knowledge)

6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Are there records of strata classification within the superficial geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
2	0	On Site	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
3	15	SE	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.2 Aquifer within Bedrock Deposits

Are there records of strata classification within the bedrock geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

6.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? Yes

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
Not shown	860	SW	515620 416950	Status: Historical Licence No: 4/29/09/*G/0124 Details: Process water Direct Source: Ground Water Source Of Supply Point: Conoco Bore2 S.killingholme Data Type: Point Name: CONOCO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 1/6/1980 Expiry Date: 31/07/2002 Issue No: 100 Version Start Date: 1/7/1997 Version End Date:
Not shown	860	SW	515620 416950	Status: Historical Licence No: 4/29/09/*G/0145 Details: Process Water Direct Source: Ground Water Source Of Supply Point: Conoco Bore2 S.killingholme Data Type: Point Name: CONOCOPHILLIPS LTD	Annual Volume (m^3): 619000 Max Daily Volume (m^3): 1700 Original Application No: NA363 Original Start Date: 2/7/2002 Expiry Date: 31/3/2010 Issue No: 2 Version Start Date: 15/7/2003 Version End Date:
Not shown	860	SW	515620 416950	Status: Historical Licence No: AN/029/0009/001 Details: Process Water Direct Source: Ground Water Source Of Supply Point: Conoco Bore2 S.killingholme Data Type: Point Name: Phillips 66 Ltd	Annual Volume (m^3): 619000 Max Daily Volume (m^3): 1700 Original Application No: NPS/WR/002956 Original Start Date: 1/4/2010 Expiry Date: 31/3/2018 Issue No: 1 Version Start Date: 1/4/2010 Version End Date:
Not shown	860	SW	515620 416950	Status: Active Licence No: AN/029/0009/001 Details: Process Water Direct Source: Ground Water Source Of Supply Point: Borehole 2 S.killingholme Data Type: Point Name: Phillips 66 Limited	Annual Volume (m^3): 619000 Max Daily Volume (m^3): 1700 Original Application No: NPS/WR/011064 Original Start Date: 1/4/2010 Expiry Date: 31/3/2018 Issue No: 2 Version Start Date: 13/7/2012 Version End Date:
Not shown	885	E	517760 417440	Status: Active Licence No: 4/29/09/*G/0129 Details: General Use Relating To Secondary Category (Low Loss) Direct Source: Ground Water Source Of Supply Point: Inland Cavern Bore 1 Data Type: Point Name: Phillips 66 Limited	Annual Volume (m^3): 14000 Max Daily Volume (m^3): 1056 Original Application No: NPS/WR/011065 Original Start Date: 8/5/1985 Expiry Date: - Issue No: 102 Version Start Date: 13/7/2012 Version End Date:
Not shown	895	E	517770 417440	Status: Active Licence No: 4/29/09/*G/0129 Details: General Use Relating To Secondary Category (Low Loss) Direct Source: Ground Water Source Of Supply Point: Inland Cavern Bore 2 Data Type: Point Name: Phillips 66 Limited	Annual Volume (m^3): 14000 Max Daily Volume (m^3): 1056 Original Application No: NPS/WR/011065 Original Start Date: 8/5/1985 Expiry Date: - Issue No: 102 Version Start Date: 13/7/2012 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	921	SW	515730 416670	Status: Historical Licence No: AN/029/0009/001 Details: Process Water Direct Source: Ground Water Source Of Supply Point: Conoco Bore1 S.killingholme Data Type: Point Name: Phillips 66 Ltd	Annual Volume (m^3): 619000 Max Daily Volume (m^3): 1700 Original Application No: NPS/WR/002956 Original Start Date: 1/4/2010 Expiry Date: 31/3/2018 Issue No: 1 Version Start Date: 1/4/2010 Version End Date:
Not shown	921	SW	515730 416670	Status: Historical Licence No: 4/29/09/*G/0145 Details: Process Water Direct Source: Ground Water Source Of Supply Point: Conoco Bore1 S.killingholme Data Type: Point Name: CONOCOPHILLIPS LTD	Annual Volume (m^3): 619000 Max Daily Volume (m^3): 1700 Original Application No: NA363 Original Start Date: 2/7/2002 Expiry Date: 31/3/2010 Issue No: 2 Version Start Date: 15/7/2003 Version End Date:
Not shown	921	SW	515730 416670	Status: Historical Licence No: 4/29/09/*G/0124 Details: Process water Direct Source: Ground Water Source Of Supply Point: Conoco Bore1 S.killingholme Data Type: Point Name: CONOCO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 1/6/1980 Expiry Date: 31/07/2002 Issue No: 100 Version Start Date: 1/7/1997 Version End Date:
Not shown	921	SW	515730 416670	Status: Active Licence No: AN/029/0009/001 Details: Process Water Direct Source: Ground Water Source Of Supply Point: Borehole 1 S.killingholme Data Type: Point Name: Phillips 66 Limited	Annual Volume (m^3): 619000 Max Daily Volume (m^3): 1700 Original Application No: NPS/WR/011064 Original Start Date: 1/4/2010 Expiry Date: 31/3/2018 Issue No: 2 Version Start Date: 13/7/2012 Version End Date:
Not shown	1346	E	518170 417800	Status: Active Licence No: 4/29/09/*G/0129 Details: General Use Relating To Secondary Category (Low Loss) Direct Source: Ground Water Source Of Supply Point: Riverside Cavern Bore 1 Data Type: Point Name: Phillips 66 Limited	Annual Volume (m^3): 14000 Max Daily Volume (m^3): 1056 Original Application No: NPS/WR/011065 Original Start Date: 8/5/1985 Expiry Date: - Issue No: 102 Version Start Date: 13/7/2012 Version End Date:
Not shown	1355	E	518180 417800	Status: Active Licence No: 4/29/09/*G/0129 Details: General Use Relating To Secondary Category (Low Loss) Direct Source: Ground Water Source Of Supply Point: Riverside Cavern Bore 2 Data Type: Point Name: Phillips 66 Limited	Annual Volume (m^3): 14000 Max Daily Volume (m^3): 1056 Original Application No: NPS/WR/011065 Original Start Date: 8/5/1985 Expiry Date: - Issue No: 102 Version Start Date: 13/7/2012 Version End Date:
Not shown	1875	SE	518578 416651	Status: Active Licence No: 4/29/09/*G/0045 Details: Raw Water Supply Direct Source: Ground Water Source Of Supply Point: Timber Yard Bore Data Type: Point Name: ASSOCIATED BRITISH PORTS	Annual Volume (m^3): 1400000 Max Daily Volume (m^3): 5480 Original Application No: NPS/WR/002800 Original Start Date: 1/6/1966 Expiry Date: - Issue No: 101 Version Start Date: 7/12/2010 Version End Date:
Not shown	1917	SE	518600 416600	Status: Historical Licence No: 4/29/09/*G/0045 Details: Raw Water Supply Direct Source: Ground Water Source Of Supply Point: Timber Yard Bore Data Type: Point Name: ASSOCIATED BRITISH PORTS	Annual Volume (m^3): 945588 Max Daily Volume (m^3): 2619 Original Application No: - Original Start Date: 1/6/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/4/1997 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1968	SE	518197 415977	Status: Active Licence No: 4/29/09/*G/0045 Details: Raw Water Supply Direct Source: Ground Water Source Of Supply Point: Reception Bore Data Type: Point Name: ASSOCIATED BRITISH PORTS	Annual Volume (m^3): 1400000 Max Daily Volume (m^3): 5480 Original Application No: NPS/WR/002800 Original Start Date: 1/6/1966 Expiry Date: - Issue No: 101 Version Start Date: 7/12/2010 Version End Date:

6.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 2000m of the study site? No

Database searched and no data found.

6.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? No

Database searched and no data found.

6.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? No

Database searched and no data found.

6.7 Source Protection Zones within Confined Aquifer

Are there any Source Protection Zones within the Confined Aquifer within 500m of the study site? No

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Is there any Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site? Yes

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Major Aquifer/Low Leaching Potential	L	Soils in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal, or they have the ability to attenuate diffuse pollutants.
338	E	Major Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.

6.9 River Quality

Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site? No

6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Database searched and no data found.

6.10 Detailed River Network

Are there any Detailed River Network entries within 500m of the study site? Yes

The following Detailed River Network records are represented on the Hydrology Map (6e):

ID	Distance (m)	Direction	Details	
1	271	NE	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
2	461	NE	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
3	495	NE	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined

ID	Distance (m)	Direction	Details	
4	495	NE	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined

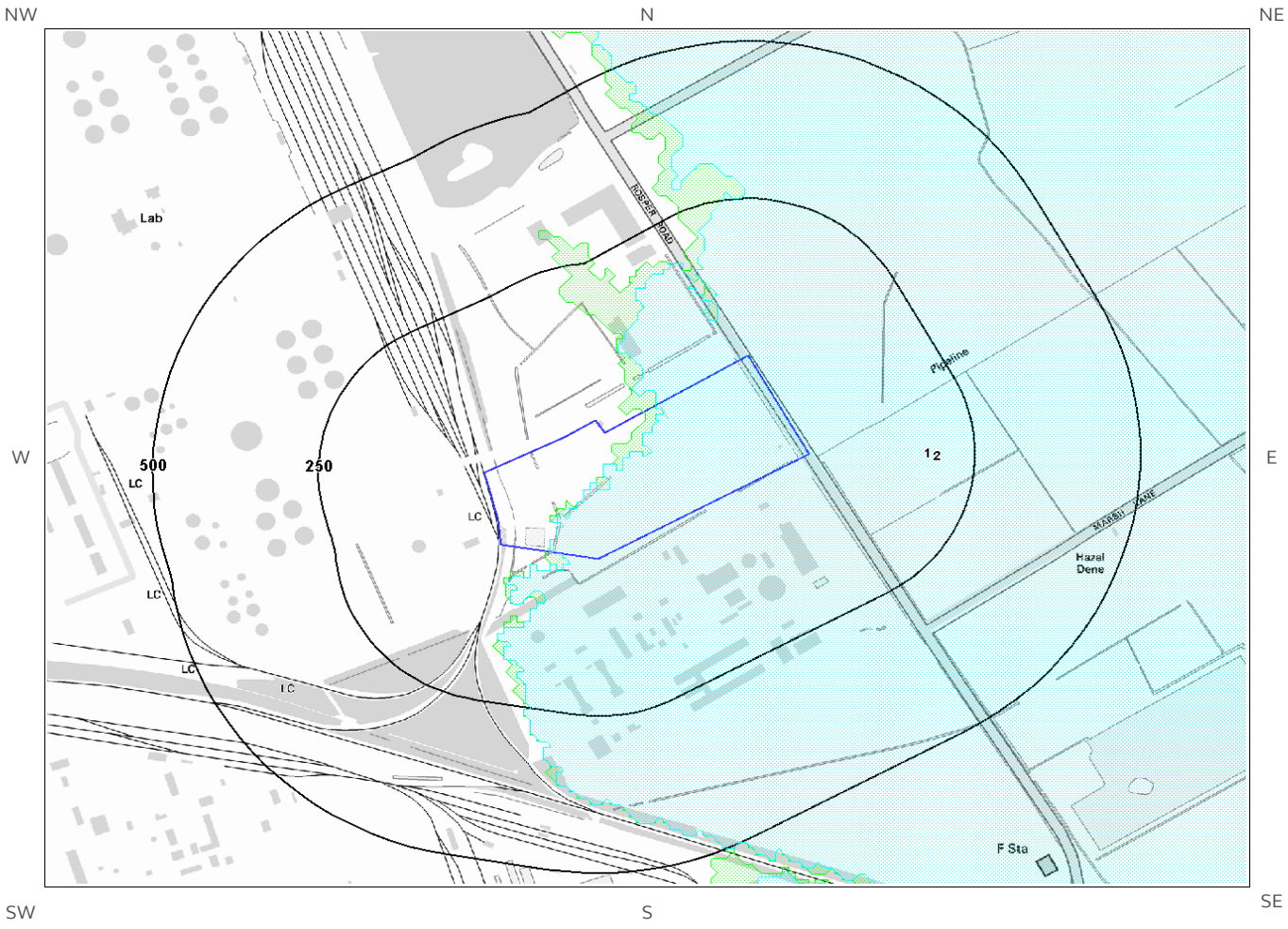
6.11 Surface Water Features

Are there any surface water features within 250m of the study site? Yes

The following surface water records are not represented on mapping:

Distance (m)	Direction
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
9	SE
21	SE
22	NW
25	NW
26	SW
29	NW
32	SE
45	W
50	NW
52	NW
55	NW
56	NW
65	W
68	W
77	S
82	NW
94	NW
142	S
156	SE
208	E
235	SW

7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



Site Outline

100
250
Search Buffers (m)

Zone 2 Floodplain

Zone 3 Floodplain

Flood Defences

Area used for Flood Storage

Area Benefiting from Flood Defences

7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map

Site Outline

100
250
Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

7 Flooding

7.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 2 floodplain? Yes

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	0	On Site	12-May-2017	Zone 2 - (Fluvial /Tidal Models)

7.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 3 floodplain? Yes

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

ID	Distance (m)	Direction	Update	Type
1	0	On Site	15-May-2017	Zone 3 - (Fluvial Models)

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

What is the highest risk of flooding onsite? High

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a High (1 in 30 or greater) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRas flood Risk
1	0.0	On Site	Very Low
2	0.0	On Site	Very Low

3	0.0	On Site	High

7.4 Flood Defences

Are there any Flood Defences within 250m of the study site? No

Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

7.6 Areas benefiting from Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? No

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site? Yes

Does this relate to Clearwater Flooding or Superficial Deposits Flooding? Clearwater Flooding

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?

Potential at Surface

Where potential for groundwater flooding to occur at surface is indicated, this means that given the geological conditions in the area groundwater flooding hazard should be considered in all land-use planning decisions. It is recommended that other relevant information e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information be investigated in order to establish relative, but not absolute, risk of groundwater flooding.

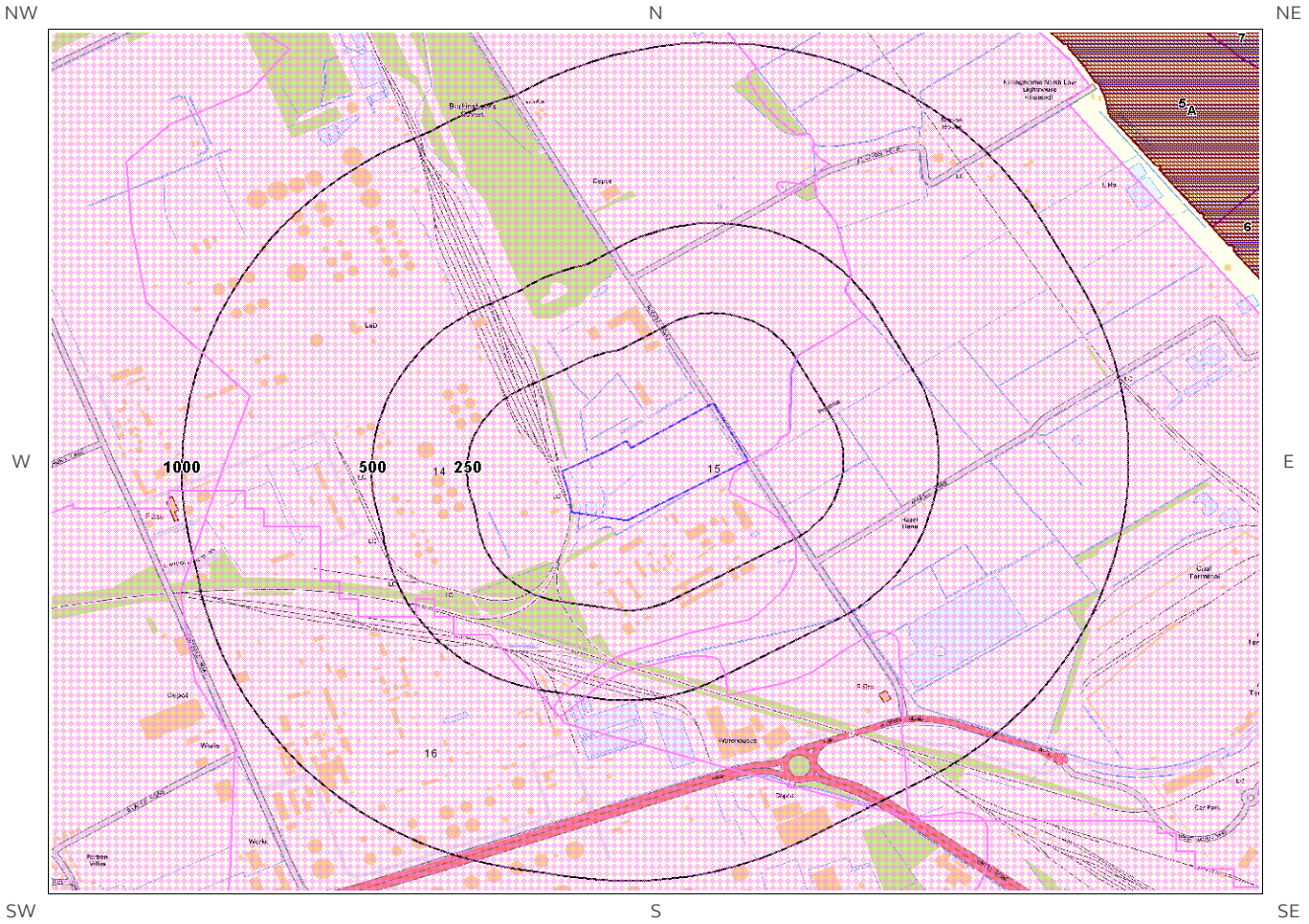
7.8 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result?	High

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map



Site Outline

100
250
Search Buffers (m)

AONB

National Park

SSSI

Special Protection Areas

Nitrate Vulnerable Zones

Green Belt

Environmentally Sensitive Areas

Special Areas of Conservation

World Heritage Sites

Nitrate Sensitive Areas

Ancient Woodland

National Nature Reserve

Local Nature Reserves

Ramsar Sites

8. Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site? Yes

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

6

The following Site of Special Scientific Interest (SSSI) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SSSI Name	Data Source
5	1313	NE	Humber Estuary	Natural England
6	1380	NE	Humber Estuary	Natural England
7	1544	NE	Humber Estuary	Natural England
Not shown	1851	E	Humber Estuary	Natural England
Not shown	1917	N	North Killingholme Haven Pits	Natural England
Not shown	1945	N	North Killingholme Haven Pits	Natural England

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

1

The following Special Area of Conservation (SAC) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SAC Name	Data Source
1	1313	NE	Humber Estuary	Natural England

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

3

The following Special Protection Area (SPA) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SPA Name	Data Source
2A	1313	NE	Humber Estuary	Natural England
Not shown	1917	N	Humber Estuary	Natural England
Not shown	1945	N	Humber Estuary	Natural England

8.5 Records of Ramsar sites within 2000m of the study site:

3

The following Ramsar records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ramsar Site Name	Ramsar Site Status	Data Source
11A	1313	NE	Humber Estuary	Listed	Natural England
Not shown	1917	N	Humber Estuary	Listed	Natural England
Not shown	1945	N	Humber Estuary	Listed	Natural England

8.6 Records of Ancient Woodland within 2000m of the study site:

0

Database searched and no data found.

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

0

Database searched and no data found.

8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

4

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
14	0	On Site	Existing	DEFRA
15	0	On Site	New	DEFRA
16	402	SW	Existing	DEFRA
Not shown	1507	W	Existing	DEFRA

8.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a Groundsure Geo Insight, available from our website. The following information has been found:

9.1.1 Shrink Swell

What is the maximum Shrink-Swell*[*] hazard rating identified on the study site? Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

9.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

9.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site? Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

9.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

What is the maximum Running Sand** hazard rating identified on the study site? Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for running sand problems with relatively small changes in ground conditions. Avoid large amounts of water entering the ground (for example through pipe leakage or soak-aways). Do not dig (deep) holes into saturated ground near the property without technical advice. For new build consider the consequences of soil and groundwater conditions during and after construction. For existing property possible increase in insurance risk from running sand, for example, due to water leakage, high rainfall events or flooding.

9.2 Radon

9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

* This indicates an automatically generated 50m buffer and site.

9.2.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing
ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

10. Mining

10.1 Coal Mining

Are there any coal mining areas within 75m of the study site? No

Database searched and no data found.

10.2 Non-Coal Mining

Are there any Non-Coal Mining areas within 50m of the study site boundary? No

Database searched and no data found.

10.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site? No
Guidance: No Guidance Required.

Contact Details

Groundsure Helpline
Telephone: 08444 159 000
info@groundsure.com

British Geological Survey Enquiries
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries:
enquiries@bgs.ac.uk

Environment Agency
National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 03708 506 506
Web: **www.environment-agency.gov.uk**
Email: enquiries@environment-agency.gov.uk

Public Health England
Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe
Email:**enquiries@phe.gov.uk**
Main switchboard**: 020 7654 8000**

The Coal Authority
200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Ordnance Survey
Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

Local Authority
Authority: North Lincolnshire Council
Phone: 01724 296 296
Web: http://www.northlincs.gov.uk/
Address: Civic Centre, Ashby Road, Scunthorpe, North Lincolns, DN16

Gemapping PLC
Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444

Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
https://www.groundsure.com/terms-and-conditions-sept-2016

Groundsure
LOCATION INTELLIGENCE

AECOM

AECOM LTD,2, CITY WALK,
LEEDS, LS11 9AR

Groundsure Reference:	GS-3982431
Your Reference:	Oil_Refinery
Report Date	13 Jun 2017
Report Delivery Method:	Email - pdf

Geo Insight

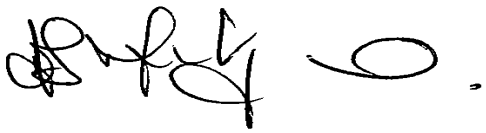
Address: TOTAL LINDSEY OIL REFINERY LTD, EASTFIELD ROAD, IMMINGHAM, DN40 3LW

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Geo Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,



Managing Director
Groundsure Limited

Enc.
Groundsure Geo Insight

Geo Insight

Address:	**TOTAL LINDSEY OIL REFINERY LTD, EASTFIELD ROAD, IMMINGHAM, DN40 3LW**
Date:	**13 Jun 2017**
Reference:	**GS-3982431**
Client:	**AECOM**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	27-Sep-2014
Grid Reference:	516613,417411
Site Size:	8.16ha

Groundsure
LOCATION INTELLIGENCE

Contents Page

Overview of Findings

The Groundsure Geo Insight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 and 1:10,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Non-coal mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Geology 1:10,000 Scale		
1.1 Artificial Ground	1.1 Is there any Artificial Ground/ Made Ground present beneath the study site at 1:10,000 scale?	No
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site at 1:10,000 scale?*	No
	1.2.2 Are there any records of landslip within 500m of the study site boundary at 1:10,000 scale?	No
1.3 Bedrock, Solid Geology and Faults	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records of faults within 500m of the study site boundary at 1:10,000 scale?	No

Section 2: Geology 1:50,000 Scale		
2.1 Artificial Ground	2.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	No
	2.1.2 Are there any records relating to permeability of artificial ground within the study site*boundary?	No
2.2 Superficial Geology and Landslips	2.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*	Yes
	2.2.2 Are there any records of permeability of superficial ground within 500m of the study site?	Yes
	2.2.3 Are there any records of landslip within 500m of the study site boundary?	No
	2.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No

Section 2: Geology 1:50,000 Scale

2.3 Bedrock, Solid Geology and Faults	2.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	2.3.2 Are there any records relating to permeability of bedrock ground within the study site boundary?	Yes
	2.3.3 Are there any records of faults within 500m of the study site boundary?	No

Section 3: Radon

3. Radon	3.1Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
	3.2Radon Protection	No radon protective measures are necessary.

Section 4: Ground Workings	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	0	0	2	Not Searched	Not Searched
4.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	0
4.3 Current Ground Workings	0	0	0	0	0

Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.1 Historical Mining	0	0	0	0	0
5.2 Coal Mining	0	0	0	0	0
5.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
5.4 Non-Coal Mining*	0	0	0	0	0
5.5 Non–Coal Mining Cavities	0	0	0	0	0
5.5 Natural Cavities	0	0	0	0	0

Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.6 Brine Extraction	0	0	0	0	0
5.7 Gypsum Extraction	0	0	0	0	0
5.8 Tin Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0

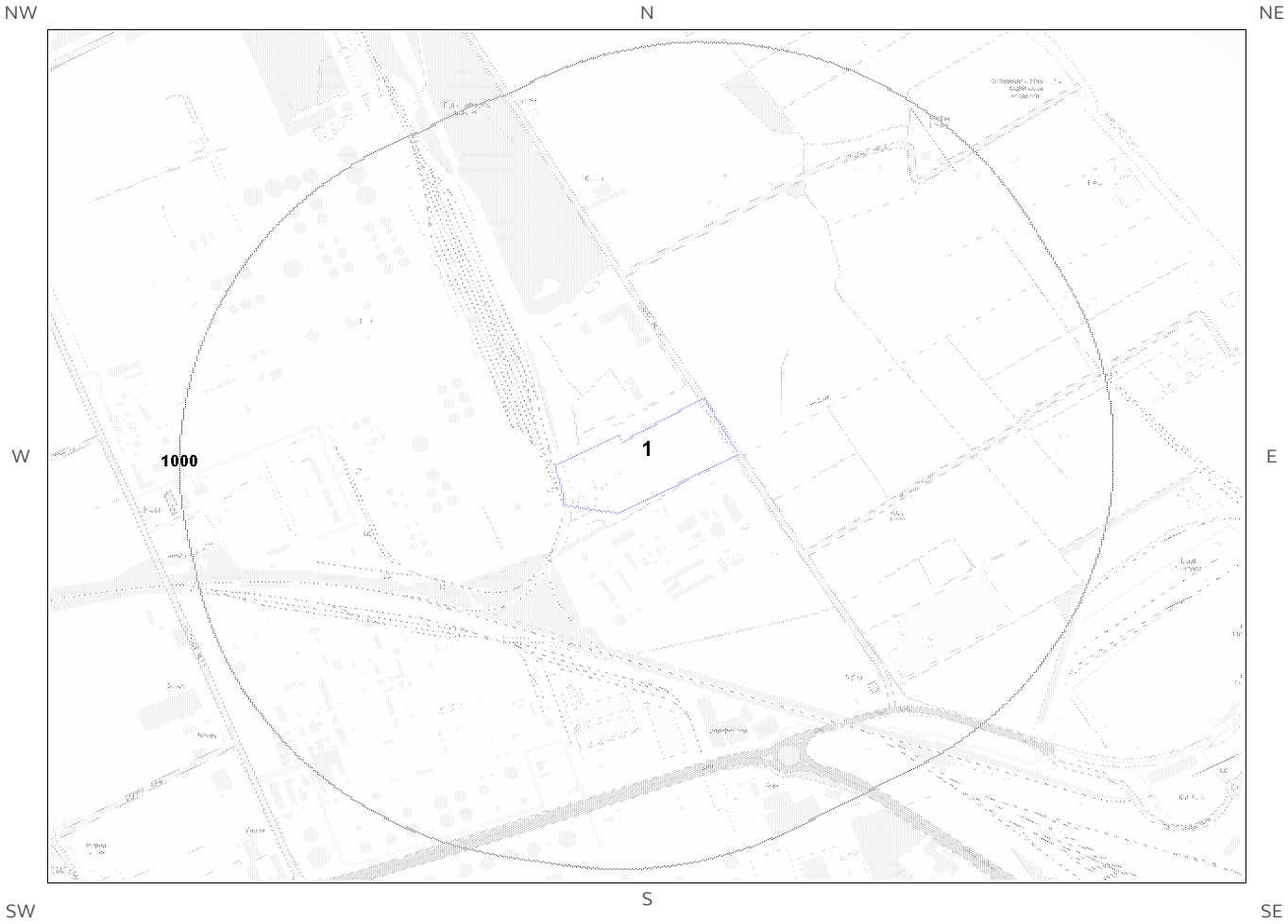
Section 6: Natural Ground Subsidence	On-site
6.1 Shrink-Swell Clay	Low
6.2 Landslides	Very Low
6.3 Ground Dissolution of Soluble Rocks	Negligible
6.4 Compressible Deposits	Moderate
6.5 Collapsible Deposits	Very Low
6.5 Running Sand	Moderate

Section 7: Borehole Records	On-site	0-50m	51-250
7 BGS Recorded Boreholes	0	0	0

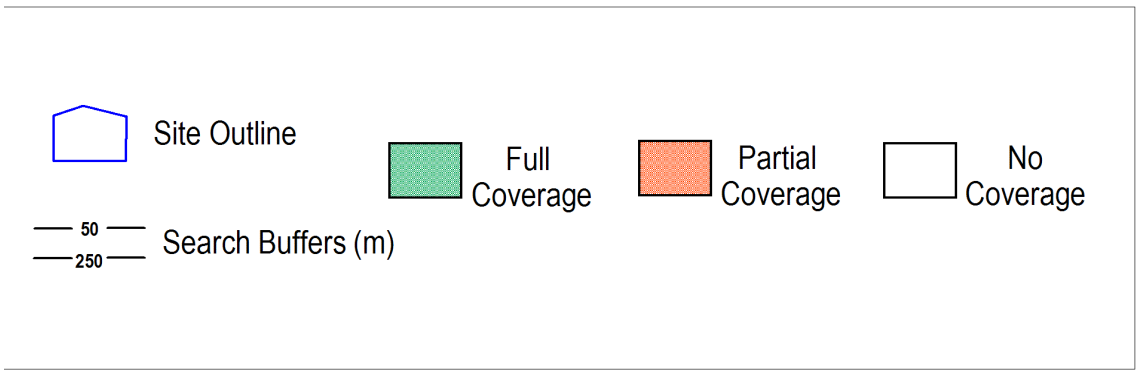
Section 8: Estimated Background Soil Chemistry	On-site	0-50m	51-250
8 Records of Background Soil Chemistry	3	2	0

Section 9: Railways and Tunnels	On-site	0-50m	51-250	250-500
9.1 Tunnels	0	0	0	Not Searched
9.2 Historical Railway and Tunnel Features	3	1	1	Not Searched
9.3 Historical Railways	0	0	0	Not Searched
9.4 Active Railways	0	24	40	Not Searched
9.5 Railway Projects	0	0	0	0

1:10,000 Scale Availability



1_10,000 Availability Legend



Availability of 1:10,000 Scale Geology Mapping

The following information represents the availability of the key components of the 1:10,000 scale geological data.

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	No deposits are mapped	No coverage	No coverage	No coverage

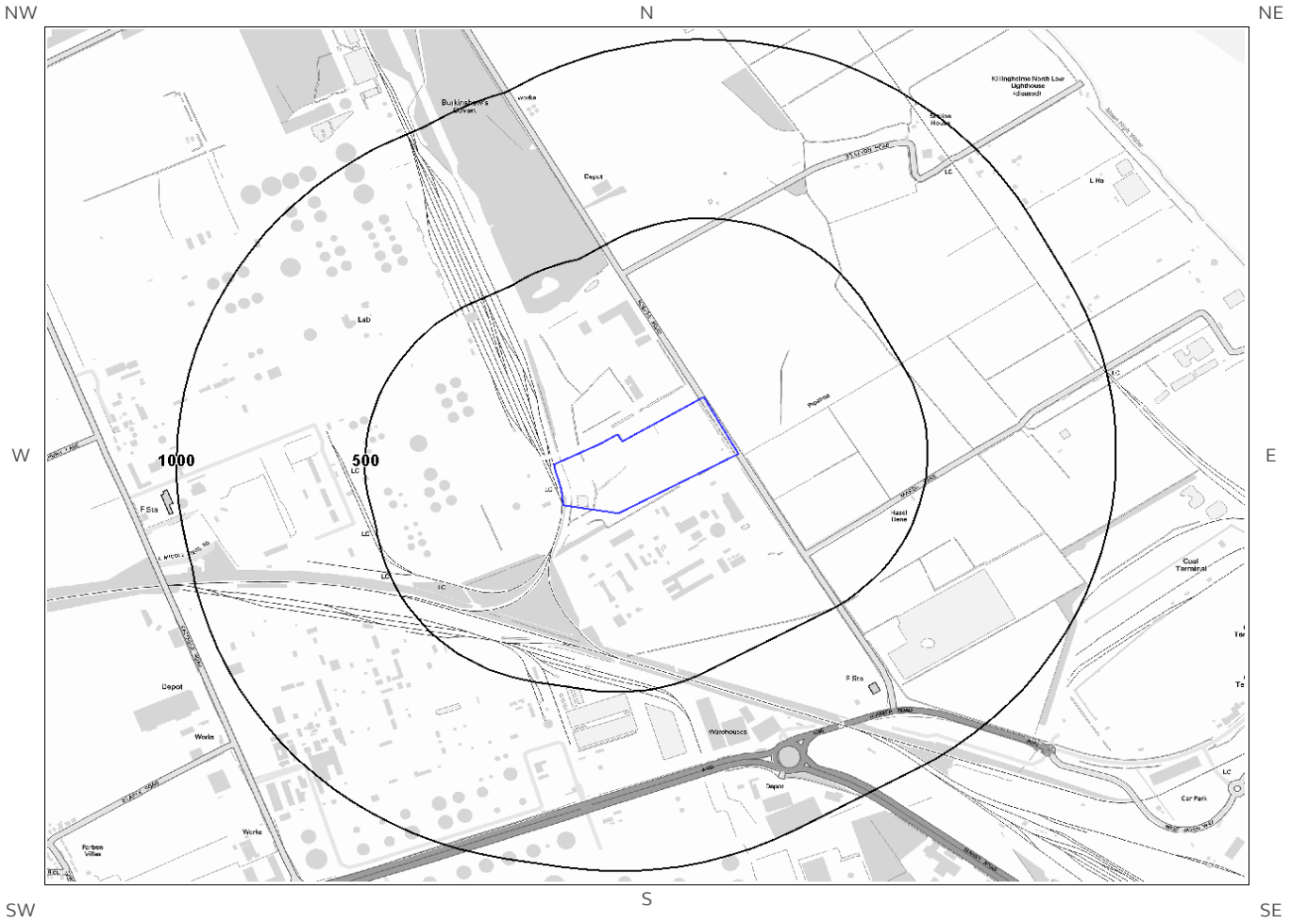
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not all themes are mapped or available on every map sheet. Therefore a coverage layer showing the availability of the four themes is presented above.

The definitions of coverage are as follows:

Geology	Full Coverage	Partial Coverage	No Coverage
Bedrock	The whole tile has been mapped	Some but not all the tile has been mapped	No coverage
Superficial	The whole tile has been mapped	Some but not all of the tile has been mapped	No coverage
Artificial	Some deposits are mapped on this tile	-	No deposits are mapped
Mass Movement	Some deposits are mapped on this tile	-	No coverage

1 Geology (1:10,000 scale).

1.1 Artificial Ground Map (1:10,000 scale)



Artificial Ground Legend

Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Disturbed Ground (undivided)

Worked Ground (undivided)

Landscaped Ground (undivided)

Infilled Ground

Reclaimed Ground

1. Geology 1:10,000 scale

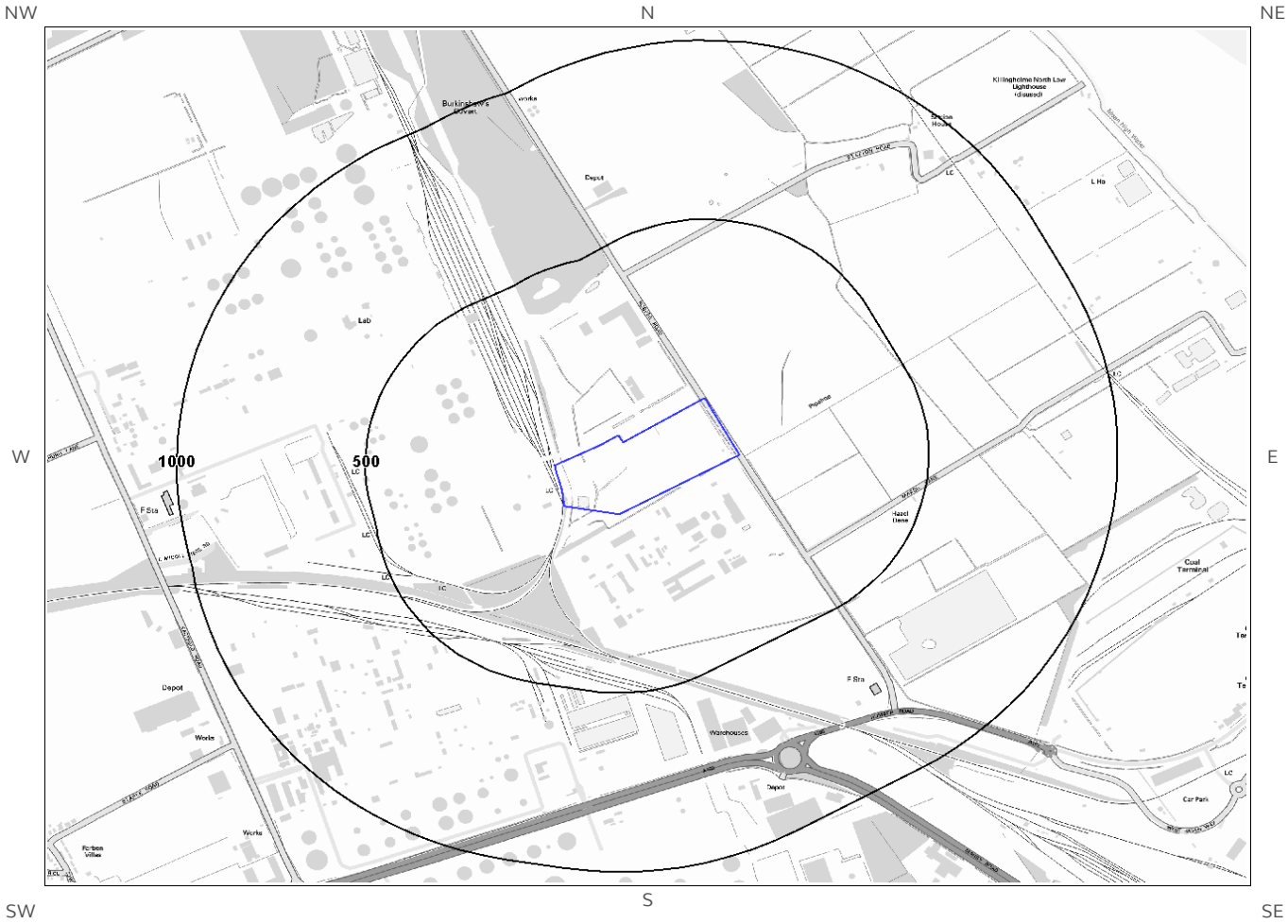
1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

Are there any records of Artificial/ Made Ground within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found.

1.2 Superficial Deposits and Landslips Map (1:10,000 scale)



Artificial Ground Legend

Site Outline

500
1000
Search Buffers (m)

1.2 Superficial Deposits and Landslips

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found.

1.2.2 Landslip

Are there any records of Landslip within 500m of the study site boundary at 1:10,000 scale?

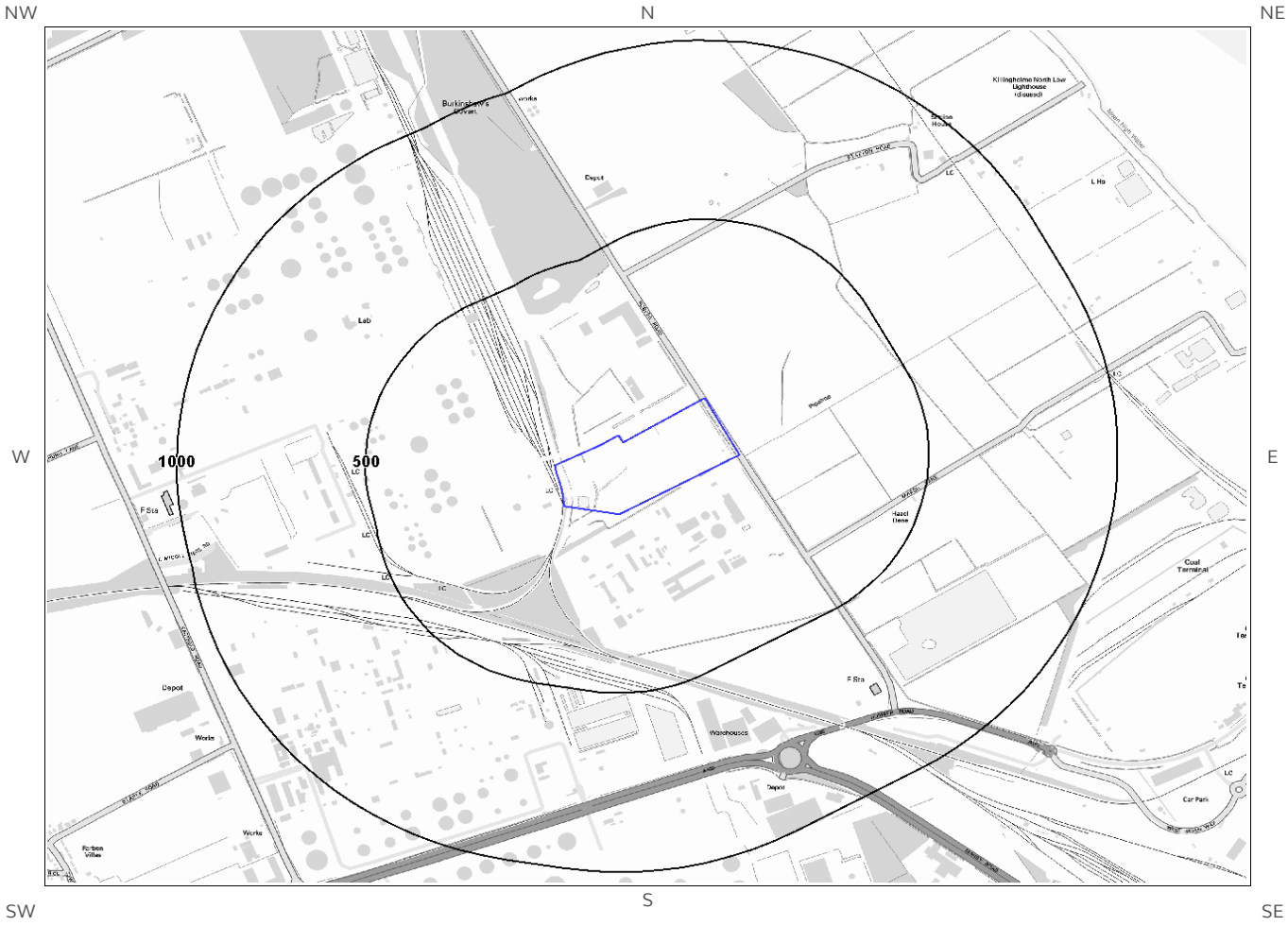
No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:10,000 scale

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.3 Bedrock and Faults Map (1:10,000 scale)



Bedrock and Faults Legend

Site Outline

500
1000
Search Buffers (m)

1.3 Bedrock and Faults

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary at 1:10,000 scale.

Database searched and no data found at this scale.

1.3.2 Faults

Are there any records of Faults within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found at this scale.

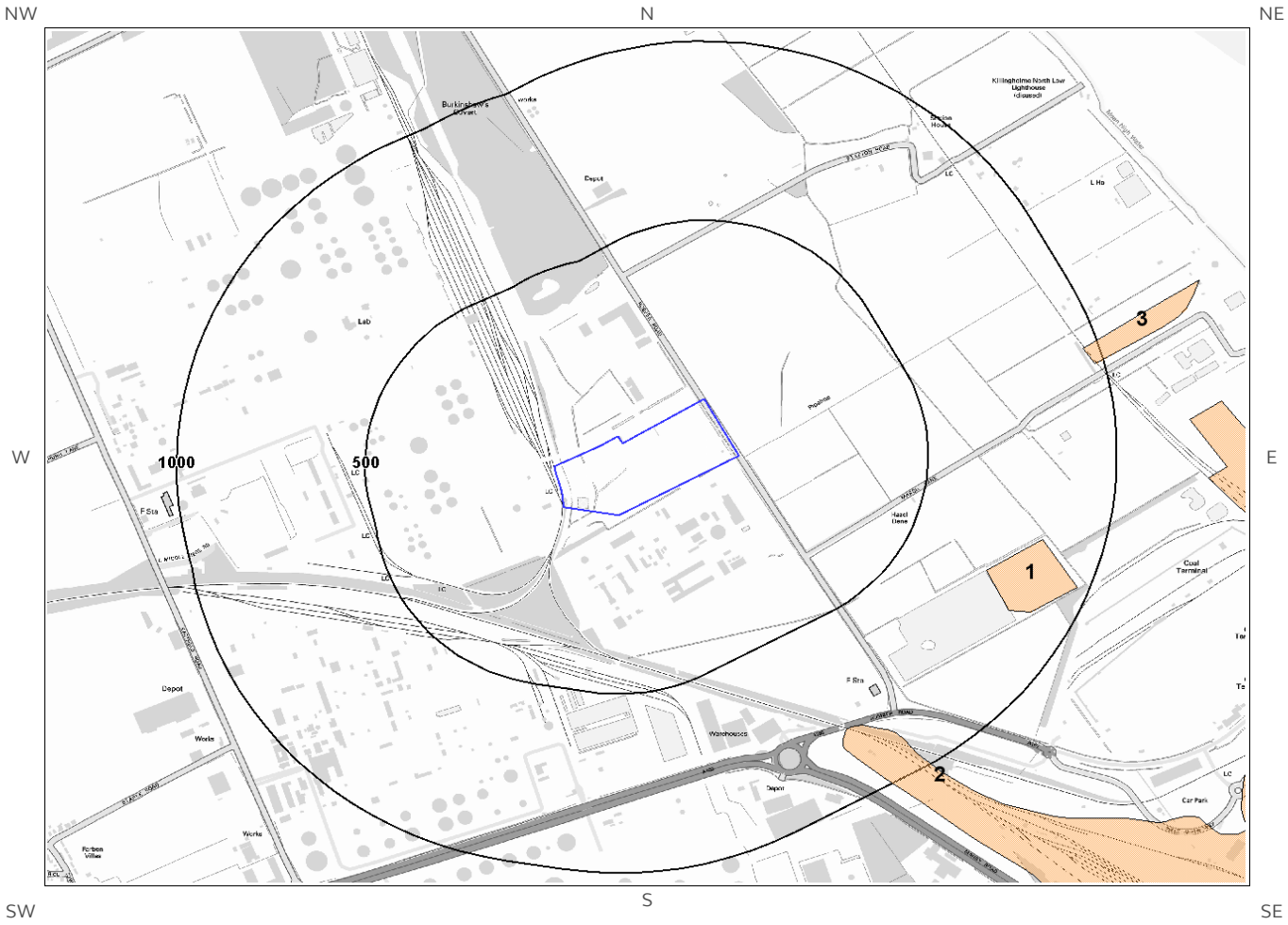
The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of great Britain at 1:10,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

---

2 Geology 1:50,000 Scale

2.1 Artificial Ground Map



Ground Workings Legend

Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Worked Ground (undivided)

Infilled Ground

Disturbed Ground (undivided)

Landscaped Ground (undivided)

Reclaimed Ground

2. Geology 1:50,000 scale

2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 081

2.1.1 Artificial/ Made Ground

Are there any records of Artificial/ Made Ground within 500m of the study site boundary? No

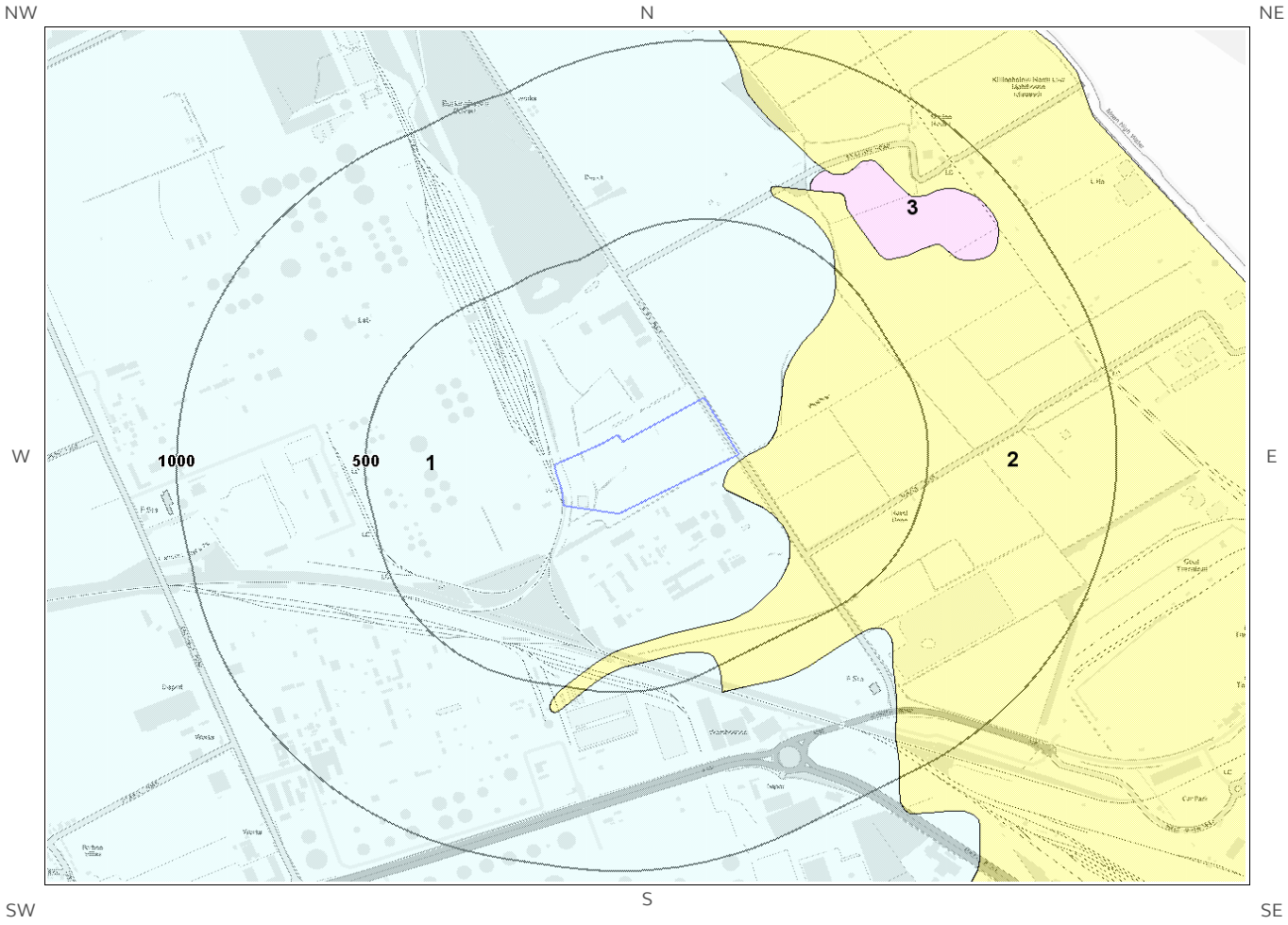
Database searched and no data found.

2.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? No

Database searched and no data found.

2.2 Superficial Deposits and Landslips Map (1:50,000 scale)



Ground Workings Legend

Site Outline

500
1000
Search Buffers (m)

2.2 Superficial Deposits and Landslips

2.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
2	15.0	SE	TFD-XCZ	TIDAL FLAT DEPOSITS	CLAY AND SILT

2.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Mixed	High	Low
15.0	SE	Intergranular	Low	Very Low

2.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

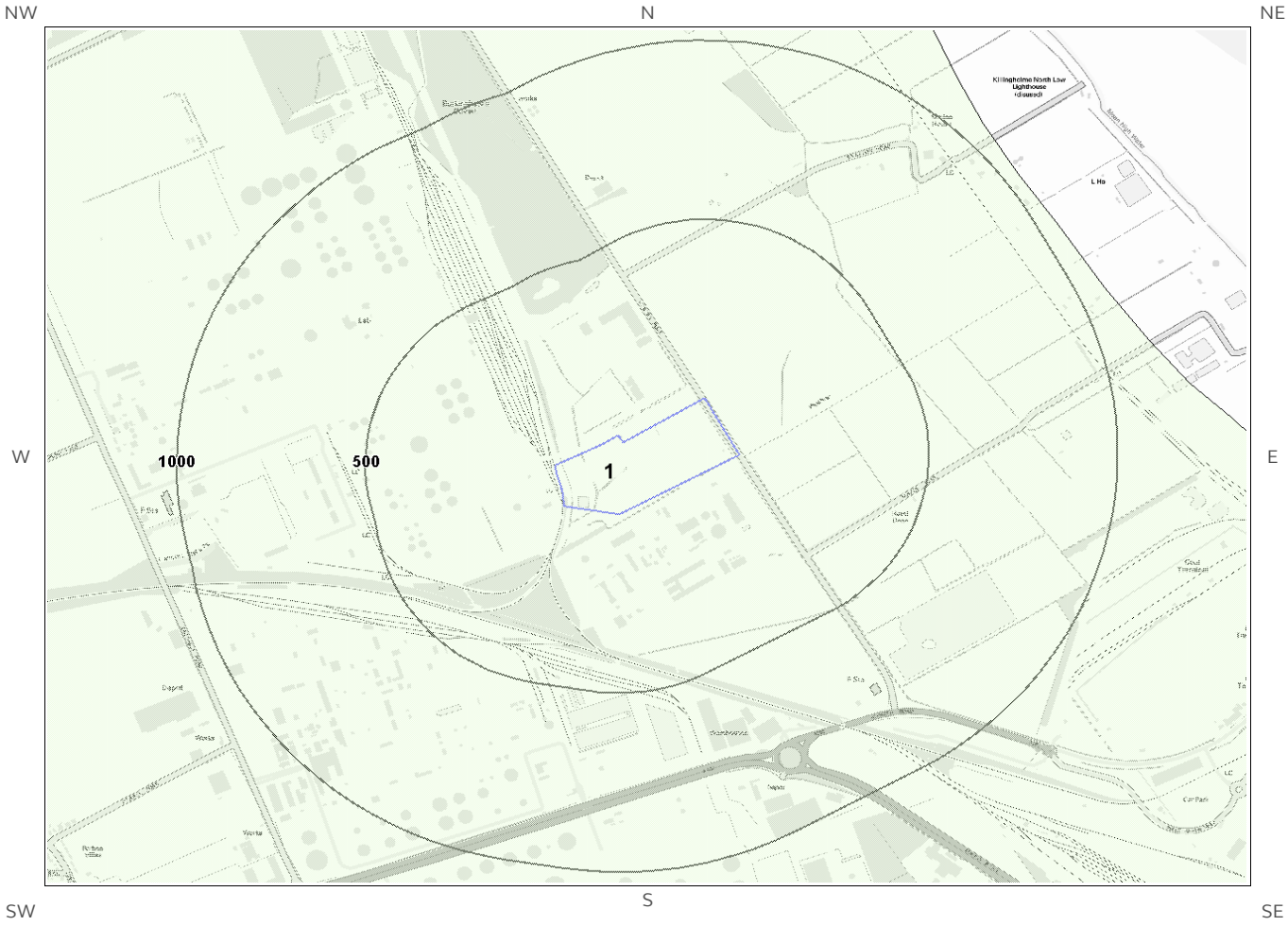
This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site boundary? No

Database searched and no data found.

2.3 Bedrock and Faults Map (1:50,000 scale)



Ground Workings Legend

Site Outline

500
1000
Search Buffers (m)

2.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 081

2.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	BCK-CHLK	BURNHAM CHALK FORMATION - CHALK	TURONIAN

2.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site boundary? Yes

Distance	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	Very High	Very High

2.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nation wide coverage.

3 Radon Data

3.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

3.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

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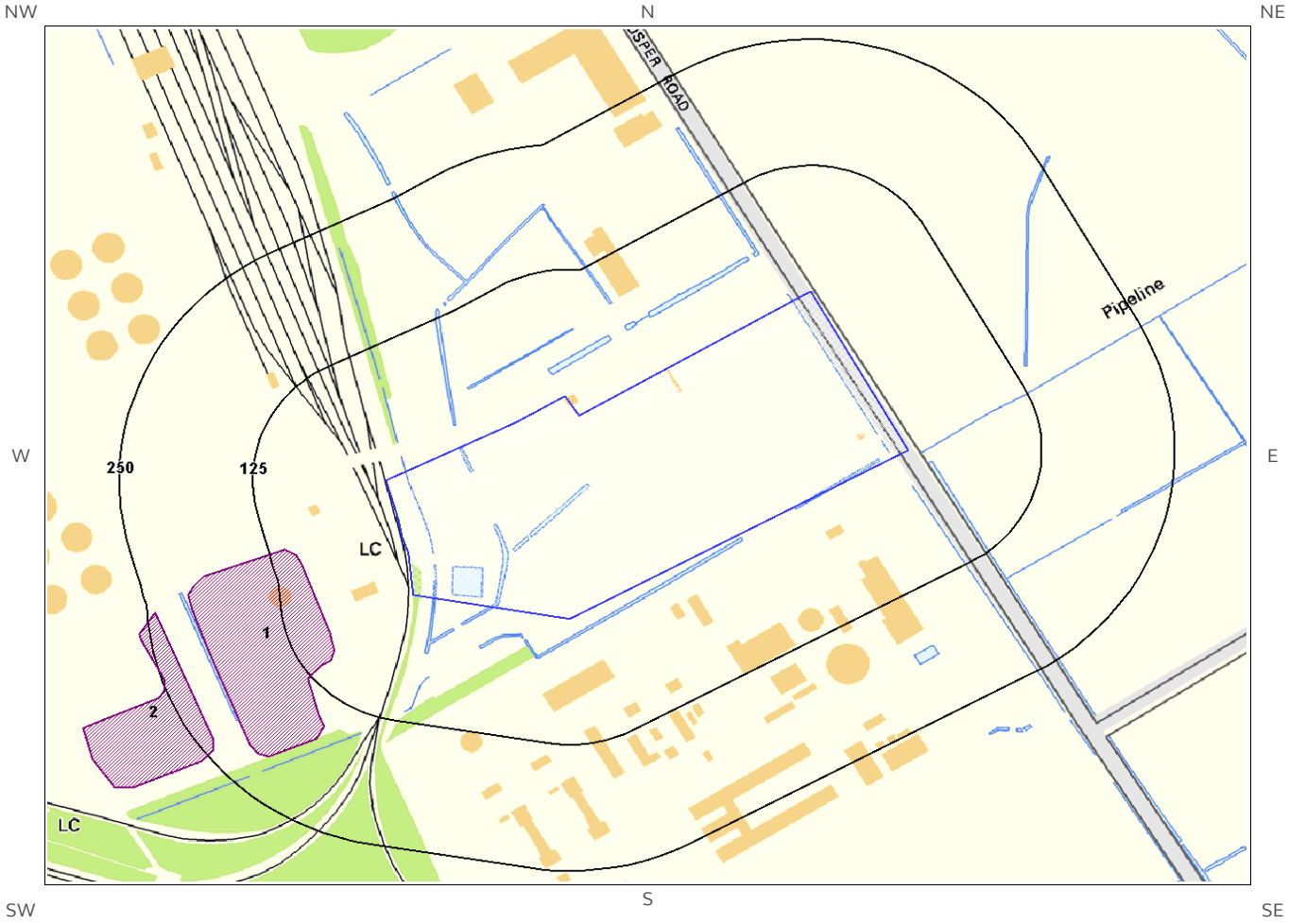
4 Ground Workings Map



Ground Workings Legend

Site Outline

125
250
Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

4 Ground Workings

4.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

ID	Distance (m)	Direction	NGR	Use	Date
1	86.0	W	516267 417234	Unspecified Heap	1983
2	229.0	SW	516186 417187	Unspecified Heap	1983

4.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? No

Database searched and no data found.

4.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? No

Database searched and no data found.

5 Mining, Extraction & Natural Cavities Map

Mining, Extraction and Natural Cavities Legend

5 Mining, Extraction & Natural Cavities

5.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? No

The following information provided by JPB is not represented on mapping: Database searched and no data found.

5.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? No

Database searched and no data found.

5.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? No

Database searched and no data found.

5.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level..

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.10 Clay Mining

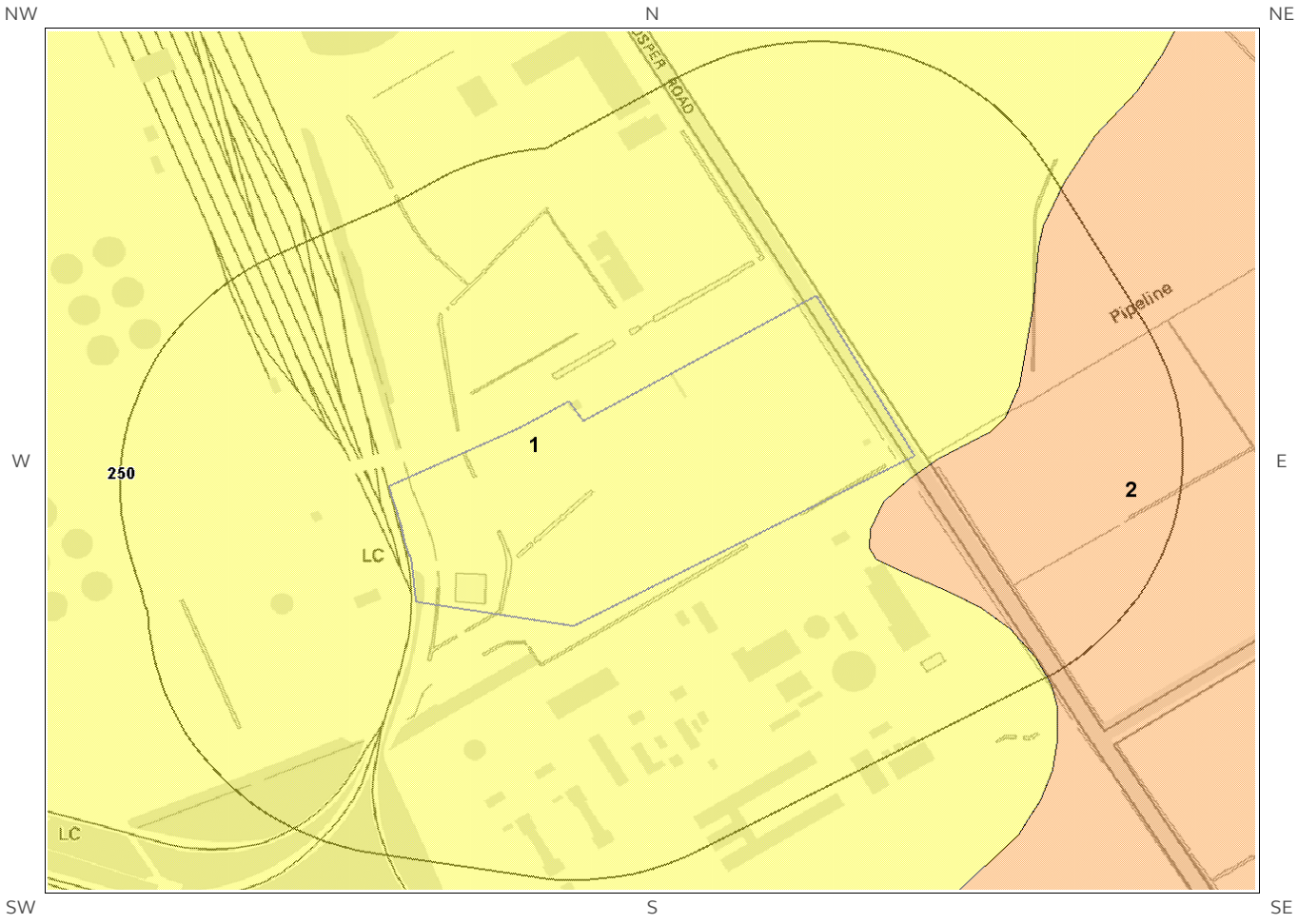
This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

6 Natural Ground Subsidence

6.1 Shrink-Swell Clay Map



Shrink Swell Clay Legend

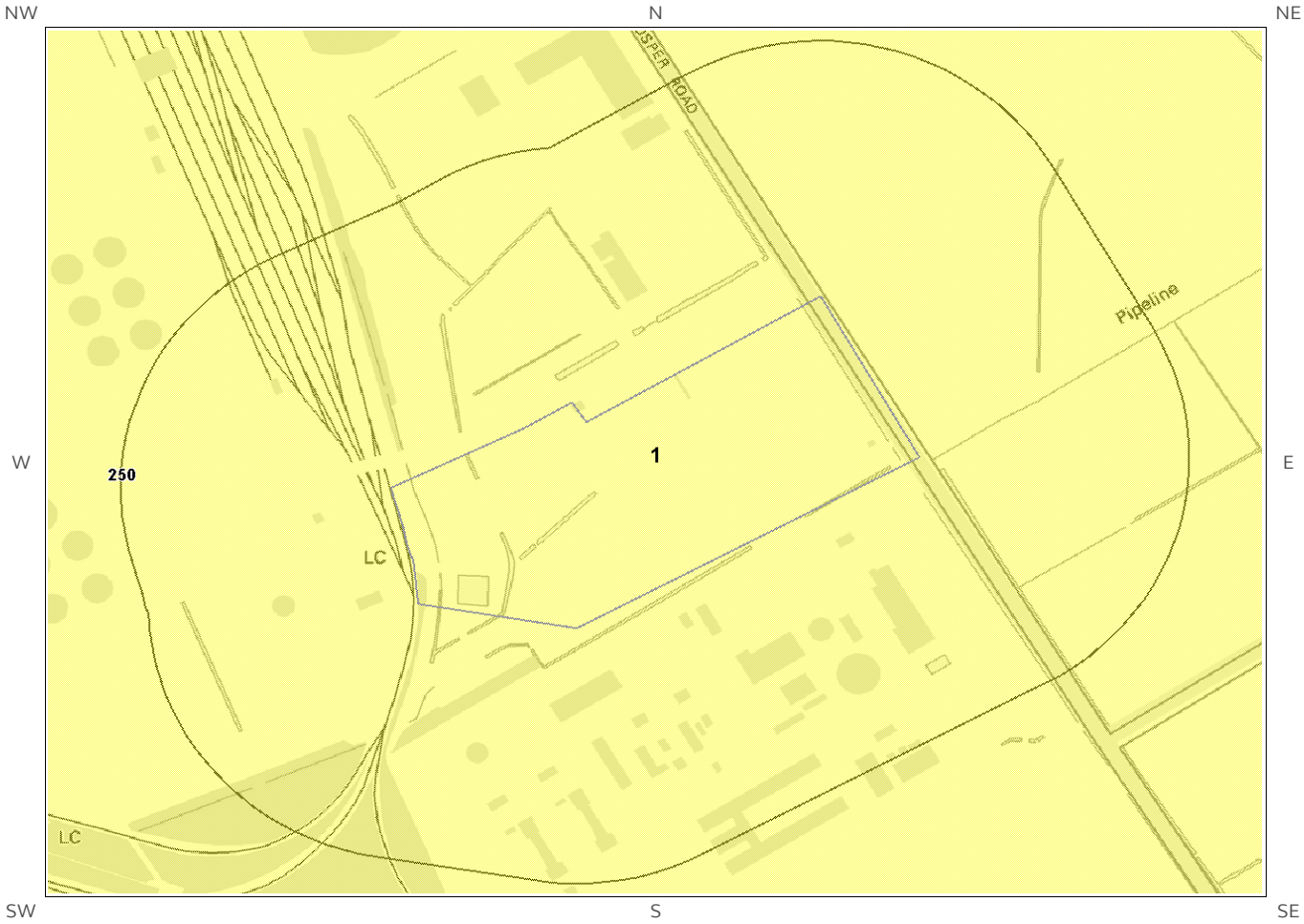
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

6.2 Landslides Map



Landslides Legend

Site Outline

125
250
Search Buffers (m)

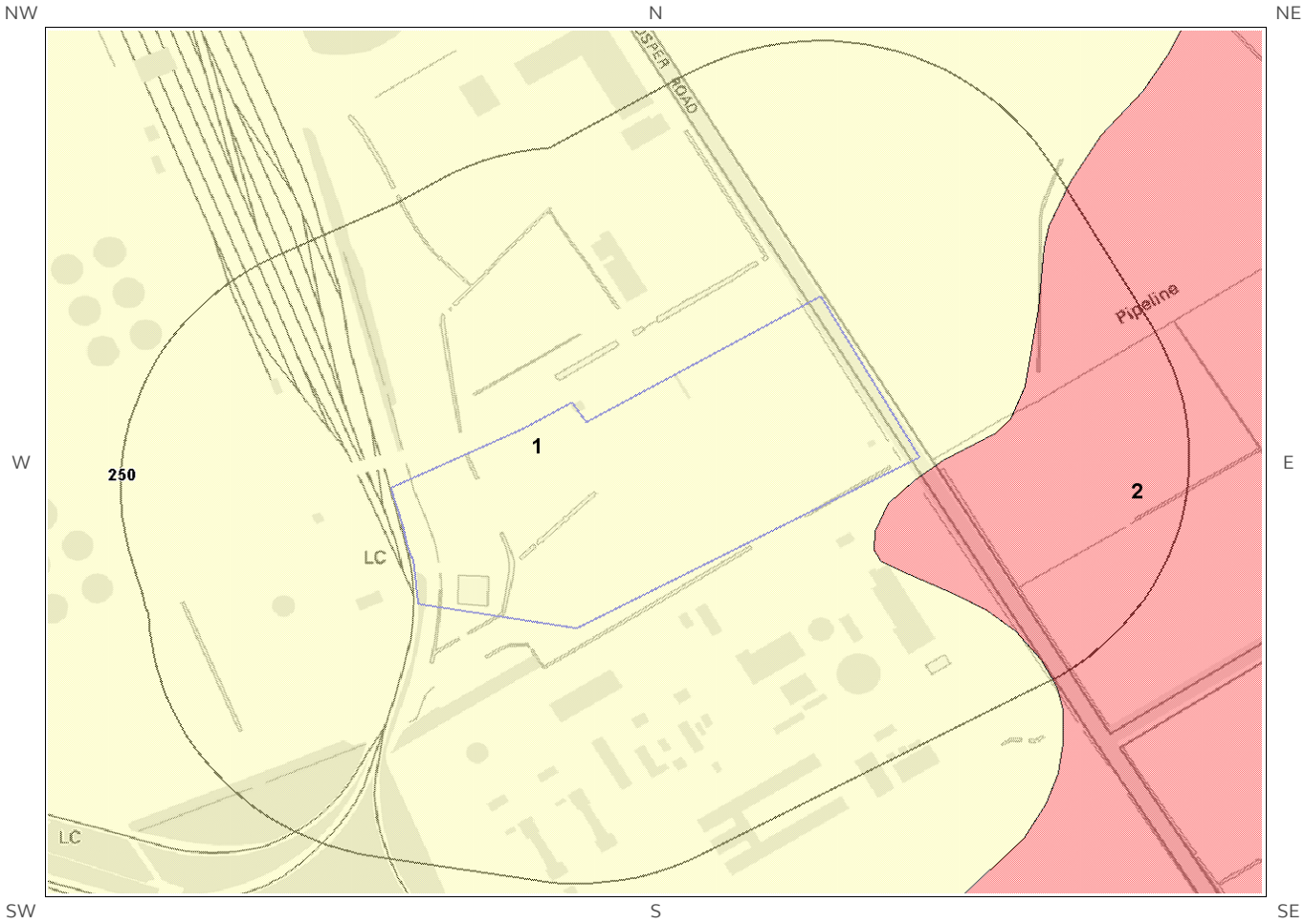
No Data / Null
Negligible
Very Low

Low
Moderate
High

6.3 Ground Dissolution of Soluble Rocks Map

Ground Dissolution Soluble Rocks Legend

6.4 Compressible Deposits Map



Compressible Deposits Legend

6.5 Collapsible Deposits Map

Collapsible Deposits Legend

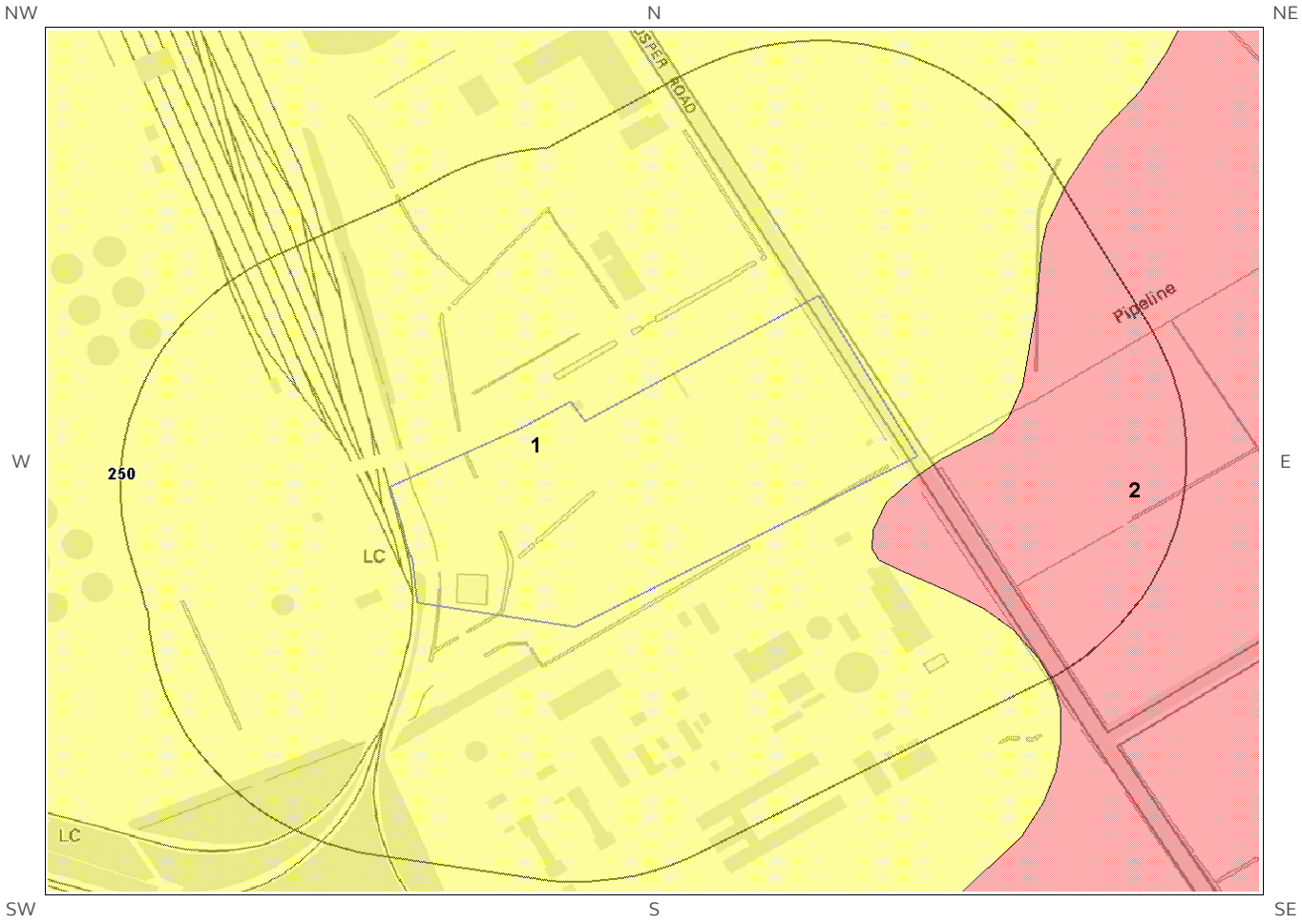
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

6.6 Running Sand Map



Running Sand Legend

6 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site*[*] boundary? Moderate

6.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.
2	15.0	SE	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

6.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

* This includes an automatically generated 50m buffer zone around the site

6.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

6.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.
2	15.0	SE	Moderate	Significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build - consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property - possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

6.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

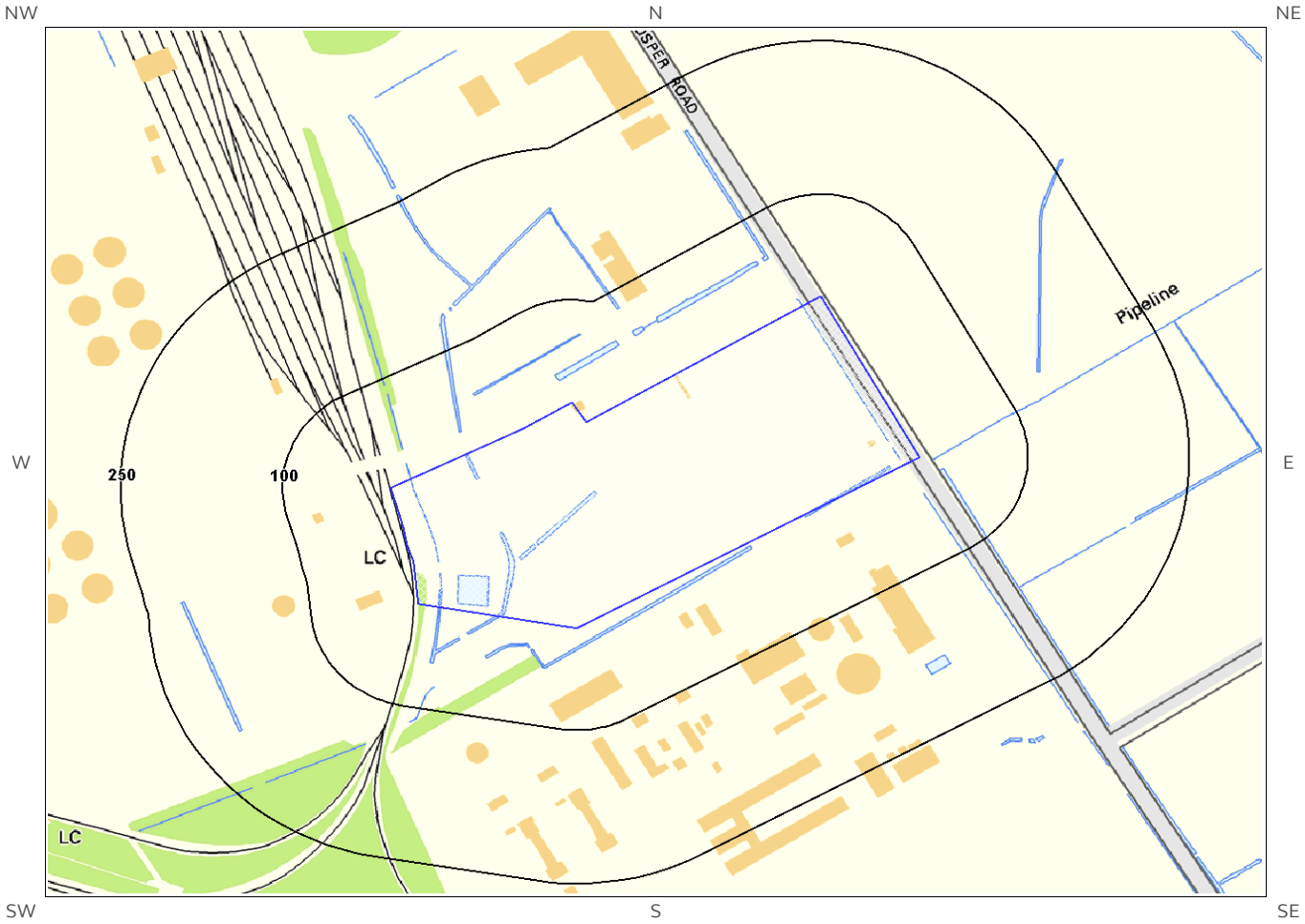
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
2	15.0	SE	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

6.6 Running Sands

The following Running Sands information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
2	15.0	SE	Moderate	Significant potential for running sand problems with relatively small changes in ground conditions. Avoid large amounts of water entering the ground (for example through pipe leakage or soak-aways). Do not dig (deep) holes into saturated ground near the property without technical advice. For new build - consider the consequences of soil and groundwater conditions during and after construction. For existing property - possible increase in insurance risk from running sand, for example, due to water leakage, high rainfall events or flooding.

7 Borehole Records Map



Borehole Records Legend

Site Outline

Borehole Locations

125
250
Search Buffers (m)

7 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary:	0

Database searched and no data found.

8 Estimated Background Soil Chemistry

Records of background estimated soil chemistry within 250m of the study site boundary: 5

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geo Insight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	30 - 45 mg/kg	<100 mg/kg
4.0	SE	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	30 - 45 mg/kg	<100 mg/kg
36.0	NW	RuralSoil	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	30 - 45 mg/kg	<100 mg/kg

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

9 Railways and Tunnels Map

Railways and Tunnels Legend

- Site Outline
- Search Buffers (m) — 250 — 500
- Underground or Partially Underground Railway / Subway System
- Railway Tunnel (OS Mapping)
- Abandoned or Dismantled Railway (OpenStreetMap)
- Railway Track (OS Mapping)
- Railway Track (OpenStreetMap)
- High Speed 2
- High Speed 2 Revised Proposed Route
- Crossrail 1
- Railway and/or Tunnel Feature from Historical Mapping

9 Railways and Tunnels

9.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary?	No
Have any underground railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary?	No
Have any other railway tunnels been identified within 250m of the site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

9.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary? Yes

Have any historical railway or tunnel features been identified within 250m of the study site boundary? Yes

ID	Distance (m)	Direction	NGR	Details	Date
1A	0	On Site	515726 417603	Railway Sidings	1983
2A	0	On Site	515726 417603	Railway Sidings	1974
3B	0	On Site	516238 417664	Railway Sidings	1985
4B	8	W	516229 417676	Railway Sidings	1970
5	246	S	516046 417031	Railway Sidings	1985

Any records that have been identified are represented on the Railways and Tunnels Map.

9.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary? No

Have any historical railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels Map.

9.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary? No

Have any active railway lines been identified within 250m of the study site boundary? Yes

Distance (m)	Direction	Name	Type
2	W	Not given	Rail
2	W	Not given	Rail
11	W	Not given	Rail
11	W	Not given	Rail
12	W	Not given	Rail
12	W	Not given	Rail
13	W	Not given	Rail
13	W	Not given	Rail
13	W	Not given	Rail
13	W	Not given	Rail
15	W	Not given	Rail
15	W	Not given	Rail
16	W	Not given	Rail
16	W	Not given	Rail
17	NW	Not given	Rail
17	NW	Not given	Rail
33	NW	Not given	Multi Track
33	NW	Not given	Multi Track
39	NW	Not given	Multi Track
39	NW	Not given	Multi Track
49	NW	Not given	Rail
49	NW	Not given	Rail
50	S	Not given	Rail
50	S	Not given	Rail
55	NW	Not given	Multi Track
55	NW	Not given	Multi Track
70	NW	Not given	Rail
70	NW	Not given	Rail
72	NW	Not given	Rail
72	NW	Not given	Rail
77	NW	Not given	Rail

Distance (m)	Direction	Name	Type
77	NW	Not given	Rail
106	NW	Not given	Rail
106	NW	Not given	Rail
110	NW	Not given	Rail
110	NW	Not given	Rail
122	S	Not given	Multi Track
122	S	Not given	Multi Track
125	S	Not given	Multi Track
125	S	Not given	Multi Track
125	S	Not given	Multi Track
125	S	Not given	Multi Track
133	NW	Not given	Rail
133	NW	Not given	Rail
134	S	Not given	Rail
134	S	Not given	Rail
136	NW	Not given	Rail
136	NW	Not given	Rail
137	NW	Not given	Rail
137	NW	Not given	Rail
144	NW	Not given	Rail
144	NW	Not given	Rail
150	NW	Not given	Rail
150	NW	Not given	Rail
164	NW	Not given	Rail
164	NW	Not given	Rail
190	NW	Not given	Rail
190	NW	Not given	Rail
214	NW	Not given	Rail
214	NW	Not given	Rail
216	NW	Not given	Rail
216	NW	Not given	Rail
248	NW	Not given	Rail
248	NW	Not given	Rail

Multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels Map.

9.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project? No

Is the study site within 500m of the route of the Crossrail 1 rail project? No

Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail 1 Report.

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

Please note that this assessment takes account of both the original Phase 2b proposed route and the amended route proposed in 2016. As the Phase 2b route is still under consultation, Groundsure are providing information on both options until the final route is formally confirmed. Practitioners should take account of this uncertainty when advising clients.

Contact Details

Groundsure Helpline

Telephone: 08444 159 000
info@groundsure.com

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:**enquiries@bgs.ac.uk**
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries

British Gypsum

British Gypsum Ltd
East Leake
Loughborough
Leicestershire
LE12 6HX

The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
https://www.gov.uk/government/organisations/public-health-england
Email: **enquiries@phe.gov.uk**
Main switchboard: 020 7654 8000

Johnson Poole & Bloomer Limited

Harris and Pearson Building, Brettel Lane
Brierley Hill, West Midlands
DY5 3LH
Tel: +44 (0) 1384 262 000
Email:**enquiries.gs@jpb.co.uk**
Website: **www.jpb.co.uk**

Ordnance Survey

Adanac Drive, Southampton
SO16 0AS

Tel: 08456 050505
Website: http://www.ordnancesurvey.co.uk/

Getmapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444
Website:**http://www1.getmapping.com/**

Peter Brett Associates
Caversham Bridge House
Waterman Place
Reading
Berkshire RG1 8DN
Tel: +44 (0)118 950 0761 E-mail:**reading@pba.co.uk**
Website:**http://www.peterbrett.com/home**

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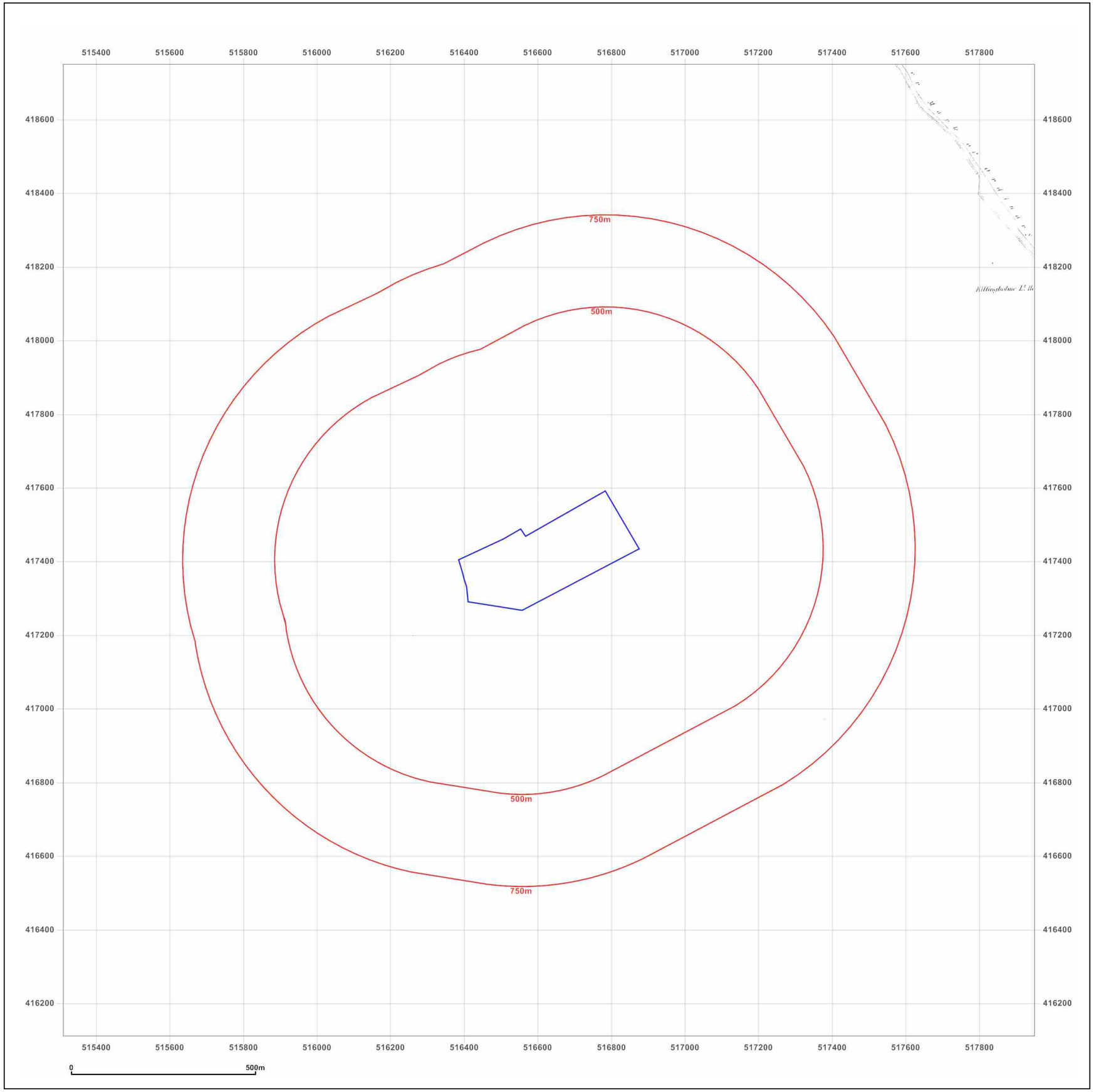
https://www.groundsure.com/terms-and-conditions-sept-2016/

Appendix B: Historic Maps



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: County Series

Map date: **1854**

Scale: 1:10,560

Printed at: 1:10,560

N
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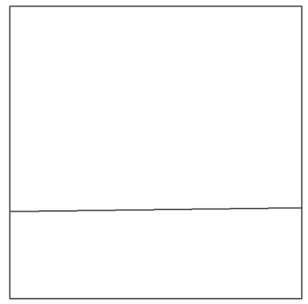
Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A



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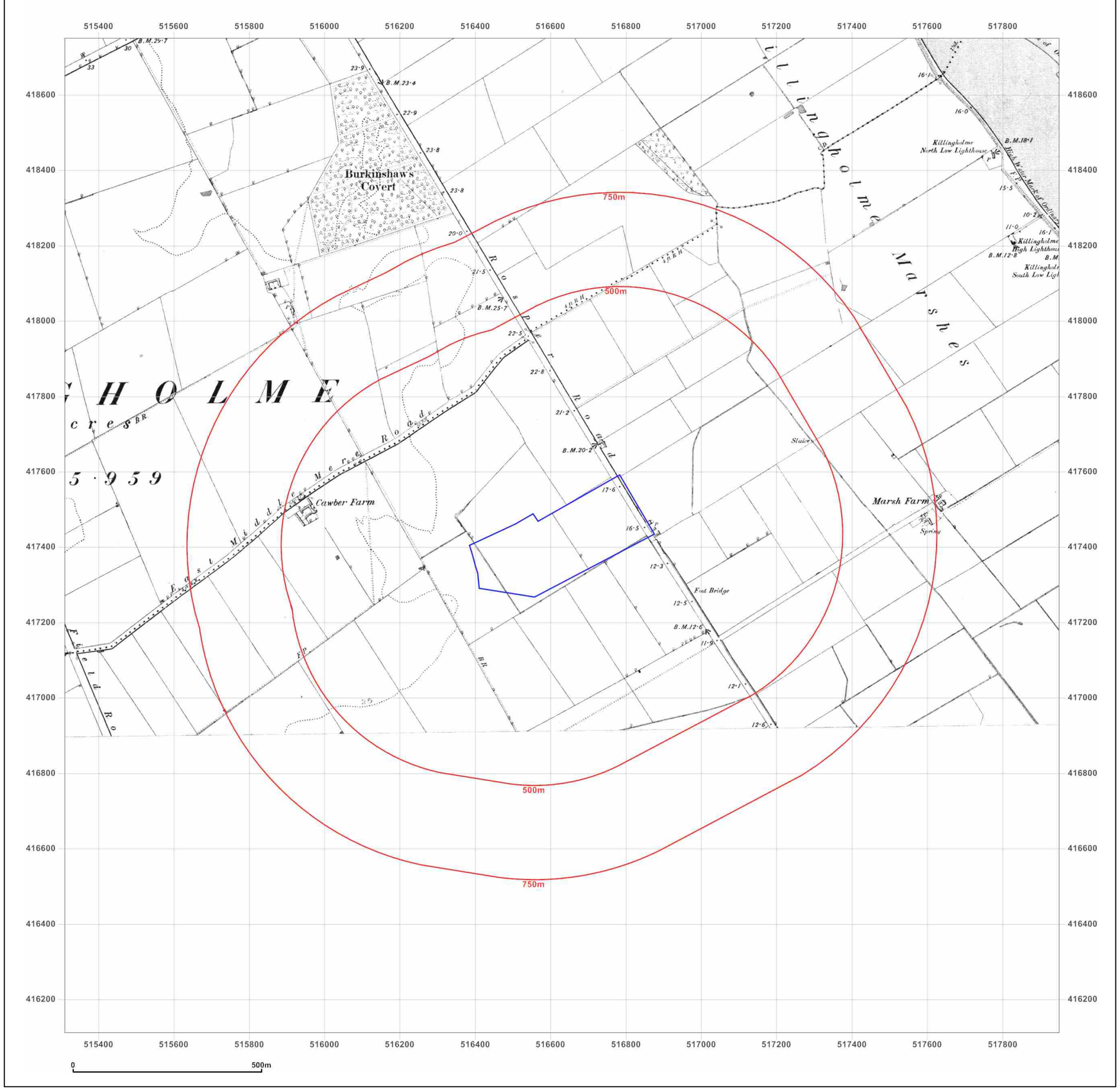
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: County Series
Map date: **1886**
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 13 June 2017

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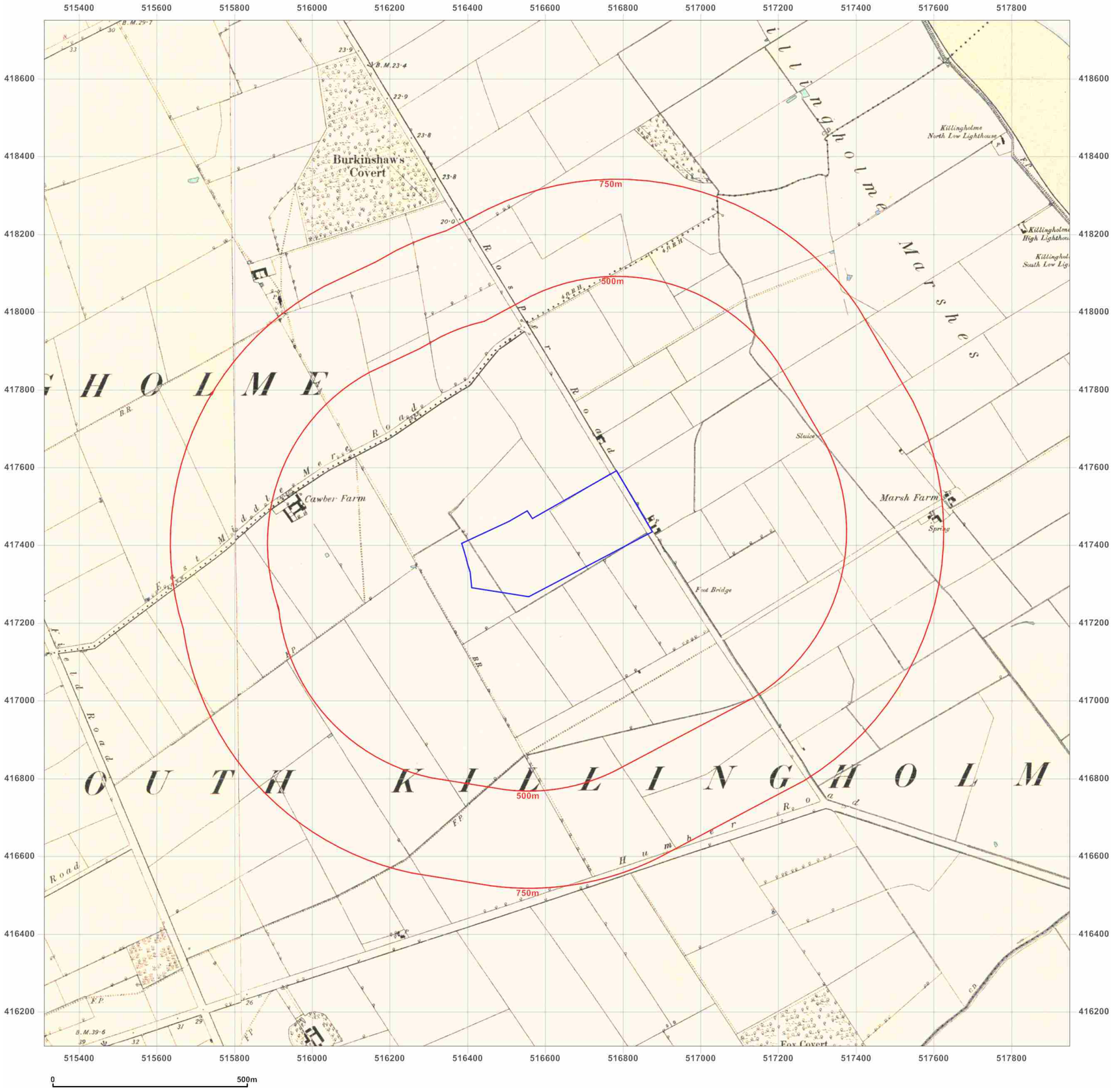

Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: County Series

Map date: **1886-1887**

Scale: 1:10,560

Printed at: 1:10,560

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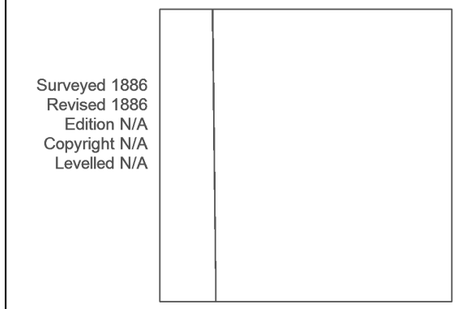

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Production date: 13 June 2017

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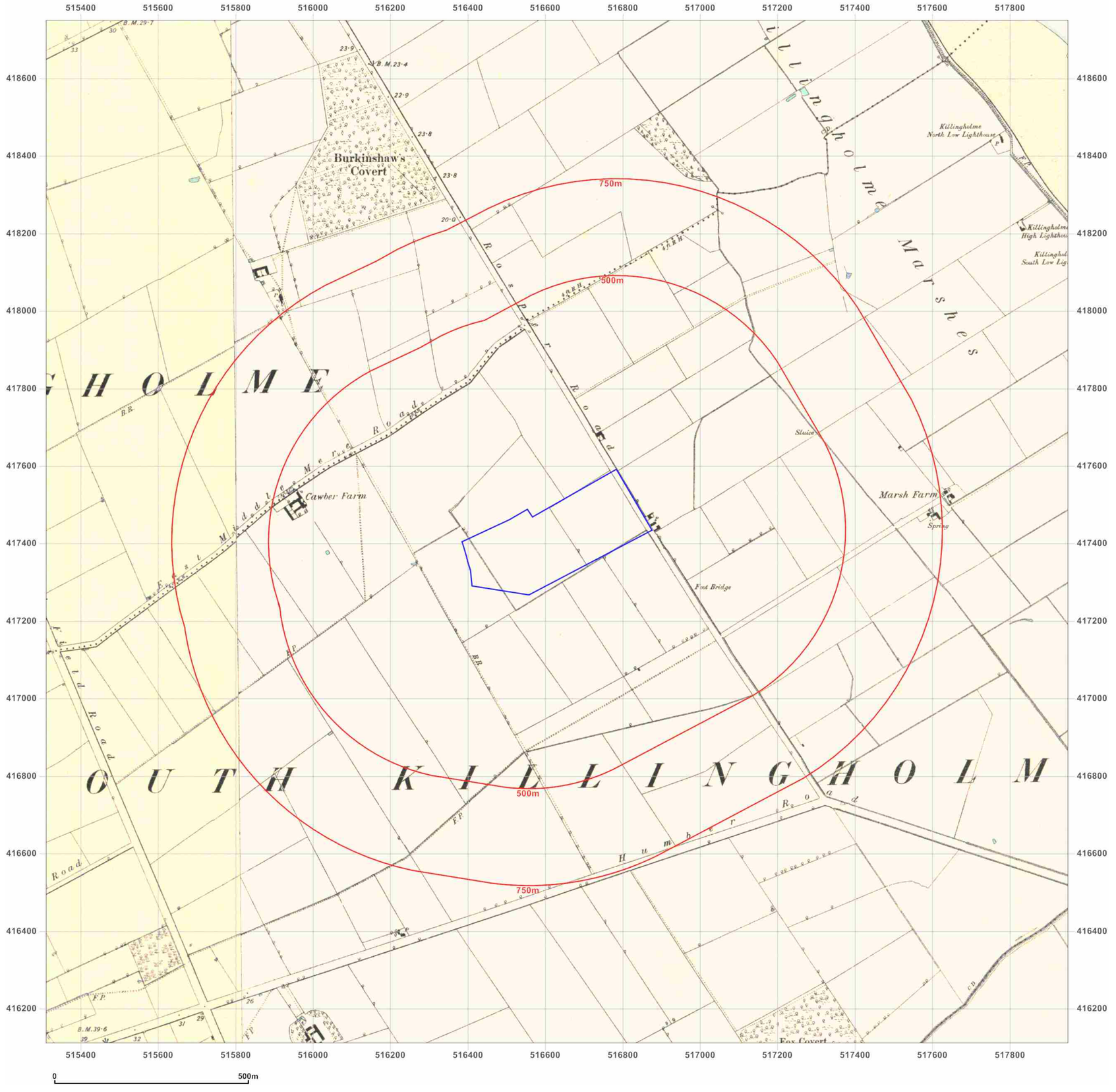

Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: County Series

Map date: **1886-1887**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1886
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1886
Revised 1886
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 13 June 2017

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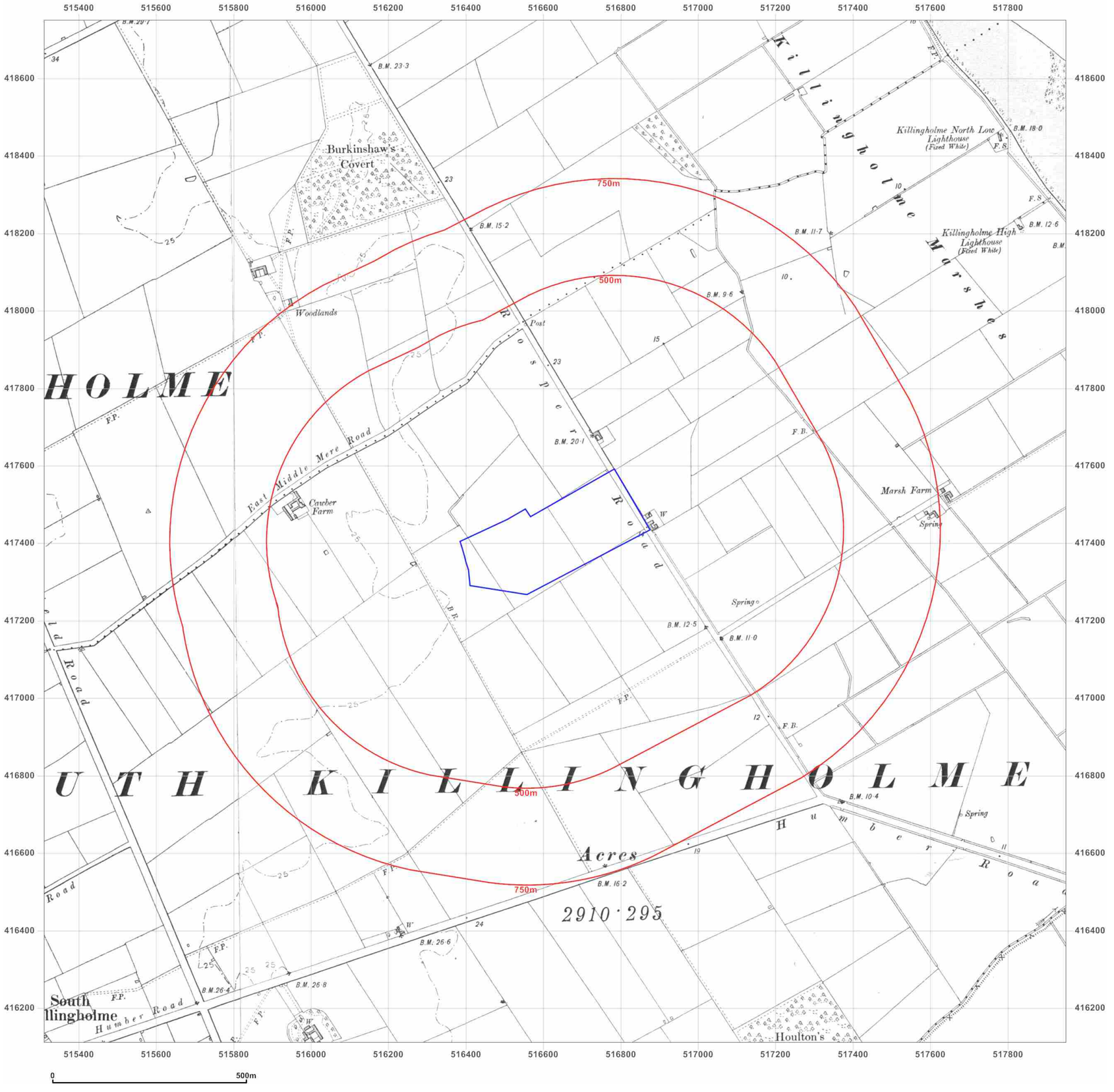

Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: County Series

Map date: **1906**

Scale: 1:10,560

Printed at: 1:10,560

N
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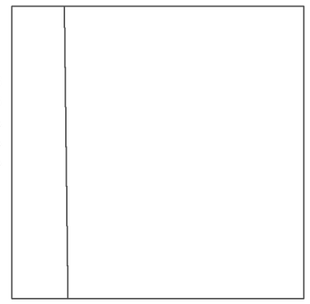
Surveyed 1886
Revised 1906
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1886
Revised 1906
Edition N/A
Copyright N/A
Levelled N/A

Powered by OS

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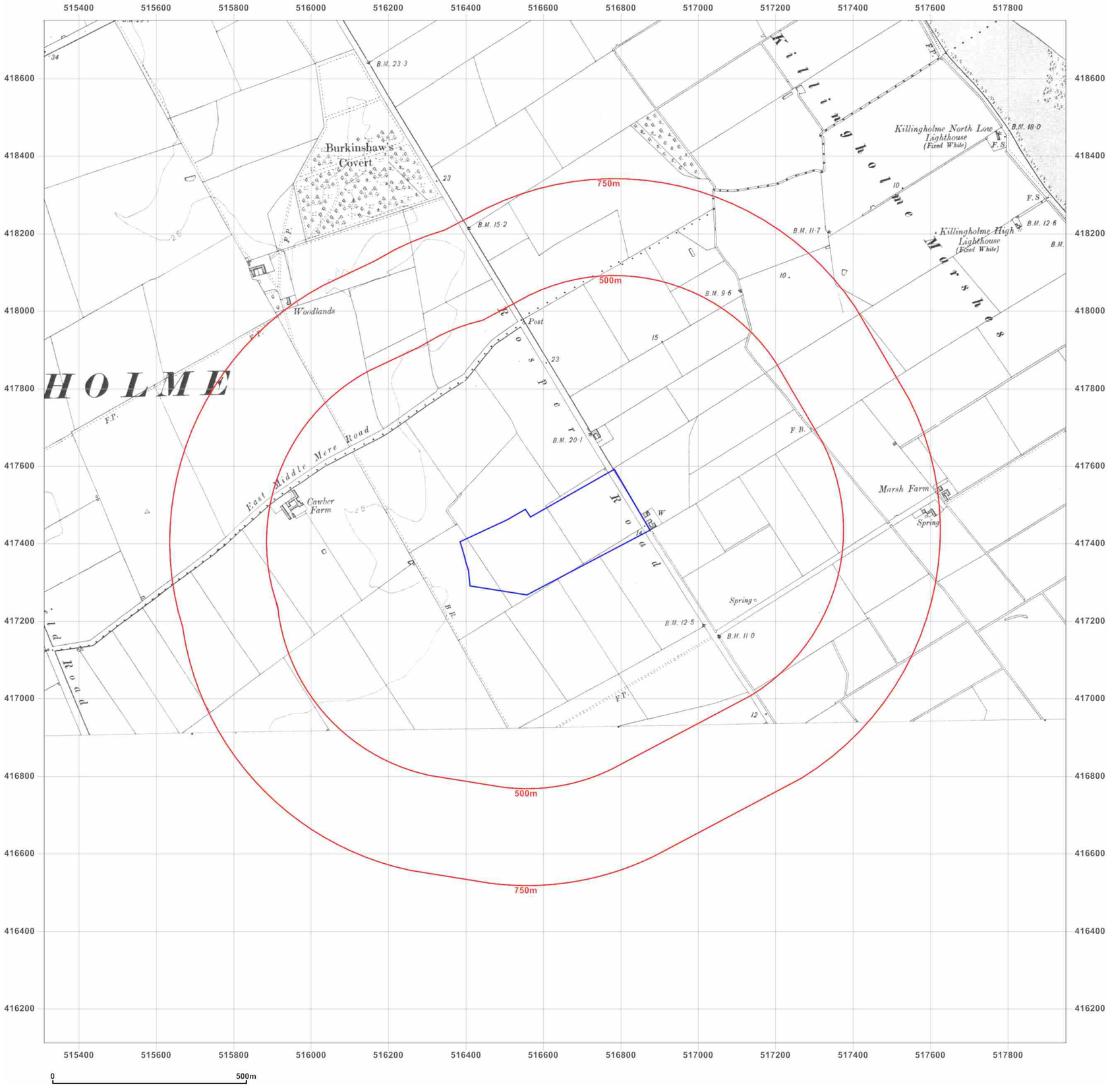
Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: County Series

Map date: **1910**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1853
Revised 1910
Edition 1910
Copyright N/A
Levelled N/A

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Production date: 13 June 2017

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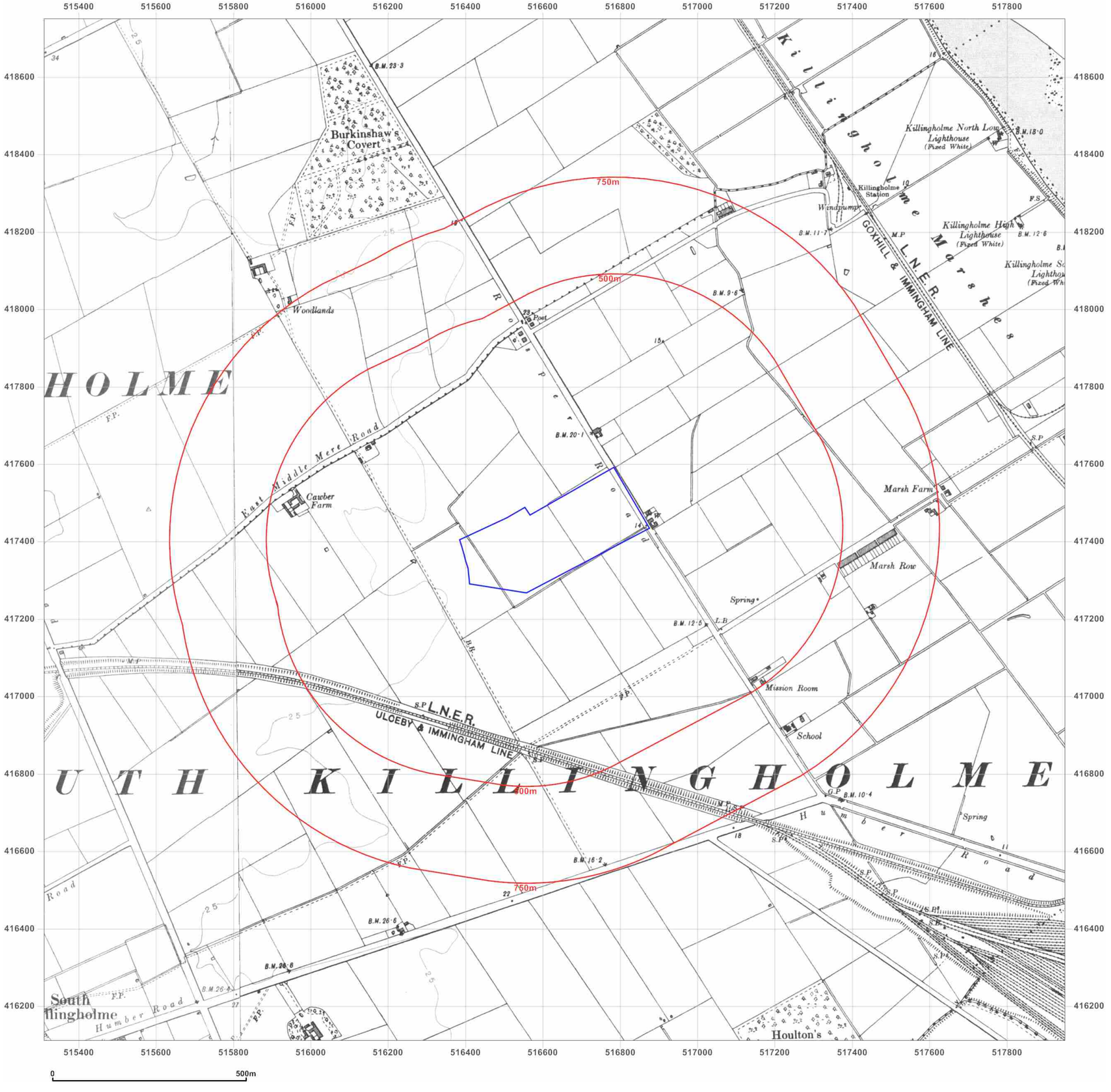

Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: County Series

Map date: **1929-1930**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1886
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1886
Revised 1930
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 13 June 2017

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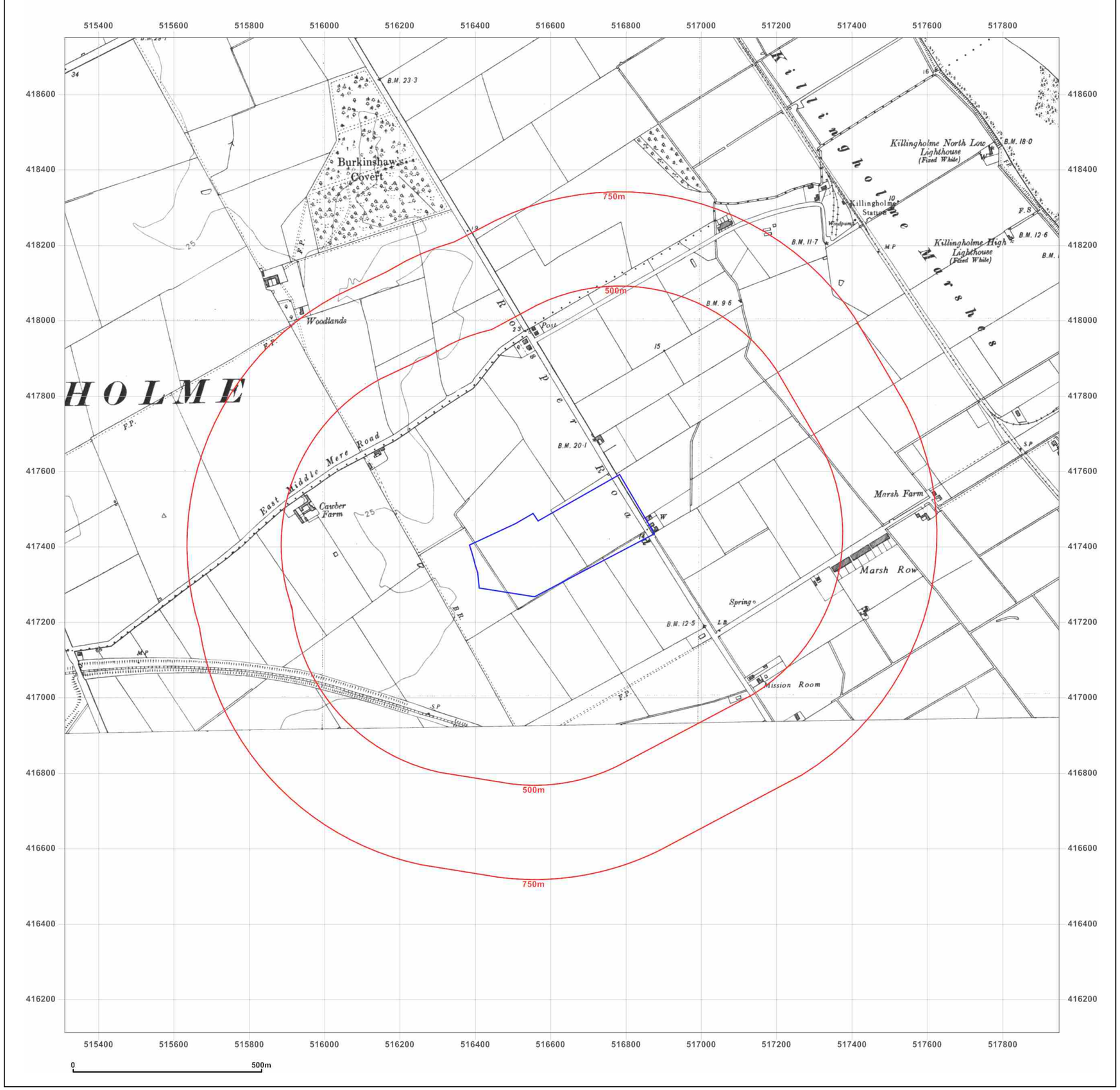

Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: County Series

Map date: **1947**

Scale: 1:10,560

Printed at: 1:10,560

N
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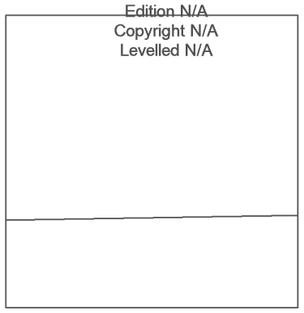
Surveyed 1853
Revised 1947
Edition N/A
Copyright N/A
Levelled N/A



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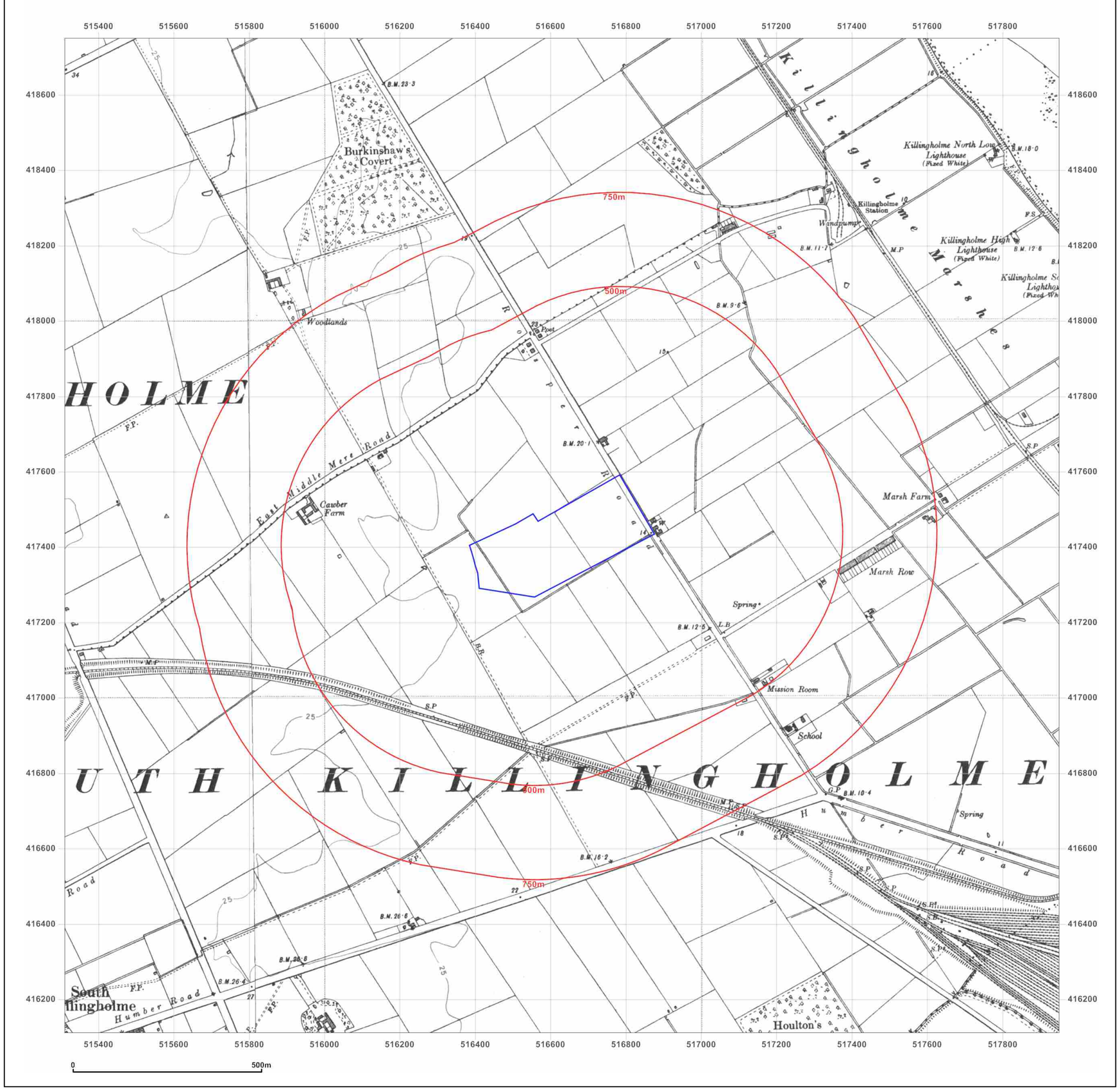
Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: County Series

Map date: **1947**

Scale: 1:10,560

Printed at: 1:10,560

N
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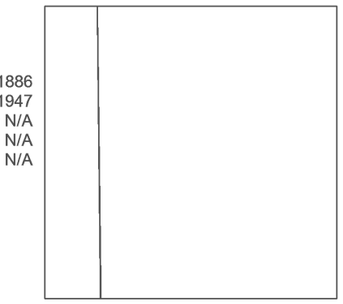
Surveyed 1886
Revised 1947
Edition N/A
Copyright N/A
Levelled N/A



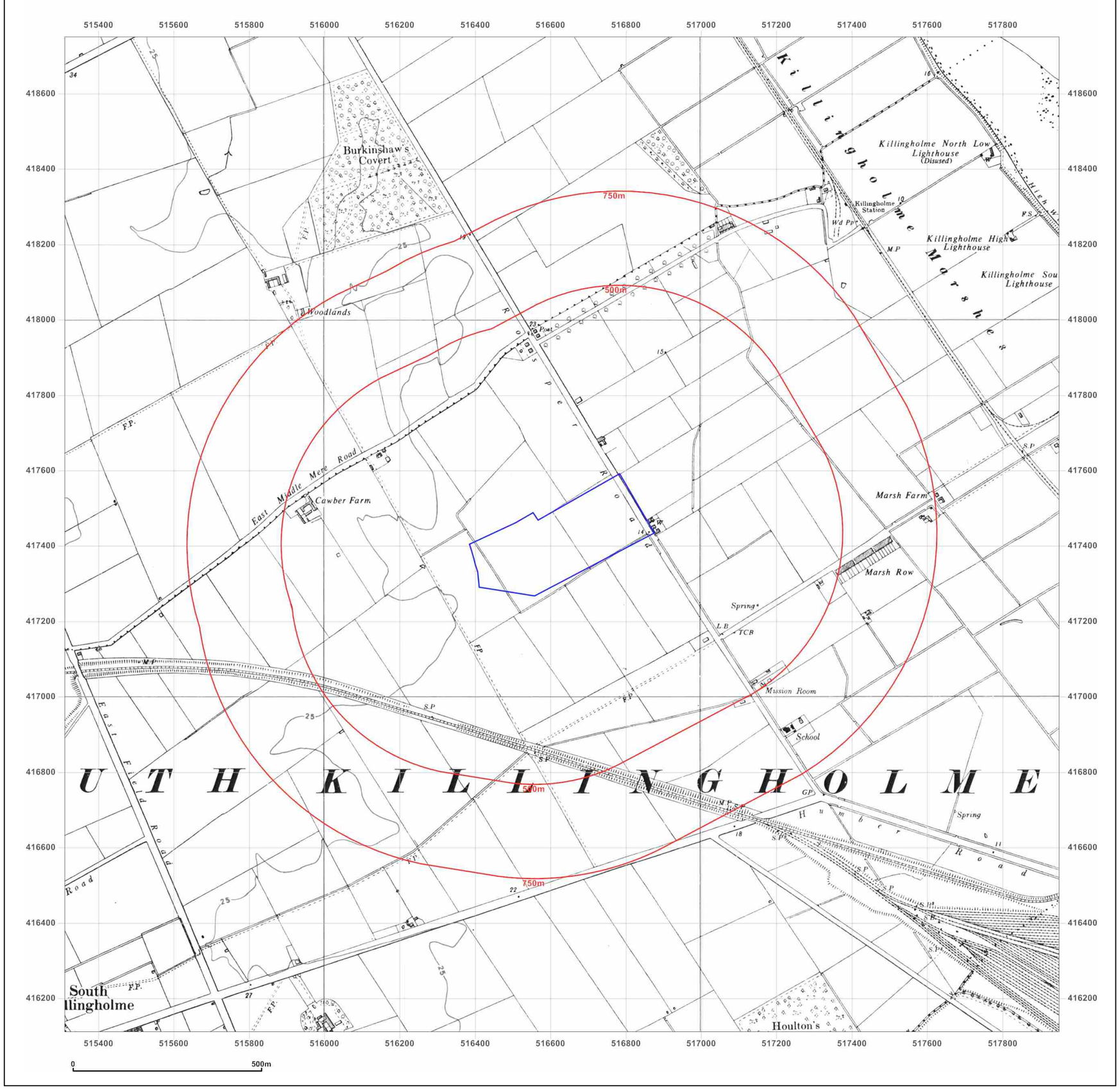
Surveyed 1886
Revised 1947
Edition 1947
Copyright N/A
Levelled N/A

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY LTD, EASTFIELD ROAD, IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: Provisional

Map date: **1951**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1951
Revised 1951
Edition N/A
Copyright N/A
Levelled N/A

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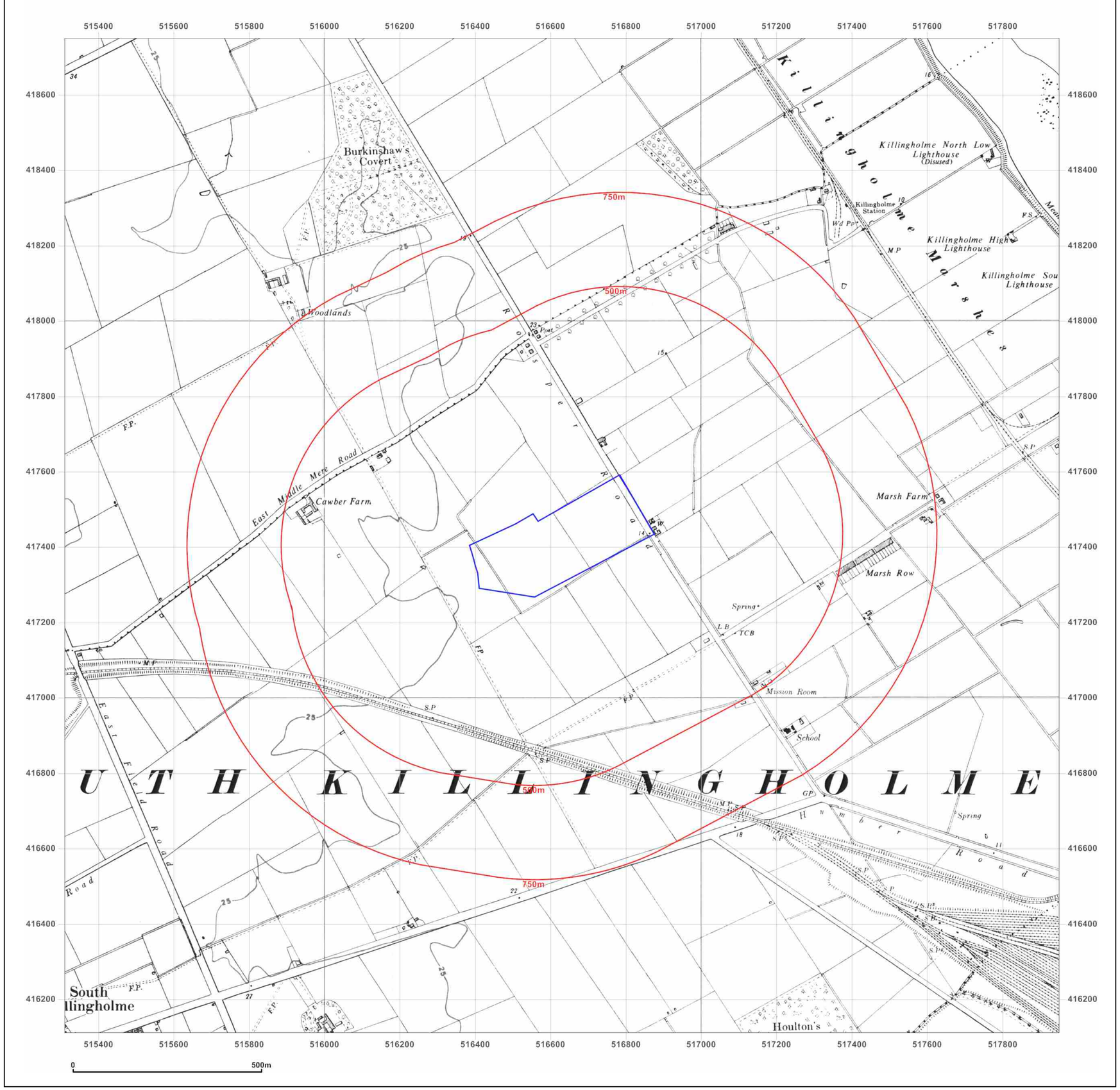
W: www.groundsure.com

Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: Provisional

Map date: **1951**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1951
Revised 1951
Edition N/A
Copyright N/A
Levelled N/A

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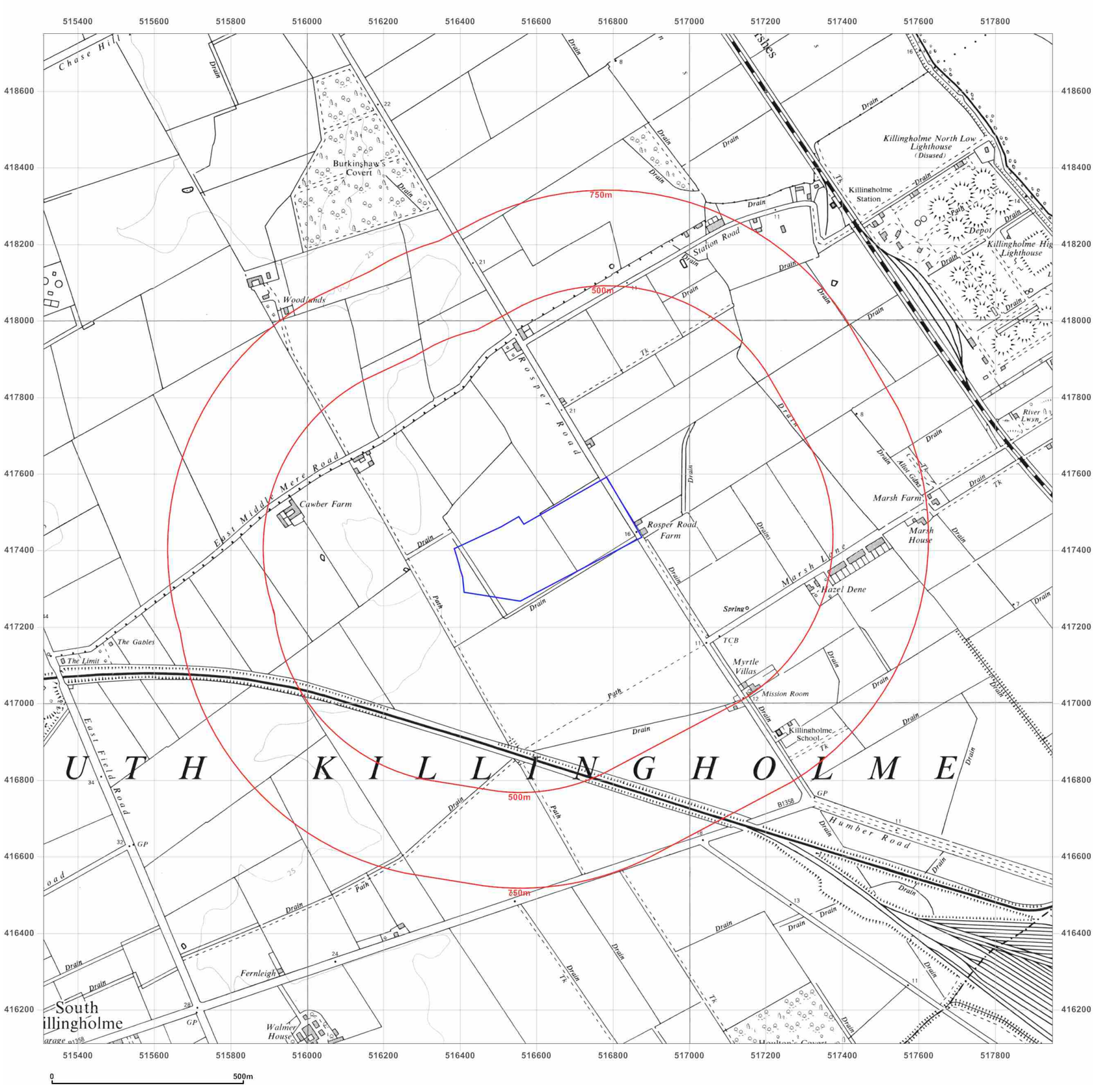
W: www.groundsure.com

Production date: 13 June 2017

To view map legend click here *Legend*



Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: Provisional

Map date: **1968**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1968
Revised 1968
Edition N/A
Copyright N/A
Levelled N/A

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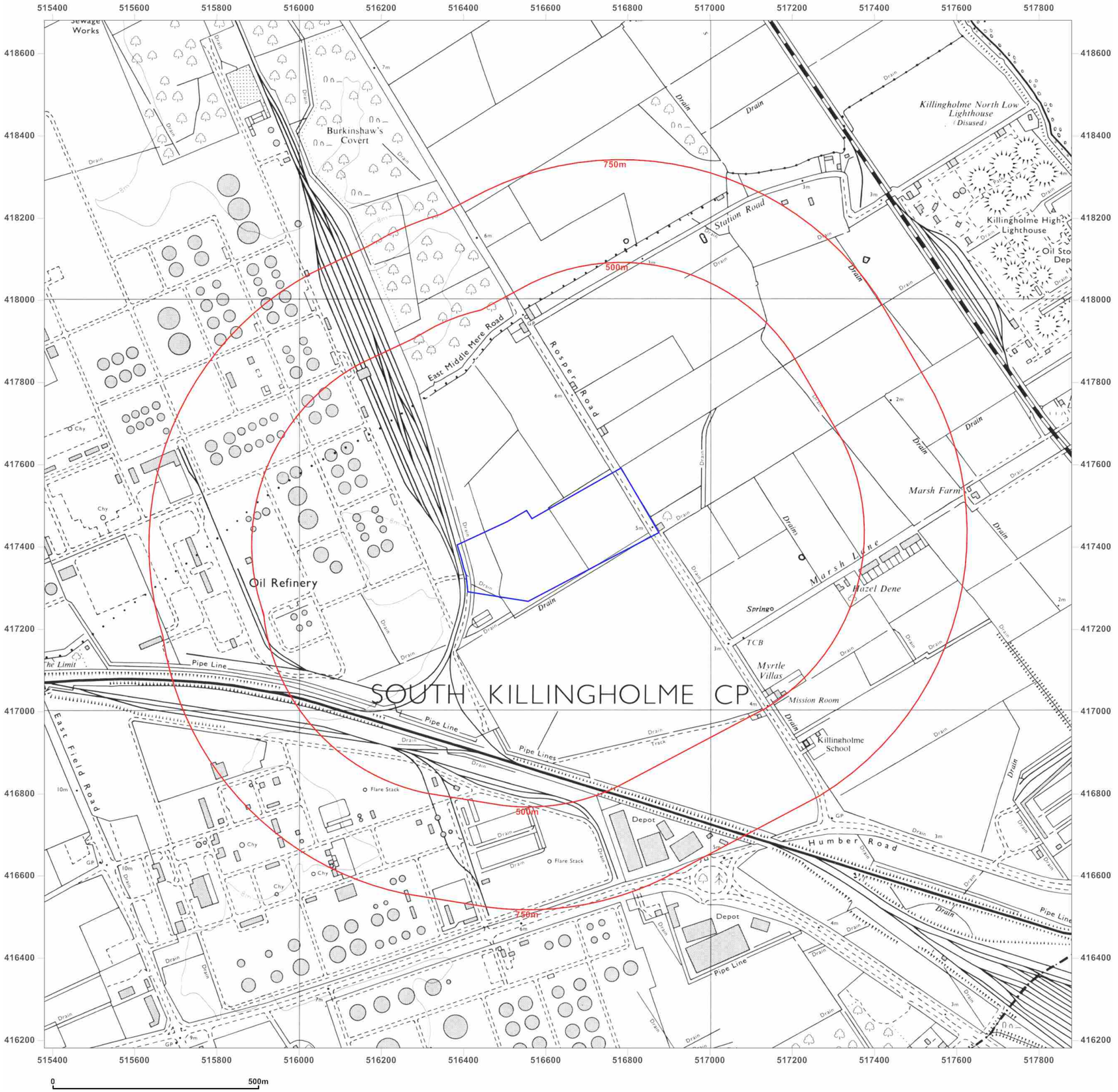
Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY LTD, EASTFIELD ROAD, IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: National Grid

Map date: **1974**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1974
Revised 1974
Edition N/A
Copyright N/A
Levelled N/A

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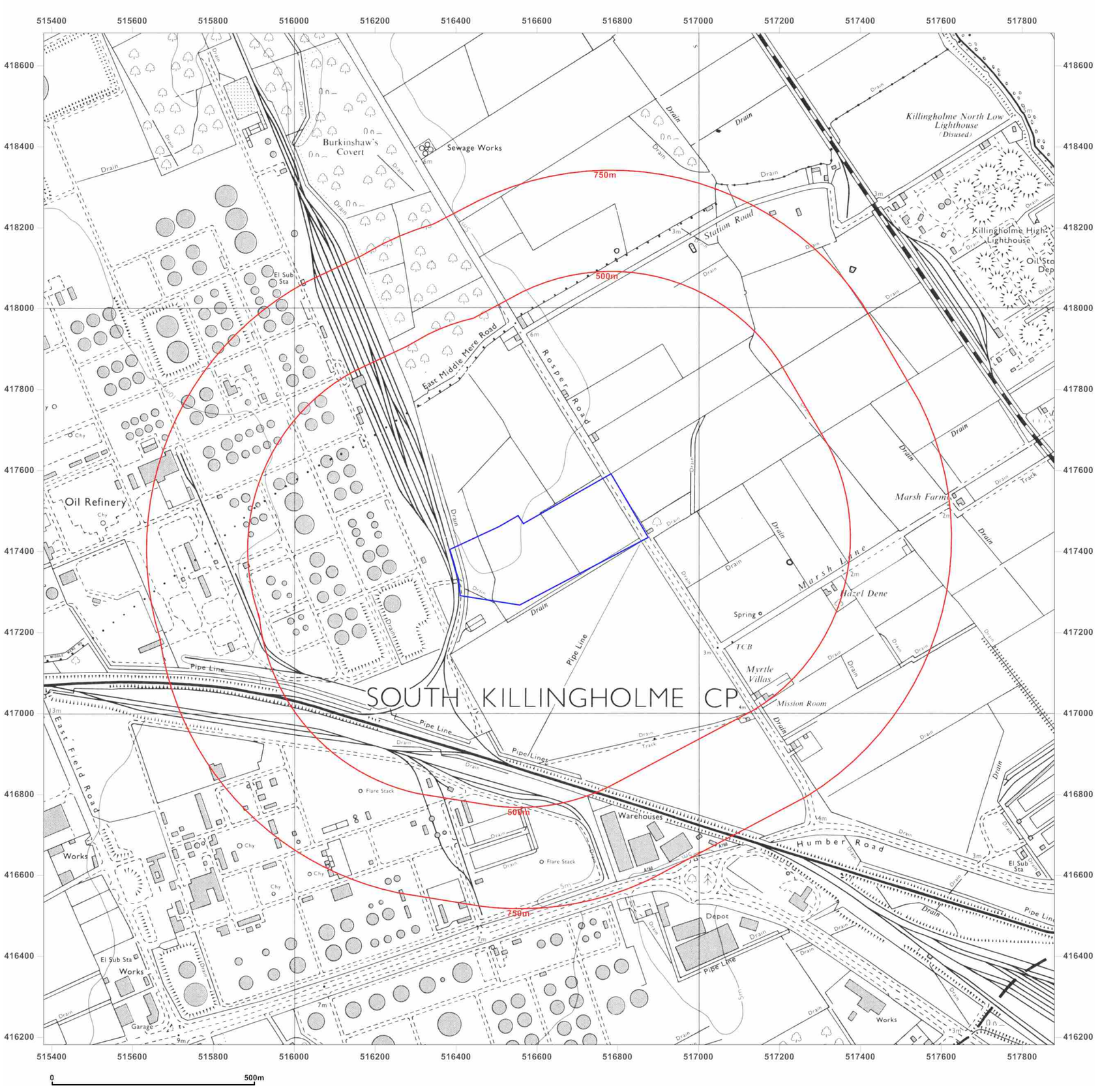
Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: National Grid

Map date: **1983**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1975
Revised 1983
Edition N/A
Copyright N/A
Levelled N/A

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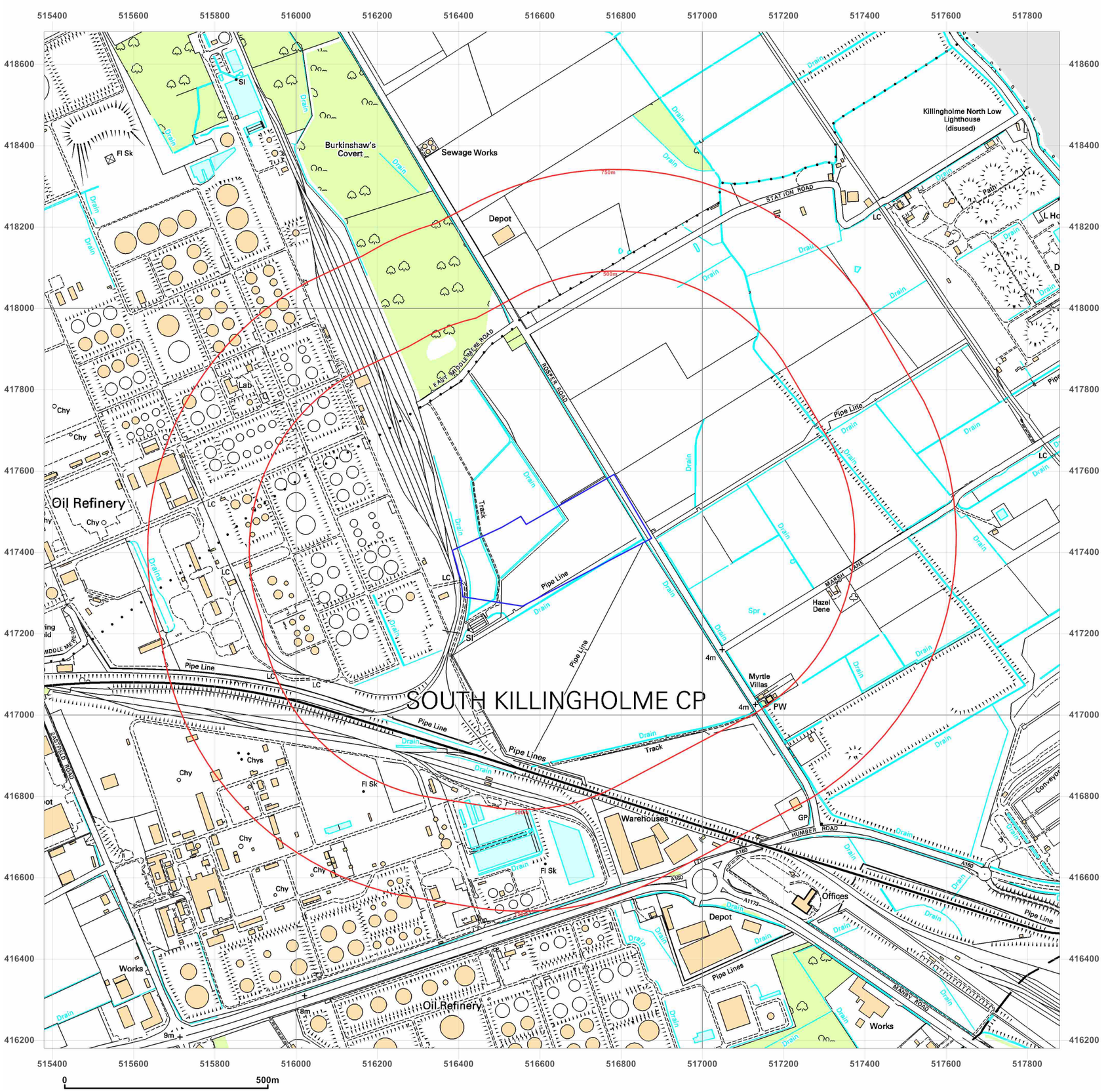
Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: 1:10,000 Raster
Map date: **2002**
Scale: 1:10,000
Printed at: 1:10,000

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2002

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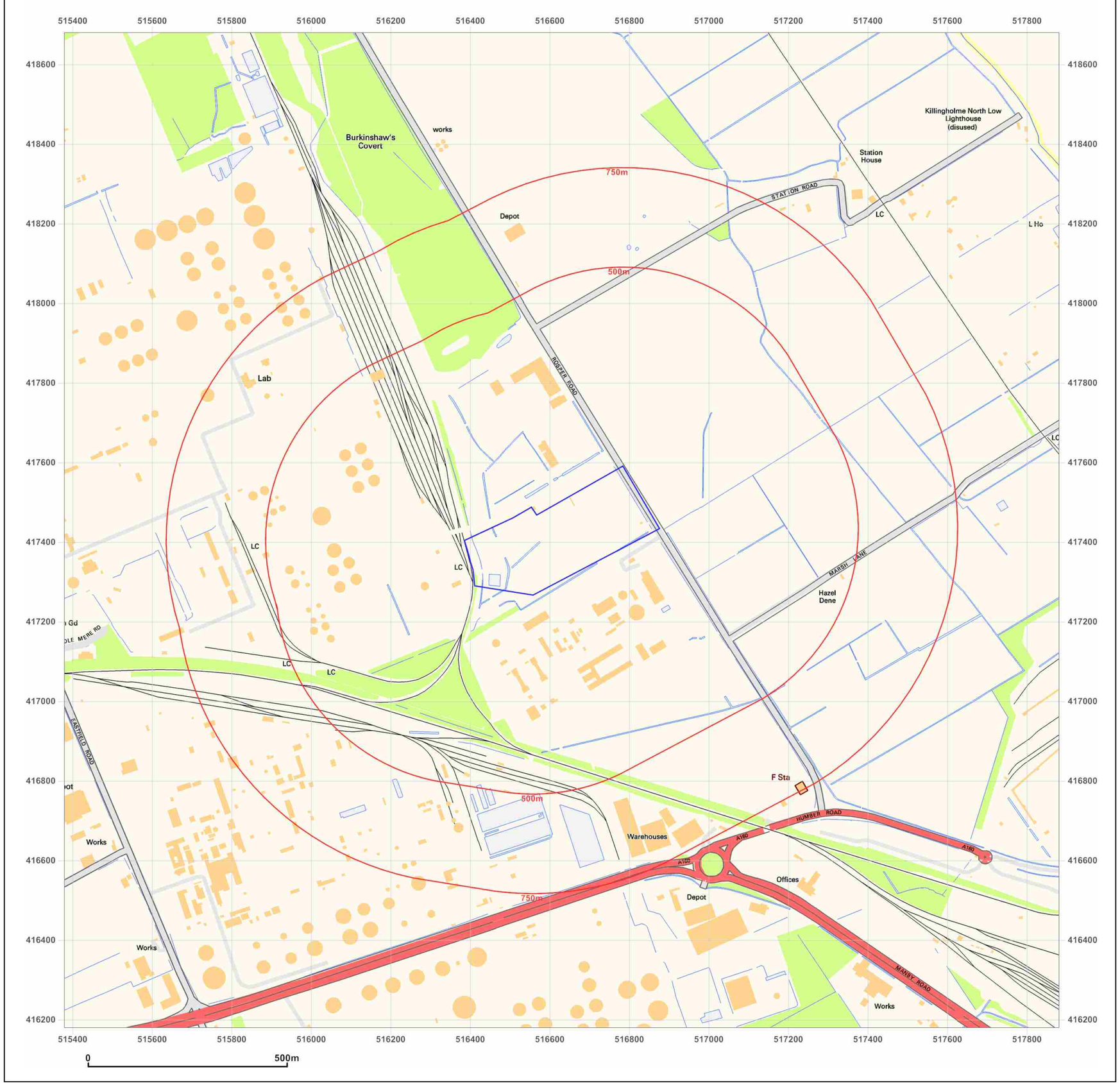
W: www.groundsure.com

Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY
LTD, EASTFIELD ROAD,
IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: National Grid
Map date: **2010**
Scale: 1:10,000
Printed at: 1:10,000

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2010

Powered by OS

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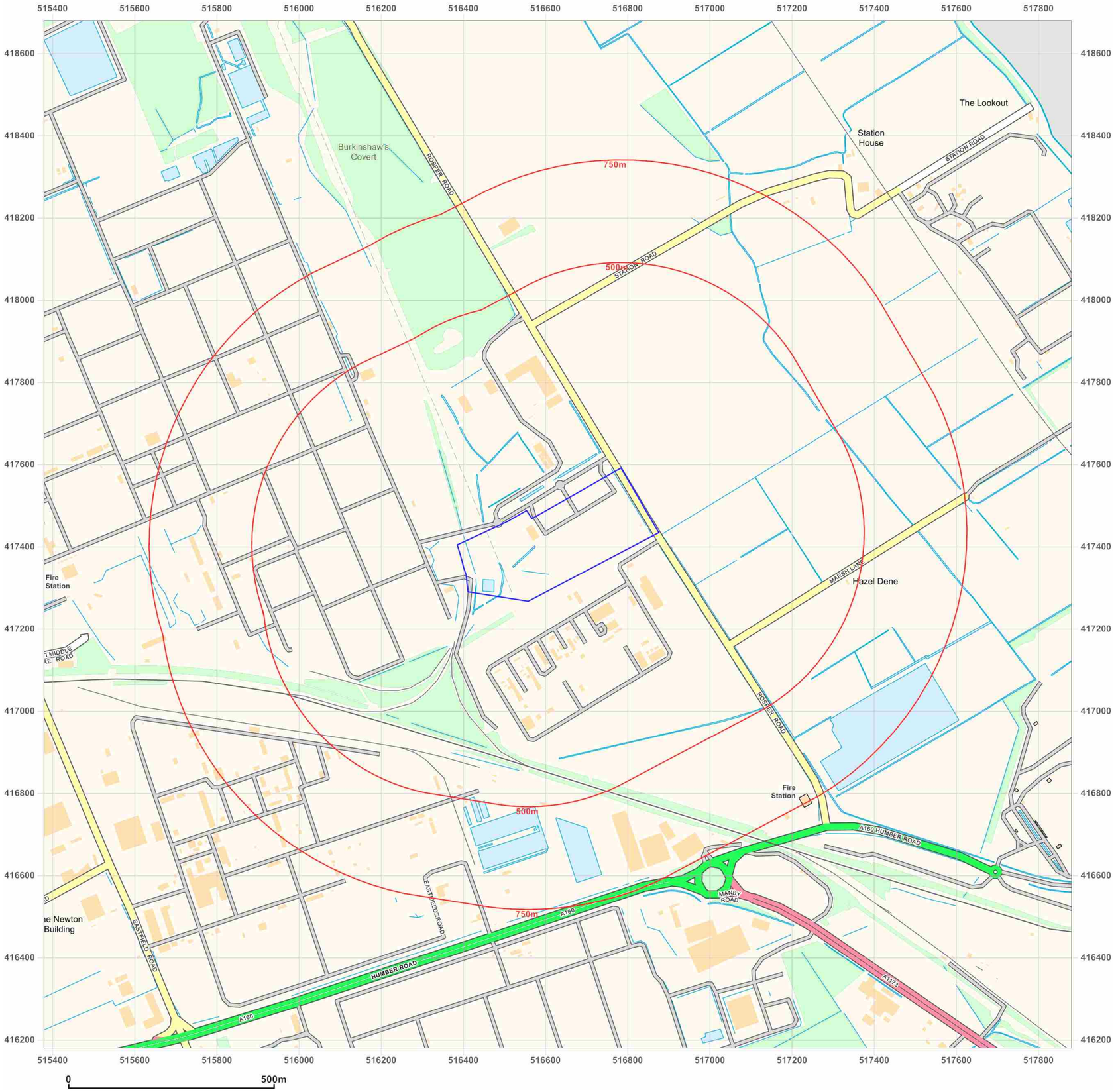
W: www.groundsure.com

Production date: 13 June 2017

To view map legend click here *Legend*



Groundsure INSIGHTS

Site Details:

TOTAL LINDSEY OIL REFINERY LTD, EASTFIELD ROAD, IMMINGHAM, DN40 3LW

Client Ref: Oil_Refinery
Report Ref: GS-3982432
Grid Ref: 516629, 417430

Map Name: National Grid
Map date: **2014**
Scale: 1:10,000
Printed at: 1:10,000

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2014

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W: www.groundsure.com

Production date: 13 June 2017

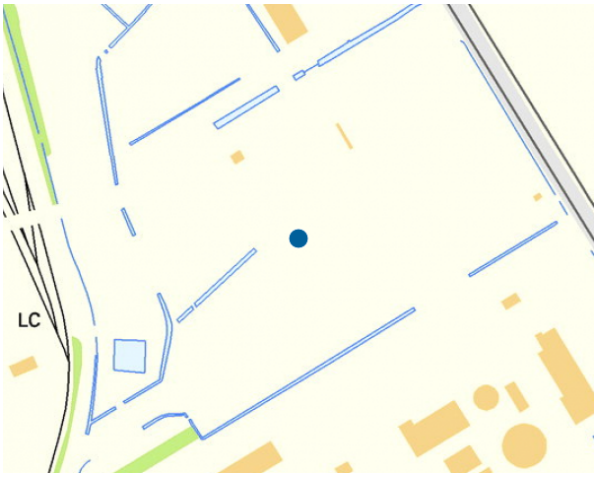
To view map legend click here *Legend*

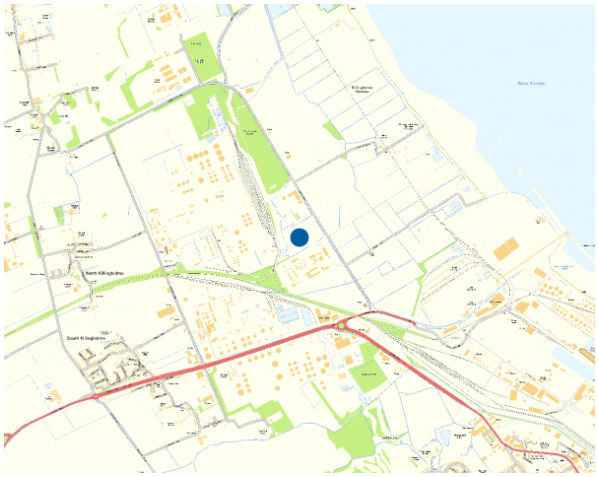
Appendix C: UXO Report

Groundsure
LOCATION INTELLIGENCE

BombRisk.com

Preliminary Unexploded Ordnance Risk Assessment





Project: TOTAL LINDSEY OIL REFINERY LTD, EASTFIELD ROAD, IMMINGHAM, DN40 3LW

Groundsure Ref: GS-3982433

Report prepared by Dynasafe BACTEC Limited and FIND Mapping Limited

Report reference: 502279

Preliminary Unexploded Ordnance Threat Assessment

TOTAL LINDSEY OIL REFINERY LTD, EASTFIELD ROAD, IMMINGHAM, DN40 3LW

Contents *Page*

1 Executive Summary

1 Has a potential unexploded ordnance (UXO) risk been identified at the site in question?

NO

Indicative British / Allied UXO Risk	**NEGLIGIBLE**
Indicative German UXO Risk	**LOW**

2 Does the site in question require further research to clarify the unexploded ordnance (UXO) risk to future ground works?

NO

3 Dynasafe BACTEC's recommendation:

It is recommended that an Explosive Ordnance Safety Awareness briefing is provided by a suitably experienced UXO Specialist.

2 Introduction

About Dynasafe BACTEC Limited

Since 1991, Dynasafe BACTEC Limited has supported the UK construction industry by assessing the risk of encountering items of unexploded ordnance (UXO) during intrusive works. Dynasafe BACTEC's specialist advice provides essential information for threat assessments, improving safety and enhancing reputations, helping contractors avoid costly delays.

Dynasafe BACTEC holds the following accreditations: Occupational Health & Safety Management Systems (OHAS 18001:2007), Environmental Management Systems (ISO 14001:2004) and Quality Management Systems (ISO 9001:2008).

The risk of encountering UXO on most sites in the UK is low. However, where a site is at increased risk it is necessary to take measures to mitigate that risk. The factors affecting UXO threat assessment are based upon the history and previous usage of a site and its surroundings.

In 2009, the Construction Industry Research and Information Association (CIRIA) established a set of guidelines to assist industry professionals.

CIRIA recommends a four stage risk management process:

- **Preliminary threat assessment**
- **Detailed threat assessment**
- **Risk mitigation**
- **Implementation**

The preliminary threat assessment enables a non-UXO specialist to place a site in context and to identify whether a more detailed assessment is necessary. The assessment is based upon data obtained from desktop reviews of the site's history and its proximity to potential indicators of UXO contamination.

There are two principal groups of onshore UXO in the UK:

- **British / Allied Army, Air Force and Navy activities – domestic military activity**
- **Enemy bombing during WWI and WWII – aerial bombing and naval bombardment**

These two groups comprise many potential UXO risk contributing sources within the UK, the most significant of which are listed below. Georeferenced databases containing this information are used by BombRisk.com to identify areas of potentially elevated UXO risk.

- **Historic army, navy and air-force facilities**
- **Explosives / ammunition factories**
- **Munitions storage depots**
- **Historic military training areas and firing ranges**

- **British army explosive ordnance clearance tasks / recces**
- **WWII heavy anti-aircraft batteries**
- **WWII anti-invasion defensive fortifications**
- **Miscellaneous WWII pipe mined locations**
- **WWII prisoner of war camps**
- **WWII German bombing density statistics**
- **WWII bombing decoy sites**
- **Press articles regarding UXO finds**
- **Locations of Dynasafe BACTEC UXO finds**
- **Locations of Dynasafe BACTEC desktop threat assessments**
- **Locations of Dynasafe BACTEC on-site support services**

About FIND Mapping Limited

Established in 2006, FIND Mapping Limited is a pioneering web mapping and spatial data technology company offering online mapping and consultancy services. FIND technology powers the generation of this report.

www.findmaps.co.uk provides detailed mapping and a wealth of data sets to hundreds of the UK's top property, environmental and design/build companies.

FIND's consultancy services provide bespoke internet mapping solutions to a range of businesses enabling them to manage their spatial data more effectively.

While working closely with a wide range of reputable data providers including Ordnance Survey and the Environment Agency, FIND works independently of these organisations. A similar arm's-length relationship is maintained in terms of software and hardware providers. This enables the team at FIND to offer truly independent advice.

3 Methodology

Dynasafe BACTEC Limited and FIND have compiled a geo-referenced database of potential sources of UXO risk within the UK. From this information a range of risk zones have been defined.

The weighting of these zones is based upon the influence of all relevant factors. A WWII-era RAF airfield, for example, has a far greater zone of influence than a single WWII-era Anti-Aircraft Battery, as it would have covered a larger area, housed a much greater quantity / variety of munitions, seen more domestic troop training activities and would have been a more likely target for enemy bombers.

An online Preliminary Automated UXO Threat Assessment will determine an indicative level of UXO risk relating to a site. Note that these risk levels could be subject to change following the completion of any Detailed Desktop Threat Assessment for the same site.

The assessment will list all factors contributing to this weighting and will also give appropriate recommendations for further action, if considered necessary.

4 Search Results

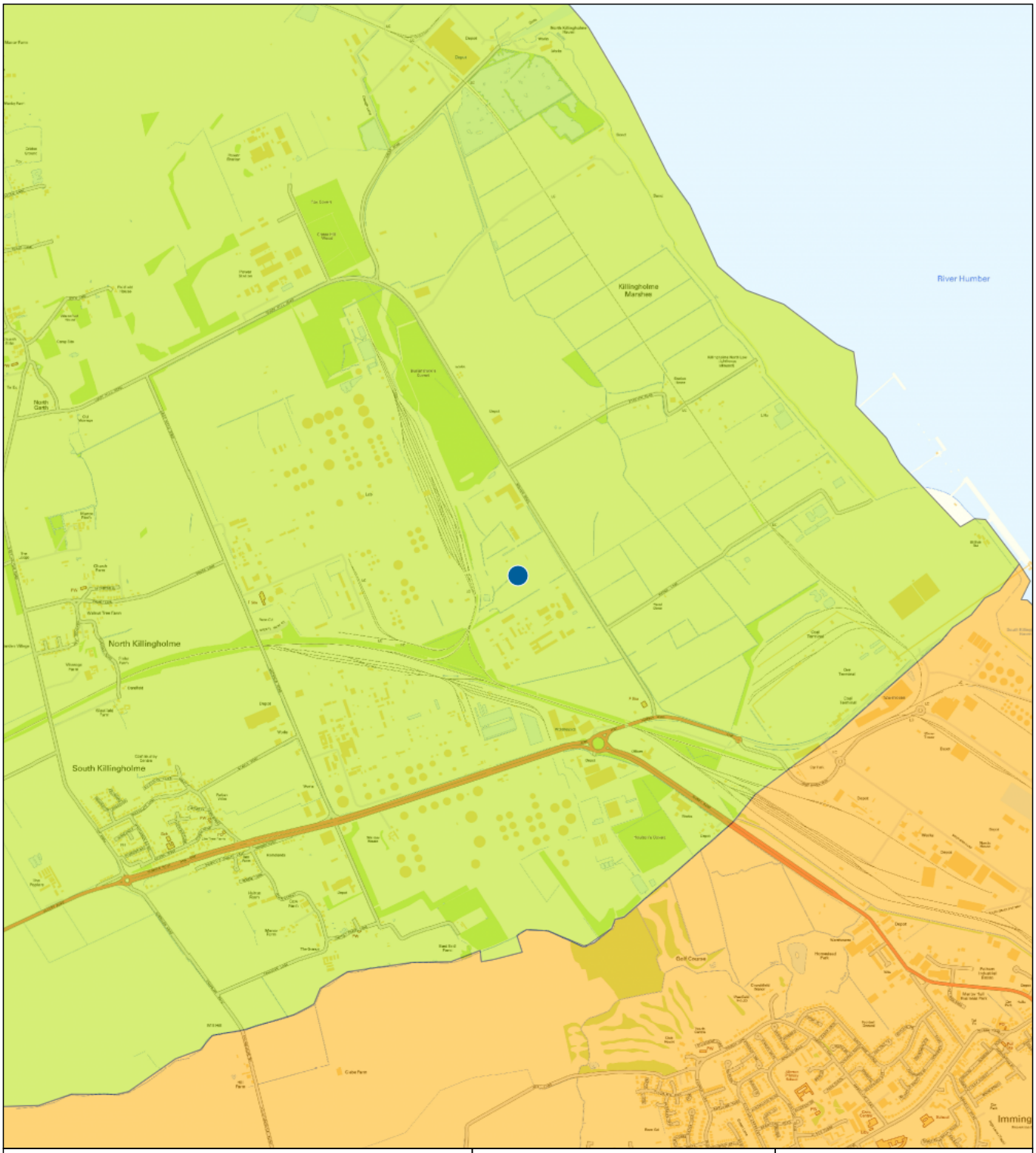
Dynasafe BACTEC Limited's UXO Source Database

Within 10km of the site the following potential sources of explosive ordnance have been recorded:

Source	*Number within 10km*
Military Airfield Sites	6
Bombing Decoy Sites	8
WWII Defence Related Positions & Pillboxes	37
Historic Army Camps	1
Prisoner of War Camps	1
Heavy Anti-Aircraft Batteries	17
Army Explosive Ordnance Clearance Tasks/Recces	2
Dynasafe BACTEC Desk-top Threat Assessments	2
Abandoned Bombs	None recorded
Press Articles regarding UXO Finds	None recorded
Military Training Areas and Firing Ranges	None recorded
Pipe Mined WWII Airfields	None recorded
Miscellaneous WWII Pipe Mined Locations	None recorded
Sites Related to the Manufacture of Explosives and Explosive Ordnance	None recorded
Dynasafe BACTEC Unexploded Ordnance Finds	None recorded
Dynasafe BACTEC On-Site Support Services	None recorded

None of these sources are deemed significant enough to be a risk and therefore do not warrant further research.

5 Risk of UXO based on WWII German bombing density



BombRisk.com

Dynasafe BACTEC Limited

DYNASAFE Area Clearance

FIND PROFESSIONAL MAPPING INTELLIGENCE

Map data

NEGLIGIBLE

LOW

MEDIUM

HIGH

1:20000

N W E S

0 400 800

Metres

6 Conclusions

Risk Levels and Recommendation

Indicative British / Allied UXO Risk

NEGLIGIBLE

There are no potential sources of British / Allied UXO recorded in Dynasafe BACTEC's historical database in close proximity to the site. If there is any empirical evidence of actual or potential contamination, Dynasafe BACTEC should be contacted for advice. Otherwise, the risk on site from UXO is considered to be Negligible.

Indicative German UXO Risk

LOW

Historical records indicate that the area was subjected to a low level of bombing density. If there is empirical evidence of UXB risk (i.e. anecdotal evidence) then please contact Dynasafe BACTEC for further advice.

This preliminary assessment has identified a Low risk from German unexploded bombs at this site.

Conclusion

This preliminary assessment has resulted in an overall Low risk from UXO. Unless any empirical evidence of actual or potential UXO contamination is available, Dynasafe BACTEC do not consider a full Explosive Ordnance Desktop Study necessary for this site. It is recommended that an Explosive Ordnance Safety Awareness briefing is provided by a suitably experienced UXO Specialist.

www.bombrisk.com

DYNASAFE
Area Clearance

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Appendix D: Risk Assessment Principles

CSM Risk Assessment Principles

Current good practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Environment Agency (EA) guidance on Model Procedures for the Management of Land Contamination (CLR 11). For a risk to be present, there must be a viable pollutant linkage; i.e. a mechanism whereby a source of contamination impacts on a sensitive receptor via a pathway.

Using criteria broadly based on those presented in the EA, Chartered Institute of Environmental Health (CIEH) and National House Building Council (NHBC) R&D Publication 66: 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (2008), the magnitude of the risk associated with potential contamination at the site has been assessed. To do this an estimate is made of:

- The magnitude of the potential consequence (i.e. severity); and
- The magnitude of probability (i.e. likelihood).

The severity of the risk is classified according to the criteria in **Table A**, below:

Table A: Severity of Potential Pollutant Linkages

SEVERITY	EXAMPLES
Major	- Acute damage to human health, likely to result in significant harm. - Catastrophic damage to buildings/property (e.g. by explosion, sites with high gassing potential, extensive VOC contamination). - Major pollution of controlled waters (e.g. surface watercourses or Principal aquifers/source protection zones). - Significant and lasting damage to sensitive ecosystems or species.
Moderate	- Chronic (long-term) risk to human health likely to result in a reduced quality of life. - Significant and costly damage to property, buildings, structures or services. - Pollution of sensitive controlled waters (e.g. surface watercourses or Principal/ Secondary aquifers). - Damage to sensitive ecosystems or species.
Minor	- Non-permanent human health effects. - Moderate damage to buildings structures or services. - Pollution of non-sensitive waters (e.g. smaller surface watercourses or non-aquifers). - Damage to non-sensitive ecosystems or species.
Minimal	- Temporary discomfort. - Minor (easily repairable) damage to buildings, structures or services. - Short-term decrease in non-sensitive waters quality. - Temporary disturbance of non-sensitive ecosystems.

The probability of the risk occurring is classified according to the criteria in **Table B**, below:

Table B: Likelihood of Risk Occurrence

LIKELIHOOD	EXPLANATION
Highly Likely	- Contaminant linkage may be present that appears very likely in the short-term and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	- Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Possible	- Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will.
Unlikely	- Contaminant linkage may be present but the circumstances under which harm could occur are improbable.

An overall evaluation of the magnitude of the risk is gained from a comparison of the severity and probability, as shown in **Table C**, below:

Table C: Risk Based on Comparison of Likelihood and Severity

		SEVERITY			
LIKELIHOOD		MAJOR	MODERATE	MINOR	MINIMAL
	HIGHLY LIKELY	Very High	High	Considerable	Medium
	LIKELY	High	Considerable	Medium	Low
	POSSIBLE	Considerable	Medium	Low	Very Low
	UNLIKELY	Medium	Low	Very Low	Negligible

Appendix 12B – Phase II Preliminary Borehole Logs

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	GC	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	MS	05/04/2018	Dando 2000.	1.20	14.00	200	14.00	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.	14.00	28.50	150	28.50	**National Grid**	
Approved		11/04/2018	SPT Hammer ID: SW15470, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.10	D 1	0.00-1.20 Hand excavated inspection pit.			Brown sandy clayey GRAVEL. Gravel is angular to subangular fine to coarse of chalk and limestone. (MADE GROUND)		0.10 (0.10)		
0.20 - 0.40	B 2						(0.35)		
0.45	D 3				Brown, locally greyish brown, slightly sandy gravelly CLAY. Gravel is angular fine to coarse of chalk and mudstone. Strong hydrocarbon odour. (MADE GROUND)		0.45		
0.50 - 0.70	B 4						(0.65)		
1.00 - 1.20	B 5		05/04/18	1800 Dry	Greyish brown, locally dark grey, slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of slag, mudstone, sandstone and chalk. Strong hydrocarbon odour. (MADE GROUND)	1.10-1.20 locally dark grey, occasional rootlets	1.10		
1.20 - 1.65	UT 6	52 blows 100% rec	06/04/18	0800 Dry					
1.65 - 1.80	D 7				Stiff brown, locally mottled light grey, slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of quartz, mudstone, sandstone and chalk.				
2.00 - 2.45	SPTS	N=25 (3,4/5,6,7,7)	1.70	Dry					
2.00 - 2.45	D 8								
2.50 - 3.00	B 9						(2.70)	1	
3.00 - 3.45	UT 10	56 blows 100% rec	2.80	Dry					
3.45 - 3.60	D 11								
3.80	W 14						3.80	1	
4.00 - 4.45	SPTS	N=14 (2,2/3,3,4,4)	3.90	Dry	Thinly laminated brown, locally light grey, CLAY with frequent gravel size pockets of fine to coarse sand.		(0.20) 4.00		
4.00 - 4.45	D 12				Stiff, becoming very stiff, greyish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk, sandstone, mudstone and quartz.				
4.00 - 4.45	B 13								
5.00 - 5.45	UT 15	50 blows 100% rec	4.70	Dry					
5.45 - 5.60	D 16								
6.50 - 6.95	SPTS	N=14 (2,2/3,3,4,4)	4.70	Dry				2	
6.50 - 6.95	D 17								
7.00 - 7.50	B 18					7.10-8.40 locally sandy			
7.20	D 19								
8.00 - 8.45	UT 20	38 blows 100% rec	4.70	Dry					
8.45	B 21						(9.00)	2	
8.50	W 21A								
								3	
9.50 - 9.95	SPTS	N=14 (2,3/3,3,4,4)	9.20	Dry					
9.50 - 9.95	D 22								
9.50 - 10.00	B 23								

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
1	3.80	Rose to 2.30 m after 20 minutes. Medium inflow	4.00
2	8.50	Rose to 6.30 m after 20 minutes. Medium inflow	9.00

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

13/04/2018 15:54:20

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	GC	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	MS	05/04/2018	Dando 2000.	1.20	14.00	200	14.00	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.	14.00	28.50	150	28.50	**National Grid**	
Approved		11/04/2018	SPT Hammer ID: SW15470, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
					Stiff, becoming very stiff, greyish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk, sandstone, mudstone and quartz.				
11.00 - 11.45	UT 24	40 blows 100% rec	9.20	Dry					
11.45 - 11.60	D 25								
12.50 - 12.95	SPTS	N=31 (5,5/6,7,8,10)	9.20	Dry					
12.50 - 12.95	D 26								
13.00	D 28						13.00		
13.00 - 13.50	B 27				Medium dense brown gravelly very clayey fine to coarse SAND. Gravel is angular to subrounded fine to coarse of chalk and flint.				
13.50	W 30							3 ▼	
							(1.80)		
14.00 - 14.45	SPTS	N=10 (3,3/2,3,2,3)	9.20	10.00					
14.00 - 14.45	D 29								
			06/04/18	1800					
			9.20	10.00					
			09/04/18	0800					
			9.20	3.80					
14.80	D 31						14.80		
15.00 - 15.50	B 32				Medium dense brown sandy slightly clayey GRAVEL. Gravel is angular to subangular fine to coarse of flint and chalk.				
							(0.90)		
15.50 - 15.95	SPTS	N=28 (3,3/5,5,8,10)	15.00	10.00					
15.50 - 15.95	D 33								
							15.70		
16.00 - 17.00	B 34				Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and rare flint. Below 17.10m, becoming greyish brown.				
17.00 - 17.45	UT 35	78 blows 100% rec	16.50	15.00					
17.45 - 17.60	D 36								
18.50 - 18.77	SPTS	50 (15,10 for 50mm/23,27 for 70mm)	18.00	17.00					
18.50 - 18.77	D 37						(5.80)		
18.50 - 19.00	B 38							4 ▼	

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
3	13.50	Rose to 9.00 m after 20 minutes. Fast inflow	

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used
14.50 - 14.80	60	Chisel

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

13/04/2018 15:54:20

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	GC	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	MS	05/04/2018	Dando 2000.	1.20	14.00	200	14.00	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.	14.00	28.50	150	28.50	**National Grid**	
Approved		11/04/2018	SPT Hammer ID: SW15470, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
20.00 - 20.40	UT 39	100 blows 56% rec	19.50	19.50	Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and rare flint. Below 17.10m, becoming greyish brown.				
20.40 - 20.50	D 40								
21.00 - 21.50	B 41							4 ▼	
21.50 - 21.79	SPTS	50 (10,15 for	19.50	20.00	Very stiff light grey gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse of chalk.		21.50		
21.50 - 21.79	D 42	60mm/22,25,3 for 5mm)							
22.50 - 22.70	SPTS	50 (25 for 75mm/28,22 for	09/04/18	1800					
22.50	UT NR	55mm)	19.50	20.00					
22.50 - 22.70	D 43	100 blows No Recovery	10/04/18	0800					
			19.50	9.00					
23.00 - 24.00	B 44								
24.00 - 24.28	SPTS	50 (15,10 for	23.50	10.00					
24.00 - 24.28	D 45	45mm/20,27,3 for 5mm)					(6.00)		
25.00 - 25.22	SPTS	50 (20,5 for 15mm/25,25	24.90	8.00					
25.00 - 25.22	D 46	for 60mm)							
26.00 - 26.22	SPTS	50 (25 for 75mm/27,23 for	25.90	8.00					
26.00 - 26.22	D 47	65mm)	10/04/18	1700					
26.00 - 27.00	B 48		25.90	8.00					
			11/04/18	0800					
			25.90	4.00					
27.50 - 27.78	SPTS	50 (15,10 for	27.50	7.00	Extremely weak to very weak white CHALK. Recovered as gravelly CLAY. Gravel is angular to subangular fine to coarse. Below 25.50m, recovered as clayey angular fine to coarse gravel.		27.50		
27.50 - 27.78	D 49	50mm/22,24,4 for 5mm)					(1.16)		
27.50 - 28.50	B 50								
28.50 - 28.66	SPTS	50 (25 for 60mm/38,12 for	11/04/18	1500					
28.50 - 28.66	D 51	20mm)	28.50	9.00			28.66		
					END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
4	21.00	Rose to 19.80 m after 20 minutes. Medium inflow	

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used
24.50 - 26.00	180	Chisel
26.50 - 27.50	120	Chisel

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

13/04/2018 15:54:20

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	GC	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	11/04/2018	Dando 2000.	1.20	14.50	200	14.50	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.	14.50	22.20	150	22.20	**National Grid**	
Approved		16/04/2018	SPT Hammer ID: SW15470, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
		0.00-1.20 Hand excavated inspection pit.			Dark brown sandy very gravelly CLAY with high cobble content. Gravel is subrounded fine to coarse of various lithologies including chalk, macadam and sandstone. Cobbles are subrounded of chalk. (MADE GROUND)		(0.50)		
0.20 0.30 - 0.50	D 1 B 2						0.50		
0.60 0.60 - 1.00	D 3 B 4				Dark brown and black slightly gravelly clayey SAND. Gravel is subangular fine to coarse of chalk and sandstone. Strong oily odour. (MADE GROUND)		(0.50)		
1.00 1.00 - 1.20 1.20 - 1.65	D 5 B 6 UT 7	30 blows 100% rec		Dry	Firm dark greyish brown slightly sandy CLAY with rare gravel. Gravel is angular medium of flint and chalk.		1.00		
1.65 - 1.80	D 8							1	
1.80 - 2.25 1.80 - 2.25 1.80 - 2.25	SPTS D 9 B 10	N=13 (2,2/2,3,4,4)	11/04/18	1.50 1800 1.50				1	
2.20 - 2.70 2.25 - 2.70	B 13 UT NR	28 blows No Recovery	12/04/18	0800 2.00			(3.20)		
2.70 - 2.80 2.80 - 3.25 2.80 - 3.25	D 12 SPTS D 14	N=15 (1,2/3,3,4,5)	1.70	Dry					
3.30 - 3.75	UT 15	45 blows 100% rec	1.70	Dry					
3.75 - 3.90	D 16							2	
3.90 - 4.35 3.90 - 4.35 3.90 - 4.35 4.00 - 4.45	SPTS D 17 B 18 UT NR	N=15 (6,7/4,3,3,5) 36 blows No Recovery	2.90 3.90	Dry Dry			4.20	2	
4.45 - 4.60	D 20				Brown mottled grey CLAY.	4.45 brown slightly gravelly sandy clay, gravel is subangular fine of chalk and mudstone	(0.50)		
4.60 - 5.05 4.60 - 5.05 4.60 - 5.05	SPTS D 21 B 27	N=17 (2,2/3,4,4,6)	4.50	4.00	Stiff to very stiff brown sandy CLAY with rare gravel. Gravel is subangular medium of sandstone and chalk.		4.70		
5.10 - 5.55	UT 28	38 blows 100% rec	5.00	4.80					
5.55 - 5.70	D 29								
5.70 - 6.15 5.70 - 6.15 5.70 - 6.15	SPTS D 30 B 31	N=25 (3,4/5,6,7,7)	5.60	Dry					
6.50 - 6.95 6.50 - 7.00	UT NR B 33	48 blows No Recovery	6.00	Dry					
7.10 - 7.55 7.10 - 7.55 7.10 - 7.55	SPTS D 34 B 35	N=22 (3,4/4,5,6,7)	6.00	Dry					
8.00 - 8.45	UT 36	60 blows 100% rec	6.00	Dry					
8.45 - 8.60	D 37								
8.60 - 9.05 8.60 - 9.05 8.60 - 9.05	SPTS D 38 B 39	N=27 (3,4/5,7,7,8)	6.00	Dry					
9.50 - 9.95	UT 40	62 blows 100% rec	6.00	Dry			(9.40)		
9.95 - 10.10	D 41							3	

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
1	1.80	Rose to 1.50 m after 20 minutes. Slow inflow	
2	4.20	Rose to 3.80 m after 20 minutes. Slow inflow	5.00

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

18/04/2018 11:39:25

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole BH2

Sheet 1 of 3

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	GC	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	11/04/2018	Dando 2000.	1.20	14.50	200	14.50	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.	14.50	22.20	150	22.20	**National Grid**	
Approved		16/04/2018	SPT Hammer ID: SW15470, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
10.10 - 10.55 10.10 - 10.55 10.10 - 10.55	SPTS D 42 B 43	N=22 (3,4/4,5,6,7)	6.00	Dry	Stiff to very stiff brown sandy CLAY with rare gravel. Gravel is subangular medium of sandstone and chalk.				
11.00 - 11.45	UT 44	64 blows 100% rec	6.00	Dry					
11.45 - 11.60	D 45								
11.60 - 12.05 11.60 - 12.05 11.60 - 12.05	SPTS D 46 B 47	N=23 (3,4/4,5,6,8)	6.00	Dry					
12.50 - 12.95	UT 48	70 blows 100% rec	6.00	Dry					
12.95 - 13.10	D 49								
13.10 - 13.55 13.10 - 13.55 13.10 - 13.55	SPTS D 50 B 51	N=30 (4,6/6,7,8,9)	6.00	Dry					
14.00 - 14.45 14.00 - 14.60 14.10	UT NR B 53 W 59	80 blows No Recovery	6.00	Dry	Firm light brown sandy very gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone.		14.10 (0.30)		3
14.60 - 15.05 14.60 - 15.05	SPTS D 54	N=39 (7,8/10,10,9,10)	14.50	10.00	Firm light brown sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and flint. Occasional gravel size pockets of fine to medium sand.		14.40 (0.80)		
15.20	D 55						15.20		
15.50 - 15.95	UT 56	70 blows 33% rec	14.50	10.00	Firm light brown sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and flint. Occasional gravel size pockets of silty fine to medium sand.		(1.20)		
16.20 - 16.65 16.20 - 16.65 16.40 - 17.00	SPTS D 57 B 58	N=37 (6,8/8,9,10,10)	15.50	7.00	Stiff greyish brown slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of chalk.		16.40		
17.00 - 17.45	UT 60	55 blows 56% rec	12/04/18 16.50 13/04/18 16.50	1800 7.00 0800 5.00					
17.45 - 17.60	D 61					17.45-18.05 light grey silty fine to coarse sand			
17.60 - 18.05 17.60 - 18.05	SPTS D 62	N=35 (3,5/7,8,10,10)	16.50	5.00			(3.10)		
18.50 - 18.95 18.50 - 19.00	UT NR B 63	60 blows No Recovery	18.40	9.00					
19.10 - 19.55 19.10 - 19.55	SPTS D 64	N=35 (4,6/7,8,9,11)	18.40	9.00					
19.50	D 65				Stiff to very stiff brownish grey slightly sandy CLAY with occasional gravel. Gravel is subangular fine to medium of chalk.		19.50		

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
3	14.10	Rose to 10.00 m after 20 minutes. Medium inflow	

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

18/04/2018 11:39:25

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH2

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	GC	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	11/04/2018	Dando 2000.	1.20	14.50	200	14.50	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.	14.50	22.20	150	22.20	**National Grid**	
Approved		16/04/2018	SPT Hammer ID: SW15470, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
20.00 - 20.45	UT 66	100 blows 56% rec	20.00	11.00	Stiff to very stiff brownish grey slightly sandy CLAY with occasional gravel. Gravel is subangular fine to medium of chalk.				
20.60 - 20.93 20.60 - 20.93 20.60 - 21.00	SPTS D 67 B 68	50 (12,13 for 65mm/17,21,12 for 40mm)	20.00	11.00			(2.84)		
21.50 - 21.64 21.50 - 21.64	SPTS D 69	50 (25 for 50mm/42,8 for 10mm)	21.00 13/04/18 21.50	11.00 1800 11.00					
			16/04/18 21.50	0800 6.00					
22.20 - 22.34 22.20 - 22.34	SPTS D 70	50 (25 for 50mm/39,11 for 15mm)	16/04/18 22.20	1000 8.00	END OF EXPLORATORY HOLE		22.34		

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used
21.90 - 21.90	180	Chisel
21.90 - 22.20	60	Chisel

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

18/04/2018 11:39:25

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH2

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	SS	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	MS	11/04/2018	Dando 175.	1.20	28.00	200	28.00	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.					**National Grid**	
Approved		13/04/2018	SPT Hammer ID: AR2068, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
		0.00-1.20 Hand excavated inspection pit.			Firm brown, locally mottled light grey, slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of quartz, sandstone, chalk and mudstone.	0.00-1.20 occasional rootlets			
0.40 - 1.20	B 1								
1.20 - 1.65	SPTS	N=16 (3,4/4,4,4,4)	1.20	Dry					
1.20 - 1.65	D 2								
							(3.00)		
1.65 - 2.00	B 3								
2.00 - 2.45	SPTS	N=13 (3,3/3,4,3,3)	1.50	Dry					
2.00 - 2.45	D 4								
2.50 - 3.00	B 5								
3.00 - 3.45	SPTS	N=8 (1,2/2,2,2,2)	1.50	1.10					
3.00 - 3.45	D 6				Firm thinly laminated brown CLAY with frequent partings of fine to medium sand.		3.00		
							(0.70)		
3.50 - 4.00	B 7								
					Medium dense brown gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse of various lithologies.		3.70		
4.00 - 4.45	SPTS	N=13 (2,2/3,3,3,4)	4.00	Dry					
4.00 - 4.45	D 8						(0.80)		
4.50 - 5.00	B 9						4.50		
					Stiff to very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, quartz and sandstone.				
5.00 - 5.45	UT 10	39 blows 100% rec	4.50	Dry	Below 7.40m, becoming greyish brown.				
5.45 - 5.65	D 11								
5.65 - 6.00	B 12								
6.00 - 6.45	SPTS	N=22 (3,3/4,6,6,6)	6.00	Dry					
6.00 - 6.45	D 13								
6.50 - 7.10	B 14								
						7.10-7.40 foreman reports reddish brown sand			
7.50 - 7.95	UT 15	49 blows 100% rec	7.50	Dry					
7.95 - 8.15	D 16								
8.15 - 8.60	SPTS	N=23 (3,3/4,5,6,8)	7.50	Dry					
8.15 - 8.60	D 17								
8.60 - 9.00	B 18								
							(8.80)		
9.00 - 9.45	UT 19	59 blows 100% rec	9.00	Dry					
9.45 - 9.65	D 20								
9.65 - 10.10	SPTS	N=29 (3,5/7,7,8,7)	9.50	Dry					
9.65 - 10.10	D 21								

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
1	3.00	Rose to 1.10 m after 20 minutes.	3.60
2	7.10	Rose to 4.15 m after 20 minutes.	7.40

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

16/04/2018 12:50:12

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH3

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	SS	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	MS	11/04/2018	Dando 175.	1.20	28.00	200	28.00	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.					**National Grid**	
Approved		13/04/2018	SPT Hammer ID: AR2068, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
10.00 - 10.50	B 22				Stiff to very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, quartz and sandstone.				
10.50 - 10.95	UT 23	76 blows 100% rec	10.50	Dry	Below 7.40m, becoming greyish brown.				
10.95 - 11.15	D 24								
11.00 - 12.00	B 26								
11.15 - 11.60	SPTS	N=36 (4,6/7,9,11,9)	11.00	Dry					
11.15 - 11.60	D 25								
12.00 - 12.45	UT 27	69 blows 100% rec	12.00	Dry					
12.45 - 12.65	D 28								
12.65 - 13.10	SPTS	N=30 (3,5/5,7,9,9)	12.00	Dry					
12.65 - 13.10	D 29								
12.80 - 13.30	B 30								
							13.30		3
13.50 - 13.95	SPTS	N=11 (1,2/2,3,3,3)	12.00	7.90	Medium dense greenish brown gravelly slightly clayey fine to medium SAND. Gravel is angular to subrounded fine to coarse of various lithologies. Occasional gravel size pockets of clay.				
13.50	D 31								
13.50 - 13.95	D 32						(0.80)		
14.10 - 15.00	B 33				Stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk, quartz, sandstone and mudstone.		14.10		
							(1.00)		
			11/04/18	1700					
			15.00	7.00					
15.00 - 15.45	SPTS	N=11 (2,3/2,2,3,4)							
15.00 - 15.45	D 34		12/04/18	0800			15.10		
			15.00	3.30	Medium dense yellowish brown gravelly fine to medium SAND. Gravel is angular to subrounded fine to coarse of various lithologies. Occasional gravel size pockets of clay.				
							(0.90)		
16.00 - 16.50	B 35				Grey slightly sandy clayey SILT. Rare subangular fine to medium gravel of chalk.		16.00		
16.50 - 16.77	SPTS	57 (10,15 for 60mm/28,29 for 60mm)	16.50	5.10					
16.50 - 16.80	D 36								
17.00 - 18.00	B 37								
							(2.70)		
18.00 - 18.20	SPTS	50 (15,10 for 50mm/50 for 70mm)	18.00	Dry					
18.00 - 18.30	D 38								
18.60 - 19.50	B 39								
					Very stiff light grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk with rare flint. Locally silty.		18.70		
					Below 24.00m, locally gravelly.				
19.50 - 19.75	SPTS	50 (11,14 for 50mm/22,28 for 50mm)	19.50	Dry					
19.50 - 19.80	D 40								

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
3	13.30	Rose to 6.10 m after 20 minutes.	14.10

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

16/04/2018 12:50:12

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH3

Borehole Log

PRELIMINARY

SOCOTEC

Drilled SS	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**		
Logged MS	11/04/2018	Dando 175.	1.20	28.00	200	28.00	**Coordinates (m)**		
Checked	**End**	Cable percussion boring.					**National Grid**		
Approved	13/04/2018	SPT Hammer ID: AR2068, Rod type: 54mm Whitworth.							

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
20.00 - 21.00	B 41				Very stiff light grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk with rare flint. Locally silty. Below 24.00m, locally gravelly.				
21.00 - 21.20 21.00 - 21.30	SPTS D 42	50 (19,6 for 10mm/31,19 for 40mm)	21.00	Dry					
22.00 - 22.50	B 43								
22.50 - 22.62 22.50 - 22.70	SPTS D 44	50 (25 for 75mm/50 for 40mm)	22.50	Dry			(8.10)		
23.00 - 24.00	B 45								
			12/04/18 24.00	1700 Dry					
24.00 - 24.14 24.00 - 24.10	SPTS D 46		13/04/18 24.00	0800 19.30					
25.00 - 25.50	B 47								
25.50 - 25.62 25.50 - 25.62	SPTS D 48	50 (25 for 75mm/50 for 50mm)	25.50	Dry					
26.00 - 26.50	B 49								
26.80 - 27.02 26.80 - 27.02 27.00 - 27.50	SPTS D 50 B 51	50 (18,7 for 10mm/28,22 for 60mm)	26.50	8.70	Extremely weak white CHALK. Recovered as gravelly clay. Gravel is angular to subangular fine to coarse of chalk with rare flint Below 27.00m, recovered as clayey angular fine to coarse gravel.		26.80 (1.20)	4	
			13/04/18 28.00	1630 4.10					
28.00 - 28.10	SPTC	50 (25 for 60mm/50 for 40mm)			END OF EXPLORATORY HOLE		28.00		

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
4	26.80	Rose to 8.70 m after 20 minutes.	

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used
27.60 - 28.00	60	Chisel

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

16/04/2018 12:50:12

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH3

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	SS	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	16/04/2018	Dando 175.	1.20	24.00	200	16.50	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.					**National Grid**	
Approved		18/04/2018	SPT Hammer ID: AR2068, Rod type: 54mm Whitworth.						

Samples and Tests / Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
		0.00-1.20 Hand excavated inspection pit.			Light brown, mottled grey, slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium of chalk and sandstone with frequent rootlets. (TOPSOIL)		(0.30) 0.30		
0.50 - 1.20	B 1				Firm brown, mottled grey and light brown, slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, flint and sandstone.				
1.20 - 1.65 1.20 - 1.65	SPTS D 2	N=16 (2,3/4,4,4,4)	1.20	Dry					
1.65 - 2.00	B 3						(2.90)		
2.00 - 2.45	UT 4	59 blows 100% rec	1.50	Dry					
2.45 - 2.65	D 5								
2.65 - 3.10 2.65 - 3.10	SPTS D 6	N=15 (2,3/3,4,3,5)	1.50	Dry					
3.10 - 3.55	UT 7	51 blows 100% rec	3.00	Dry					
					Soft brown very sandy CLAY.		3.20		
						3.55 brown clayey sand	(0.95)		
3.75 - 4.20 3.75 - 4.20	SPTS D 8	N=6 (1,2/1,2,1,2)	3.00	1.00					
4.00 - 4.50	B 9						4.15		
					Stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk and sandstone.				
4.50 - 4.95	UT 10	47 blows 100% rec	4.50	Dry					
4.95 - 5.15	D 11								
5.15 - 5.60 5.15 - 5.60	SPTS D 12	N=22 (2,3/4,6,6,6)	4.50	Dry					
5.50 - 6.00	B 13						(2.95)		
6.00 - 6.45	UT 14	42 blows 100% rec	6.00	Dry					
6.45 - 6.65	D 15								
6.65 - 7.10 6.65 - 7.10	SPTS D 16	N=24 (2,3/4,6,6,8)	6.00	Dry					
			16/04/18 6.00	1700 2.10					
7.20 - 7.50	B 17		17/04/18 6.00	0800 2.00	Stiff to very stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk and sandstone.	7.10-7.20 fine sand and gravel	7.10		
7.50 - 7.95	UT 18	51 blows 100% rec	7.50	Dry					
7.95 - 8.15	D 19								
8.15 - 8.60 8.15 - 8.60	SPTS D 20	N=25 (4,4/5,6,7,7)	7.50	Dry					
8.50 - 9.00	B 21								
9.00 - 9.45	UT 22	42 blows 100% rec	9.00	Dry					
9.65 - 10.10 9.65 - 10.10	SPTS D 23	N=23 (3,4/5,5,7,6)	9.00	Damp			(4.90)		

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
1	3.20	Rose to 1.00 m after 20 minutes.	4.15
2	7.40	Rose to 2.10 m after 20 minutes.	7.20

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

24/04/2018 10:41:25

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH4

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	SS	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	16/04/2018	Dando 175.	1.20	24.00	200	16.50	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.					**National Grid**	
Approved		18/04/2018	SPT Hammer ID: AR2068, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Time Casing / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
10.00 - 10.50	B 24			Stiff to very stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk and sandstone.				
10.50 - 10.95	UT 25	40 blows 100% rec	10.50 Dry					
10.95 - 11.15	D 26							
11.15 - 11.60	SPTS	N=24 (3,4/5,6,6,7)	10.50 Dry					
11.15 - 11.60	D 27							
11.50 - 12.00	B 28							
12.00 - 12.45	SPTS	N=33 (4,4/6,7,9,11)	10.50 7.20	Brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of chalk, sandstone and flint.	12.00-12.30 driller notes reddish brown fine sand	12.00		3
12.00 - 12.45	D 29							
12.50 - 13.00	B 30				12.50 becomes sandy and light brown	(1.40)		
13.50 - 13.95	SPTS	N=37 (5,5/7,10,9,11)	13.50 2.10	Stiff to very stiff light yellowish brown sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, sandstone and flint.		13.40		4
13.50 - 13.95	D 31							
14.00 - 15.00	B 32				14.00-15.00 becoming slightly gravelly clayey sand			
15.00 - 15.45	SPTS	N=16 (3,3/4,3,4,5)	15.00 1.10					5
15.00 - 15.45	D 33					(3.70)		
15.50 - 16.00	B 34				15.50-16.00 sandy clayey gravel			
16.50 - 16.95	SPTS	N=44 (6,8/7,11,13,13)	16.50 1.30					
			17/04/18 1700					
			16.50 1.30					
			18/04/18 0800					
17.10 - 17.50	B 36		16.50 1.30	Dark brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium of chalk and sandstone.		17.10		
						(0.70)		
18.00 - 18.45	SPTS	N=13 (2,3/2,3,3,5)		Very stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium of chalk and sandstone.		17.80		5
18.00 - 18.45	D 37							
18.00 - 19.00	B 38					(1.30)		
19.50 - 19.74	SPTS			Very stiff greyish brown slightly sandy slightly gravelly CLAY with pockets of coarse gravel size extremely weak weathered chalk. Gravel is subrounded fine to coarse of chalk.		19.10		
19.50 - 19.70	D 39							

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
3	12.00	Rose to 6.95 m after 20 minutes.	12.30
4	13.40	Rose to 4.10 m after 20 minutes.	
5	17.80	Rose to 15.10 m after 20 minutes.	

Depth Related Remarks

Depths (m)	Remarks
13.50 - 16.50	Water added to assist boring.

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

24/04/2018 10:41:25

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH4

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	SS	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	16/04/2018	Dando 175.	1.20	24.00	200	16.50	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.					**National Grid**	
Approved		18/04/2018	SPT Hammer ID: AR2068, Rod type: 54mm Whitworth.						

Samples and Tests / Strata Description

Depth	Type & No.	Records	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
20.00 - 21.00	B 40				Very stiff greyish brown slightly sandy slightly gravelly CLAY with pockets of coarse gravel size extremely weak weathered chalk. Gravel is subrounded fine to coarse of chalk.		(2.30)		
21.00 - 21.22 21.00 - 21.25	SPTS D 41					21.00-21.25 white chalk, possible cobble	21.40		
					Very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium of chalk.				
22.00 - 22.50	B 42						(2.00)		
22.50 - 22.64 22.50 - 22.60	SPTS D 43	50 (18,7 for 10mm/50 for 60mm)							
23.00 - 24.00	B 44						23.40		
					Very stiff light grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium of chalk and flint.		(0.75)		
24.00 - 24.15 24.00 - 24.15	SPTS D 45	50 (25/50 for 60mm)	18/04/18	1700		24.00-24.15 light grey clayey silt	24.15	6	
					END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
6	24.00	Rose to 9.60 m after 20 minutes.	

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used
21.40 - 21.90	40	
23.40 - 24.00	60	

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

24/04/2018 10:41:25

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH4

Borehole Log

PRELIMINARY

SOCOTEC

Drilled GC	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**		
Logged WH	17/04/2018	Dando 2000.	1.20	13.00	200	13.00	**Coordinates (m)**		
Checked	**End**	Cable percussion boring.	13.00	26.10	150	26.00	**National Grid**		
Approved	19/04/2018	SPT Hammer ID: SW15470, Rod type: 54mm Whitworth.							

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.10 0.10 - 0.40	D 1 B 2	0.00-1.20 Hand excavated inspection pit.			Dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk and sandstone. (TOPSOIL)		(0.40)		
0.50 0.50 - 0.80	D 3 B 4				Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium of flint.		0.40 (0.50)		
1.00 1.00 - 1.20 1.20 - 1.65	D 5 B 6 UT 7	35 blows 89% rec		Dry	Firm brown, mottled light grey, slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of chalk, flint and mudstone.		0.90		
1.65 - 1.80 1.80 - 2.25 1.80 - 2.25 1.80 - 2.25	D 8 SPTS D 9 B 10	N=16 (2,3/3,4,4,5)		Dry					
2.30 - 2.75	UT 11	38 blows 100% rec	1.70	Dry					
2.75 - 2.90 2.90 - 3.35 2.90 - 3.35 2.90 - 3.35	D 12 SPTS D 13 B 14	N=19 (3,4/4,5,5,5)	1.70	Dry		2.90-4.45 brown slightly gravelly clay. Gravel is subangular to subrounded fine to coarse of chalk, flint and mudstone	(3.60)		
3.40 - 3.85	UT 15	32 blows 100% rec	3.00	Dry					
3.85 - 3.90 4.00 - 4.45 4.00 - 4.45 4.00 - 4.45	D 16 SPTS D 17 B 18	N=17 (2,3/4,4,4,5)	3.00	Dry					
4.50 - 4.95 4.50	UT 20 D 19	40 blows 100% rec	4.40	Dry	Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine of chalk, sandstone and mudstone.		4.50		
4.95 - 5.10 5.10 - 5.55 5.10 - 5.55 5.10 - 5.55	D 21 SPTS D 22 B 22A	N=13 (2,2/3,3,3,4)	4.40	Dry					
6.50 - 6.95	UT 23	46 blows 100% rec	4.60	Dry					
6.95 - 7.10 7.10 - 7.55 7.10 - 7.55 7.10 - 7.55	D 24 SPTS D 25 B 26	N=15 (2,3/3,4,4,4)	4.60	Dry					
8.00 - 8.45	UT 27	60 blows 100% rec	4.60	Dry					
8.45 - 8.60 8.60 - 9.05 8.60 - 9.05 8.60 - 9.05	D 28 SPTS D 29 B 30	N=29 (3,5/6,7,8,8)	4.60	Dry			(7.90)		
9.50 - 9.95	UT 31	50 blows 100% rec	4.60	Dry					
9.95 - 10.10	D 32								

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

23/04/2018 09:39:29

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH5

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	GC	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	17/04/2018	Dando 2000.	1.20	13.00	200	13.00	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.	13.00	26.10	150	26.00	**National Grid**	
Approved		19/04/2018	SPT Hammer ID: SW15470, Rod type: 54mm Whitworth.						

Samples and Tests

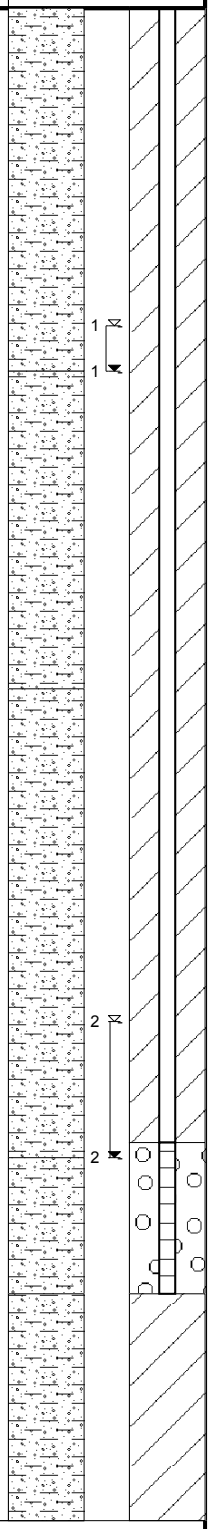
Depth	Type & No.	Records	Date Casing	Time Water
10.10 - 10.55	SPTS	N=30 (2,4/7,7,8,8)	4.60	Dry
10.10 - 10.55	D 33			
10.10 - 10.55	B 34			
11.00 - 11.45	UT 35	60 blows 100% rec	4.60	Dry
11.45 - 11.60	D 36			
11.60 - 12.05	SPTS	N=31 (4,6/7,7,8,9)	4.60	Dry
11.60 - 12.05	D 37			
11.60 - 12.05	B 38			
12.40	W 41			
12.50 - 12.95	SPTS	N=32 (4,6/7,7,8,10)	4.60	Dry
12.50 - 12.95	D 39			
12.50 - 12.95	B 40		17/04/18	1800
			4.60	12.10
13.00	D 42		18/04/18	0800
			4.60	2.00
14.00 - 14.45	UT 43	70 blows 100% rec	13.50	
14.45 - 14.60	D 44			
14.60 - 15.05	SPTS	N=46 (7,8/9,10,13,14)	13.50	
14.60 - 15.05	D 45			
14.60 - 15.05	B 46			
15.50 - 15.95	UT 47	100 blows 100% rec	15.00	
15.95 - 16.10	D 48			
16.10 - 16.48	SPTS	50 (8,10/13,18,19 for 75mm)	15.00	Dry
16.10 - 16.48	D 49			
16.10 - 16.48	B 50			
17.00 - 17.36	SPTS	50 (10,12/14,17,19 for 65mm)	15.00	Dry
17.00 - 17.36	D 51			
17.00 - 17.36	B 52			
17.70	D 53			
17.70 - 18.50	B 54			
18.50 - 18.86	SPTS	50 (11,13/15,18,17 for 65mm)	18.00	18.00
18.50 - 18.86	D 55			
18.50 - 18.86	B 56			

Strata Description

Main	Detail	Depth, Level (Thickness)
Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine of chalk, sandstone and mudstone.	11.45-12.05 dark brown slightly gravelly clay. Gravel is subrounded fine to medium of chalk, sandstone and mudstone	
Stiff light brown slightly sandy gravelly CLAY. Gravel is subrounded fine to medium of chalk, sandstone and mudstone.		12.40 (2.10)
Stiff to very stiff light grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of chalk and mudstone.	14.50-16.10 brown	14.50 (3.10)
Very stiff light grey slightly sandy slightly gravelly CLAY with coarse gravel size pockets of highly weathered extremely weak chalk. Gravel is subrounded fine to medium of chalk.		17.60 (0.90)
Very stiff light grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of chalk.		18.50

Legend

Backfill



Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
1	12.40	Rose to 12.10 m after 20 minutes. Slow inflow	
2	17.60	Rose to 16.70 m after 20 minutes. Medium inflow	18.00

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

23/04/2018 09:39:29

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH5

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	GC	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	17/04/2018	Dando 2000.	1.20	13.00	200	13.00	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.	13.00	26.10	150	26.00	**National Grid**	
Approved		19/04/2018	SPT Hammer ID: SW15470, Rod type: 54mm Whitworth.						

Samples and Tests / Strata Description

Depth	Type & No.	Records	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
20.00 - 20.28 20.00 - 20.28 20.00 - 20.28	SPTS D 57 B 58	50 (12,13 for 55mm/20,30 for 75mm)	19.50	19.50	Very stiff light grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of chalk.				
21.50 - 21.74 21.50 - 21.74 21.50 - 21.74	SPTS D 59 B 60	50 (20,5 for 15mm/26,24 for 70mm)	21.00	21.00			(7.65)		
23.00 - 23.21 23.00 - 23.21 23.00 - 23.21	SPTS D 61 B 62	50 (18,2 for 20mm/30,20 for 40mm)	22.50	22.00		23.00-23.30 some gravel of sandstone			
24.50 - 24.62 24.50 - 24.62 24.50 - 24.62	SPTS D 63 B 64	45 (25 for 20mm/33,12 for 25mm)	23.50	24.00					
25.60 - 25.72 25.60 - 25.72	SPTS D 65	50 (25 for 50mm/50 for 70mm)	18/04/18 25.00 19/04/18 25.00	1800 24.00 0800 21.00					
26.10 - 26.15	SPTC	50 (25 for 20mm/50 for 30mm)	19/04/18 26.00	1530 23.00	END OF EXPLORATORY HOLE		26.15		

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used
25.40 - 25.60	60	Chisel
25.70 - 26.10	180	Chisel

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

23/04/2018 09:39:29

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH5

Borehole Log

PRELIMINARY

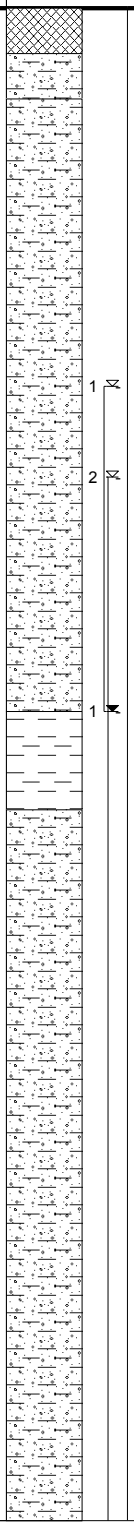
SOCOTEC

Drilled SS	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**		
Logged MS	05/04/2018	Dando 175.	1.20	24.30	200	22.50	**Coordinates (m)**		
Checked	**End**	Cable percussion boring.					**National Grid**		
Approved	10/04/2018	SPT Hammer ID AR2068, Rod type: 54mm Whitworth.							

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.00 - 0.30	B 1	0.00-1.20 Hand excavated inspection pit.			Greyish brown sandy slightly clayey GRAVEL. Gravel is angular to subrounded fine to coarse of mudstone, sandstone, chalk and brick. (MADE GROUND)		(0.30)		
0.30 - 0.55	B 2						0.30		
0.55 - 1.20	B 3				Firm brown, locally greyish brown, slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and sandstone.		(0.30)		
							0.60		
1.20 - 1.65	SPTS	N=14 (1,2/2,4,4,4)	1.20	Dry	Stiff to very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of predominantly chalk, mudstone, quartz and sandstone and rare coal.				
1.20 - 1.65	D 4								
1.65 - 2.00	B 5								
2.00 - 2.45	UT 6	71 blows 100% rec	1.50						
2.45 - 2.65	D 7						(4.05)		
3.00 - 3.45	SPTS	N=16 (3,4/3,4,4,5)	3.00	Dry					
3.00 - 3.45	D 8								
3.50 - 4.00	B 9								
4.00 - 4.45	UT 10	60 blows 100% rec	4.00						
4.45 - 4.65	D 11		05/04/18 4.00	1700 2.50					
							4.65		
			06/04/18 4.00	0800 2.00	Firm thinly laminated CLAY with occasional partings of fine sand. Frequent gravel size pockets of fine to coarse sand.				
5.00 - 5.45	SPTS	N=10 (1,1/1,2,3,4)	4.60	2.90			(0.65)		
5.00 - 5.45	D 12								
							5.30		
5.50 - 6.00	B 13				Stiff to very stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, mudstone and sandstone.				
6.00 - 6.45	UT 14	71 blows 100% rec	6.00						
6.45 - 6.65	D 15								
7.00 - 7.50	B 16								
7.50 - 7.95	SPTS	N=18 (3,3/4,4,5,5)	7.50	Dry					
7.50 - 7.95	D 17								
8.00 - 9.00	B 18								
9.00 - 9.45	UT 19	61 blows 100% rec	9.00				(7.60)		
9.45 - 9.65	D 20								



Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
1	4.65	Rose to 2.50 m after 20 minutes.	5.30

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

13/04/2018 15:54:43

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH6

Sheet 1 of 3

Borehole Log

PRELIMINARY

SOCOTEC

Drilled SS	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**		
Logged MS	05/04/2018	Dando 175.	1.20	24.30	200	22.50	**Coordinates (m)**		
Checked	**End**	Cable percussion boring.					**National Grid**		
Approved	10/04/2018	SPT Hammer ID AR2068, Rod type: 54mm Whitworth.							

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
10.00 - 10.50	B 21				Stiff to very stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk, mudstone and sandstone.				
10.50 - 10.95	SPTS	N=18 (3,3/4,5,4,5)	10.50	Dry					
10.50 - 10.95	D 22								
11.00 - 11.80	B 23								
						11.80-12.00 occasional gravel size pockets of gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of chalk			2
12.00 - 12.45	SPTS	N=21 (3,4/5,4,6,6)	12.00	4.10					
12.00 - 12.45	D 24								
							12.90		
13.00 - 13.50	B 25				Brown gravelly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of chalk and flint.				
13.50 - 13.95	SPTS	N=4 (1,0/1,1,1,1)	13.50	9.10					
13.70	D 26								
14.00 - 15.00	B 27						(2.30)		
			06/04/18	1630					
			15.00	9.10					
15.00 - 15.45	SPTS	N=34 (6,6/7,9,10,8)							
15.00 - 15.45	D 28		09/04/18	0800					
			15.00	10.40			15.20		
15.50 - 16.50	B 29				Stiff to very stiff light grey slightly sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of chalk and rare flint.				
								4	
16.50 - 16.95	SPTS	N=28 (7,7/7,7,7,7)	16.50	14.10				3	
16.70	D 30								
17.50 - 18.00	B 31								
18.00 - 18.45	SPTS	N=28 (6,7/6,7,7,8)	18.00	Dry					
18.00 - 18.45	D 32								
							(6.30)		
18.50 - 19.50	B 33							3	
19.50 - 19.95	SPTS	N=39 (7,8/9,10,10,10)	19.50	Dry					
19.50 - 19.95	D 34								
19.50 - 21.00	B 35								

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
2	11.80	Rose to 3.10 m after 20 minutes.	
3	18.60	Rose to 16.60 m after 20 minutes.	18.70

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

AGS

Scale 1:50

13/04/2018 15:54:43

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH6

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	SS	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	MS	05/04/2018	Dando 175.	1.20	24.30	200	22.50	**Coordinates (m)**	
Checked		**End**	Cable percussion boring.					**National Grid**	
Approved		10/04/2018	SPT Hammer ID AR2068, Rod type: 54mm Whitworth.						

Samples and Tests

Strata Description

Depth	Type & No.	Records	Date / Casing	Time / Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
					Stiff to very stiff light grey slightly sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of chalk and rare flint.				
21.00 - 21.45	SPTS	N=33 (4,5/5,9,9,10)	21.00	Dry					
21.00 - 21.45	D 36								
21.50 - 22.50	B 37						21.50		
					Extremely weak cream CHALK. Recovered as gravelly clay. Gravel is angular fine to coarse.				
							(1.00)		
22.50 - 22.95	SPTS	N=44 (7,8/9,10,13,12)	22.00	13.00			22.50		
22.50 - 22.95	D 38				Very weak white, locally orangish brown, CHALK. Recovered as subangular fine to coarse gravel with low cobble content. Rare subangular cobble of flint.				
			09/04/18	1700					
			22.00	13.00					
23.00 - 23.80	B 39		10/04/18	0800					
			22.00	4.00					
							(1.80)		
23.80 - 23.91	SPTC	50 (25 for 60mm/50 for 50mm)	22.50	4.00					
			10/04/18	1010					
24.25 - 24.30	SPTC	50 (25 for 30mm/50 for 20mm)	22.50	4.00			24.30		
					END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
4	21.50	Rose to 16.10 m after 20 minutes.	

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used
23.80 - 24.25	60	Chisel

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

13/04/2018 15:54:43

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

BH6

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 11/04/2018 **End** 11/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator. Machine excavated.	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 270 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Depth	Type & No.	Records
0.10	D1	
0.10 - 0.30	B2	
0.70	D3	
0.70 - 0.90	B4	
1.20	HV	p 120kPa, r N/A
1.20	D5	
1.20 - 1.50	B6	
2.00	HV	p 120kPa, r N/A
2.00	D7	
2.00 - 2.20	B8	
3.40 - 3.60	B10	
3.50	D9	
		11/04/18 Dry

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Dark brown sandy clayey subangular to subrounded fine to coarse GRAVEL of sandstone, chalk, clinker, macadam and slag with low cobble content. Cobbles are subrounded to subangular of concrete and chalk. (MADE GROUND)		(0.50)		
Firm dark greyish brown, mottled black, slightly sandy gravelly CLAY. Gravel is subangular to subrounded of brick, clinker, sandstone, flint and chalk. Strong oil/hydrocarbon odour. (MADE GROUND)		0.50 (0.60)		
Firm brown, mottled grey, slightly sandy gravelly CLAY. Gravel is subrounded fine to medium of chalk and sandstone.		1.10 (1.40)		
Firm brown, mottled light grey, slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of predominantly chalk with sandstone.		2.50 (1.40)		
END OF EXPLORATORY HOLE		3.90		

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks
0.00 - 3.90	No groundwater encountered during excavation.

Stability Stable
Shoring None
Weather Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:36

AGS

Project **VPI IMMINGHAM**

Project No. **A8015-18**

Carried out for **AECOM**

Trial Pit

TP1

Sheet 1 of 1

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 11/04/2018 **End** 11/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator. Machine excavated.	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 270 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Depth	Type & No.	Records
0.10 - 0.30	B2	
0.20	D1	
0.30	D3	
0.30 - 0.50	B4	
1.30	HV	p 120kPa, r N/A
1.30	D5	
1.30 - 1.50	B6	
2.30 - 2.50	B8	
2.50	D7	
3.10	HV	p 120kPa, r N/A
3.40	D9	
3.40 - 3.50	B10	
4.00	D11	
4.00 - 4.20	B12	
		11/04/18 Dry
4.40	HV	p 120kPa, r N/A
4.40	D13	
4.40 - 4.50	B14	

Strata Description

Main	Detail	Depth, Level (Thickness)
Soft dark brown slightly gravelly sandy CLAY with low cobble content and rootlets. Gravel is subangular to subrounded fine to coarse of chalk, flint, sandstone and debris including metal bolts, wood and concrete. Cobbles are subrounded of chalk. (MADE GROUND)		(0.30) 0.30
Firm dark brown, mottled black, slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and flint. Strong oil/hydrocarbon odour. (MADE GROUND)		(0.30) 0.60
Firm brown, mottled light grey, slightly gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse of predominantly chalk with sandstone and flint. Cobbles are subrounded of chalk.	0.60-0.90 firm light brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, sandstone and flint	(2.90)
	3.20-3.50 becoming grey with less gravel	
Light brown clayey, locally very clayey, fine to coarse SAND.		3.50 (0.90)
Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk.		4.40 (0.10)
END OF EXPLORATORY HOLE		4.50

Legend: Backfill

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks
0.00 - 4.50	No groundwater encountered during excavation.
0.00 - 3.50	Material too friable for hand vane testing.

Stability Stable

Shoring None

Weather Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:37

AGS

Project **VPI IMMINGHAM**

Project No. **A8015-18**

Carried out for **AECOM**

Trial Pit

TP2

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 10/04/2018 **End** 10/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator. Machine excavated.	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 340 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Depth	Type & No.	Records
0.10 0.10 - 0.20	D1 B2	
0.50 0.50 0.50 - 0.80	HV D3 B4	p 120kPa, r N/A
1.80 1.80 - 2.00	D5 B6	
2.50 2.50 2.50 - 2.80	HV D7 B8	p 120kPa, r N/A
3.40 3.40 - 3.60	D9 B10	
4.00 4.00 - 4.20	D11 B12	
		10/04/18 Dry

Strata Description

Main	Detail	Depth, Level (Thickness)
Soft dark brown slightly sandy slightly gravelly CLAY with frequent rootlets. Gravel is subangular to subrounded fine to medium of sandstone, chalk and flint.		(0.20)
Firm light brown, mottled grey, gravelly CLAY with low cobble content. Gravel is subrounded fine to medium of predominantly chalk with sandstone and mudstone. Cobbles are subrounded of flint and chalk.	0.20-0.40 light brown, mottled orangish brown, slightly sandy slightly gravelly clay. Gravel is subrounded fine to medium of chalk	0.20 (2.30)
Firm brown CLAY.		2.50 (0.30)
Dark brown slightly clayey fine to coarse SAND.		2.80 (0.80)
Soft dark brown very sandy CLAY with occasional gravel size pockets of sand.		3.60 (0.90)
END OF EXPLORATORY HOLE		4.50

Legend: Backfill

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks
0.00 - 4.50	No groundwater encountered during excavation.

Stability	Face A and E collapsed from 2.80m
Shoring	None
Weather	Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:37

AGS

Project **VPI IMMINGHAM**

Project No. **A8015-18**

Carried out for **AECOM**

Trial Pit

TP3

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 09/04/2018 **End** 10/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator Machine excavated pit	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / B / C / D 290 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.10 0.10 - 0.30	D1 B2	09/04/18	Dark brown slightly sandy slightly gravelly CLAY with frequent rootlets. Gravel is subangular to subrounded fine to medium of sandstone, chalk and flint.		(0.30)		
			Firm brown, mottled light grey, gravelly CLAY. Gravel is subangular to subrounded fine to coarse of predominantly chalk with sandstone, mudstone and flint.		0.30 (1.10)		
0.80 0.80 - 1.00	D3 B4			1.10 disused land drain		1	
1.40 1.40 1.40 - 1.60	HV D5 B6	p 120kPa, r N/A	Firm brown, mottled light grey, CLAY.		1.40 (2.00)		
				2.60-3.00 firm grey mottled brown clay			
3.00 3.00 - 3.20	D7 B8			3.00-3.40 brown slightly gravelly clayey sand. Gravel is subangular fine to coarse of chalk			
3.40 3.50	B10 D9		Firm brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk, flint and sandstone.		3.40 (1.10)		
4.00 4.00 - 4.30	D11 B12	10/04/18					
			END OF EXPLORATORY HOLE		4.50		

Groundwater Entries

No.	Depth Strike (m)	Remarks
1	1.10	Seepage

Remarks

Depth (m)	Remarks

Stability Stable

Shoring None

Weather overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:38

AGS

Project **VPI IMMINGHAM**

Project No. **A8015-18**

Carried out for **AECOM**

Trial Pit

TP4

Sheet 1 of 1

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 10/04/2018 **End** 10/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator. Machine excavated.	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 120 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

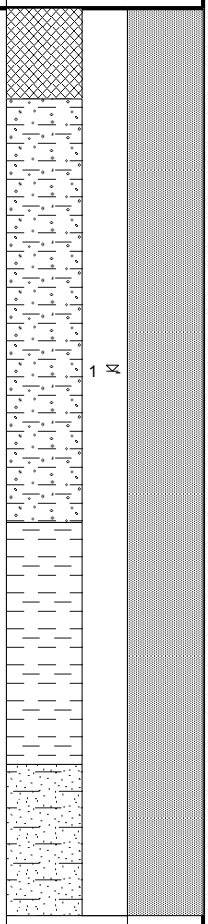
Samples and Tests

Depth	Type & No.	Records
0.10	D1	
0.10 - 0.20	B2	
0.50	HV	p 120kPa, r N/A
0.50	D3	
0.50 - 0.70	B4	
1.50	HV	p 120kPa, r N/A
1.50	D5	
1.50 - 1.70	B6	
2.00	D7	
2.00 - 2.20	B8	
2.50	D9	
2.50 - 2.70	B10	
		10/04/18

Strata Description

Main	Detail	Depth, Level (Thickness)
Soft dark brown slightly sandy slightly gravelly CLAY with frequent rootlets. Gravel is subangular to subrounded fine to medium of sandstone, chalk and flint. (MADE GROUND)		(0.30)
		0.30
Firm brown, mottled grey, gravelly CLAY with low cobble content. Gravel is subrounded fine to medium of chalk, flint and mudstone. Cobbles are subangular of chalk.	0.60-0.90 soft light yellowish brown slightly sandy clay	(1.40)
	1.20 disused land drain	
Stiff bluish grey, mottled brown, CLAY.		1.70
		(0.80)
Light brown slightly clayey fine to coarse SAND. Rare angular fine gravel of mudstone.		2.50
		(0.50)
END OF EXPLORATORY HOLE		3.00

Legend / **Backfill**



Groundwater Entries

No.	Depth Strike (m)	Remarks
1	1.20	Seepage

Remarks

Depth (m)	Remarks

Stability Faces A and C collapsed

Shoring None

Weather Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:38

AGS

Project **VPI IMMINGHAM**

Project No. **A8015-18**

Carried out for **AECOM**

Trial Pit

TP5

Sheet 1 of 1

PRELIMINARY

Trial Pit Log

SOCOTEC

Logged WH	Start 10/04/2018	Equipment, Methods and Remarks	Dimension and Orientation	Ground Level
Checked	End	Tracked 360 excavator. Machine excavated.	Width 0.60 m; Length 4.00 m; A, B, C, D; 240 (Deg)	Coordinates (m)
Approved	10/04/2018			National Grid

Samples and Tests / Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)
0.10 0.10 - 0.30	D1 B2		Dark brown slightly gravelly clayey SAND with medium cobble content. Gravel is subangular fine to coarse of clinker, chalk and macadam. Cobbles are subrounded of chalk. (MADE GROUND)		(0.30) 0.30
0.40 - 0.60 0.50	B4 D3		Firm dark brown, mottled orangish brown, slightly gravelly CLAY. Gravel is subrounded fine to coarse of chalk and flint. (MADE GROUND)		(0.30) 0.60
1.00 1.00 - 1.20 1.50 2.00 2.50 2.50 - 3.00	D5 B6 HV HV D7 B8	p 120kPa, r N/A (1.50) p 120kPa, r N/A (2.00)	Firm light brown slightly gravelly CLAY. Gravel is subrounded fine to coarse of flint, chalk, mudstone and sandstone.	0.60-1.20 brown mottled grey gravelly clay 1.20 disused land drain	(3.50) 4.10
4.10 4.10 - 4.30	D9 B10	10/04/18	Firm dark brown sandy CLAY with occasional gravel size pockets of sand.		(0.50) 4.60
			END OF EXPLORATORY HOLE		

Legend / Backfill: groundwater strike marker 1 at 1.90

Groundwater Entries		
No.	Depth Strike (m)	Remarks
1	1.90	Seepage

Remarks
Depth (m) Remarks

Stability: Stable
Shoring: None
Weather: Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25 17/04/2018 15:33:38

AGS

Project: VPI IMMINGHAM
Project No.: A8015-18
Carried out for: AECOM

Trial Pit: **TP6**

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 10/04/2018 **End** 10/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator. Machine excavated.	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 140 (Deg)

Ground Level
Coordinates (m)
National Grid

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.10 - 0.30 0.20	B2 D1		Soft brown sandy slightly gravelly CLAY with frequent rootlets. Gravel is subrounded fine to medium of chalk. (TOPSOIL)		(0.30)		
			Soft brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to medium of chalk sandstone and flint.	1.10 soft orangish brown sandy clay 1.10 disused land drain	0.30		1
1.30 1.30 1.30 - 1.60	HV D3 B4	p 120kPa, r N/A			(2.60)		
			Brown clayey fine to coarse SAND.		2.90		
3.50 3.50 - 3.80	D5 B6				(0.90)		
			Firm dark greyish brown CLAY.		3.80		
4.00 4.00 - 4.20	D7 B8	10/04/18			(0.40)		
			END OF EXPLORATORY HOLE		4.20		

Groundwater Entries

No.	Depth Strike (m)	Remarks
1	1.10	Seepage

Remarks

Depth (m)	Remarks

Stability	Faces A and C collapsed from 2.90m
Shoring	None
Weather	Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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AGS

Project **VPI IMMINGHAM**

Project No. **A8015-18**

Carried out for **AECOM**

Trial Pit

TP7

Sheet 1 of 1

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 10/04/2018 **End** 10/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator. Machine excavated.	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 35 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Depth	Type & No.	Records
0.10	D1	
0.10 - 0.20	B2	
0.20	HV	p 120kPa, r N/A
0.20	D3	
0.20 - 0.50	B4	
0.80	HV	p 120kPa, r N/A
0.80	D5	
0.80 - 1.00	B6	
2.00	D7	
2.00 - 2.20	B8	
3.10	D9	
3.10 - 3.30	B10	
3.70 - 3.90	B12	
3.80	D11	
4.00	HV	p 100kPa, r N/A
4.00	D13	
4.00 - 4.50	B14	Dry

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Soft dark brown silty CLAY with rootlets. (TOPSOIL)		(0.20) 0.20		
Light orangish brown slightly sandy gravelly CLAY. Gravel is subrounded fine to coarse of sandstone and chalk. (MADE GROUND)		(0.30) 0.50		
Firm brown, mottled light grey, gravelly CLAY with low cobble content. Gravel is subrounded to rounded fine to coarse of chalk and sandstone. Cobbles are subrounded of chalk.		(2.50) 3.00		
Soft light grey, mottled brown, CLAY with rare gravel. Gravel is subrounded fine to medium of chalk.	3.20-3.90 firm dark brown clay	(0.30) 3.30		
Dark brown slightly clayey fine to coarse SAND with occasional gravel size pockets of sandy clay.		(0.60) 3.90		
Firm brown slightly sandy silty CLAY.		(0.60) 4.50		
END OF EXPLORATORY HOLE				

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks
0.00 - 4.50	No groundwater encountered during excavation.

Stability Stable
Shoring None
Weather Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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AGS

Project **VPI IMMINGHAM**

Project No. **A8015-18**

Carried out for **AECOM**

Trial Pit

TP8

Sheet 1 of 1

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 10/04/2018 **End** 10/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator. Machine excavated.	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 310 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.10 0.10 - 0.20	D1 B2		Soft dark brown slightly gravelly slightly silty CLAY with frequent rootlets. Gravel is angular to subrounded fine to medium of sandstone and flint. (TOPSOIL)		(0.20)		
0.30 0.30 - 0.40	D3 B4		Light yellowish brown very gravelly clayey SAND. Gravel is angular to subangular fine to coarse of limestone and sandstone. (MADE GROUND)		0.20 (1.40)		
0.80 0.80 - 1.00	D5 B6						
1.60 1.60 1.60 - 1.80	HV D7 B8	p 120kPa, r N/A	Stiff dark orangish brown, mottled dark brown, CLAY with rare gravel. Gravel is subangular fine of flint.		1.60 (0.40)		
2.00 2.00 - 2.20	D9 B10		Stiff light brown, mottled grey, slightly gravelly CLAY. Gravel is subangular fine to coarse of chalk.		2.00 (2.20)		
3.20 3.20 - 3.40	D11 B12						
		10/04/18					
			END OF EXPLORATORY HOLE		4.20		

1 ▽

Groundwater Entries

No.	Depth Strike (m)	Remarks
1	0.70	Seepage

Remarks

Depth (m)	Remarks

Stability	Faces A and C collapsed from 0.20 to 4.20m
Shoring	None
Weather	Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:39

AGS

Project	**VPI IMMINGHAM**
Project No.	**A8015-18**
Carried out for	**AECOM**

Trial Pit

TP9

Sheet 1 of 1

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 06/04/2018 **End** 06/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator. Machine excavated.	**Dimension and Orientation** Width 0.60 m Length 3.00 m A / D / B / C 230 (Deg)

Ground Level
Coordinates (m)
National Grid

Samples and Tests

Depth	Type & No.	Records
0.10 - 0.40	B2	
0.30	D1	
0.40	HV	p 120kPa, r N/A
0.40	D3	
0.40 - 0.60	B4	
0.80	HV	p 120kPa, r N/A
0.90	D5	
0.90 - 1.20	B6	
2.20	D7	
2.20 - 2.70	B8	
3.00	D9	
3.20 - 3.70	B10	
4.20	D11	
4.20 - 4.50	B12	06/04/18

Strata Description

Main	Detail	Depth, Level (Thickness)
Soft light brown, mottled greyish brown, slightly sandy slightly gravelly CLAY with frequent rootlets. Gravel is subangular to rounded of chalk and mudstone. (TOPSOIL)		(0.40)
Firm dark greyish brown, mottled dark grey, slightly sandy CLAY with frequent wood and plant material.		0.40 (0.40)
Firm light orangish brown, mottled light grey, gravelly CLAY. Gravel is subangular to subrounded of predominantly chalk with mudstone and flint.	1.00-1.20 light yellowish brown sand pockets	0.80 (2.20)
Firm dark brown CLAY with rare gravel. Gravel is subrounded fine to medium of mudstone.		3.00 (1.00)
Greyish brown slightly gravelly clayey fine to coarse SAND. Gravel is subrounded fine to medium of mudstone.		4.00 (0.50)
END OF EXPLORATORY HOLE		4.50

Legend / **Backfill**

1

Groundwater Entries

No.	Depth Strike (m)	Remarks
1	1.00	Seepage

Remarks

Depth (m)	Remarks

Stability Stable
Shoring None
Weather Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:37

AGS

Project **VPI IMMINGHAM**
Project No. **A8015-18**
Carried out for **AECOM**

Trial Pit

TP10

Sheet 1 of 1

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 09/04/2018 **End** 09/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator. Machine excavated.	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 220 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

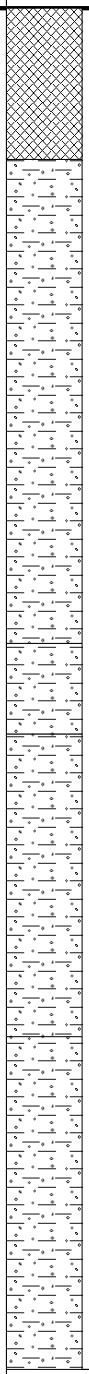
Samples and Tests

Depth	Type & No.	Records
0.10	D1	
0.10 - 0.30	B2	
0.50	HV	p 120kPa, r N/A
0.50	D3	
0.50 - 0.70	B4	
1.70	D5	
1.70	D6	
2.20	HV	p 100kPa, r N/A
2.20	D7	
2.20 - 2.30	B8	
2.50	D9	
2.50 - 2.70	B10	
3.40	D11	
3.50 - 3.70	B12	
		09/04/18

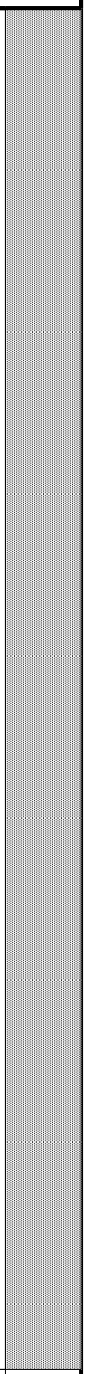
Strata Description

Main	Detail	Depth, Level (Thickness)
Soft brown slightly gravelly CLAY. Gravel is angular to rounded fine to coarse of chalk, brick, sandstone and concrete. (MADE GROUND)		(0.50) 0.50
Firm brown, mottled light grey, gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone, flint and sandstone.	0.50 concrete block wider than trench on side D 1.40 low cobble content. Cobbles are subrounded of chalk	(1.60) 2.10
Firm dark greyish brown, mottled dark grey, slightly gravelly CLAY. Gravel is subrounded fine to coarse of sandstone.		(0.30) 2.40
Firm light brown, mottled light grey, slightly gravelly CLAY. Gravel is subrounded to rounded fine to coarse of chalk. Locally light orangish brown sandy slightly gravelly CLAY.		(1.00) 3.40
Stiff light brown, mottled grey slightly gravelly CLAY. Gravel is subrounded fine to coarse of sandstone and chalk.	4.10 locally slightly sandy gravelly clay	(1.10) 4.50
END OF EXPLORATORY HOLE		

Legend



Backfill



Groundwater Entries

No.	Depth Strike (m)	Remarks
1	1.50	Seepage

Remarks

Depth (m)	Remarks

Stability	Stable
Shoring	None
Weather	Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:40

AGS

Project	**VPI IMMINGHAM**
Project No.	**A8015-18**
Carried out for	**AECOM**

Trial Pit

TT1

Sheet 1 of 1

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 06/04/2018 **End** 06/04/2018	**Equipment, Methods and Remarks** Wheeled 360 excavator. Machine excavated. Top strata too frangible to do hand vein.	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 160 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Depth	Type & No.	Records
0.00 - 0.25	B2	
0.25	D1	
1.00	D3	
1.00 - 1.25	B4	
2.00	HV	p 70kPa, r N/A
2.00	D5	
2.00 - 2.15	B6	
3.00	HV	p 120kPa, r N/A
3.00	D7	
3.00 - 3.20	B8	
3.25	HV	p 120kPa, r N/A
3.25	D9	Dry
3.25 - 3.50	B10	06/04/18

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Soft light brown slightly silty CLAY with localised pockets (50/50/50) of light brown firm slightly gravelly clay. Gravel is subangular to subrounded of flint and sandstone. Occasional rootlets. (MADE GROUND)		(3.00)		
Dark greyish brown, mottled light brown, CLAY with rare gravel. Gravel is angular to subrounded fine to medium of various lithologies including flint and quartzite.		3.00 (0.25)		
Firm light brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of flint and mudstone.		3.25 (0.25)		
END OF EXPLORATORY HOLE		3.50		

Groundwater Entries

No.	Depth Strike (m)	Remarks

Remarks

Depth (m)	Remarks
0.00 - 3.50	No groundwater encountered during excavation.

Stability Stable

Shoring None

Weather Overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:40

AGS

Project **VPI IMMINGHAM**

Project No. **A8015-18**

Carried out for **AECOM**

Trial Pit

TT2

Trial Pit Log

PRELIMINARY

SOCOTEC

Logged WH **Checked** **Approved**	**Start** 05/04/2018 **End** 06/04/2018	**Equipment, Methods and Remarks** Tracked 360 excavator Machine excavated pit	**Dimension and Orientation** Width 0.60 m Length 4.00 m A / D / B / C 230 (Deg)	**Ground Level** **Coordinates (m)** **National Grid**

Samples and Tests

Strata Description

Depth	Type & No.	Records	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
		05/04/18	Brown, locally light brown, slightly silty CLAY with low cobble content. Cobbles are subrounded of flint and sandstone.				
0.30 0.30 - 0.60	D1 B2				(1.40)		
1.30 1.30 - 1.60	D3 B4				1.40		
			Dark greyish brown silty CLAY with occasional burnt wood fragments. Slight organic odour.		(0.60)		
2.10 2.10 2.10 - 2.50	HV D5 B6	p 120kPa, r N/A 06/04/18	Firm light brown, mottled light grey, slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of sandstone, chalk and quartzite.		2.00 (0.50)		
			END OF EXPLORATORY HOLE		2.50		

Groundwater Entries

No.	Depth	Strike (m)	Remarks

Remarks

Depth (m)	Remarks
0.00 - 2.00	Material too friable for hand vane testing.
0.00 - 2.50	No groundwater encountered during excavation.

Stability Stable

Shoring None

Weather overcast

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

17/04/2018 15:33:41

AGS

Project **VPI IMMINGHAM**

Project No. **A8015-18**

Carried out for **AECOM**

Trial Pit

TT3

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	MB	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	IH	06/04/2018	Archway Dart.	1.20	3.60	87		**Coordinates (m)**	
Checked		**End**	Dynamic sampling.	3.60	4.60	55		**National Grid**	
Approved		06/04/2018	SPT Hammer ID: ***, Rod type: ***.						

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.00 - 0.50	D 2					Dark brown slightly sandy slightly gravelly CLAY with low cobble content. Gravel is subangular to rounded fine to medium, rarely coarse, of chalk and mudstone with occasional concrete, quartz and flint. Cobbles are subangular of chalk. (MADE GROUND)				
0.00 - 0.50	B 1							(0.50)		
0.25	HV		p 120kPa, r N/A							
0.50	HV		p 120kPa, r N/A				0.50 rare rootlets	0.50		
0.50 - 1.20	D 4									
0.50 - 1.20	B 3									
1.00	HV		p 120kPa, r N/A			Dark brown, occasionally mottled black, slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of chalk, mudstone and rare flint. Strong hydrocarbon odour. (MADE GROUND)		(0.90)		
1.20 - 1.65	SPTS		N=10 (2,2/2,2,3,3)							
1.20 - 1.65	D 5									
1.20 - 1.70	B 7							1.40		
1.20 - 2.00	L		100% rec, diameter 87mm			Firm reddish brown, occasionally mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk and mudstone with occasional flint and rare sandstone.		(0.35)		
1.30 - 1.50	D 6							1.75		
1.80 - 2.00	D 8							(0.25)		
2.00 - 2.45	SPTS		N=26 (3,5/4,5,8,9)				1.95 possible rare chert nodules	2.00		
2.00 - 2.20	D 10						2.10 unknown fibrous rock/material			
2.00 - 2.45	D 9					Firm grey, mottled brown, slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk and mudstone with occasional flint and rare sandstone.				
2.00 - 2.80	B 12						2.40 occasional pockets of reddish pink clayey fine sand			
2.00 - 2.80	L		100% rec, diameter 87mm							
2.30 - 2.50	D 11					Firm to stiff indistinctly laminated reddish brown, mottled grey, slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk and mudstone with occasional flint and rare sandstone.		(1.60)		
2.80 - 3.25	SPTS		N=20 (4,4/4,4,5,7)							
2.80 - 3.25	D 13									
2.80 - 3.60	L		100% rec, diameter 87mm							
3.00 - 3.20	D 14									
3.40 - 3.60	D 15									
3.60 - 4.05	SPTS		N=20 (4,5/4,4,5,7)					3.60		
3.60 - 3.80	D 16									
3.60 - 4.05	D 17					Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of chalk.				
3.60 - 4.60	L		75% rec, diameter 55mm					(0.60)		
4.20 - 4.40	D 18							4.20	1	
						Brown fine to medium SAND.		(0.40)		
4.50 - 4.60	D 19						4.50-4.60 brown slightly gravelly fine to coarse sand. Gravel is subangular to well rounded fine to medium of chalk and rare quartz	4.60		
4.60 - 5.05	SPTS		N=16 (3,3/3,4,4,5)							
4.60 - 5.05	D 20					Firm dark brown slightly gravelly sandy CLAY. Gravel is subangular to rounded fine to medium of chalk.		(0.45)		
				06/04/18	1200					
						END OF EXPLORATORY HOLE		5.05		

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed
1	4.20		

Depth Related Remarks

Depths (m)	Remarks
0.00 - 1.20	Hand excavated inspection pit.

Chiselling Details

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

17/04/2018 15:44:17

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

WS1

Sheet 1 of 1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	MB	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	IH	10/04/2018	Archway Dart. Dynamic sampling.	1.20	1.70	87		**Coordinates (m)**	
Checked		**End**		1.70	2.50	77		**National Grid**	
Approved		10/04/2018		2.50	3.30	67			

Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
0.00 - 0.50	D 2				
0.00 - 0.50	B 1				
0.25	HV		p 120kPa, r N/A		
0.50	HV		p 120kPa, r N/A		
0.50 - 1.20	D 4				
0.50 - 1.20	B 3				
1.00	HV		p 120kPa, r N/A		
1.20 - 1.65	SPTS		N=16 (2,2/3,3,5,5)		
1.20 - 1.40	D 5				
1.20 - 1.65	D 6				
1.20 - 1.70	B 8				
1.20 - 1.70	L		100% rec, diameter 87mm		
1.50 - 1.70	D 7				
1.70 - 2.15	SPTS		N=28 (3,3/5,8,7,8)		
1.70 - 2.15	D 9				
1.70 - 2.50	B 11				
1.70 - 2.50	L		100% rec, diameter 77mm		
2.20 - 2.40	D 10				
2.40 - 2.50	D 12				
2.50 - 2.95	SPTS		N=22 (2,4/4,5,6,7)		
2.50 - 2.95	D 13				
2.50 - 3.10	B 16				
2.50 - 3.30	L		100% rec, diameter 67mm		
2.85 - 3.10	D 14				
3.10 - 3.30	D 15				
3.30 - 3.75	SPTS		N=26 (3,5/5,5,8,8)		
3.30 - 3.75	D 17			10/04/18	1100

Strata Description

Main	Detail	Depth, Level (Thickness)
Brown, mottled orange and grey, slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of mudstone and sandstone. Strong oil/hydrocarbon odour. (MADE GROUND)	0.50 rare gravel. Gravel is angular to subrounded fine to medium of flint and sandstone with rare chalk	(1.20)
Firm orangish brown, mottled grey, slightly sandy slightly gravelly CLAY with rare rootlets. Gravel is subangular to subrounded fine to medium of chalk and mudstone with rare flint.	1.50-2.50 indistinctly laminated	1.20 (1.30)
Firm indistinctly laminated dark brown, mottled grey, CLAY.	2.30 gravel size pocket of dark grey fine sand 2.40-2.50 very rare gravel of chalk 2.50-3.20 soft 2.85-3.10 gravel size pockets of fine sand	2.50 (0.60)
Firm yellowish dark brown, mottled grey, slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium of chalk, flint and sandstone.		3.10 (0.20) 3.30
Firm dark brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to medium of chalk and sandstone.		(0.45)
END OF EXPLORATORY HOLE		3.75

Legend

Backfill

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks
0.00 - 1.20	Hand excavated inspection pit.

Chiselling Details

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

17/04/2018 15:44:17

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

WS2

Sheet 1 of 1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	MB	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	IH	10/04/2018	Archway Dart. Dynamic sampling.	1.20	2.00	87		**Coordinates (m)**	
Checked		**End**		2.00	3.00	77		**National Grid**	
Approved		10/04/2018		3.00	4.00	67			

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.00 - 1.20	D 2					Brown, mottled black and grey and rarely orangish brown, slightly sandy slightly gravelly CLAY with frequent roots and wood fragments. Gravel is subangular to rounded fine to medium of chalk and mudstone with occasional concrete. 1No. angular cobble of chalk. (MADE GROUND)		(1.20)		
0.00 - 1.20	B 1									
1.20 - 1.65	SPTS		N=11 (2,2/2,2,3,4)			Soft, becoming firm, orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of mudstone and flint with rare chalk.		1.20 (0.10)		
1.20 - 1.30	D 3							1.30		
1.20 - 1.65	D 4									
1.20 - 2.00	L		100% rec, diameter 87mm							
1.30 - 2.00	B 6									
1.50 - 1.70	D 5									
2.00 - 2.45	SPTS		N=23 (3,5/6,5,6,6)			Firm to stiff brown, mottled grey and rarely black, slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to coarse of chalk and flint with rare sandstone.	2.05-3.40 indistinctly laminated			
2.00 - 2.20	D 7						2.30-3.40 no gravel			
2.00 - 2.45	D 8					Below 2.55m, thinly laminated.		(2.10)		
2.00 - 3.00	L		100% rec, diameter 77mm				2.55-3.40 extremely closely spaced laminations			
2.30 - 3.00	B 10									
2.80 - 3.00	D 9									
3.00 - 3.45	SPTS		N=14 (4,5/4,3,3,4)							
3.00 - 3.45	D 11									
3.00 - 4.00	L		40% rec, diameter 67mm							
3.40 - 3.65	D 12					Brown fine to coarse SAND.		3.40 (0.25)		
3.65 - 3.80	D 13					Firm brown, mottled grey, sandy CLAY. Gravel is angular to subrounded fine to medium of chalk.		3.65		
4.00 - 4.45	SPTS		N=20 (2,3/5,4,5,6)				4.00-4.45 slightly gravelly	(0.80)		
				10/04/18	0000					
						END OF EXPLORATORY HOLE		4.45		

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks
0.00 - 1.20	Hand excavated inspection pit.
0.00 - 1.00	Material too granular for hand vane testing.

Chiselling Details

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

17/04/2018 15:44:17

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

WS3

Sheet 1 of 1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	MB	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	IH	06/04/2018	Archway Dart.	1.20	2.00	87		**Coordinates (m)**	
Checked		**End**	Dynamic sampling.	2.00	3.00	77		**National Grid**	
Approved		06/04/2018		3.00	3.60	57			

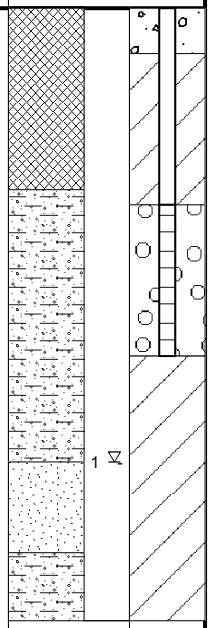
Samples and Tests

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water
0.00 - 0.50	D 2				
0.00 - 0.50	B 1				
0.25	HV		p 120kPa, r N/A		
0.50	HV		p 120kPa, r N/A		
0.50 - 1.20	D 4				
0.50 - 1.20	B 3				
1.00	HV		p 120kPa, r N/A		
1.20 - 1.65	SPTS		N=19 (2,3/4,5,5,5)		
1.20 - 1.40	D 5				
1.20 - 1.65	D 6				
1.20 - 2.00	B 8				
1.20 - 2.00	L		100% rec, diameter 87mm		
1.60 - 1.80	D 7				
2.00 - 2.45	SPTS		N=22 (3,4/5,5,6,6)		
2.00 - 2.20	D 10				
2.00 - 2.45	D 9				
2.00 - 3.00	L		75% rec, diameter 77mm		
2.40 - 2.60	D 11				
2.80 - 3.00	D 12				
3.00 - 3.45	SPTS		N=20 (2,3/4,5,5,6)		
3.00 - 3.20	D 13				
3.00 - 3.45	D 14				
3.00 - 3.50	B 16				
3.00 - 3.60	L		83% rec, diameter 57mm		
3.50 - 3.60	D 15				
3.60 - 4.05	SPTS		N=15 (3,3/3,4,4,4)		
3.60 - 4.05	D 17			06/04/18	1500

Strata Description

Main	Detail	Depth, Level (Thickness)
Brown, occasionally mottled grey, slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk and mudstone with rare flint and occasional rootlets (<1mm diameter). (MADE GROUND)	0.50 dark brown	(1.20)
Firm brown, occasionally mottled grey and rare reddish brown, slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of chalk and mudstone with rare sandstone and flint. Rare gravel size pockets of weathered chalk.	1.35-1.40 layer of brick, recovered as subangular medium to coarse gravel 1.60 pocket of sandy clay (30mm diameter) 2.00-2.40 sandy 2.40 indistinctly laminated, slightly sandy 2.70 extremely closely spaced laminations	1.20 (1.80)
Medium dense orangish brown fine to coarse SAND.	3.50-3.60 brown slightly clayey fine to medium sand	3.00 (0.60)
Firm dark brown slightly gravelly sandy CLAY. Gravel is subangular to rounded fine to medium of chalk and mudstone.		3.60 (0.45)
END OF EXPLORATORY HOLE		4.05

Legend / Backfill



Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed
1	3.00		

Depth Related Remarks

Depths (m)	Remarks
0.00 - 1.20	Hand excavated inspection pit.

Chiselling Details

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

17/04/2018 15:44:18

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

WS4

Sheet 1 of 1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	MB	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	IH	10/04/2018	Archway Dart.	1.20	2.00	87		**Coordinates (m)**	
Checked		**End**	Dynamic sampling.	2.00	3.00	77		**National Grid**	
Approved		10/04/2018		3.00	5.00	67			

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.00 - 1.20	D 2					Dark brown, mottled grey and black, slightly sandy slightly gravelly CLAY with low cobble content and occasional rootlets. Gravel is subangular to subrounded fine to coarse of mudstone, chalk, sandstone and occasional brick fragments. Cobble is subangular of chalk. (MADE GROUND)		(1.25)		
0.00 - 1.20	B 1									
0.25	HV		p 110kPa, r N/A							
0.50	HV		p 100kPa, r N/A							
1.00	HV		p 100kPa, r N/A							
1.20 - 1.65	SPTS		N=9 (1,2/2,2,2,3)				1.20 soft	1.25		
1.20 - 1.25	D 3					Firm, becoming stiff, greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to well rounded fine to coarse of mudstone with occasional sandstone and flint.				
1.20 - 1.65	D 4									
1.20 - 2.00	L		100% rec, diameter 87mm							
1.25 - 1.80	B 7									
1.50 - 1.70	D 5									
1.80 - 2.00	D 6						1.80 brown mottled grey. Gravel is chalk and occasional mudstone			
2.00 - 2.45	SPTS		N=20 (3,4/5,4,5,6)							
2.00 - 2.45	D 8									
2.00 - 3.00	B 11									
2.00 - 3.00	L		88% rec, diameter 77mm				2.35-5.45 indistinctly laminated			
2.20 - 2.40	D 9									
2.80 - 3.00	D 10						2.65-5.45 rare gravel			
3.00 - 3.45	SPTS		N=24 (3,4/5,6,6,7)							
3.00 - 3.20	D 12									
3.00 - 3.45	D 13									
3.00 - 4.00	L		85% rec, diameter 67mm				3.35-5.45 soft, gravelly. Gravel is subangular to subrounded fine to medium of chalk and mudstone with rare sandstone and flint	(4.20)		
3.75 - 3.85	D 14						3.40 dark brown 3.75 firm 4.00-4.45 occasional gravel size pockets of sand			
4.00 - 4.45	SPTS		N=23 (4,4/4,5,6,8)							
4.00 - 4.45	D 15									
4.00 - 5.00	L		Diameter 67mm							
5.00 - 5.45	SPTS		N=19 (4,4/4,4,5,6)							
5.00 - 5.45	D 16									
				10/04/18	1300					
						END OF EXPLORATORY HOLE		5.45		

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks
0.00 - 1.20	Hand excavated inspection pit.

Chiselling Details

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

17/04/2018 15:44:18

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

WS5

Sheet 1 of 1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	MB	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	11/04/2018	Archway Dart.	1.20	3.00	87		**Coordinates (m)**	
Checked		**End**	Dynamic sampling.	3.00	4.00	77		**National Grid**	
Approved		11/04/2018		4.00	5.00	67			

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.00 - 1.20	B 1					Brown sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of chalk, mudstone and sandstone. (MADE GROUND)				
0.25	HV		p 90kPa, r N/A							
0.50	HV		p 90kPa, r N/A							
0.60	D 2									
								(1.70)		
1.00	HV		p 90kPa, r N/A							
1.20 - 1.65	SPTS		N=8 (1,1/3,1,1,3)				1.20-1.30 1No. subrounded cobble of chalk			
1.20 - 1.65	D 3						1.40-1.50 dark greyish brown clay			
1.20 - 2.00	L		94% rec, diameter 87mm							
1.30 - 1.70	B 5									
1.50	D 4									
1.70 - 2.00	B 7							1.70		
1.80	D 6									
2.00 - 2.45	SPTS		N=22 (3,3/4,6,5,7)			Firm to stiff brown, occasionally mottled grey, slightly gravelly CLAY. Gravel is subangular fine to coarse of chalk, flint and sandstone.				
2.00 - 2.45	D 8									
2.00 - 3.00	B 10									
2.00 - 3.00	L		100% rec, diameter 87mm							
2.50	D 9									
								(1.99)		
2.80 - 3.25	SPTS		N=21 (4,4/5,4,6,6)							
2.80 - 3.25	D 11									
3.00 - 3.60	B 13									
3.00 - 4.00	L		100% rec, diameter 77mm							
3.50	D 12									
3.80 - 4.25	SPTS		N=29 (5,8/8,7,7,7)			Soft brown CLAY	3.69-3.80 light brown fine to coarse sand pocket	3.69		
3.80	D 14							(0.31)		
3.80 - 4.25	D 15							4.00		
4.00 - 5.00	L		70% rec, diameter 67mm			Medium dense light brown gravelly slightly clayey fine to coarse SAND with rare pockets of gravelly clay. Gravel is subangular coarse of sandstone.				
4.30 - 5.00	B 17									
4.50	D 16									
								(1.45)		
5.00 - 5.45	SPTS		N=19 (4,4/5,4,5,5)							
				11/04/18	1100					
						END OF EXPLORATORY HOLE		5.45		

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed
1	4.00		

Depth Related Remarks

Depths (m)	Remarks
0.00 - 1.20	Hand excavated inspection pit.

Chiselling Details

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

17/04/2018 15:44:18

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

WS6

Sheet 1 of 1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	MB	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	11/04/2018	Archway Dart.	1.20	3.00	87		**Coordinates (m)**	
Checked		**End**	Dynamic sampling.	3.00	4.00	77		**National Grid**	
Approved		11/04/2018		4.00	5.00	67			

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.00 - 0.30	B 1					Brown slightly gravelly sandy CLAY with rootlets and low cobble content. Gravel is subangular fine to coarse of chalk and sandstone. Cobbles are subrounded of chalk. (TOPSOIL)	0.50-0.70 pockets of dark greyish brown clay	(0.30)		
0.20	D 2							0.30		
0.30 - 0.80	B 3					Light brown sandy gravelly CLAY with low cobble content. Gravel is subangular fine to coarse of sandstone. Cobbles are subrounded of chalk. (MADE GROUND)		(0.90)		
0.50	D 4									
0.80 - 1.20	B 5									
0.90	D 6									
1.20 - 1.65	SPTS		N=6 (3,3/2,2,1,1)			Soft greyish brown slightly sandy CLAY with rare gravel of subrounded fine to medium chalk.		1.20		
1.20 - 1.65	D 7									
1.20 - 1.80	B 9							(0.60)		
1.20 - 2.00	L		100% rec, diameter 87mm							
1.50	D 8									
1.80 - 2.00	B 11					Firm, becoming stiff, brown, mottled light grey, slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of chalk.		1.80		
1.90	D 10									
2.00 - 2.45	SPTS		N=19 (3,4/4,4,5,6)							
2.00 - 2.45	D 12									
2.00 - 3.00	L		80% rec, diameter 87mm							
2.40 - 3.00	B 14									
2.80	D 13									
3.00 - 3.45	SPTS		N=23 (4,5/5,6,6,6)							
3.00 - 3.45	D 15									
3.00 - 4.00	L		40% rec, diameter 77mm					(3.20)		
3.60 - 4.00	B 17									
3.80	D 16									
4.00 - 4.45	SPTS		N=23 (5,5/5,6,6,6)							
4.00 - 4.45	D 18									
4.00 - 5.00	L		90% rec, diameter 67mm							
4.60 - 5.00	B 20									
4.90	D 19						4.80-4.85 soft brown clay			
5.00 - 5.45	SPTS		N=18 (5,5/5,4,5,4)							
5.00 - 5.45	D 21			11/04/18	1300	Medium dense light brown gravelly fine to coarse SAND. Gravel is subrounded coarse of igneous rock and chalk.		5.00	1	
								(0.45)		
						END OF EXPLORATORY HOLE		5.45		

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed
1	5.00		

Depth Related Remarks

Depths (m)	Remarks
0.00 - 1.20	Hand excavated inspection pit.
0.00 - 1.00	Material too granular for hand vane testing.

Chiselling Details

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

17/04/2018 15:44:19

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

WS7

Sheet 1 of 1

Borehole Log

PRELIMINARY

SOCOTEC

Drilled	MB	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	
Logged	WH	11/04/2018	Archway Dart.	1.20	2.00	87		**Coordinates (m)**	
Checked		**End**	Dynamic sampling.	2.00	3.00	77		**National Grid**	
Approved		11/04/2018		3.00	4.00	67			

Samples and Tests

Strata Description

Depth	TCR SCR RQD	If	Records/Samples	Date Casing	Time Water	Main	Detail	Depth, Level (Thickness)	Legend	Backfill
0.00 - 1.20	B 1					Brown slightly sandy slightly gravelly CLAY with rootlets. Gravel is subangular fine to medium of sandstone. (MADE GROUND)				
0.25	HV		p 120kPa, r N/A							
0.50	HV		p 120kPa, r N/A							
0.60	D 2							(1.35)		
1.00	HV		p 120kPa, r N/A							
1.20 - 1.65	SPTS		N=12 (1,1/3,3,3,3)							
1.20 - 1.65	D 3							1.35		
1.20 - 2.00	L		100% rec, diameter 87mm			Firm brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of chalk and sandstone.		(0.35)		
1.35 - 1.70	B 5							1.70		
1.50	D 4					Firm brown slightly gravelly CLAY. Gravel is subrounded fine to medium of chalk and sandstone.				
1.70	D 6									
1.70 - 2.00	B 7									
2.00 - 2.45	SPTS		N=18 (3,4/4,4,5,5)							
2.00 - 2.45	D 8									
2.00 - 3.00	L		40% rec, diameter 77mm							
2.70	D 9							(2.00)		
2.70 - 3.00	B 10									
3.00 - 3.45	SPTS		N=12 (3,3/3,2,3,4)							
3.00 - 3.45	D 11									
3.00 - 4.00	L		30% rec, diameter 67mm							
3.70	D 12					Soft brown CLAY.		3.70		
4.00 - 4.45	SPTS		N=14 (3,3/3,3,4,4)					(0.75)		
4.00 - 4.45	D 13			11/04/18	1500					
						END OF EXPLORATORY HOLE		4.45		

Groundwater Entries

No.	Depth Strike	Remarks	Depth Sealed

Depth Related Remarks

Depths (m)	Remarks
0.00 - 1.20	Hand excavated inspection pit.

Chiselling Details

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

17/04/2018 15:44:19

Project VPI IMMINGHAM

Project No. A8015-18

Carried out for AECOM

Borehole

WS8

Sheet 1 of 1

Appendix 13A – Flood Risk Assessment

VPI-Immingham Energy Park 'A'

Proposed 49MW Gas-Fired Power Station Town and Country Planning (Environmental Impact Assessment) Regulations 2017

Appendix 13A - Flood Risk Assessment

VPI Immingham LLP

Project number: 60547702

April 2018

Quality information

Prepared by	Checked by	Verified by	Approved by
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Tables

1. Introduction

1.1 Commission

1.1.1 AECOM Infrastructure and Environment Ltd (AECOM) has been commissioned by VPI Immingham LLP ('the Applicant' or 'VPI' as appropriate) to prepare this Flood Risk Assessment (FRA) to accompany a Planning Permission under the Town and Country Planning Act 1990 (TCPA, as amended) for a new gas-fired power station on land adjacent to the existing Combined Heat and Power (CHP) Plant at South Killingholme, Immingham.

1.1.2 The proposed works (hereafter referred to as the 'Site') comprises the development of a gas fired power station including a number of gas engines. The proposed works will have a gross electrical output of up to 49.9MW and would export electricity onto the existing substation infrastructure.

1.2 Background

1.2.1 The Site comprises an undeveloped parcel of land approximately 2.1 hectares (ha) lying between the existing VPI CHP plant to the south, Lindsey Oil Refinery to the west and Rosper Road to the east. A location plan is presented in Annex 1.

1.2.2 The Environment Agency (EA) Flood Map for Planning[1] (refer to Annex 2) shows the southern area (Power Plant Site) and north eastern area (Permanent Access road and part of the Construction laydown area – both existing development currently on site) of the Site is located in Flood Zone 3a and Flood Zone 2; and the area to the north and north west of the Site (construction laydown area) is located in Flood Zone 1. The Site is not located within an area defined as Functional Floodplain (Flood Zone 3b).The definition of flood zones, in accordance with the NPPG are summarised in Table 1-1.

1.2.3 The National Planning Policy Framework[2] (NPPF) and associated Planning Practice Guidance[3] (PPG) specifies that planning applications for development proposals greater than 1 ha in area or located in Flood Zone 2 or Flood Zone 3, must be accompanied by a FRA. The FRA should demonstrate how flood risk will be managed so that the development remains safe throughout its lifetime, taking into account the vulnerability of the Proposed Development and the potential impact of climate change on flood risk.

Table 1-1. EA Flood Zone Definitions

Flood Zone.	Definition.
Flood Zone 1	Land that has a low probability of flooding (less than 1 in 1,000 annual probability of river or sea flooding (<0.1% Annual Exceedance Probability (AEP))
Flood Zone 2	Land that has a medium probability of flooding (between 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1-1% AEP), or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1-0.5% AEP)
Flood Zone 3a	Land that has a high probability of flooding (1 in 100 year or greater annual probability of river flooding (>1% AEP), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5% AEP)

[1] Environment Agency. Flood Map for Planning. Available at: https://flood-map-for-planning.service.gov.uk/
[2] Communities and Local Government, (2012); National Planning Policy Framework. Available at: http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950
[3] Communities and Local Government, (2014); Planning Practice Guidance. Available at: http://planningguidance.planningportal.gov.uk

Flood Zone.	Definition.
	1.2.4
Flood Zone 3b (Functional floodplain)	Land where water has to flow or be stored in times of flood based on flood modelling of a 5% AEP event (1 in 20 chance of flooding in any one year) or greater, or land purposely designed to be flooded in an extreme flood event (0.1% AEP).

1.3 Scope of Services

1.3.1 The aim of this FRA is to undertake a study that is appropriate to the nature and scale of the Proposed Development at the Site. The FRA considers the risk of flooding from all sources, including, tidal, fluvial, surface water flow, artificial sources, groundwater, and sewerage and drainage infrastructure, assesses how the proposed works will affect flood risk to the Site and surroundings, and recommends suitable mitigation measures, where required.

1.3.2 The objectives of this report are to:

- Collect and review existing information relating to the flood risk posed to the Site from all sources (including tidal, fluvial, surface water, groundwater, artificial sources and sewerage and drainage infrastructure);
- Consult with the Lead Local Flood Authority (LLFA), IDB and the EA in relation to flood risk and their requirements for management of any risk;
- Assess the flood risk to the Proposed Development under both existing and post-development conditions (taking into account climate change), including assessing the impact that the development may have on flood risk elsewhere; and
- Outline any mitigating measures needed to ensure the Proposed Development will be safe for the lifetime of the development and will meet the requirements of the NPPF.

1.4 Data Sources

1.4.1 The baseline conditions for the Site have been established through a desk study and via consultation with the EA, IDB and LPA, where required. This information has been utilised to inform the assessment made within the FRA. Data collected during the course of this assessment is described in Table 1-2.

Table 1-2. Sources of data reviewed

Purpose	Source	Comments
Identification of Hydrological Features	1: 10,000 Ordnance Survey (OS) mapping	Identifies the location of local hydrological features
Identification of Land Use	Street Check	Identifies the type of land use
Identification of Existing Flood Risk	1: 10,000 OS mapping	Provides indicative ground levels of the Site and surrounding area
	EA Flood Map for Planning[1]	Identifies fluvial/ tidal inundation extents
	EA Flood Risk from Surface Water Map[4]	Identification of flood risk from surface water
	EA Flood Inundation Mapping[5]	Provides information on the risk of flooding

[4] Environment Agency. Flood Risk from Surface Water Available at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater

Purpose	Source	Comments
		from reservoirs (artificial sources)
	EA Groundwater Conditions Map[6]	Identification of groundwater designations through geology
	British Geological Survey (BGS) records[7]	Provides details of geology and hydrogeology in the vicinity of the Site
	North Lincolnshire Preliminary Flood Risk Assessment[8] (PFRA)	Indicative risk of flooding from the local drainage system and minor watercourses within the vicinity of the Site
	North and North East Lincolnshire Strategic Flood Risk Assessment[9] (SFRA)	Assesses local flood risk from fluvial/tidal, sewers, overland flow, groundwater and artificial sources
	North Lincolnshire Local Flood Risk Management Strategy[10] (LFRMS)	Provides details flood risk within the Borough and which statutory authorities are responsible for the management of local flood risk. The report does not consider flood risk from Main Rivers.
	Grimsby and Ancholme Catchment Flood Management Plan[11] (CFMP)	Outlines flood risk sources within the plan area and how these may be managed in the future.
Identification of Historical Flooding	North Lincolnshire PFRA	Details of historical flooding and local flooding records
	North and North East Lincolnshire SFRA	
	North Lincolnshire LFRMS	
	Environment Agency pre-development response	
Details of the Scheme	Indicative Development Plans	Provides the layout of the Proposed Development
Surface Water Drainage Plans	1:10,000 OS Mapping	Identified existing site drainage, public drainage system near the Site and details of existing surface water runoff from the site
	Indicative Developments Plans	

[5] Environment Agency. Flood Risk from Reservoirs. Available at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=Reservoirs
[6] Environment Agency. Groundwater. Available at: http://magic.defra.gov.uk/MagicMap.aspx
[7] British Geological Survey. Geology Viewer Available at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[8] Entec (2011). North Lincolnshire Preliminary Flood Risk Assessment. Available at: http://webarchive.nationalarchives.gov.uk/20140328094437/http://www.environment-agency.gov.uk/research/planning/135526.aspx#15
[9] North Lincolnshire Council and North East Lincolnshire Council (2011). North and North East Lincolnshire Strategic Flood Risk Assessment. Available at: http://www.planning.northlincs.gov.uk/PlanningReports/SFRA/2011/SFRA_November_2011.pdf
[10] Amec Foster Wheeler (2016). North Lincolnshire Council Local Flood Risk Management Strategy. Available at: http://www.northlincs.gov.uk/transport-and-streets/roads-highways-and-pavements/flooding-drains/local-flood-risk-management-strategy/
[11] Environment Agency (2009). Grimsby and Ancholme Catchment Flood Management Plan. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/288839/Grimsby_and_Ancholme_Catchment_Flood_Management_Plan.pdf

2. Site Information

2.1 Site Location and Context

2.1.1 The Site is located immediately to the north of the existing VPI CHP power station and east of the Lindsey Oil Refinery in North Killingholme, Lincolnshire, DN40 3DZ.

2.1.2 Immingham Dock is located approximately 1.75km to the south east at its closest point. The Humber ports facility is located approximately 500m north at its closest point and the Humber Refinery is located approximately 550m to the south.

2.1.3 The nearest conurbation is the town of Immingham and is located approximately 2.5km southeast of the Site and the nearest residential property is a single property on Marsh Lane located approximately 700m to the east of the Site. The Site location is shown in Annex 1.

2.1.4 The Site is located entirely within the boundary of the administrative area of North Lincolnshire Council, which is a unitary authority, and close to the administrative boundary with Lincolnshire County Council and North East Lincolnshire District Council.

2.1.5 The Site occupies a total area of approximately 1.4 ha. The Site consists of two areas:

- The Power Plant Site, on which all components of the Proposed Development will be situated; and
- Construction Laydown area for the receipt, storage and partial assembly of the project equipment and materials to be installed or constructed.

2.1.6 The different areas of the Site are described below and illustrated in Annex 1.

The Power Plant Site

2.1.7 The Power Plant Site consists of an area of land of approximately 1ha in area located immediately to the south of the existing Lindsey Oil Refinery (LOR) canteen building. The Power Plant Site is currently undeveloped and consists of disturbed ground with limited vegetation.

2.1.8 The Power Plant Site is bounded as follows:

- North: Undeveloped land identified as Construction Laydown are for the Proposed Development (see below) and the LOR canteen building and car park;
- East: Undeveloped land;
- South: Pipework and services related to the operation of LOR, a vegetated drainage ditch and access trackway and the CHP plant operated by the Applicant; and,
- West: Undeveloped land access trackways and ponds associated with the drainage system for the P66 refinery and LOR. Beyond is a railway line and LOR itself. A single tower (pylon) associated with a high voltage transmission line is present approximately 20m from the Site boundary.

The Construction Laydown area

2.1.9 The Construction Laydown area consists of an area of land, approximately 0.4ha in area, located immediately to the north of the Power Plant Site and west of the existing LOR canteen building. The land is undeveloped and consists of bare compacted ground and is used for vehicle parking.

The Surrounding Area

2.1.10 The Site is located in an area comprising a mix of industrial and agricultural activities. In addition to the activities identified above, the land to the east of the Site on the other side of Rosper Road comprises agricultural fields extending approximately 1km toward the Humber Estuary before industrial activities associated with the storage and export of gas and oil and other port activities commence along the banks of the Estuary itself, approximately 1.4km from the Site at is closest point.

2.1.11 LOR itself is located to the east of the Site with the CHP plant located immediately to the south. Humber refinery is located approximately 500m to the south of the Site at its closest point.

2.1.12 A railway spur runs north-south to the immediate west of the Site. This spur services LOR and joins the main line approximately 400m south west of the Site. This line is the principal railway line in north east Lincolnshire running between Cleethorpes and Barton on Humber

2.2 Topography

2.2.1 A review of topographic survey data shows that ground levels across the Site range from 6.67m above Ordnance Datum (AOD) in the north east to 3.9m AOD in the south east. Ground levels, in general, decrease from the northern site boundary towards the south and south east.

2.2.2 The ground elevation within the proposed construction laydown area, to the north of the central drainage ditch, is generally flat with ground levels between 6.67m and 5.86m AOD.

2.2.3 To the south of the central drainage ditch ground elevations are generally between 5.89m AOD, to the south west corner, and 3.9m AOD to the south east. Ground levels directly adjacent to the drainage ditch are generally between 5.3m and 5m AOD.

2.2.4 Spot levels on OS mapping show ground levels at the junction of Rosper Road and Station Road, to the north of the Site, are approximately 6m AOD whilst at the junction of Rosper Road and Marsh Lane, to the south east of the Site ground levels are approximately 4m AOD.

2.2.5 Ground levels are shown to increase from east to west in the general area.

2.3 Local Water Features

2.3.1 There are two unnamed surface water features located within the Site to the west and south west. These are associated with the main route of the treated surface water and process water effluent from the p66 refinery prior to treatment at the existing VPI CHP plant site effluent plant (to the south of the Proposed Development and subsequent discharge).

2.3.2 The following notable watercourses have been identified in close proximity to the Site:

- A land drain located within the Site boundary between the Power Plant Site and the Construction Laydown Area
- Land drains running parallel with and adjacent to the Site boundary to the north, south, east and west;
- Watercourse 9 and Watercourse 9A (North East Lindsey IDB drains) located approximately 50m to the south east of the Site to the east of Rosper Road;
- A series of land drains approximately 53m to the west of the Site;
- A series of land drains approximately 120m to the north of the Site;

- The Humber Estuary, located approximately 1.4km to the west;
- A water storage lagoon and settlement lagoon, approximately 50m to the west and 90m to the south west of the Site respectively, located within the Lindsey Oil Refinery Site boundary; and
- Rosper Road Pools, an artificial flood relief reservoir, located approximately 740m to the south east of the Site.

2.3.3 In addition, the area surrounding the Site is drained via a network of small land drainage ditches that convey surface water from the surrounding greenfield areas located between the Site and the Humber Estuary.

2.4 The Proposed Development

2.4.1 The Proposed Development comprises a gas-fired power station with a gross electrical output of up to 49.9 megawatts (MWe). The power station will not be designed to run continuously but to run intermittently to respond quickly to shorter term periods of high electrical demand.

2.4.2 The design of the Proposed Development incorporates a degree of flexibility in the dimensions and configuration of structures and buildings to allow for the selection of the preferred technology and contractor. This allows the Applicant to optimise the plant to help meet UK energy demands.

2.4.3 For example, as well as choosing which option will be developed, the scale of the buildings within the Proposed Development may vary depending upon the contractor appointed and their specific selection and configuration of the plant and process equipment. The design of the Proposed Development therefore needs to incorporate a degree of flexibility to allow for such circumstances.

2.4.4 In order to ensure a robust assessment this FRA has been undertaken adopting the principles of the 'Rochdale Envelope'. This involves assessing the maximum (and where relevant, minimum) parameters for the elements where flexibility needs to be retained.

2.4.5 In accordance with this approach, two potential indicative layouts (termed Example Layout 'A' and Example Layout 'B') have been developed which illustrate the maximum extent of the Proposed Development in terms of their potential environmental impact.

2.4.6 Subject to the planning and other consents being granted (and an investment decision being made), work on site could commence in early 2019 and will consist of 12 - 18 months of construction work with the Proposed Development expected to commence commercial operation in 2020.

2.4.7 The Proposed Development will include the following key elements:

- An engine hall up to 15m height housing up to 7 gas engines each associated with a stack of up to 35m in height external to the building and a bank of fin fan coolers up to 7m high (Example Layout 'A' only); or
- Up to 33 containerised gas engines, each associated with an stack of between 10m and 15m (Example Layout 'B' only)."

2.4.8 Gas and electricity connections would be supplied from tie-ins to existing services located on the existing adjoining CHP plant. These connections would be facilitated by a new above ground pipe bridge passing over the LOR services drainage ditch and access roadway.

2.4.9 In addition there are a number of ancillary elements that are common to both layouts and are not anticipated to vary as a result of the Rochdale Envelope, although their location within the Site boundary may alter depending on the layout adopted. These elements are:

- Gas pipeline to the adjacent VPI CHP site. This may include an section of above ground pipeline to pass over the existing services, drainage ditch and roadway bordering the Site;
- Gas receiving compound to monitor and regulate the flow of gas to the Site;
- Black start unit (skid mounted diesel fired generator);
- Raw/fire water tank and fire pump for fire control purposes;
- Treated water tank to facilitate cooling of the engines
- Transformers to allow the export of electricity at the correct voltage;
- Gatehouse to control access to Site;
- Workshop and stores;
- Diesel tank for the storage of fuel for the black start unit;
- Lubrication oil tank, to facilitate the operation of the engines; and
- Offices, workshops and a control module to facilitate the operation of the power station.

2.4.10 Access to the Site from public roads for both construction and operation will be via the existing Main Entrance for the Lindsey Oil Refinery (LOR) off Rosper Road. During the construction phase, traffic would be directed through the private road network associated with the existing car park to a new temporary haul road to be constructed along the southern boundary of the existing car park.

2.4.11 During the operational phase, traffic would follow the access road from Rosper Road to the existing main gatehouse of LOR, turning south before the gate house to run along the existing road to the east of the existing canteen building to enter the site by a new permanent access at the southwest corner of the existing car park.

2.4.12 Further information with regards the proposed Development can be found in the Environmental Statement Chapter 4: The Proposed Development.

3. Planning Policy and Guidance

3.1.1 The sections below consider the planning policies and guidance of relevance to the Proposed Development with regards to flood risk and surface water management.

3.2 National Planning Policy Context

3.2.1 The NPPF is supported by the PPG, an online resource published in March 2014. The PPG supersedes the PPS25 Practice Guide[12] and the Technical Guidance to the National Planning Policy[13], as detailed in the Ministerial Statement 'Making the planning system work more efficiently and effectively'[14].

3.2.2 The NPPF and associated PPG must be taken into account in the preparation of local and neighbourhood plans, and are a material consideration in planning decisions. It constitutes guidance for Local Planning Authorities (LPAs) and decision-takers, both in drawing up plans and as a material consideration in determining applications.

3.2.3 The NPPF and PPG recommend that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and develop policies to manage flood risk from all sources, taking account of advice from the EA and other relevant flood risk management bodies, such as Lead Local Flood Authorities (LLFAs) and Internal Drainage Boards (IDBs). Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:

- Applying the Sequential Test;
- Applying the Exception Test, if necessary;
- Safeguarding land from development that is required for current and future flood management;
- Using opportunities offered by new development to reduce the causes and impacts of flooding; and
- Seeking opportunities to facilitate the relocation of existing development, including housing, to more sustainable locations where climate change is expected to increase flood risk.

The Sequential and Exception Tests

3.2.4 The overall aim of the Sequential Test is to steer new development to areas designated as located in Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, LPAs allocating land in Local Plans or determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zone 1 or 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

[12] Communities and Local Government, (2012); 'Planning Policy Statement 25: Development and Flood Risk, Practice Guidance'
[13] Communities and Local Government, (2012); 'Technical Guidance to the National Planning Policy Framework'
[14] Communities and Local Government (2014); 'Making the planning system work more efficiently and effectively'

3.2.5 For the Exception Test to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and
- A site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall.

3.2.6 Both elements of the test will have to be passed for development to be allocated or permitted.

Development and Flood Risk Vulnerability

3.2.7 The NPPF considers the vulnerability of different forms of development and infrastructure to flooding and classifies proposed uses accordingly. Section 7, Paragraph 066 of the NPPG illustrates a matrix which identifies which vulnerability classifications are appropriate within each flood zone. This can be seen below in Table 3.

3.2.8 As mentioned in Section 2.4, the Proposed Development comprises a new gas-fired power station. Based on Table 2 of the PPG, the Proposed Development is considered 'Essential Infrastructure' under the heading "Essential utility infrastructure which has to be in a flood risk area for operational reasons, including electricity generating power stations".

3.2.9 Section 7, Paragraph 066 of the PPG illustrates a matrix which identifies which vulnerability classifications are appropriate within each flood zone - this can be seen in Table 3-1.

Table 3-1. Flood Risk Vulnerability and Flood Zone Compatibility

Flood risk vulnerability classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	×	Exception test required	✓
Zone 3b 'Functional Floodplain'	Exception test required	✓	×	×	×

Key
✓ Development is appropriate.
× Development should not be permitted.

3.2.10 Based on the classification shown in Table 3-1 the Proposed Development is appropriate in Flood Zones 1 and 2. The Proposed Development may be appropriate in Flood Zone 3 providing the development can satisfy the requirements of the Exception Test.

The Sequential Test

3.2.11 The Site is allocated in the North Lincolnshire Local Plan and Local Development Framework as an area for employment growth. The Site forms a part of the South Humber Bank Area that is subject to Policy SHBE-1 of the Housing and Employment Land Development Plan Document. This policy identifies the area as being suitable for B1 office/light industry, B2 general industry, B8 storage and distribution and port related

development. On the basis of this allocation it is assumed that the proposed development has passed the Sequential Test.

The Exception Test

3.2.12 The Energy White Paper 'Meeting the Energy Challenge' published in 2007 by the Department for Trade and Industry, which formed the basis of the Energy Act 2008, sets out the Government's plans for tackling climate change by reducing carbon emissions whilst ensuring the availability of secure, clean, affordable energy.

3.2.13 The White Paper and the Overarching NPS for Energy (EN-1) both emphasise the importance of a diverse mix of energy generating technologies, including renewables, nuclear and fossil fuels, to avoid over-dependence on a single fuel type and thereby ensure security of supply.

3.2.14 In the transition to the low carbon economy, the large-scale deployment of renewable technologies and construction of new nuclear power plant will change the energy mix of the UK. This is compounded by the Government's commitment to close all coal-fired power stations by 2025, which would remove plant currently providing a balancing service to the national grid when the need should arise. As a result, there is a need for power plants that can operate flexibly. This need is underpinned by a combination of Government policy drivers and the Industrial Emissions Directive (IED) resulting in the closure of fossil generation plant and is reflected in future generation projections.

3.2.15 Energy Market Reform (EMR) is intended to deliver low carbon energy and reliable supplies that the UK needs, while minimising costs to consumers. EMR introduces a mechanism to provide incentives for the investment required in low carbon generation infrastructure, the Capacity Market. The Capacity Market provides a regular retainer payment to reliable forms of capacity (both demand and supply side) in return for such capacity being available when needed.

3.2.16 The reformed electricity market is intended to transform the UK electricity sector to one in which low-carbon generation can generate in an affordable way, while maintaining the security of supply and ensuring a cleaner, more sustainable energy mix. In the run up to 2050, gas generation is still required to meet electricity demand. It is preferable over coal generation as generating electricity from gas is more efficient and of lower carbon intensity, resulting in significantly lower CO2 emissions per generated megawatt from gas-fired power stations compared to coal-fired power stations.

3.2.17 The Site will bring additional employment to the area and will regenerate a currently derelict area of land.

3.2.18 This FRA provides evidence that the proposed development will be safe for its lifetime taking account and will not increase flood risk elsewhere.

3.2.19 As the Proposed Development provides wider sustainability benefits to the community that outweigh flood risk and will remain safe over the lifetime of the development it is considered that the Site passes the Exception Test.

3.3 Planning Practice Guidance: Climate Change (2016)

3.3.1 Guidance on the consideration of climate change within the planning system was updated and replaced in February 2016 by the Environment Agency Flood Risk Assessments: Climate Change Allowances document, which provides catchment / region specific uplift factors for three future scenarios:

- Total potential change anticipated for the '2020s' (2015 to 2039);
- Total potential change anticipated for the '2050s' (2040 to 2069);

- Total potential change anticipated for the '2080s' (2070 to 2115).

3.3.2 Within each of the three scenarios, the estimates can be further divided into Central, Higher Central and Upper End; the specific scenario chosen should be reflective of the developments vulnerability and potential to impact flood risk elsewhere. Climate change is discussed further in Section 5.

3.4 Local Planning Policy

North Lincolnshire Core Strategy

3.4.1 The Core Strategy[15] was adopted by NLC in June 2011. This Core Strategy sets-out the long term spatial planning framework for the development of North Lincolnshire up to 2026 by providing strategic policies and guidance to deliver the vision for the area including the scale and distribution of development, the provision of infrastructure to support it and the protection of the natural and built environment.

3.4.2 Policies within the NLC Core Strategy relevant to flood risk and surface water management include:

- **Policy CS2: Delivering More Sustainable Development** - A 'sequential approach' will also be applied to ensure that development is, where possible, directed to those areas that have the lowest probability of flooding, taking account the vulnerability of the type of development proposed, its contribution to creating sustainable communities and achieving the sustainable development objectives of the plan. Where development does take place in the floodplain, mitigation measures should be applied to ensure that the development is safe.
- **Policy CS12: South Humber Bank Strategic Employment Site (SHBSES)** - Development will be assisted by a drainage programme. The outcome will be to include surface water and sewage management solutions to accommodate development of the SHBSES without harming the natural environment. Safeguard and improve the flood defences of the SHBSES from tidal flooding through partnership working with the Environment Agency and its Humber Flood Risk Management Strategy, North Lincolnshire and North East Lincolnshire Councils, Yorkshire Forward, landowners and industry. This will include managing the predicted effects of climate change in harmony with the development of port related activities by managing and minimising the risk of flooding.
- **Policy CS18: Sustainable Resource Use and Climate Change** - Requiring the use of Sustainable Urban Drainage Systems (SuDS) where practicable and supporting the necessary improvement of flood defences and surface water infrastructure required against the actions of climate change, and preventing development in high flood risk areas wherever practicable and possible.
- **Policy CS19: Flood Risk** - The council will support development proposals that avoid areas of current or future flood risk, and which do not increase the risk of flooding elsewhere. This will involve a risk based sequential approach to determine the suitability of land for development that uses the principle of locating development, where possible, on land that has a lower flood risk, and relates land use to its vulnerability to flood. Development in areas of high flood risk will only be permitted where it meets the requirements of the Exception Test and, in addition, development will be required, wherever practicable, to incorporate SuDS to manage surface water drainage.

[15] North Lincolnshire Council (2011) *North Lincolnshire Core Strategy Adopted 2011*

3.5 Other Relevant Policy and Guidance

North and North East Lincolnshire SFRA

3.5.1 The SFRA was prepared to assist North East and North Lincolnshire Councils in spatial planning decisions that are required to inform the Local Development Framework preparation. Using information and analysis gathered during the assessment, a strategic overview of the flood risk was carried out to identify potential conflicts between development pressures and flood risk now and in the future.

North Lincolnshire PFRA

3.5.2 The NLC PFRA was published in 2011 and is a high level screening exercise that compiles information on significant local flood risk from past and future floods, based on readily available and derivable information. The PFRA also includes the identification of flood risk areas where the subsequent two stages of the Flood Risk Regulations apply; Stage Two delivers Flood Risk Maps and Stage Three delivers Flood Risk Management Plans.

3.5.3 Local flood risk is defined as flood risk originating from sources other than main rivers, the sea and large reservoirs and principally meaning flood risk from surface water runoff, groundwater and ordinary watercourses. This main definition of local flood risk requires further clarification: a) it includes lakes and ponds, b) it does not consider flooding from sewers unless this is wholly or partly caused by rainwater or other precipitation entering or otherwise affecting the system, c) it does not include flooding from water supply systems (for example burst water mains), and d) it considers the interaction with flooding from main rivers, the sea and sewers.

North Lincolnshire LFRMS

3.5.4 The Local Flood Risk Management Strategy[10] (LFRMS) details the Councils preferred strategy to manage the risk from local sources of flooding initially over the next 3 years and with revised editions every 6 years. Local sources of flooding, are those from ordinary watercourses (small streams and channels), pluvial (surface water runoff as a result of heavy rainfall) and groundwater (where water held beneath the ground reaches the surface). The LFRMS includes a Flood Risk Action Plan which identifies the practical steps that the Council and other partners need to take to reduce their risks from flooding.

Grimsby and Ancholme CFMP

3.5.5 The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. CFMPs can be used to help target limited resources where the risks are greatest.

3.5.6 The Site lies within the Grimsby and Ancholme CFMP, and in the sub-area of 'Immingham, Grimsby and Buck Beck'. This CFMP identifies flood risk management policies to assist all key decision makers in the catchment. It was produced through a wide consultation and appraisal process, however it is only the first step towards an integrated approach to flood risk management.

3.5.7 The CFMP identifies that flood defences have historically been constructed in the sub-area to reduce the probability of river and tidal flooding. However, in the future the standard of protection offered by existing defences may decline. Therefore the preferred policy for this sub-area is Policy Option 4: Areas of low, moderate or high flood risk where the EA are already managing the flood risk effectively but where further actions may need to be undertaken to keep pace with climate change. The preferred approach to manage flood risk

in Immingham is to work with partners to develop a flood risk study to investigate how further action can be taken to manage flood risk in the future.

4. Assessment of Flood Risk

4.1.1 The NPPF requires the effects of all forms of flood risk to and from the Site to be considered within a FRA. There should be demonstration of how these risks should be managed so that the development remains safe throughout its lifetime, taking into account climate change.

4.2 Tidal Flooding

4.2.1 The EA Flood Map indicates that the predominant flood risk on the Site is associated with tidal flooding from the Humber Estuary located approximately 1.4km to the east of the Site.

4.2.2 The EA Flood Zone Map (Annex 2) shows that the southern (Power Plant Site) and north eastern (Permanent Access and part of the Construction laydown area) area of the Site is located in Flood Zone 3 (high risk) and Flood Zone 2 (medium risk). The area to the north and north west of the Site (construction laydown area) is located in Flood Zone 1 (low risk). The definition of flood zones, in accordance with the NPPG are summarised in Table 1-1.

4.2.3 The Flood Map does not take into account the presence of flood defences.

Flooding History

4.2.4 The EA have provided mapping showing historical flood extents in proximity to the Site (Annex 2). The historical flood map and the North and North East Lincolnshire SFRA indicate that the only significant record of tidal flooding in the area occurred in 1953. Major flooding occurred at numerous locations on the east coast of England and the Site was partially inundated (to the east) during this event.

4.2.5 On the 5th December 2013, many of communities along the coast and south Humber bank were flooded by the largest tidal surge ever recorded in this location. The Site is not recorded as having been inundated during this event.

4.2.6 The flooding that occurred in the summer of 2007 caused extensive flooding in nearly all parts of the Louth, Grimsby and Ancholme catchment. The flooding that occurred was caused by prolonged rainfall saturating the catchment followed by a short period of extremely heavy rainfall. It is not known if the Site was flooded during this event.

Modelled Tidal Water Levels

4.2.7 The EA has provided tidal flood water levels for the for the South Humber, East Coast and The Wash. Water levels for Ref. H130 (North Killingholme located at 516350, 420000) have been used to assess tidal flood risk at the Site and are presented in Table 4-1 below. The model node locations are presented in Annex 2.

Table 4-1. Tidal Water Levels at North Killingholme (mAOD)

Year	Annual Chance (1 in X) of Tide Level	
	200 (0.5% AEP)	1000 (0.1% AEP)
2014	5.42	5.77
2018*	5.58	5.93
2083**	5.93	6.28
2115***	6.35	6.70

* Present day adjustment

** Assumed operational life of development – 65 years

*** The operational life of the power station is assumed to be 65 years but will be assessed for climate change based on an operational life of 100 years as a worst case scenario (See Section 5).

Source: EA Consultation Data (Annex 2)

4.2.8 The base date for the EA data is 2014 therefore the tidal water level for a 1 in 200 (0.5% AEP) and a 1 in 1000 (0.1% AEP) flood events have been adjusted, using the latest EA climate change guidance, to reflect the current 2018 tidal water level. Based on this guidance tidal levels are estimated to increase by 4mm per year up to 2025. For the purpose of this assessment a total increase in tidal level from 2014 to 2018 equating to 16mm has been added to the EA data and is shown in Table 4-1.

4.2.9 Topographic data indicates that ground levels in the north of the Site in the location of the proposed Construction Laydown Area are elevated above the 2018 0.5% AEP tidal flood level (5.58m AOD) at between approximately 6.67m and 5.86m AOD. Levels to the south of the Site (the proposed Power Plant Site) are generally below the tidal flood level, with elevations between 5.89m and 3.9m AOD. This data provides good correlation with the EA flood extent map presented in Annex 2.

Flood Defences

4.2.10 There are no formal flood defences in close proximity to the Proposed Development; however, there are tidal flood defences in place along the entire south bank of the Humber Estuary (See Annex 2). The existing defences to the north and east of the proposed development consist of:

- An earth embankment topped by a concrete wave return wall (Asset Ref: 053BBHUMB1501C05) with a crest height of 6.448 m AOD;
- A reclamation area (Asset Ref: 053BBHUMB1501C06) with a crest height of 6.448 m AOD;
- A sea defence protecting reclaimed land (Asset Ref: 053BBHUMB1501C09) with a crest height of 6.4m AOD; and
- An earth embankment topped by a concrete wave return wall (Asset Ref: 053BBHUMB1501C07) with a crest height of 6.16 m AOD.

4.2.11 The EA has stated that the tidal flood defences provide protection against a flood event with a 0.5% chance of occurring in any year, based on the Still Water Tidal Water Levels.

4.2.12 The flood defences are owned both privately and by the EA and the EA has confirmed that the condition of the flood defences are classed as either 'good' (Condition Grade 2) or 'fair' (Condition Grade 3). The Environment Agency inspects these defences regularly to ensure that any potential defects are identified early.

4.2.13 The NLC SFRA shows the flood defences are located in Compartment IT3 - Immingham and North Killingholme. The NLC 2011 SFRA states '*ignoring freeboard, these defences will protect the area behind against events with a 0.2% annual probability of occurring or better. The standard will remain above the 0.5% annual probability requirement set out in PPS25 for the next 50 years, taking the effect of sea level rise into account*'.

4.2.14 In 2008 the Environment Agency published the Humber Flood Risk Management Strategy[16] (HFRMS). The strategy outlines the flood risk management plan for the Humber Estuary for the next 25 years and beyond. It looks at different ways of managing flood risk; raising defences where appropriate, but also introducing sites for managed realignment and flood storage which will help maintain valuable habitats.

4.2.15 The site is located within Flood Area 24 Immingham to West Grimsby. The proposed management approach in this area is to continue to protect the area and improve the defences that protect existing development.

4.2.16 As the Site is afforded protection from defences up to and including the 0.5% AEP flood event still water levels, the primary risk from the Humber Estuary is the residual risk from overtopping and/or from failure of the defences, however the likelihood of either occurring is considered to be low.

Overtopping of the Flood Defences

4.2.17 The EA has provided flood extent maps from the Northern Area Tidal Overtopping Hazard Mapping Study for the 0.5% AEP and the 0.1% AEP overtopping scenarios. The modelling is based on the Still Water Tidal Levels from the Northern Area Tidal Model Analysis 2006 including a 100% AEP (1 in 1) wave height allowance (current year 2006 and 2115). For the climate change scenarios it is assumed that the tidal defences remain at the 2006 heights.

4.2.18 The hazard classification methodology is based on Flood Risk Assessment Guidance for New Development known as FD2320/TR217. Table 4-2 summarises the hazard classifications as defined for the overtopping/breach hazard modelling based on FD2320/TR2.

Table 4-2. Hazard Classifications based on FD2320/TR2

Flood Hazard		Essential Infrastructure	Indicative Depth Range (m)
	Low	**Caution** - Flood zone with shallow flowing water or deep standing water	Up to 0.25m
	Moderate	**Dangerous for some** (i.e. Children) – Danger: Flood zone with deep or fast flowing water	Up to 0.5m
	Significant	**Dangerous for most people** – Danger: Flood zone with deep fast flowing water	0.2 – 2.0m
	Extreme	**Dangerous for all** – Extreme Danger: Flood zone with deep fast flowing water	0.3 to over 2.0m

[16] Environment Agency (2008), *Planning for Rising Tides. The Humber Flood Risk Management Strategy*
[17] Defra/ Environment Agency (2005) *Flood Risk Assessment Guidance for New Development (Phase 2) R & D Technical Report FD2320/TR2*

4.2.19 The extent maps, presented in Annex 2, indicate that the Site would not flood if overtopping of the flood defences occurred for both the 2006 0.5% AEP and 0.1% AEP events. For both the 2115 0.5% AEP and 0.1% AEP events the Power Plant Site and the eastern area of the access road and existing car parks are located in an 'extreme' hazard area whilst the construction laydown area and the western section of the car parks and access road are located within a 'significant' hazard area.

4.2.20 Maximum flood depths across the Site for both the 2115 0.5% AEP and 0.1% AEP overtopping events are shown to be greater than 1.6m with velocities of between 0.3 and 1.0 m/s.

4.2.21 Given the proposed management approaches for the area (see above) the likelihood of overtopping is considered to be low, however; current NPPF guidance requires that plans and mitigation is put in place to manage the risks if flooding should occur. Mitigation measures for the Site are outlined in Section 6.

Breach of Defences

4.2.22 The EA has provided breach location and associated breach flood extent maps from the Northern Area Tidal Breach Mapping Study. The Northern Area Tidal Breach Hazard Mapping project provides a modelled representation of tidal breaches along the east coast and the south bank of the Humber Estuary, with breaches in the hard defences set at 20 m wide and the defences assumed to breach down to the ground level behind the defence. The defences were raised within the model to create reservoir cells, ensuring that the most precautionary volumes of water were driven through the breach opening.

4.2.23 The breach modelling was based on the Still Water Tidal Levels from the Northern Area Tidal Model Analysis 2006 including a 100% AEP (1 in 1) wave height allowance (current year 2006 and 2115) on top of the 0.5% AEP and 0.1% AEP (1 in 1000) flood events. The breach location nearest the site is located to the south east of Killingholme High Lighthouse to the east/south east of the Inland and Riverside Caverns area.

4.2.24 Breach modelling was also undertaken as part of the NLC SFRA for the 2115 scenario during a 1 in 200 (0.5%) annual probability event (Annex 3). Whilst the EA's study uses estuary levels based on the Northern Area Tidal Model Analysis the NLC's study uses a worst-case combined fluvial/tidal event and provides a more conservative approach to flood hazard mapping.

4.2.25 The breach location and flood extent maps are contained in Annex 2.

4.2.26 The southern area of the Power Plant Site is located in a 'low hazard' and 'moderate hazard' area for the 2006 0.5% breach event. During the 0.1% AEP event the low and moderate hazard extents increase slightly northwards across the Power Plant Site. An area of 'significant hazard' is located to the south east corner of the Site. The south eastern section of the haul road, located to the south of the existing car park is located in a 'low hazard' area during the 0.1% AEP event. The construction laydown area and access road remains outside the breach flood extent for both the 0.5% and 0.1% AEP breach events.

4.2.27 For the 2115 breach events the Power Plant Site and the eastern extent of the access road and car parks are located in area of 'significant hazard' with an area of 'extreme hazard' to the south east Power Plant Site boundary for both the 0.5% AEP and 0.1% AEP events. The western extent of the access road is located in a 'low hazard' and 'moderate hazard' area for the both the 0.5% and 0.1% AEP breach events whilst the construction laydown area remains outside the breach extents.

4.2.28 Maximum water depths for the 2006 0.5% AEP and 0.1% AEP breach scenarios are generally between 0 and 0.5 m across the southern area of the Power Plant Site increasing to a maximum depth of 1m to the southeast corner for the 0.1% AEP breach event. Maximum velocities of flood water for both breach scenarios are between 0 and 0.3 m/s.

4.2.29 Maximum water depths for the 2115 0.5% AEP and 0.1% AEP breach scenarios are generally 1m to greater than 1.6 m across the Power Plant Site and the car park and access road to the east. Maximum velocities of flood water for both the breach scenarios generally remains between 0 and 0.3 m/s with small areas, predominantly located to the east (car park and access road), with maximum velocities of between 0.3 and 1.0 m/s.

4.2.30 For the NLC 2115 0.5% breach scenario:

- The Power Plant Site is located predominantly within a 'severe hazard' area with a localised area of 'extreme hazard' to the south east corner;
- The existing access road car parks are located within a 'severe hazard' area;
- The west and north west of construction laydown area is located within an 'negligible hazard' area whilst the eastern area is located within a 'low to moderate' hazard area; and
- The Rosper Road corridor in close proximity to the Proposed Development is located within a 'severe hazard' area.

4.2.31 Though a breach of the flood defences would represent a significant to extreme hazard, the SFRA states that likelihood of a breach is low however; current NPPF guidance requires that plans and mitigation is put in place to manage the risks if failure should occur. Mitigation measures for the Site are outlined in Section 6.

4.3 Fluvial Flooding

4.3.1 With the exception of the River Humber (Humber Estuary), see Section 4.1 above, there are no other EA Main Rivers in close proximity to the Site.

4.3.2 NELIDB have provided a map showing the watercourses under their jurisdiction in close proximity to the Proposed Development. The NELIDB map is presented in Annex 4.

4.3.3 None of these watercourses are currently supported by pumping but there is a proposal for a pumping station at Killingholme Marshes together with the widening of drainage channels in connection with the Able Marine Energy Park, part of which includes Watercourse 9B.

4.3.4 Correspondence with NELIDB reports that the IDB has no records of previous flood extents and no information suggesting flood issues in the past for Watercourse 9B and the area in close proximity to the development area.

4.3.5 The SFRA states that '*the drainage systems managed by the NELIDB are understood to be able to accommodate storm events with 0.1% AEP by a combination of storage and pumping, without flooding the surrounding area*'.

4.3.6 For NELIDB watercourses located within Compartment IT3 – Immingham and North Killingholme, the NLC SFRA states "*The NELIDB have examined conditions in the watercourses they manage on a number of occasions in the recent years to generally assess the drainage implications of large industrial developments in the area. These studies indicate that the existing systems were mostly designed to cater for events with a 1.0% probability of occurrence. The designs generally include a freeboard of between 300 mm and 450 mm between the peak water level and the surrounding ground level. If this additional storage is taken into account the studies suggest that the drainage systems will accommodate the 1% annual probability flood from the area in its undeveloped state without water levels rising above the local ground level*".

4.3.7 Given the nature of the managed catchment with small watercourses of sufficient capacity, fluvial flood risk is considered to be low.

4.4 Surface Water Flooding (Overland Flow)

4.4.1 Overland flow results from rainfall that fails to infiltrate the surface and travels over the ground surface; this is exacerbated where the permeability of the ground is low due to the type of soil and geology (such as clayey soils) or urban development with impermeable surfaces.

4.4.2 The PFRA details recorded local flood events as defined by NLC and Anglian Water, the local water and wastewater provider. The report refers to the severe pluvial flooding across large parts of North Lincolnshire during the June/July 2007 storms. An IDB Shire Group Report on the June 2007 floods18 defined the rainfall event as having a 1 in 150 year return period. Data suggests that the Site did not flood in 2007. The PFRA historical flood map shows no records of pluvial flooding for the Site and the Site is not located within a Critical Drainage Area (CDA).

4.4.3 The majority of the land surrounding the Site (to the east) is undeveloped and greenfield in nature with a low propensity to generate overland flow. Further to this, the IDB land drains serving the area reportedly have the capacity to ensure that excess surface water is stored and removed from the area and discharged into the Humber Estuary.

4.4.4 The EA published the updated Flood Maps for Surface Water (uFMfSW) in December 2013. The maps indicate areas at risk from surface water flooding, when rainwater does not drain away through the normal drainage systems or soak into the ground, but instead lies on or flows over the ground. The mapping can be viewed on the EA website. The EA Risk of Flooding from Surface Water map19 indicates that the majority of the Site is at very low risk from surface water flooding. Very low risk means that each year this area has a chance of flooding of less than 0.1%.

4.4.5 Small pockets of land at low, medium and high risk from surface water flooding are identified within the Site boundary. Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. Medium risk means that each year this area has a chance of flooding of between 1% and 3.3% and high risk means that each year this area has a chance of flooding of greater than 3.3%. These areas are likely to correspond to areas of low topography within the Site where surface water ponds rather than draining away.

4.4.6 Pools of standing water were seen on land to the east and south east of the Site during a Site walkover undertaken by ecologists in September 2017 thought to be associated with areas of impeded drainage. The Preliminary Ecological Appraisal (PEA) Report20 states “Two permanently shallow ponds are located in the northern part of the area at the base of the bunds. Both supported vegetation that indicated the area holds water for much of the year, although seasonal drying (or a reduction in extent) in the summer months cannot be ruled out”

4.4.7 A small area of high risk is located along the drain to the south of the Site. Surface water is seen to enter the Site from the drain, most likely via a low spot along the bank; however flooding is not extensive.

4.4.8 Based on the information above the Site is assessed as being at very low to low risk of flooding from surface water sources.

4.5 Artificial Waterbodies

4.5.1 Artificial flood sources include raised channels, such as canals, or storage features such as ponds and reservoirs.

[18] Ancholme, Scunthorpe and Messingham Internal Drainage Boards, Member of the Shire Group – *Report on Storm Damage and Flooding the Followed June 2007* (JBA Consulting)
[19] https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
[20] AECOM (2017) Preliminary Ecological Appraisal (PEA) Report October 2017

4.5.2 The Flood and Water Management Act (FWMA) updated the Reservoirs Act and targeted a reduction in the capacity at which reservoirs should be regulated from 25,000m³ to 10,000m³. This reduction is, at the time of writing, yet to be confirmed meaning the requirements of the Reservoirs Act 1975 should still be adhered to.

4.5.3 The EA's Long-term Flood Risk mapping shows that the Site is not located in an area at risk of flooding from a reservoir in the event of a structural failure or breach.

4.5.4 There are no canals located in close proximity to the Site.

4.6 Flooding from Groundwater

4.6.1 Groundwater flooding can occur when groundwater levels exceed ground surface levels as a result of periods of sustained high rainfall. The underlying geology has a major influence on where this type of flooding takes place; it is most likely to occur in low-lying areas underlain by permeable rocks (aquifers) where the water table is more likely to be at shallow depth.

Geology

4.6.2 The British Geological Survey (BGS) 1:50,000 solid and drift geology map indicates that the site is underlain by Devensian aged glacial till, overlying Upper Cretaceous aged chalk of the Burnham Chalk Formation.

Superficial Geology

4.6.3 Made Ground is present across the northern and eastern part of the Site, predominantly located in the area to be used as the general laydown area.

4.6.4 The predominant superficial material on site is glacial deposits, comprising of glacial till and glacial sands and gravels. The BGS Engineering Geology Viewer describes the glacial till as *"Firm to very stiff or hard slightly gravelly sandy CLAY with few cobbles and boulders. Occasional medium to extremely widely spaced interbeds and lenses of sand and gravel may be present".*

4.6.5 Solid Geology Published geological maps indicate that the site is underlain by the Burnham Chalk Formation of the Upper Cretaceous period. The BGS Lexicon describes the Burnham Chalk Formation as *"White, thinly-bedded chalk with common tabular and discontinuous flint bands; sporadic marl seams".* Bedrock does not outcrop at any location in the study area and is overlain by a thick covering of the aforementioned superficial deposits.

Hydrogeology

4.6.6 The EA Aquifer Maps[21] indicate that:

- The superficial glacial deposits are classified as a 'Secondary Aquifer (undifferentiated)', defined either as 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers', or 'lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, tin permeable horizons and weathering'; and
- The bedrock, Burnham Chalk Formation, is classified as a Principal Aquifer, defined as 'highly permeable formations usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes.

Groundwater Levels

[21] http://apps.environment-agency.gov.uk/wiyby/117020.aspx

4.6.7 The 2006 Soil Mechanics ground investigation[22] showed water to be encountered within the more granular glacial horizons within the nearby BH5 at 4.3m bgl with sub-artesian conditions resulting in a water level rise to 3.9m after 20 minutes.

4.6.8 Additionally, during the 2009-2010 Highways England ground investigation[23], groundwater was encountered within the thicker granular glacial deposits, and in thin granular horizons within the glacial till, between depths of 2.4m and 15m bgl (-4.7 to -11.9m AOD). Again sub-artesian groundwater conditions were noted in several locations where groundwater was encountered, with borehole water level rises of up to 8.3m.

4.6.9 The Grimsby and Ancholme Catchment Flood Management Plan[24] (CFMP) states that '*land from Barrow upon Humber to Cleethorpes, including Grimsby and the Humber trade zone, is susceptible to flood risk if groundwater levels are high in the underlying rock*'.

4.6.10 The NLC SFRA notes that groundwater levels can rise following heavy rain leading to ponding if the water cannot get away, as occurred in July 2007. However, there are no historical records that suggest the Site was affected by this flood event.

4.6.11 Information in the NLC PFRA notes that unless an area identified as 'susceptible to groundwater flooding' is also identified as 'at risk from surface water flooding', it is unlikely that this location would actually experience groundwater flooding to any appreciable depth and therefore it is also unlikely that the consequences of such flooding would be significant. Based on the mapping showing susceptibility to groundwater flooding the Site is located in an area with an equal or greater than 25% but less than 50% susceptibility to groundwater flood emergence.

4.6.12 The proposed development will not affect the groundwater profile across the local area and flow routes will be maintained. If, during the construction phase, groundwater is encountered the appropriate mitigation measures will be temporarily employed (dewatering/ pumping etc.) to prevent the risk of flooding along the pipeline route.

4.6.13 Based on the above data the risk from groundwater flooding is considered to be low.

4.7 Flooding from Drainage Infrastructure

4.7.1 Flooding from drains, sewers and surface waters are normally interconnected. Insufficient or reduced drainage capacity within the sewer network can result in drainage capacity being exceeded causing extensive surface water flooding. Likewise increased volumes of surface water can overload sewers and drains, causing the drainage network to backup and surcharge causing surface water flooding.

4.7.2 The existing access road located within the red line boundary, which will be used as a permanent access road to the Proposed Development and the adjacent car parks (outside the red line boundary) comprise areas of hardstanding that are positively drained. Surface water from these areas is discharged to and stored inthe local land drain located directly adjacent to the northern Site boundary.

4.7.3 The PFRA details recorded local flood events as defined by NLC and Anglian Water. The Anglian Water DG5 database shows combinations of internal and external flooding to properties in the NLC area (no dates are given) but the database indicates that the area in proximity to the Proposed Development has not been flooded.

4.7.4 On the basis of the above, the Site is considered to be at low risk of flooding from drainage infrastructure.

[22] Soil Mechanics (2006) Interpretive Report on Ground Investigation for Total Oil Limited (ref. A6032), April 2006
[23] Highways Agency (2010) Geotechnical Data Management System Report (No 25153), A160 Improvements Ground Investigation Report, August 2010
[24] Environment Agency (2009) *Grimsby and Ancholme Catchment Flood Management Plan*

5. Climate Change

5.1 Context

5.1.1 The NPPF requires site specific FRAs accompanying planning applications to assess the risk of all sources of flooding to and from the development and to demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

5.1.2 The EA published updated climate change guidance in February 2016[25]. The guidance indicates that climate change is likely to increase river flows, sea levels, rainfall intensity, wave height and wind speed.

5.2 Sea Level Allowance

5.2.1 There is a single regional allowance for each epoch or time frame for sea level rise as shown in Table 5-1.

Table 5-1. Sea Level Allowance

Area of England	1990 to 2025	2026 to 2055	2056 to 2085	2086 to 2115
North West, North East	2.5 (87.5 mm)	7 (210 mm)	10 (300 mm)	13 (390 mm)

5.3 Offshore Wind Speed and Extreme Wave Height Allowance

5.3.1 Wave heights may change because of increased water depths resulting from climate change. The frequency, duration and severity of storms could also change. Table 5-2 shows the single allowance for each epoch for offshore wind speed and wave height. A 10% sensitivity should be applied to the allowance to understand the range of impact.

Table 5-2. Caption Offshore Wind Speed and Extreme Wave Height Allowance

Applies around all the English coast	1990 to 2050	2051 to 2115
Offshore wind speed allowance	+5%	+10%
Offshore wind speed sensitivity test	+10%	+10%
Extreme wave height allowance	+5%	+10%
Extreme wave height sensitivity test	+10%	+10%

[25] Environment Agency (2016). Flood Risk Assessment: Climate Change Allowances. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

5.4 Peak River Flow Allowances by River Basin District

5.4.1 The peak river flow allowances show the anticipated changes to peak flow by river basin district. The range of climate change allowances is based on percentiles. A percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level. The 50th percentile is the point at which half of the possible scenarios for peak flows fall below it and half fall above it:

- The central allowance is based on the 50th percentile;
- The higher central is based on the 70th percentile; and
- The upper end is based on the 90th percentile.

5.4.2 The EA Climate Change Guidance states "*If the central allowance is 30%, scientific evidence suggests that it is just as likely that the increase in peak river flow will be more than 30% as less than 30%*".

5.4.3 At the higher central allowance, 70% of the possible scenarios fall below this value. So, if the higher allowance is 40%, then current scientific evidence suggests that there is a 70% chance that peak flows will increase by less than this value, but there remains a 30% chance that peak flows will increase by more.

5.4.4 The Proposed Development lies within the Humber River Basin District. Table 5-3 shows the climate change peak river flow allowances for the Anglian River Basin District.

Table 5-3. Peak river flow allowances based on flood risk vulnerability classification and flood zone

Allowance category	Total potential change anticipated for '2020s' (2015 to 2039)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Upper end	20%	30%	50%
Higher central	15%	20%	30%
Central	10%	15%	20%

Peak River Flow Allowances for Different Assessments

5.4.5 For FRAs, the "Flood Risk Vulnerability Classification" must be used to categorise the development in order to determine its compatibility with the flood zone. The Proposed Development at the Site is classified as 'Essential Infrastructure'.

5.4.6 The vulnerability classification and flood zone designation should be used to decide which peak river flow allowances (allowance category) to use based on the lifetime of the development. Table 5-4 shows the peak river flow for the different flood risk vulnerability classifications for each zone.

Table 5-4. Peak river flow allowances based on flood risk vulnerability classification and flood zone

Flood Zone 2
• Essential infrastructure – use the higher central and upper end to assess a range of allowances • Highly vulnerable – use the higher central and upper end to assess a range of allowances • More vulnerable – use the central and higher central to assess a range of allowances • Less vulnerable – use the central allowance • Water-compatible – use none of the allowances
Flood Zone 3a
• Essential infrastructure – use the upper end allowance • Highly vulnerable – development should not be permitted • More vulnerable – use the higher central and upper end to assess a range of allowances • Less vulnerable – use the central and higher central to assess a range of allowances • Water-compatible – use the central allowance
Flood Zone 3b
• Essential infrastructure – use the upper end allowance • Highly vulnerable – development should not be permitted • More vulnerable – development should not be permitted • Less vulnerable – development should not be permitted • Water-compatible – use the central allowance
If (exceptionally) development is considered appropriate when not in accordance with flood zone vulnerability categories, then it would be appropriate to use the upper end allowance.

Peak River Flow Allowances for the Proposed Development

5.4.7 As outlined in Section 4.2, the lifetime of the development is assumed to be 65 years, however; for the purpose of this assessment it has been assumed that the lifetime of the development is 100 years, providing a worst case scenario. . The allowance to be applied for climate change in peak river flow over the lifetime of the development is as shown in Table 5-5.

Table 5-5. Peak river flow allowances for the Proposed Development

Immingham Energy Park A	
River Basin District	Humber
Flood Zone	3a
Flood risk vulnerability classification	Essential Infrastructure
Lifetime of development	100 years
Climate change allowance to be assessed	Upper end allowance 50%

5.5 Peak Rainfall Intensity Allowance

5.5.1 Increased rainfall affects river levels and land and urban drainage systems. Table 5-6 shows anticipated changes in extreme rainfall intensity in small and urban catchments. For FRAs and SFRAs, both the central and upper end allowances need to be assessed to understand the range of impact.

5.5.2 The lifetime of the development (100 years) determines that the highest epoch needs to be evaluated. As shown in Table 5-6, an increase in peak rainfall allowance of between 20 – 40% needs to be assessed.

Table 5-6. Peak Rainfall Allowance in small and urban catchments

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2069	Total potential change anticipated for 2070 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

5.6 Impacts of Climate Change

Tidal Flooding

5.6.1 The 2011 SFRA states "'*The incidence of coastal flooding is also likely to increase, partly because the increased storminess will increase the frequency of waves and surges but also because sea levels are expected to rise. Government guidance currently suggests that sea levels off the East Coast could rise by up to 1m over the next 100 years'*.

5.6.2 The impact of climate change on peak still tidal water levels is presented in Table 4-1 and shows climate change is projected to increase water levels in the Humber Estuary. Based on the regional allowances, as set-out in Table 5-1 above, the total allowance for the impact of climate change on still tidal water levels at North Killingholme has been calculated as:

- 0.51 m for a climate change horizon of 2083; and
- 0.93 m for a climate change horizon of 2115.

5.6.3 The predicted increases in water levels were calculated using an incremental rate of sea level rise from the date the Northern Area Tidal Model Analysis water levels published in 2014.

5.6.4 The allowance for climate change has been added to the 0.5% AEP event maximum still water level value, 5.42 m AOD, to consider the maximum increase in still water level over the lifetime of the development and beyond. Therefore the maximum still water level with climate change for the 2081 scenario is 5.93 m AOD and the maximum still water level for the 2115 scenario is 6.35 m AOD.

5.6.5 The height of the flood defences (approximately 6.44m AOD in proximity to the Site) are above the estimated 0.5% (1 in 200) AEP 2115 still tidal water levels but these levels do not include an allowance for wave height. When wave height is taken into account, the defences would not be sufficient to defend the land behind them from these higher return period events in the future. On this basis, the flood risk at the Site due to the overtopping of the tidal flood defences will increase with climate change.

5.6.6 The residual flood risk to the Proposed Development due to the breaching of the tidal flood defences is not likely to increase due to climate change. However, if a breach event did occur climate change would result in an increase in the depth of floodwater across the Site (refer to Section 4.1).

5.6.7 Section 4.1 outlines how climate change will increase the risk of flooding at the Site due to overtopping of the flood defences. In the HFRMS, outlining the flood risk management plan for the Humber Estuary for the next 25 years and beyond, the development area is located in Flood Area 24 Immingham to Grimsby. The proposed management approach in this area is to continue to protect the area and improve the defences that protect existing development.

5.6.8 The Grimsby and Ancholme Catchment Flood Management Plan[26] (CFMP) indicates that the Site area falls within Sub-Area 4 Immingham, Grimsby and Buck Beck where the preferred policy option for future flood risk management is Policy Option 4: Areas of low, moderate or high flood risk where the Environment Agency are already managing the flood risk effectively but where the Environment Agency may need to take further action to keep pace with climate change.

5.6.9 It is considered that the existing defences will be maintained to an appropriate standard to keep providing protection to the area and therefore the risk of flooding to the Site will not increase above the existing scenario.

Fluvial Flooding

5.6.10 There is no data available for the watercourses in close proximity to the Site that demonstrate the potential effects of climate change, however, Table 5-3 indicates fluvial peak flows may increase by up to 50%.

5.6.11 The Site is classed as at low risk of flooding from fluvial sources. As the watercourses in close proximity to the Proposed Development are part of a wider managed drainage system, by NELIDB, the current capacity for a 0.1% AEP event it is unlikely that the changes to the magnitude of fluvial flooding will present a significant hazard to the Proposed Development.

Surface Water (Overland Flow)

5.6.12 Increase in rainfall intensity and magnitude of storm events are expected to increase. As a result of the Proposed Development the impermeable area of the Site is expected to increase significantly. As a result of increasing rainfall intensities and an increase in impermeable surface area, surface water runoff rates at the Site will also be expected to increase.

5.6.13 Climate change must be taken into account when considering surface water runoff generated by development sites. This is usually represented by increasing the peak rainfall intensities (Table 5-6). An increase in rainfall intensity will result in an increase in runoff rates and volumes from the development, exacerbated by increased amounts of impermeable surface associated within the proposed development.

5.6.14 Additional surface water drainage will be required to ensure that the increase in impermeable surface area compared to the existing site does not increase the risk of flooding from surface water both on the Site and to the surrounding area. Therefore design of the drainage infrastructure will need to take this into account in accordance with the NPPF and NLC policies.

5.6.15 The outline drainage strategy detailing how surface water runoff will be managed on-site post development is provided in Section 6 and mitigation measures are outlined in Section 8.

Groundwater Flooding

5.6.16 The predicted increase in the wetness of winters and the intensity of storm events could impact groundwater level fluctuations across the Site, and possibly increase the level of the water table. As the likelihood of groundwater emergence under the climate change scenario is likely to increase, the potential for groundwater flooding to impact infrastructure is also likely to increase.

[26] EA (2009) *Grimsby and Ancholme Catchment Flood Management Plan, Summary Report.*

5.6.17 The Site is currently considered to be at low risk of groundwater flooding. The Proposed Development is planned to increase the impermeable area, hence there is expected to be a limited chance of groundwater emergence that would cause flooding to the Proposed Development. Therefore the potential for groundwater flooding, under climate change, remains a low risk.

Flooding from Drainage Infrastructure

5.6.18 It is difficult to predict precisely the impact of climate change on flooding from drainage infrastructure. However, with the projected increases in rainfall intensity, a greater amount of surface water runoff may enter the drain and sewer systems during storm events.

5.6.19 In order to account for this increase, new drainage and sewer systems should be designed to accommodate flows under climate change scenarios, with SuDS methods used where possible. As such the risk of flooding from drains and sewers is expected to remain low under climate change scenarios.

6. Surface Water Management

6.1 Policy Requirements

6.1.1 There are a number of national and local policy requirements which need consideration in the design of any drainage strategy to ensure that the Proposed Development will be sustainable and can, if possible, contribute to a decreased flood risk elsewhere.

National Planning Policy Framework

6.1.2 NPPF requires that new development should not increase flood risk both on the Site and in the area surrounding it. This effectively means that surface water runoff should not exceed the peak volumes already generated on the site and that betterment should be provided where possible.

North Lincolnshire Council SuDS Guidance

6.1.3 North Lincolnshire Council (NLC) has created a SuDS guidance document[27] which stipulates the expectations of NLC for designers and developers in regards to the use of SuDS. This guidance document has been produced based on best practice guidelines from the Ciria SuDS manual.

6.1.4 The document details the requirements for SuDS, appropriate design processes and discusses various types of SuDS. Specific NLC requirements for drainage projects are also detailed with a checklist given for the required steps to be taken for the adoption of SuDS.

Building Standards Regulations 2000 Part H

6.1.4 The Building Standards Regulations 2000 Part H[28] requires that surface water runoff be preferentially discharged first to soakaways, then to surface watercourses and finally to sewers.

6.2 Surface Water Drainage

Existing Surface Water Runoff

6.2.1 The Site currently comprises partially undeveloped greenfield land (Power Plant Site) with existing areas of permeable hardstanding (Construction Laydown Area) which are to be retained and an access road leading to areas of car parking and the Lindsey Oil Refinery. The permeable hardstanding areas and access road fall within the Site red line boundary and are to be retained post-development. The total Site covers an area of 2.1 ha, with the greenfield area to be developed (Power Plant Site) covering an area of approximately 1 ha.

6.2.2 The Site is broadly flat with some undulations and a general slope from west to east. Standing water has been observed on site and this is believed to be due to minor undrained low points caused by the surface undulations.

6.2.3 The existing access road to the Site (and associated car parks located outside the Site red line boundary) are currently drained via gravity by an existing surface water drainage

[27] North Lincolnshire Council (2017) SuDS and Flood Risk Guidance Document Rev I April 2017
[28] Office of the Deputy Prime Minister (2002) The Building Regulations 2000, Drainage and Water Disposal (Approved Document H)

network that discharges to the land drain allocated adjacent to the northern Site boundary and this system/connection will be maintained.

6.2.4 The permeable hardstanding areas drain via infiltration with no known existing formal drainage infrastructure. It is believed that this drainage arrangement is currently functional and as such there is no need to add additional drainage infrastructure for these areas.

6.2.5 There is no known buried drainage infrastructure within the greenfield area, although there are existing surface channels. These act as drainage channels for the surrounding industrial developments. It is not currently known how much available capacity there is in these channels.

6.2.6 Both NLC and NELIDB have stated that surface water runoff generated on the Site should be restricted to the existing greenfield runoff rate (See Annex 3 and Annex 4). The greenfield runoff rate for the Power Plant Site is as shown in Table 6-1 based on the IoH124 runoff calculation method from the HR Wallingford online calculator.

Table 6-1: Greenfield Runoff Rates

Return Period	Runoff Rate (l/s)
Qbar*	4.16
1 in 1 year	3.62
1 in 30 years	10.19
1 in 100 years	14.8

* QBAR: the mean annual flood flow from a rural catchment in l/s (approximately 2.3 year return period).

Proposed Surface Water Management

6.2.7 The Proposed Development will increase the total area of impermeable surfaces on the Site. It has been assumed that post-development the Power Plant Site will be 100% impermeable. Following the development works the surface water runoff rate will increase and this increase in runoff will need to be attenuated prior to discharge to meet the required greenfield runoff rate.

6.2.8 The drainage system which is to be installed as part of the Proposed Development will ensure that flooding on site is mitigated to an acceptable level during the design event and any flooding is directed to non-critical areas. It is also required to prevent surface water flows originating within the Site from causing or exacerbating flooding to surrounding areas.

Sustainable Drainage Systems

6.2.9 In line with EA advisory recommendations, CIRIA SuDS manual best practice guidelines and local planning policy sustainable drainage systems should be used as a preferential option. A summary of sustainable drainage systems is given in Table 6-2, this is not an exhaustive list and other options will also be considered. The SuDS management train will be taken into account during detailed drainage design with an aim of capturing surface water as close to the source as possible.

Table 6-2: Sustainable Drainage Systems

Technique	Description	Restrictions of use
Storage Pond	Storage ponds can be used to attenuate overland runoff and slowly release it into a watercourse or sewer. These systems do not offer water quality benefits unless additional water quality measures are added such as filters or sedimentation volume.	Storage ponds may require substantial earthworks and thus incur high costs during the construction phase. Additionally, large ponds which store water above ground level may be classified as reservoirs which are subject to a range of legislative requirements. Land take requirements for storage ponds are likely to be substantial.
Permeable Paving	Permeable paving allows rainwater to infiltrate through a hard-standing surface to underlying soil or drainage infrastructure. From which it may infiltrate or be directed to a local watercourse or sewer.	Permeable pavements may be restricted by the presence of basements or groundwater levels as well as high imposed loads.
Rainwater Harvesting	Rainwater from roofs and hard surfaces can be stored and used for non-potable purposes. This can provide a reduction of surface water runoff through control at source as well as reducing the demand on the water supply system. In the case of the proposed development harvested rainwater could be used to supplement cooling water supplies.	Rainwater harvesting is dependent on a consistent supply of rainwater which cannot be ensured. As such it will be used as a supplement to conventional water supply only.
Below Ground Attenuation	Below ground storage tanks will attenuate surface water flows in much the same way as surface water ponds, although with reduced land take. Storage tanks will typically require a hydro brake to ensure steady and controlled discharge.	Upfront costs are likely to be high for buried storage tanks. The maintenance regime may be onerous or involve heightened health and safety risks due to enclosed spaces.

6.3 Surface Water Attenuation

6.3.1 Surface water attenuation systems will be required to limit the discharge to the existing greenfield runoff rate. This may take the form of one or more of the sustainable drainage options discussed above in Table 6-2 or alternative solutions may be preferred. Detailing the composition of the attenuation system is outside of the scope of this report, however an estimate of the required storage volume has been made.

6.3.2 Storage volume calculations have been undertaken for the critical storm duration of the design return period storm event based on an allowable discharge of 4.2l/s, equal to the existing Qbar greenfield runoff rate. The storage volume estimate has been made using the quick storage estimate tool within the Microdrainage 2016.1 Source Control Program; results are shown in Table 6-3. FSR rainfall estimated hyetographs were used to undertake this analysis.

Table 6-3: Required Attenuation Volume

Rainfall Event	Impermeable Area (ha)	Min Storage (m³)	Max Storage (m³)
1% AEP + 40% Climate Change	1	623	842

6.3.3 Detailed attenuation calculations will be undertaken as part of the drainage design as the development project is progressed and attenuation solutions will be specified at this stage.

6.4 Infiltration

6.4.1 Based on available geological information it is believed to be unlikely that infiltration based drainage solutions will be viable. An assessment to confirm this will be undertaken during detailed drainage design if an infiltration based drainage system is progressed.

6.5 Discharge

6.5.1 As discharge via infiltration is likely to be unviable it is proposed that all drainage be discharged to the land drain to the south of the Power Plant Site due to favourable site topography and development layout. This will be subject to confirmation that sufficient capacity is available and receiving discharge consent from the NELIDB.

6.5.2 Should the southern drainage ditch be unviable as a discharge point then discharge to other nearby watercourses will be considered. If necessary the Site may be split into multiple catchments which can outfall to different drainage ditches. Discharge consent must be attained for each watercourse that is to be used as an outfall location.

6.5.3 There are no known local sewers which could be used as discharge points. Discharge to sewers will only be considered if all local watercourses are unviable as outfalls.

6.6 Pollution Prevention and Control

6.6.1 As the Proposed Development will be an active industrial site, pollution controls will be required to prevent accidental discharge of pollutants such as hydrocarbons with surface water. Pollution prevention must be considered throughout the design phases and will be undertaken as detailed below:

- The design of oil interceptors shall be undertaken based on manufacturer supplied information. Based on the Site use and proposed receiving water body, these will be Class 1 Full Retention systems. Provision shall be made where appropriate to prevent silt and debris from entering the drainage system in accordance with Building Regulations 2010;
- Foul flows and effluent arising from the Proposed Development operation will be kept separate from the surface drainage network. Measures will be taken to ensure accidental flows such as fuel/ chemical spillages and fire control do not enter the surface water network. Such measures may include isolation points such as penstocks, or source control measures such as booms or absorbent systems;
- Areas which are expected to be sources of frequent pollutant spills will be isolated through the use of bunds to an appropriate level or other physical barriers to prevent spills from impacting the rest of the Site;
- During construction, the Contractor will adhere to EA pollution prevention guidelines, for example by locating stockpiles and storage areas in Flood Zone 1 wherever possible to reduce the risk of pollution in the event of flooding on Site; and

- The use of sediment removal techniques, particularly SuDS with passive sediment removal benefits will be utilised as part of the drainage design.

7. Flood Risk Management Measures

7.1 Mitigation against Tidal flooding

7.1.1 Although the Site is located partially within Flood Zone 3, based on the information provided by the EA. it is afforded protection by the presence of flood defences along the Humber Estuary up to and including the 0.5% AEP with climate change flood event.

7.1.2 As the Site is located in an area benefitting from tidal flood defences ground rising to remove the Proposed Development from Flood Zone 3 and associated compensatory is not required.

7.1.3 Over the lifetime of the Proposed Development the Site is at residual risk of flooding from overtopping of the tidal flood defences. Given the proposed management approaches for the area (continue to protect the area and improve the defences that protect existing development) the likelihood of overtopping is considered to be low.

7.1.4 The Site is at residual risk of flooding should a breach in the tidal flood defences occur. Although the risk to the Proposed Development in the event of a breach is high, the probability of a breach occurring is considered to be low.

7.1.5 Environmental management and emergency planning will be regulated by the Environment Agency through the Environmental Permit that will be required for both the construction phase and the operation of the plant.

7.1.6 Mitigation measures as follows will be considered to reduce the probability of flooding during extreme events and residual risks should also be considered. These measures will help to reduce the impact of a flood event should it occur and ensure the safety of the workforce.

Construction Environmental Management Plan

7.1.7 A Construction Environmental Management Plan (CEMP) would be produced to manage the risks to the environment during the project construction phase. A draft CEMP is included with the ES accompanying the Planning Application. This incorporates measures aimed at preventing an increase in flood risk during construction works, including the following;

- Topsoil and other construction materials would be stored outside of the 1 in 100 year (1% AEP) floodplain extent (Flood Zone 3);
- Contractor(s) will be required to place arisings and temporary stockpiles away from watercourses and drainage systems, and surface water will be directed away from stockpiles to prevent erosion;
- Adequate containment of storage areas, to ensure that material does not wash away and cause pollution, blockage and damage to infrastructure;
- The construction laydown area site office and supervisor would be notified of any potential high water levels by use of the Flood line Warnings Direct service;

- The Contractor would be required to produce a Method Statement outlining appropriate temporary dewatering/ pumping measures to be employed to prevent groundwater flooding of the Site, if required;
- All existing utilities will be identified and marked prior to works commencing;
- Signs will be used to warn of the presence of utility infrastructure; and
- Any damage to the drainage network will be immediately repaired.

Flood Resistant and Resilient Design

7.1.8 Flood resistant and resilient design can reduce the damage that occurs to development from flooding and reduce recovery time.

7.1.9 Where technically feasible the following methods of flood resistant and resilient construction will be included:

- Pipelines and storage tanks used for the development will be designed to withstand the water pressures associated with high return period event flooding. Tanks will be bunded to a level as high as reasonably practical taking into account operational requirements. The tanks will be securely tethered in such a way to ensure the infrastructure remains secure during a flood event;
- Pollution control will be considered to prevent/ reduce the chance of any fuel stored on site leaking. This will also assist with reducing the recovery time and costs at the site following flooding, by minimising the risk of possible contamination of the fuel stores by water ingress;
- If technically feasible, critical equipment will be raised above the expected 0.5% climate change scenario flood depth of 5.93 mAOD (for the year 2083); and
- Flood sensitive equipment will be raised a minimum of 600 mm above ground/ floor level.

Emergency Evacuation and Planning

7.1.10 The Northern Area Tidal Breach Mapping Study outputs provided by the Environment Agency (Annex 2), suggest that the Site is at risk of being flooded to significant depths in the event of overtopping (2115 0.5% and 0.1% AEP events) or a breach in the tidal flood defences coinciding with the 0.5% and 0.1% AEP events for both 2006 and 2115. Although the risk to the Site in the event of a breach is high, the probability of a breach occurring is considered to be low.

7.1.11 Developments in flood risk areas must provide safe, dry access and egress to enable evacuation of people, routes for emergency services and flood defence authorities to carry-out the necessary duties during a flood event.

7.1.12 As the Site is located within an area of high flood risk a Flood Warning and Evacuation Plan (FWEP) will be prepared for both the construction and operational phases of the development. A FWEP will inform and assist VPI Immingham on the protocols and procedures required to reduce the risk to site occupants and infrastructure from flooding and detail the emergency evacuation procedures required in the event of a breach of the Humber flood defences.

7.1.13 Given the location of the Proposed Development it is considered that the most appropriate course of action for the Site in the event of a breach in local flood defences would be to evacuate the Site rather than providing safe refuge within the Site.

7.1.14 Site owners will subscribe to the EA's Flood Warning Direct (FWD) Service for the following Flood Alerts Areas:

- Tidal flooding of low-lying areas from New Holland to the Port of Immingham;
- Tidal Flooding of Areas near the South Humber Bank; and
- Far Extent of Tidal Flooding on the South Humber Bank.

7.1.15 The EA aim to issue fluvial Flood Warnings at least 2 hours prior to the onset of flooding mainly based upon actual river level rise. Tidal flood warnings are issued based on forecast information, and therefore the lead time provided is longer. The EA aim to issue tidal Flood Warnings a minimum of 6 hours in advance, but depending on confidence in the forecast they could be issued 24 or even 36 hours in advance.

7.1.16 Tidal flood warnings are triggered by a combination of forecast high water (astronomical tide level plus any additional surge), forecast wind speed, and forecast wind direction. Due to the flood defences in place, it is quite rare that Flood Warnings are issued for tides. It is more common to issue the lower-level Flood Alerts, which are issued when the EA expect wave splash and wind-blown spray to cause localised pooling of water on land but no actual flooding of properties.

7.1.17 On receipt of a 'Flood Alert' warning from the FWD, the occupants at the Site wll be made aware of the possibility of flooding and prepare for possible evacuation. The scaling down of activities at the Site will also be considered. On receipt of a 'Severe Flood Warning', the Site will be evacuated.

7.1.18 Information regarding 'What to do in the event of a flood?' will be included in the Site health and safety plan and as a controlled site; all personnel entering the Site will be inducted and be aware of all health and safety procedures. In addition site notices will include methods of evacuation and notification of dry refuge areas.

7.1.19 As part of the emergency planning for the Site in the event of a breach or overtopping of the defences, pollution control will be considered to prevent/ reduce the chance of liquid bulk stored on site leaking. This will also assist with reducing the recovery time and costs at the Site following flooding and for liquid bulk products by minimising the risk of contamination of the fuel stores by water ingress.

7.2 Watercourses and Crossings

7.2.1 The NELIDB have stated that that their required Byelaw distance is approximately 7m from the bank of the watercourse channel and formal consent is required for any development within this byelaw distance.

7.2.2 Any proposed works to the local land drainage ditches will require Land Drainage Consent and may also require a Water Framework Directive Assessment.

7.2.3 Construction works undertaken adjacent to local watercourses would comply with relevant guidance during construction, including the requirements of the Environmental Permit, EA Pollution Guidance of Prevention of Pollution (GPP) or Prevention Guidance (PPG), as required.

8. Off-Site Impacts and Residual Risk

8.1 Off-Site Impacts

8.1.1 The outline surface water management plan will provide storage for up to and including the 1% AEP storm event with a potential 40% allowance for climate change. This will ensure that the scheme will not increase flood risk elsewhere and will provide betterment over the existing situation. The proposed surface water drainage strategy will therefore meet with the requirements of the NPPF.

8.1.2 It is considered that the Proposed Development will not result in any offsite impacts.

8.2 Residual Risk

8.2.1 There is a residual risk of flooding from overtopping and/ or a breach in the tidal flood defences. Despite this, the likelihood of this happening is low due to regular inspection of the defences, maintenance by the EA and proposed management for climate change. Mitigation measures outlined in Section 7, including a FWEP, will be put in place to manage the risks if failure of the defences should occur.

8.2.2 Information from the SFRA suggests that the surrounding NELIDB watercourse catchments have sufficient capacity within the drainage channels to contain the 1% AEP flood event.

8.2.3 There is also a residual risk to the Proposed Development from the surface water management drainage system; this may be due to exceedance of the design event and/or failure of the drainage system. The proposed drainage strategy provides storage for up to and including the 1% AEP storm event with a 40% allowance for climate change however, if a storm event was to occur that exceeds this capacity (e.g. 0.66% and 0.5% AEP return period rainfall events) flooding from the drainage system would occur.

8.2.4 Regular maintenance of the drainage system will be undertaken to ensure that the system continues to perform as designed. An appropriate 'body' (Site owner or IDB/LLFA) to adopt the SUDS features once operational will need to be identified. It will be the responsibility of the 'SUDS adoption body' to make sure that the SUDS features are regularly inspected and maintained to ensure their design standard is not compromised over the lifetime of the development.

8.2.5 To manage the risk from exceedance flows, the drainage design will follow such guidance as CIRIA C635[29], to provide flow paths such that any overland flow is directed away from impacting the proposed development.

[29] Balmforth D, Digman C, Kellagher R, Butler D (2006), Designing for Exceedance in Urban drainage – Good practice, (CIRIA 635)

9. Conclusions

9.1.1 The following conclusions can be made regarding flood risk to the Site and to off-site areas as a result of the proposed works:

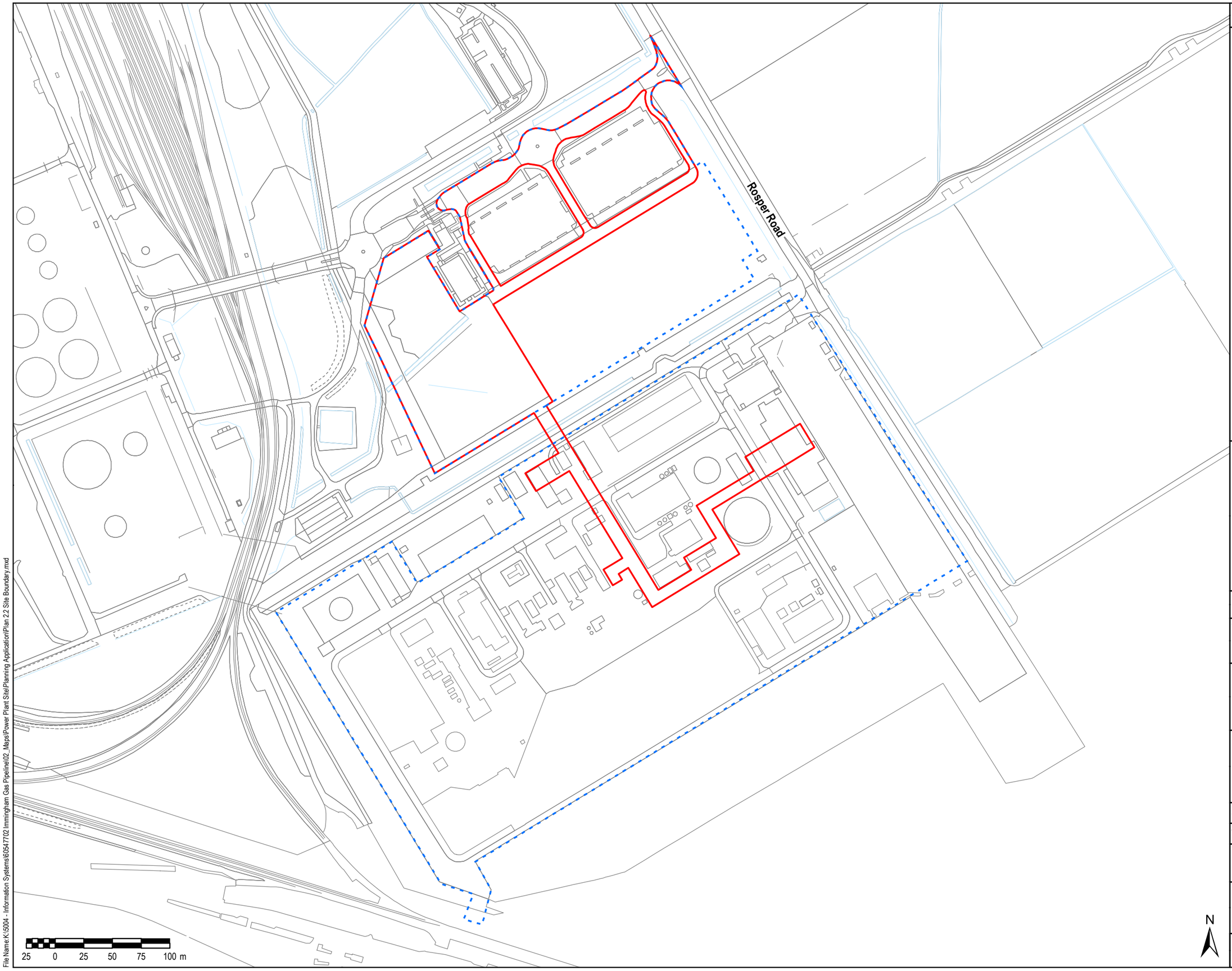
- The EA Flood Map for Planning shows the southern area (Power Plant Site) and north eastern area (Permanent Access road and part of the Construction laydown area – both existing development currently on site) of the Site is located in Flood Zone 3a (high risk) and Flood Zone 2 (medium risk); and the area to the north and north west of the Site (construction laydown area) is located in Flood Zone 1 (low risk);
- The predominate flood risk to the Site is tidal, as the Site is located in close proximity to the Humber Estuary;
- The Site is located behind tidal flood defences along the south bank of the Humber Estuary. Tidal flood defences protecting the Proposed Development comprise earth embankments topped with concrete wave return walls and have a maximum crest height of 6.44 m AOD providing a standard of protection for the 0.5% AEP event (based on the Still Water Level, not taking into account tidal surges or wave height) to the year 2115;
- The SFRA indicates that the principal residual risks in the North Killingholme area would be failure or overtopping of the flood defences;
- The overtopping assessment identified that the Site is currently located in an area that would not flood if overtopping of the flood defences occurred for both the 2006 0.5% AEP and 0.1% AEP events. For both the 2115 0.5% AEP and 0.1% AEP events the Power Plant Site and the eastern area of the access road and existing car parks are located in an 'extreme' hazard area whilst the construction laydown area and the western section of the car parks and access road are located within a 'significant' hazard area;
- The breach assessment identified that the Power Plant Site is located in a 'low hazard' and 'moderate hazard' area for the 2006 0.5% AEP breach event. During the 0.1% AEP event the low and moderate hazard extents increase slightly northwards across the Power Plant Site. An area of 'significant hazard' is located to the south east corner of the Site. For the 2115 breach events the Power Plant Site and the eastern extent of the access road and car parks are located in area of 'significant hazard' with an area of 'extreme hazard' to the south east Power Plant Site boundary for both the 0.5% AEP and 0.1% AEP events;
- The SFRA notes that the probability of a breach or overtopping of the defences occurring is considered to be low;
- The Site is located in the vicinity of a number of watercourses managed by the NELIDB. The IDB and the SFRA indicate that flood risk to the study area from these watercourse drainage catchments is low. The drainage catchment has sufficient capacity within its drainage channels to contain the 1% and 0.1% AEP flood events and therefore the site is considered to be at low risk of fluvial flooding;
- The EAs map showing the risk of flooding from reservoirs in the event of a failure identifies the Site as not being located within an area identified as being at risk. There are no canals in the North Lincolnshire and the Site is not at risk of flooding from the ponds located in the area;
- The risk of flooding from groundwater and sewer sources is considered to be low;
- The majority of the land surrounding the Site (to the east) is undeveloped and greenfield in nature with a low propensity to generate overland flow. Further to this, the IDB land drains serving the area reportedly have the capacity to ensure that excess

surface water is stored and removed from the area and discharged into the Humber Estuary, therefore the risk to the Site from pluvial flooding is considered to be low;

- Flood resilience and resistance measures are for managing the residual flood risk to the proposed works will be adopted. For example, pipeline and storage tanks used for the development will be designed to withstand the water pressures associated with high return period event flooding;
- The development will subscribe to the EAs FWD Service and a FWEP will be created for the development area for both the construction and operational phases. The plan will detail the procedures for site occupants to undertake in the event that a flood warning is issued, including the details of appropriate evacuation routes from the Site;
- In order to comply with the requirements of the local, regional and national planning policy, the surface water runoff from the Site will be restricted to approximately 4.2 l/s (Qbar greenfield runoff rate);
- To meet this requirement the Site requires an attenuation volume of between approximately 623 m^3 and 842 m^3. This volume will accommodate surface water runoff for a 1% AEP storm event with a 40% allowance for climate change;
- It is likely, due to the use of the Site and ground/groundwater conditions that surface water attenuation will be provided by underground tanks and/or oversized pipes. Additional SuDS measures suitable for the facility will be assessed at the detailed drainage design stage;
- The Proposed Development will not increase surface water runoff and therefore meets with the requirements of the NPPF; and
- AECOM does not consider that there are any off site impacts as a result of the Proposed Development in relation to flood risk.

9.1.2 This FRA provides evidence to demonstrate that the proposed development will remain safe during its lifetime and will not increase flood risk elsewhere. It is therefore considered to be acceptable in flood risk terms.

Annex 1 – Figures



File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Planning Application\Plan 2.2 Site Boundary.mxd

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Planning Application Boundary
- Land Under Control of the Applicant

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A'

Drawing Title
PLANNING APPLICATION BOUNDARY PLAN

Drawn	Checked	Approved	Date
TD	DH	MS	27/04/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:3,000

AECOM
Midpoint
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Planning Application Boundary
- Gas and Electricity Connections
- Permanent Site Access
- Proposed Power Plant Site
- Temporary Construction Laydown Area and Temporary Construction Access

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A'

Drawing Title
PARTS OF THE SITE PLAN

Drawn	Checked	Approved	Date
TD	DH	MS	25/04/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:2,000

AECOM
Midpoint
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Rosper Road

Electrical Connection

Gas Connection

Control Room

DCS Connection

N

20 0 20 40 60 80 100 m

File Name:I:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Planning Application\Plan 3.1 Parts of the Site.mxd

Annex 2 – Environment Agency Consultation

Joanne Somerton
joanne.somerton@aecom.com

Our ref: CCN/2018/73227

Date: 12 February 2018

Dear Jo

Provision of Flood Risk Information for a site in South Killingholme, Lincolnshire.

Thank you for your request to use our flood risk information in the development of the Flood Risk Assessment (FRA) for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains there are many kilometres of raised flood defences. To meet the requirements of the National Planning Policy Framework, these defences are removed in their entirety to produce the Flood Map for Planning (Rivers and Sea). The map therefore shows the full extent of areas that would be at risk of flooding if no defences existed and water could spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of flooding particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

Historic Flood Extent Map

A copy of the Historic Flood Extent Map showing the extent of previous recorded flooding in your area is attached. This only covers information we hold and it is possible other flooding may have occurred which other organisations, such as the Local Authority or Internal Drainage Boards, may have records.

Tidal Flood Risk Information

Tidal Defence Information

The tidal defences protecting this site consist of concrete floodwalls which are supplemented by saltmarsh to maintain foreshore levels.

They are in good condition and reduce the risk of flooding to a 0.5% (1 in 200) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Tidal Flood Levels

The attached table shows our current best estimate for extreme tide levels.

Levels for the Humber Estuary have an assessment date of 2014, with others having an assessment date of 2006, which should be used in any consideration of future increases due to climate change.

Modelled Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available. Hazard mapping is also available for fluvial flood risk in Northampton, Thrapston, Lincoln, Brigg, Wainfleet and some isolated rural locations.

The number of locations we have this information for is expected to increase in time.

Hazard Mapping – Breaching

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

- Year 2006 0.5% (1 in 200) chance
- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

Hazard Mapping – Overtopping

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from simulated overtopping of defences for the following scenarios:

- Year 2006 0.5% (1 in 200) chance
- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

Development Planning
If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of our information for Flood Risk Assessments. We recommend that you undertake a formal pre-application enquiry using the form available from the website.

https://www.gov.uk/planning-applications-assessing-flood-risk

https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Climate change will increase flood risk due to overtopping of defences. Please note the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in February 2016. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

Supporting Information
Please see the Standard Notice or licence for details of permitted use. The Standard Notice can be found at the link below.
http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

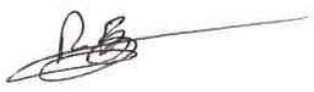
Further information on flood risk can be found on the GOV.UK website at:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

Other Flood Risk Management Authorities
The information provided with this letter relates to flood risk from main river or the sea. Additional information may be available from your Lead Local Flood Authority (ie county council or unitary authority) or, where they exist, the Internal Drainage Board.

Further Contact
I hope we have correctly interpreted your request. If you are not satisfied with our response to your request for information, you can contact us within two calendar months to ask for our decision to be reviewed.

If you have any queries or would like to discuss the content of this letter further please contact Robert Eames using the details below.

Yours sincerely,



Ceres House, Searby Road, Lincoln, LN2 4DT
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

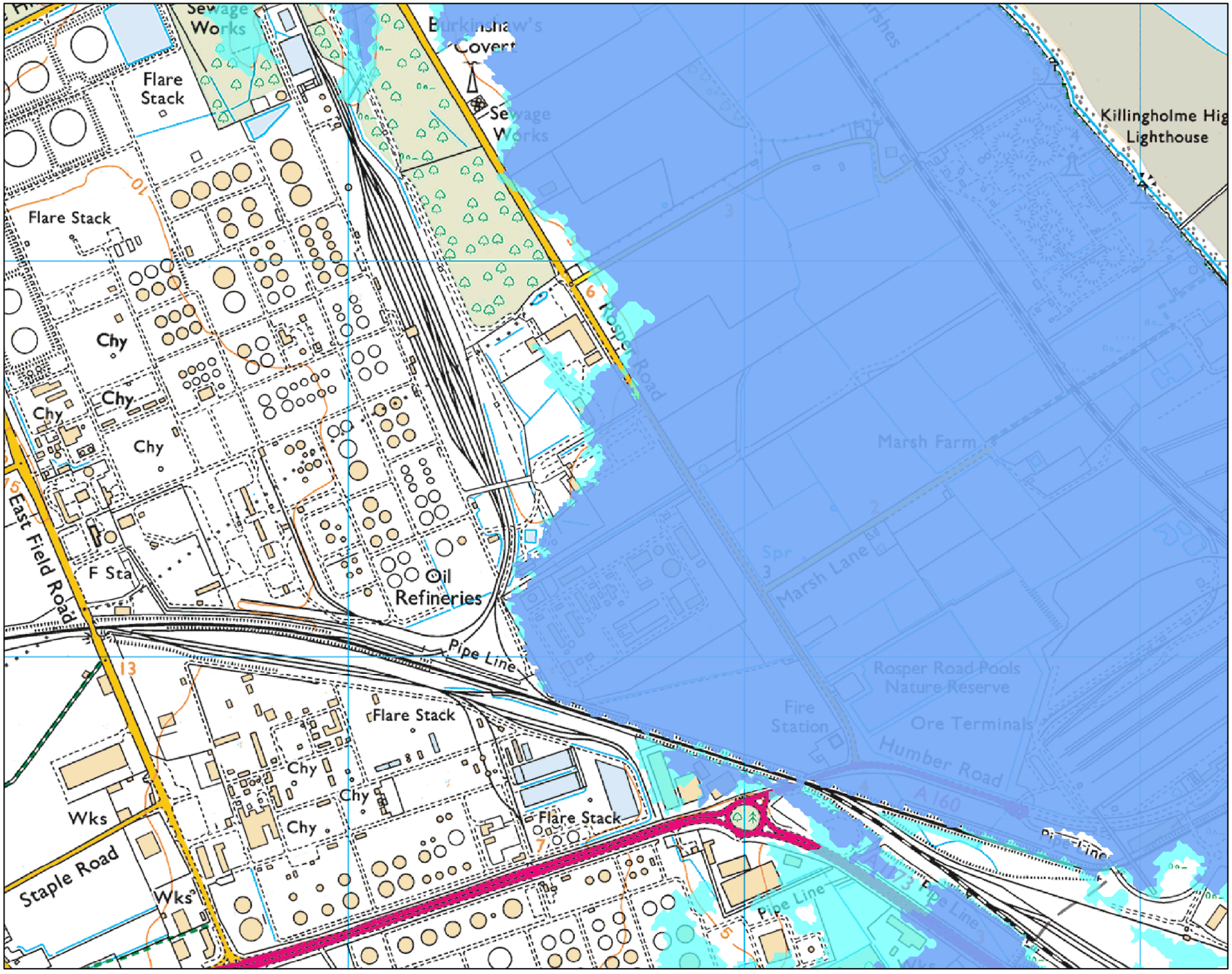
FOR Claire Rose
Partnerships and Strategic Overview Team Leader - South Humber and East Coast

Direct dial 0208 474 9436
Direct e-mail PSO_Coastal@environment-agency.gov.uk

Enc.
Flood Map
Historic Flood Extent Map
Estimated Tide Levels
Tidal Breach Locations Map
Hazard Mapping – Breaching (4 maps)
Hazard Mapping – Overtopping (4 maps)

Awarded to Lincolnshire & Northamptonshire Area

Flood Map centred on TA 16677 17430 - created February 2018 [Ref: CCN-2018-73227]



Environment Agency

Scale 1:10,000

N W E S

- Main River
- Flood Storage Areas
- Area at Risk of Flooding from Rivers or The Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.

- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

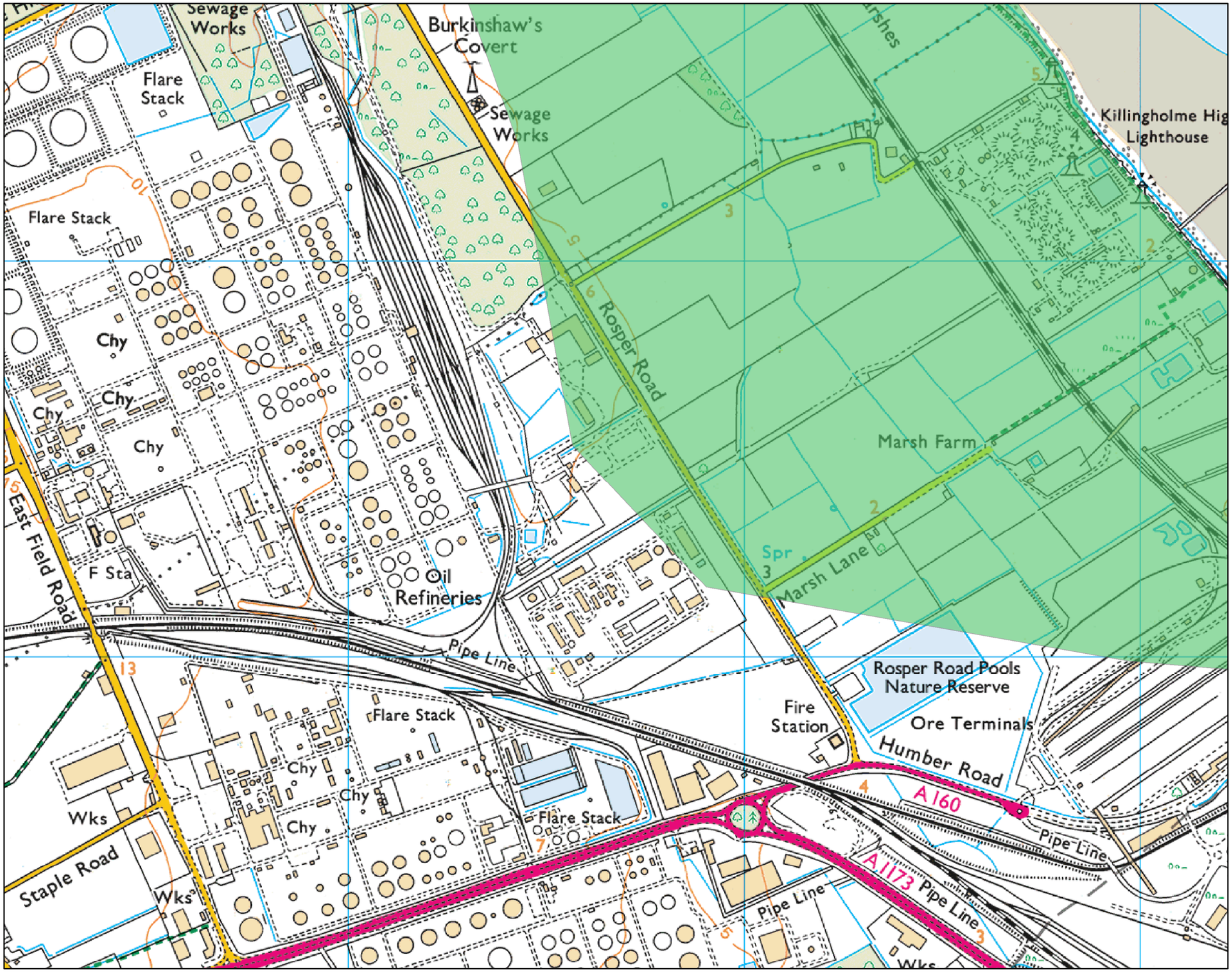
Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Lincoln

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Historic Flood Extent Map centred on TA 16677 17430 - created February 2018 [Ref: CCN-2018-73227]



Environment Agency

Scale 1:10,000

N W E S

Main River

January 1953 along the Lincolnshire Coastline

Created by the Partnerships and Strategic Overview Team, Lincoln

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Tidal Level Location Map
Lincolnshire & Northamptonshire Area

Environment Agency

Produced May 2017

Produced by Partnerships & Strategic Overview Team

Tidal Water Levels for the South Humber, East Coast and The Wash

The table below shows still water levels for locations, from the above location map, around the South Humber Estuary, East Coast and The Wash. It is important to note the following:

- The base date for the data is 2014 for the South Humber and 2006 for the East Coast and The Wash.
- The data are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- The water level quoted is the 'Best Estimate' water level. Depending on the use of the data it may be necessary to carry out sensitivity testing. Upper and Lower 95% confidence bandings are available upon request.
- Levels for other annual chance scenarios are available if required.

Ref	Location	Easting	Northing	Annual Chance (1 in x) of Tide Level					
				metres ODN					
				1	10	50	100	200	1000
HUMBER									
H030	Tetney	535420	403180	3.94	4.29	4.56	4.69	4.82	5.15
H050	Buck Beck	532700	406580	4.03	4.36	4.62	4.74	4.87	5.18
H060	Grimsby	527878	411346	4.10	4.43	4.70	4.82	4.95	5.27
H080	Haborough Marsh	520790	415740	4.26	4.61	4.88	5.01	5.14	5.47
H090	Immingham	519141	417449	4.26	4.61	4.88	5.01	5.14	5.47
H100	South Killingholme	518700	417120	4.41	4.77	5.05	5.18	5.32	5.66
H130	North Killingholme	516530	420000	4.51	4.87	5.15	5.28	5.42	5.77
H150	East Halton	514450	422870	4.59	4.96	5.25	5.39	5.53	5.89
H170	Goxhill	511970	425440	4.67	5.04	5.34	5.47	5.61	5.95
H200	New Holland	508020	424330	4.87	5.26	5.55	5.68	5.81	6.12
H210	Barrow Haven	506380	422620	4.92	5.31	5.60	5.73	5.86	6.17
H220	Ferriby	497550	421150	5.04	5.42	5.67	5.77	5.86	6.04
H230	Winterton	493420	422830	5.14	5.51	5.74	5.83	5.90	6.02
H250	Blacktoft	484247	424190	5.25	5.62	5.83	5.90	5.96	6.04
H270	Goole	474857	422960	5.46	5.85	6.07	6.15	6.21	6.29
East Coast									
~	Great Eau	545500	393800	3.80	4.19	4.46	4.57	4.69	4.96
~	Boygrift	553300	379800	3.84	4.24	4.53	4.65	4.77	5.05
~	Burgh Sluice	555190	358620	4.26	4.45	4.76	4.90	5.03	5.34
Wash									
~	Hobhole	536610	339940	4.82	5.30	5.64	5.78	5.93	6.27
~	Lawyers Sluice	540750	334550	4.84	5.32	5.66	5.80	5.95	6.29
~	West Lighthouse	549150	325750	4.88	5.37	5.71	5.86	6.01	6.35
~	Grand Sluice	532400	344500	4.88	5.33	5.65	5.78	5.93	~
~	Fosdyke Bridge	531700	332200	4.91	5.38	5.71	5.85	5.99	~
~	Marsh Road	526000	324000	5.04	5.44	5.73	5.85	5.98	~
~	Wisbech	546100	310000	4.83	5.25	5.53	5.66	5.78	~
~	Dog In Doublet	527300	299300	3.67	4.00	4.22	4.32	4.42	~

^ **Modelled Breach Locations**

0 3.5 7 14 Kilometres

This map indicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

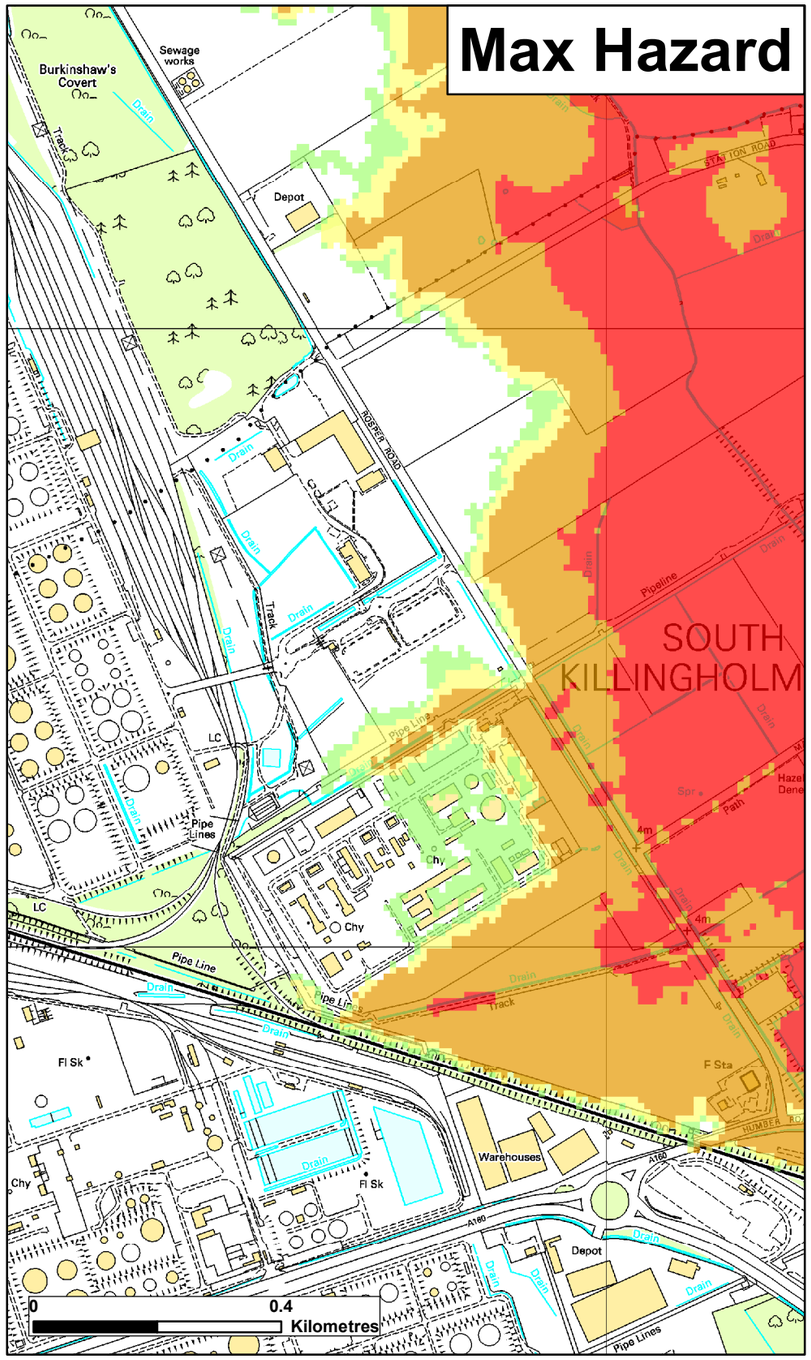
General Enquiries No: 03708 506 506.
Weekday daytime calls cost 5p plus up to 6ppm from BT Weekend Unlimited. Mobile and other providers charges may vary

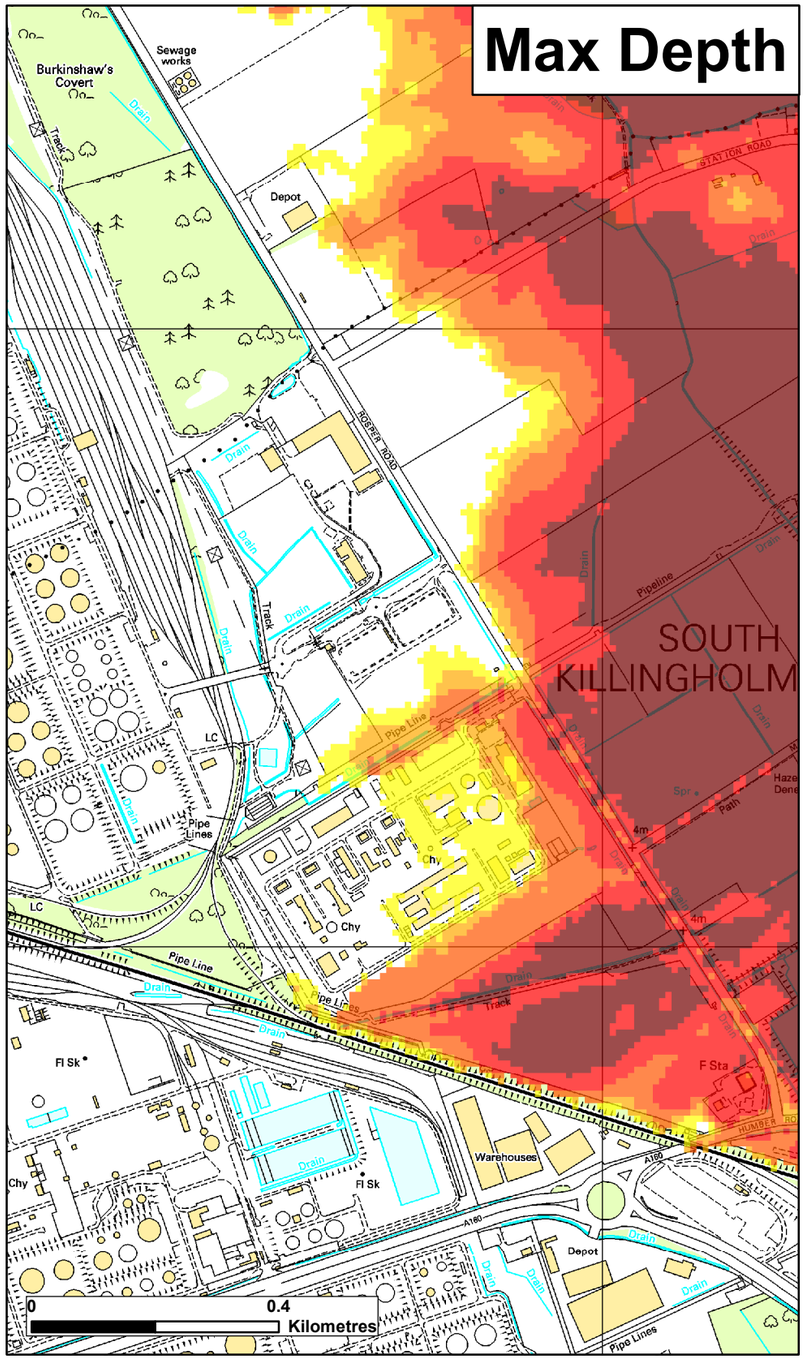
Environment Agency

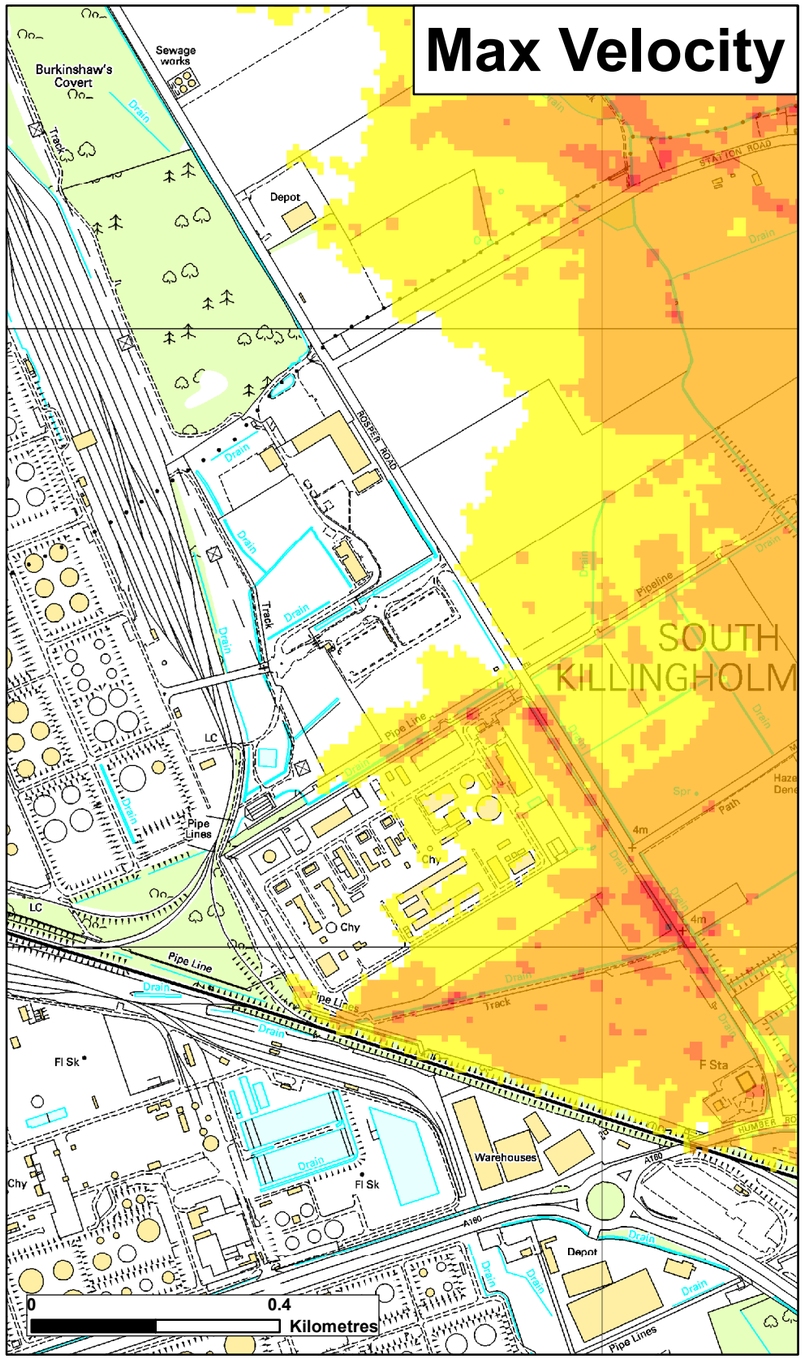
Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

Northern Area Tidal Hazard Mapping

Location of Modelled Breaches







★ Modelled Breach Locations

- see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	February 2018	Scenario year	2006	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2018-73227

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

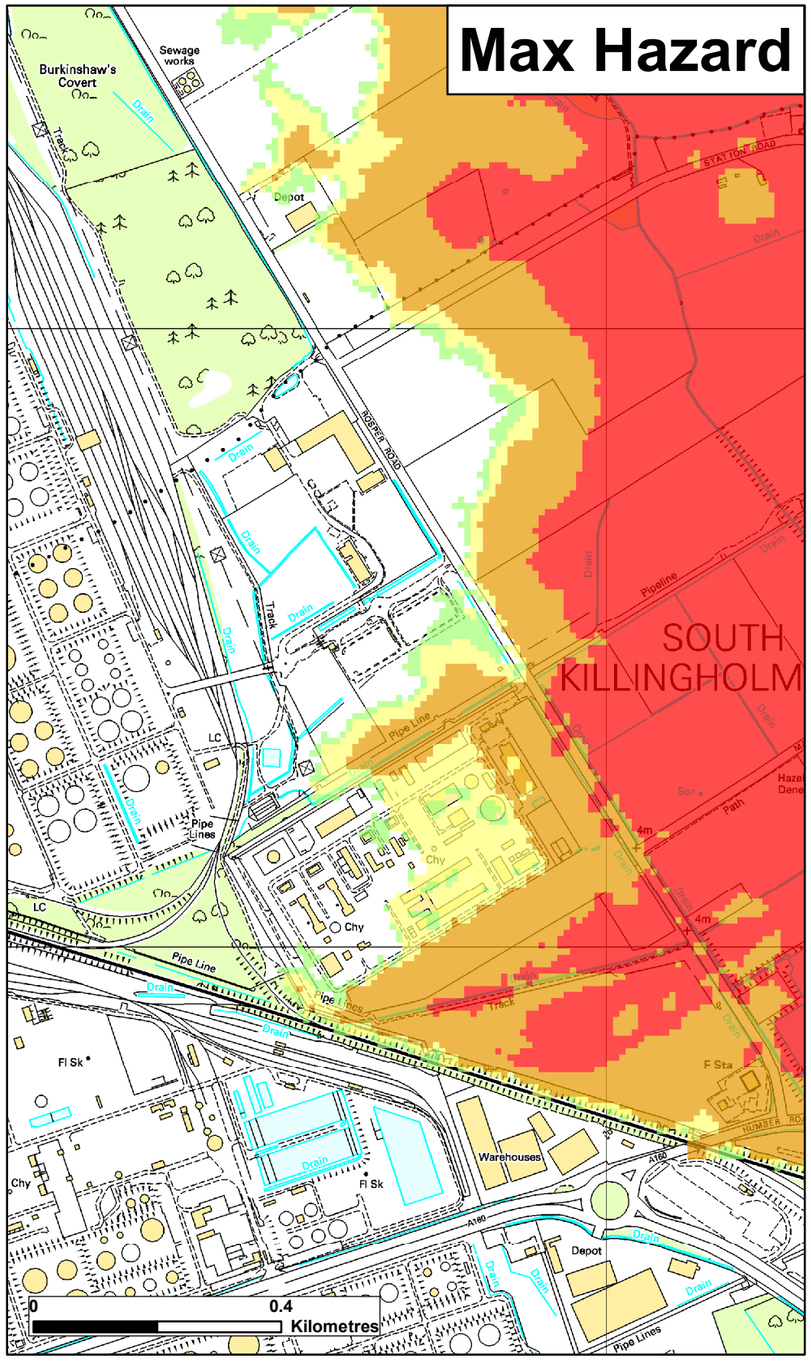
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

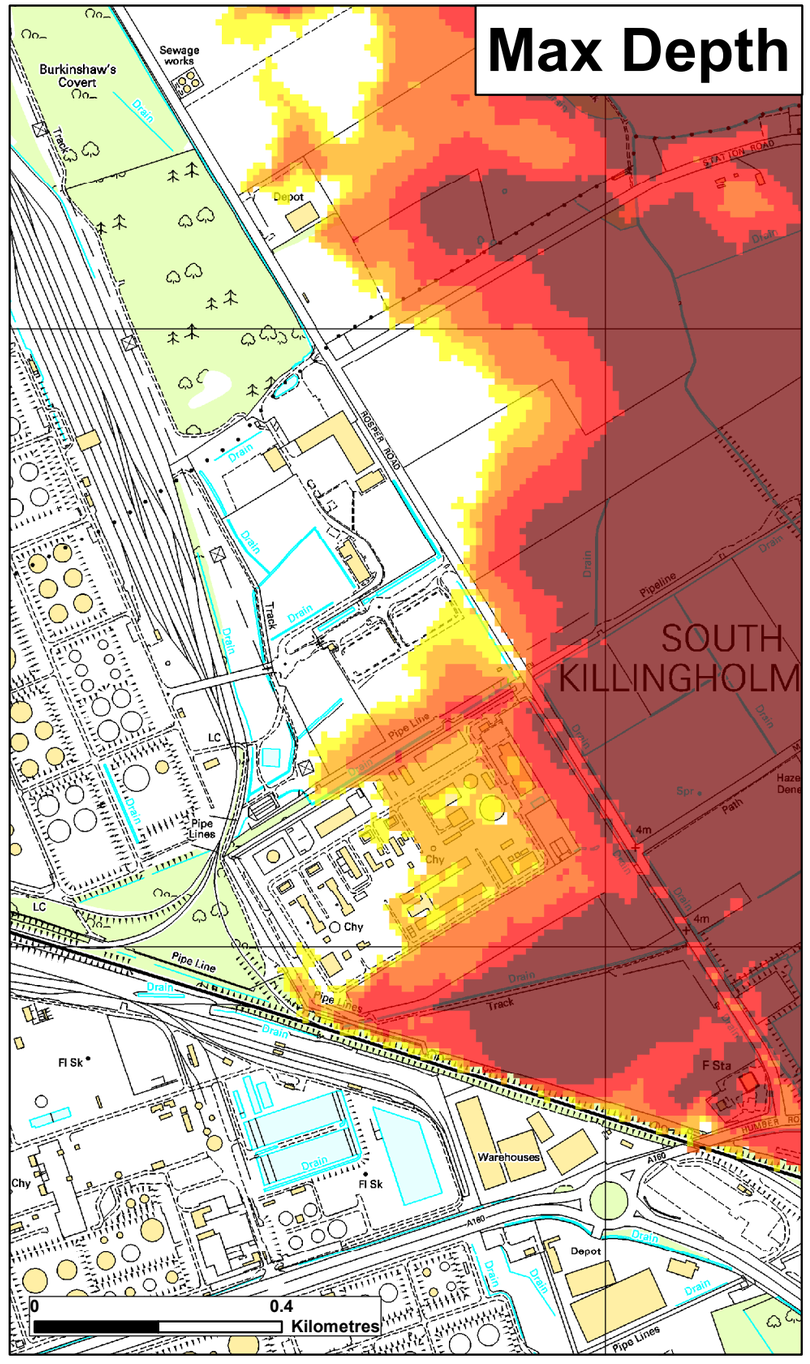
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

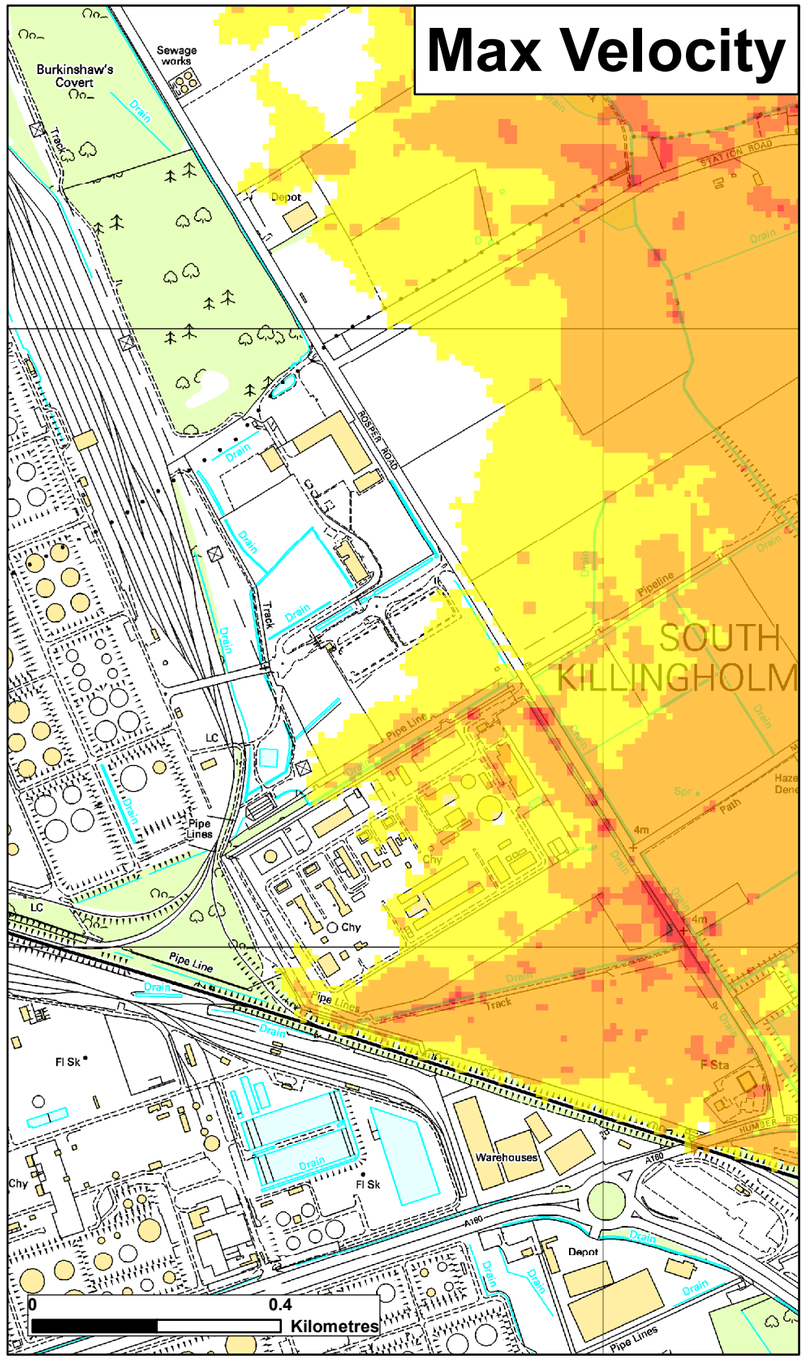
Environment Agency

Lincolnshire and Northamptonshire Breach Hazard mapping

Map Centred on TA 16677 17430







★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	February 2018	Scenario year	2006	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2018-73227

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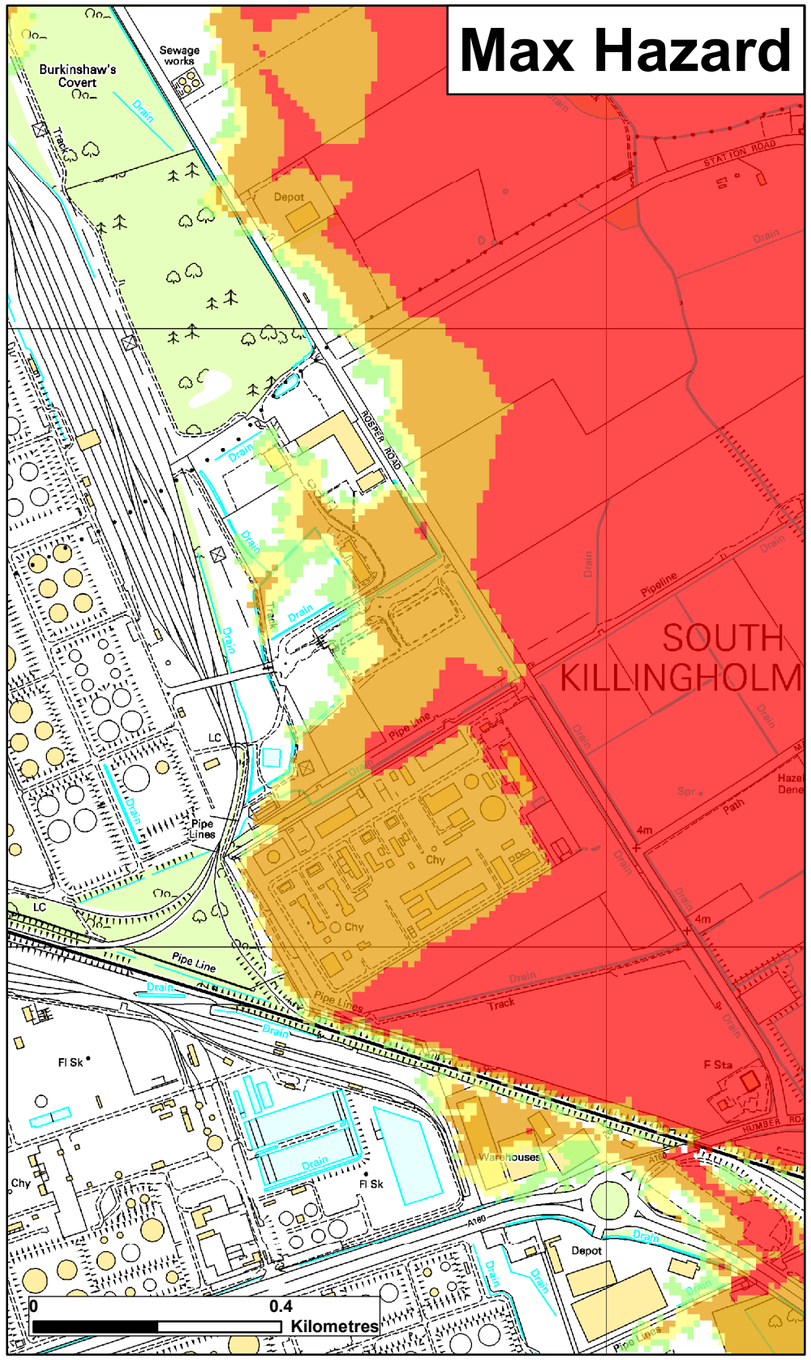
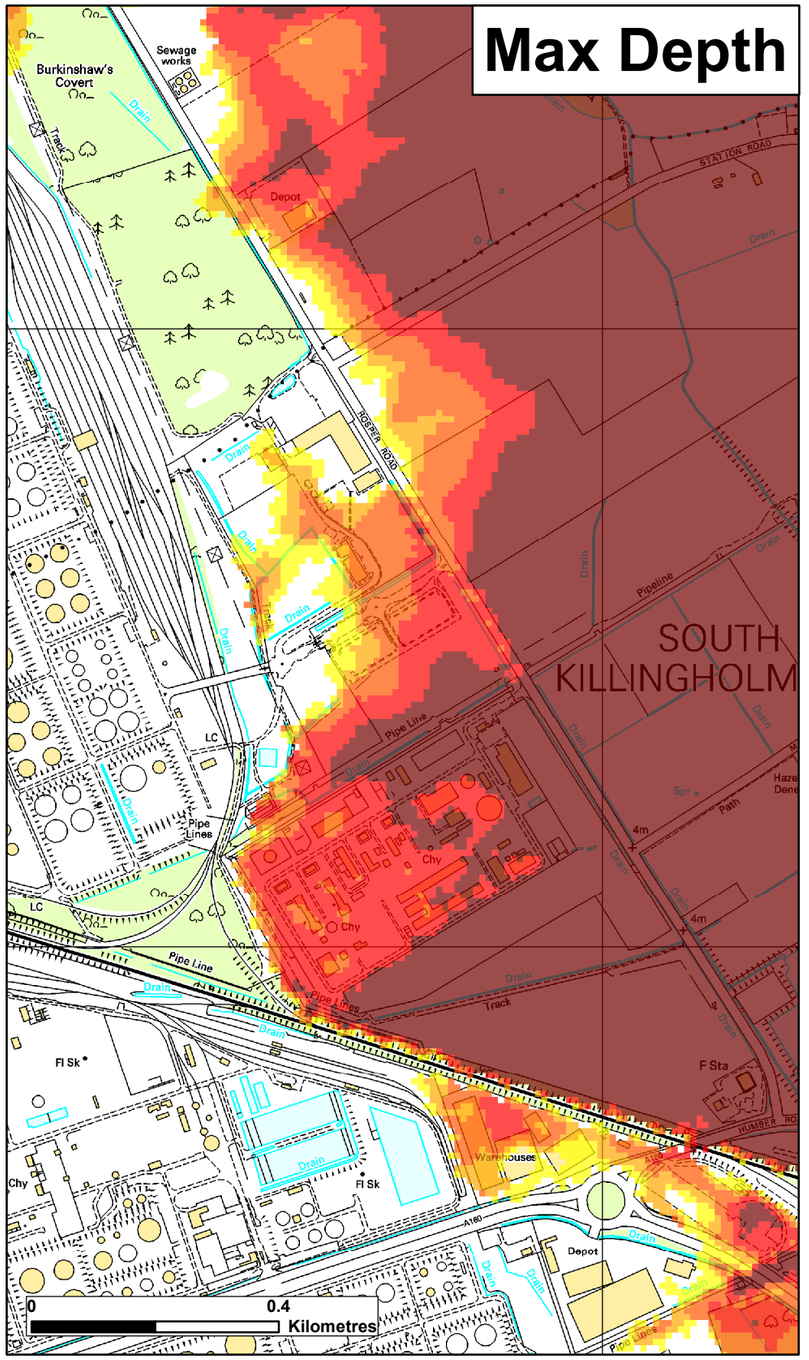
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

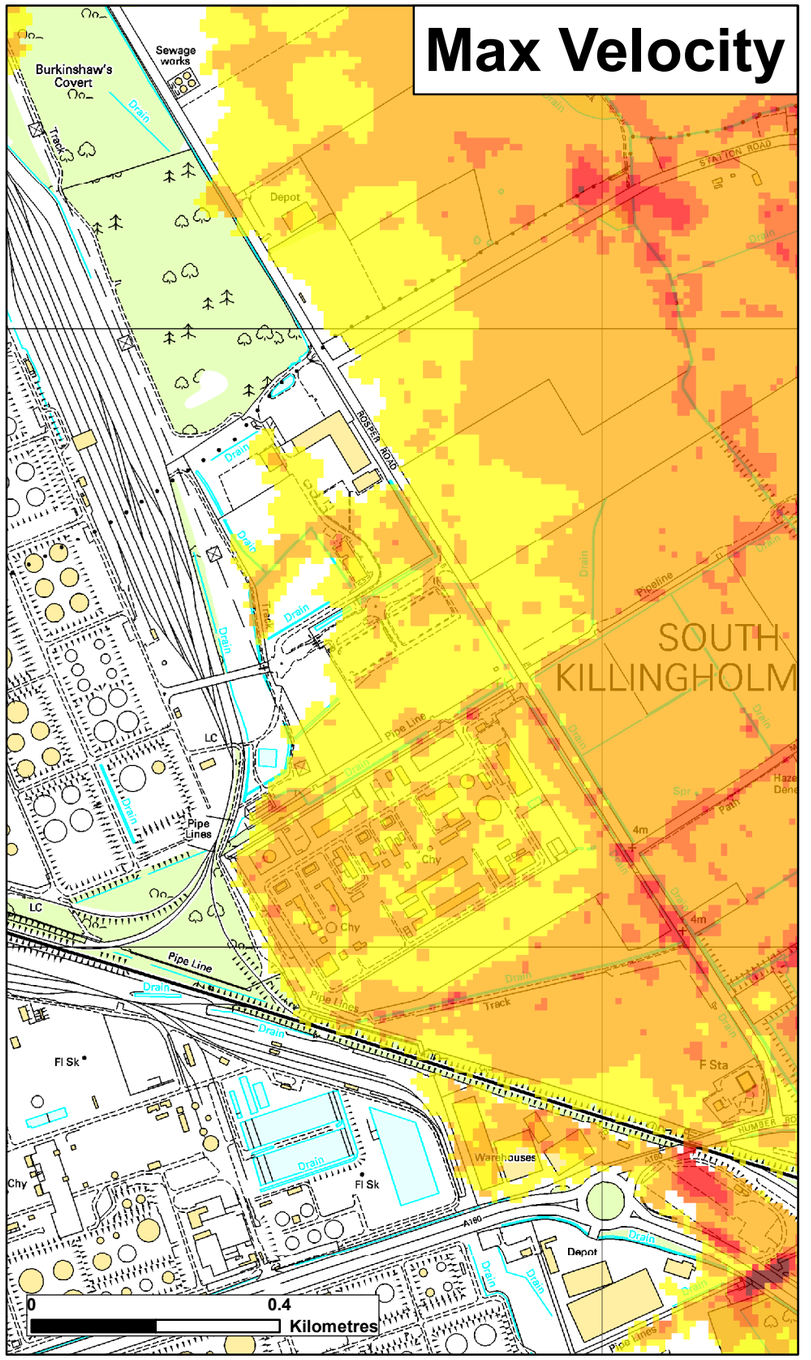
Environment Agency

Lincolnshire and Northamptonshire Breach Hazard mapping

Map Centred on TA 16677 17430







★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
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Max Velocity (m/s)

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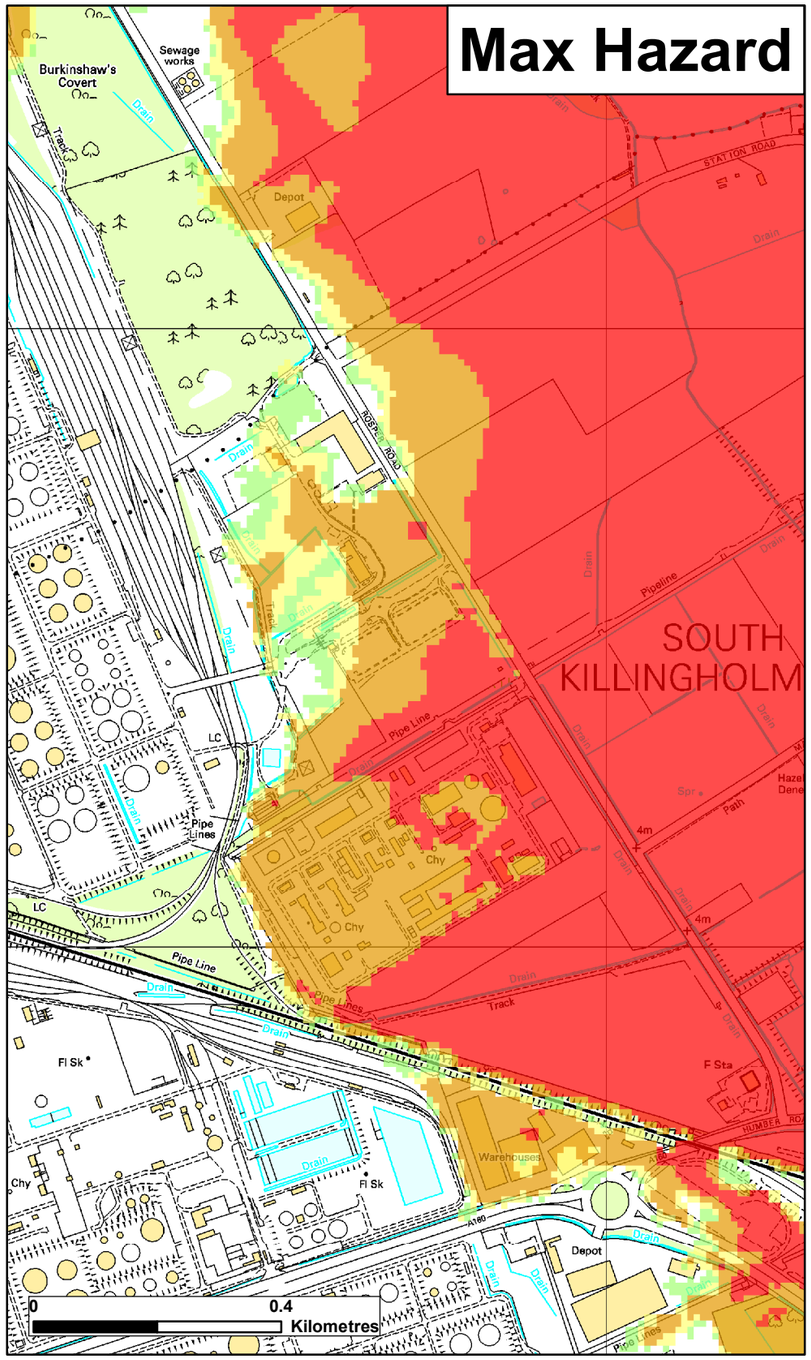

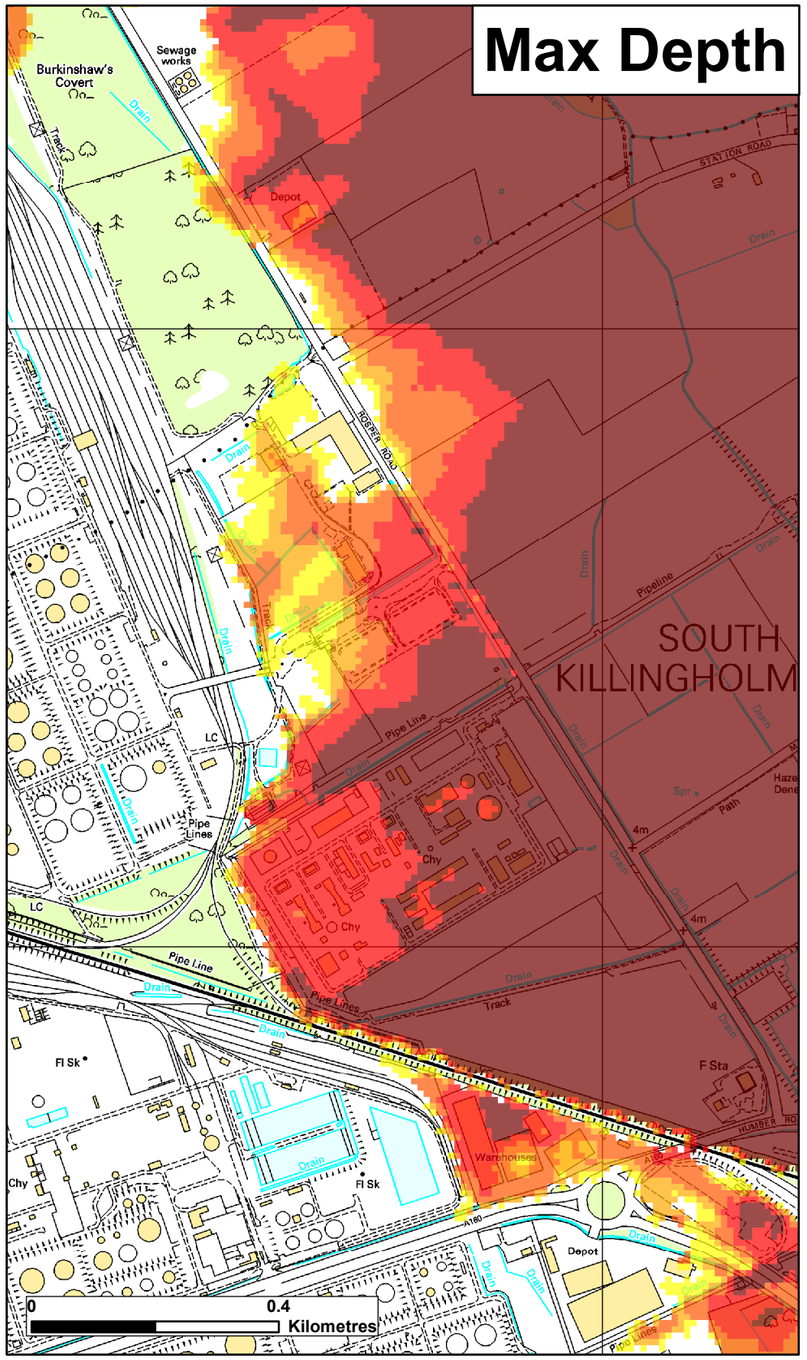

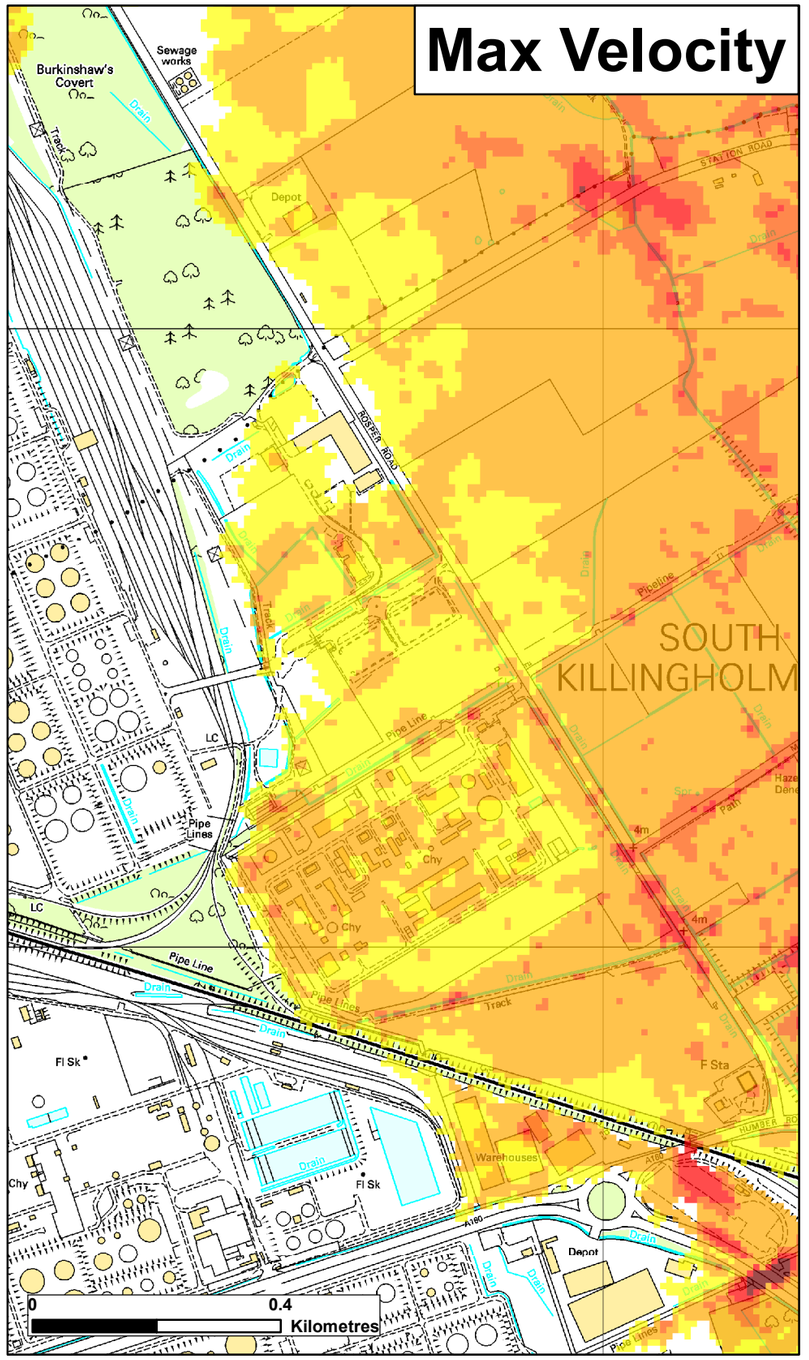

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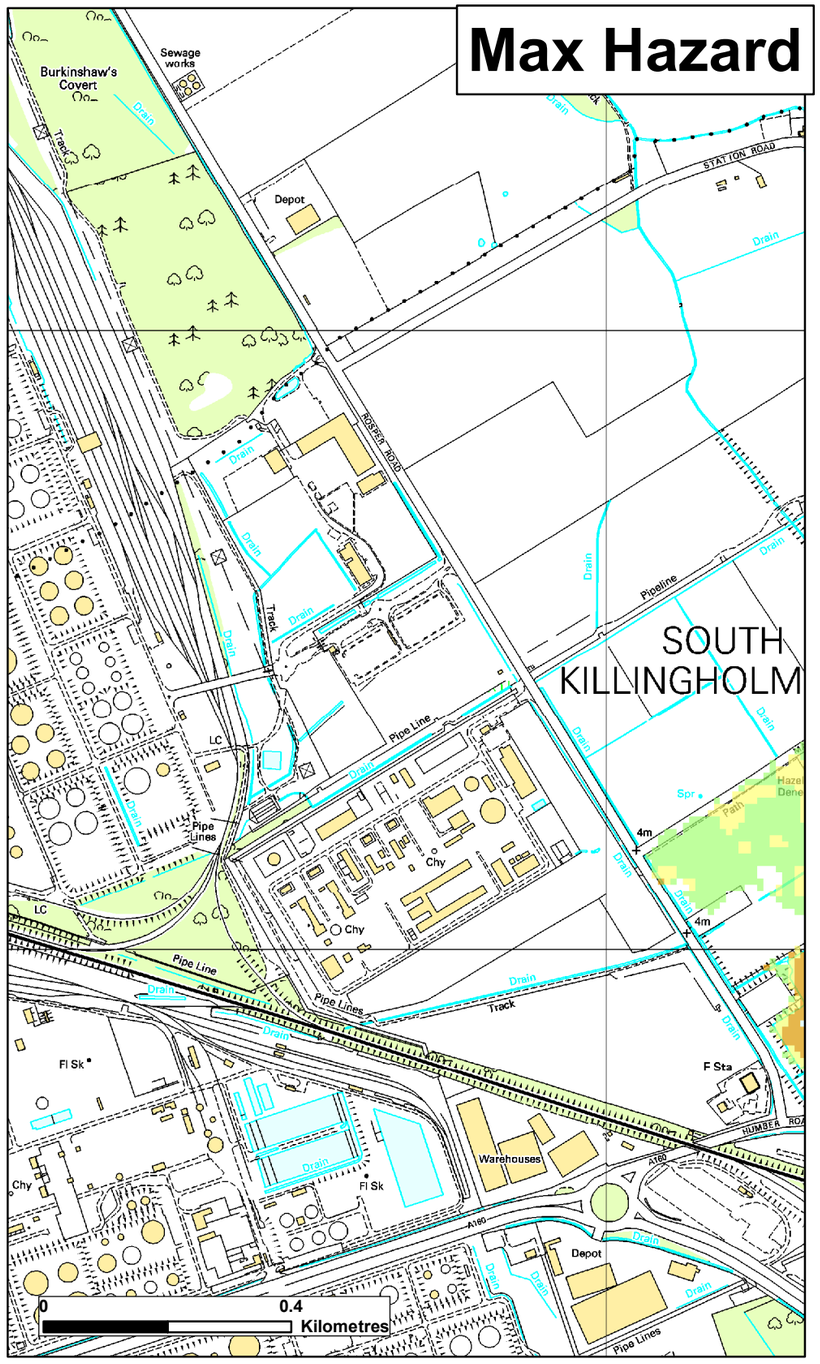

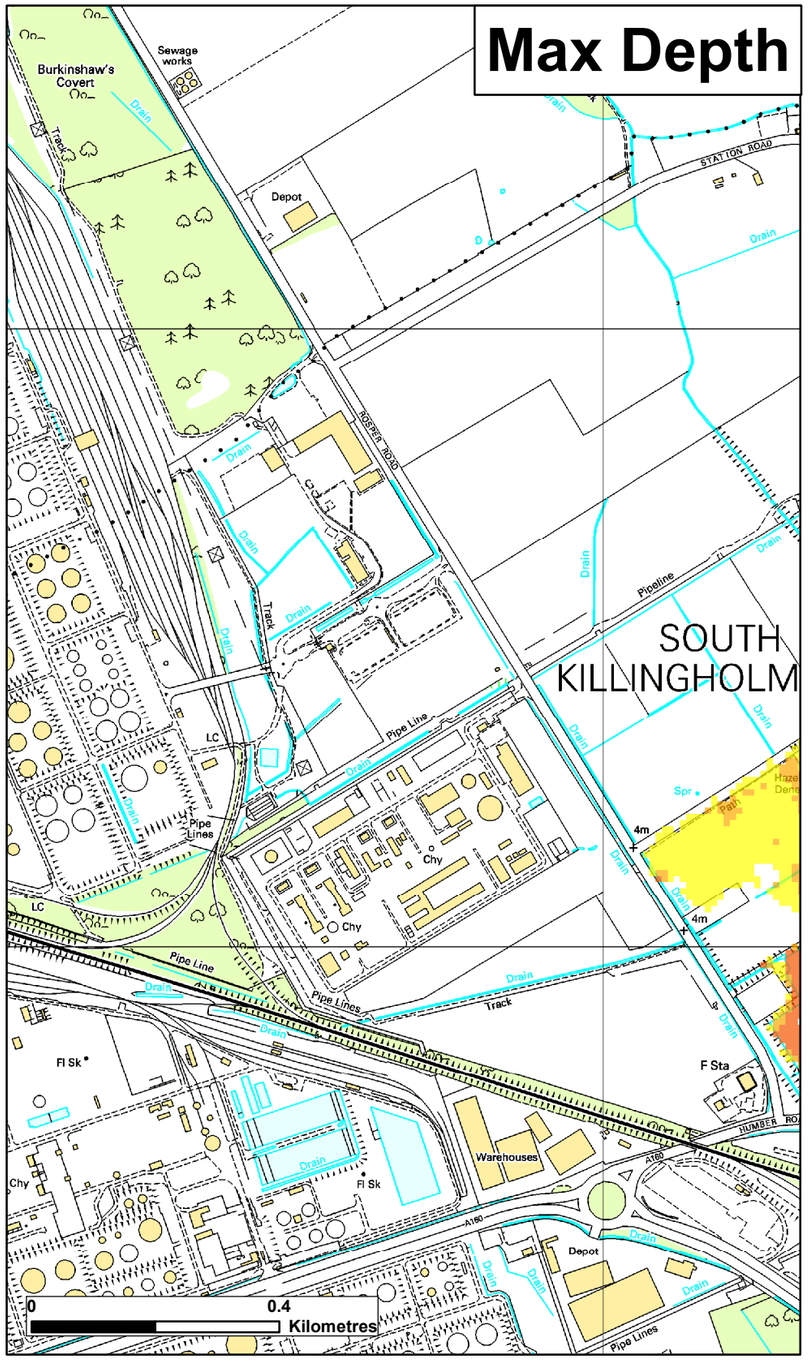

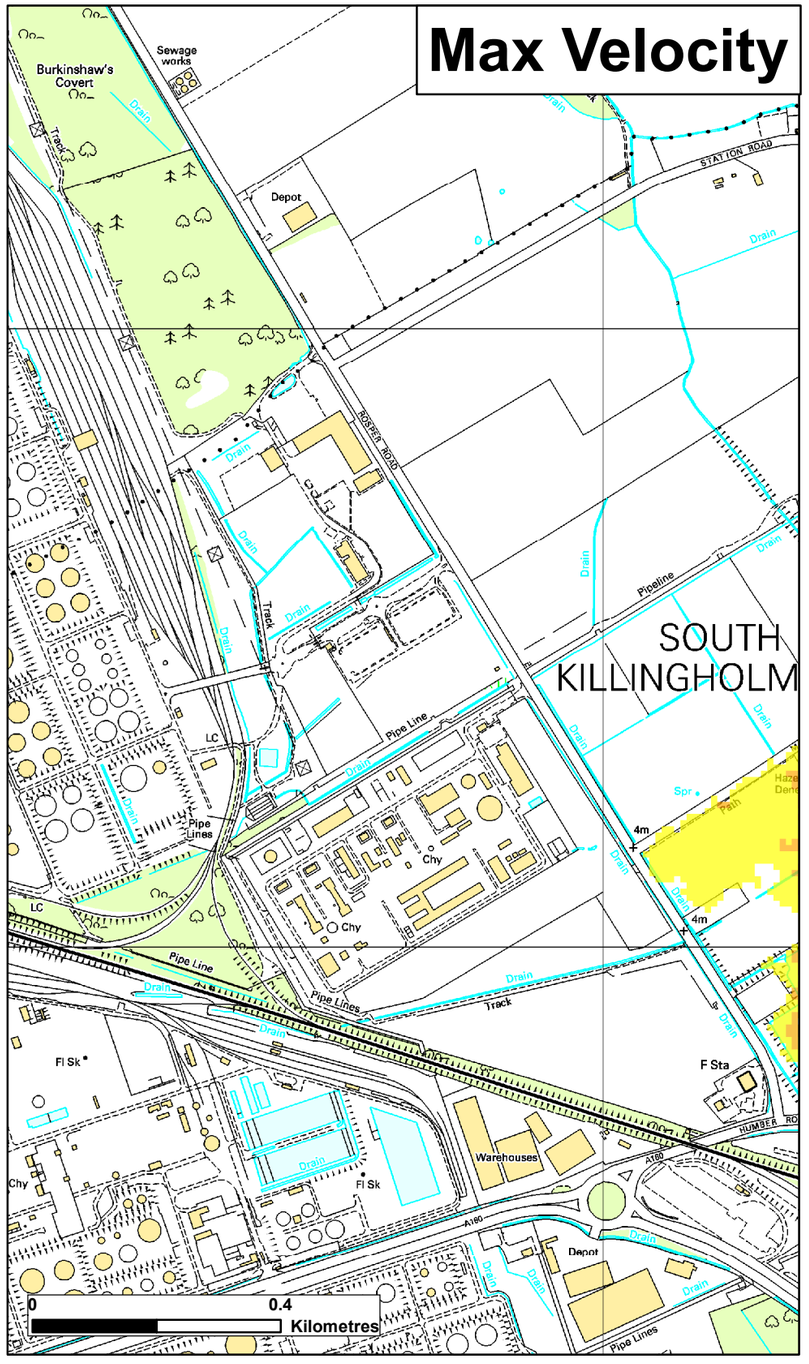

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For future climate change scenarios it is assumed that defences remain at 2006 heights.

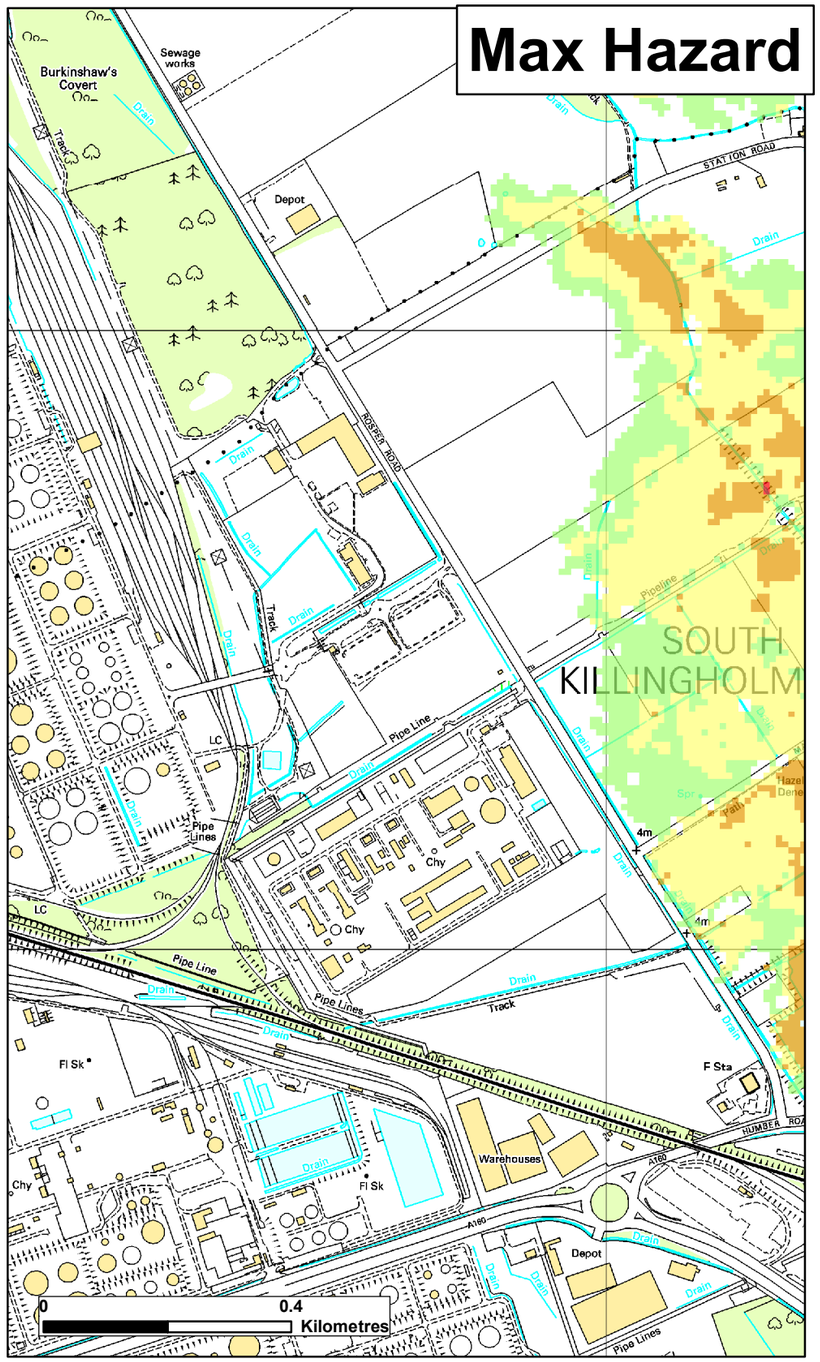
These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)

Environment Agency

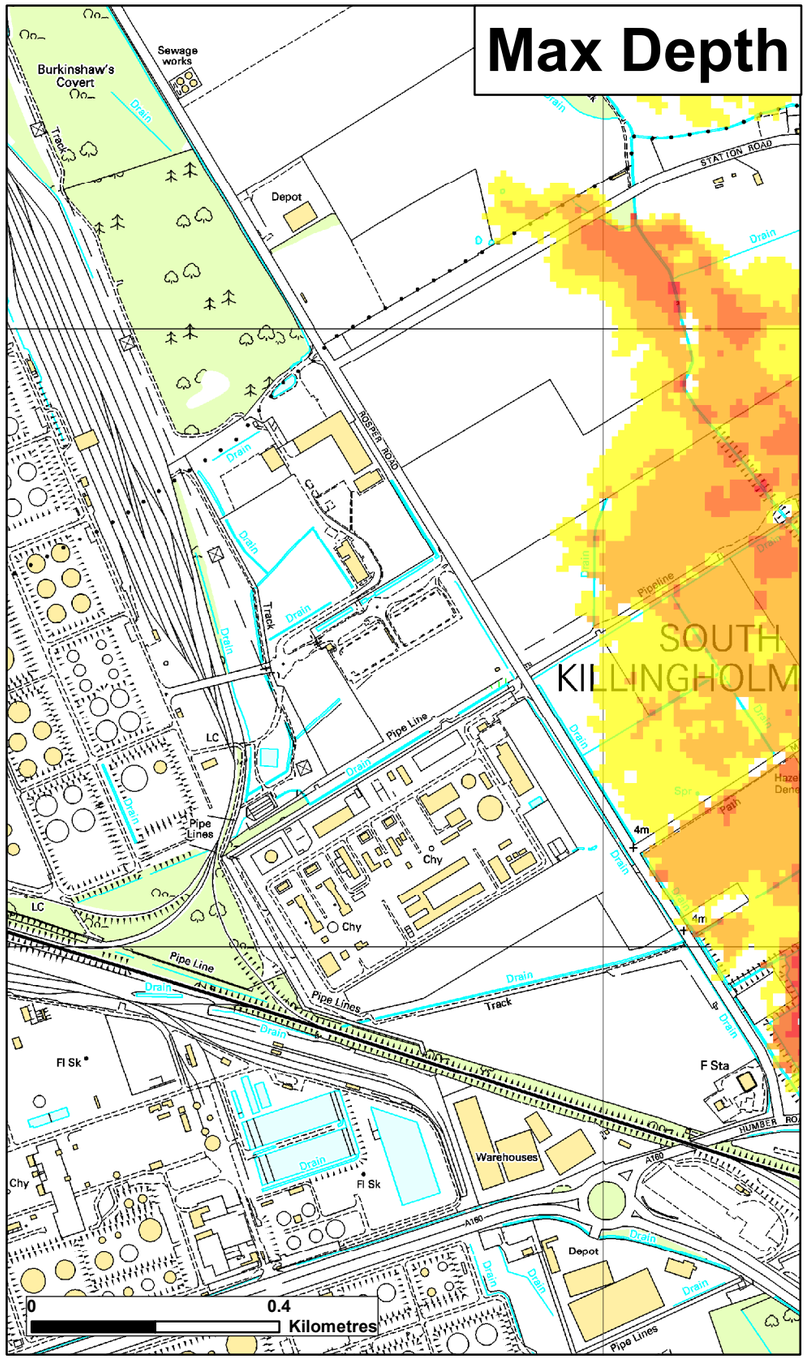
Lincolnshire and Northamptonshire Overtopping Hazard Mapping

Map Centred on TA 16677 17430

Max Hazard



Max Depth



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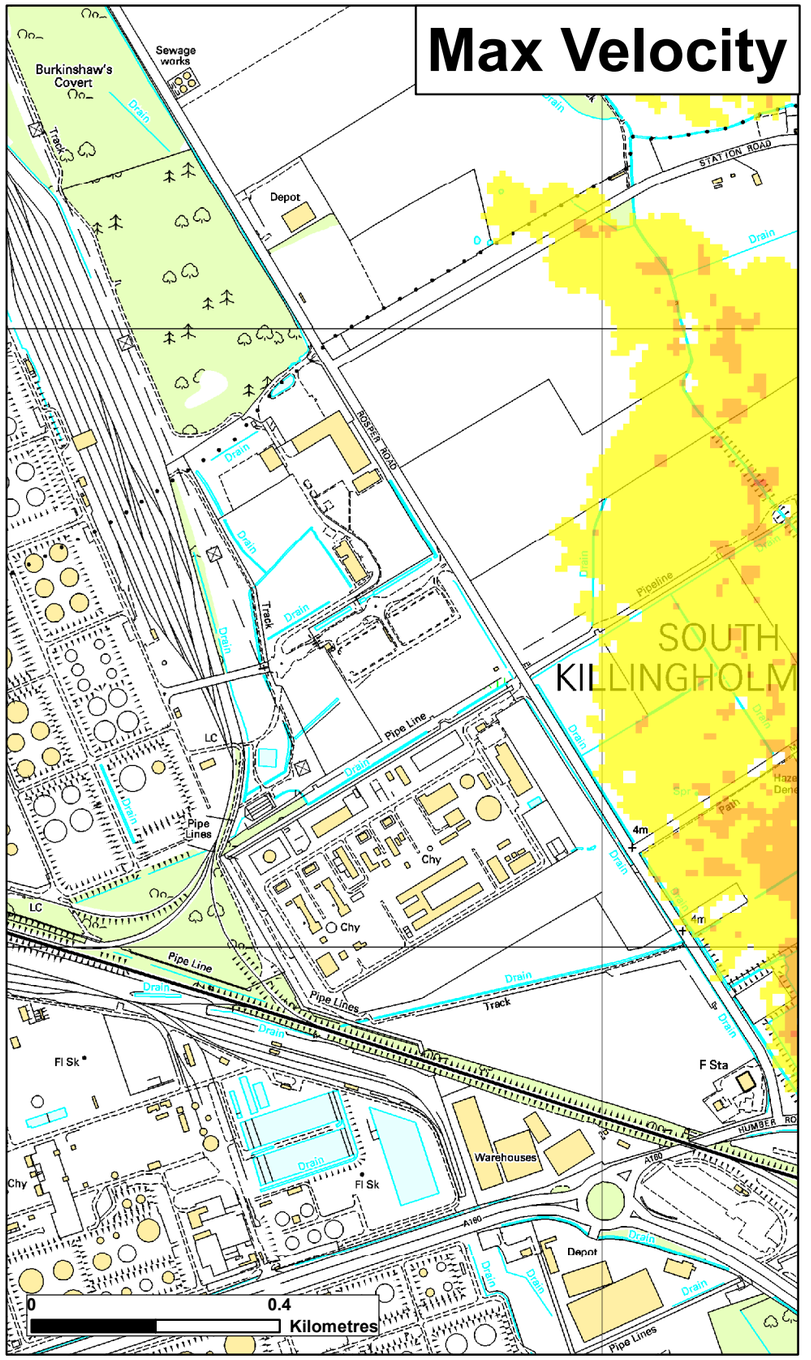

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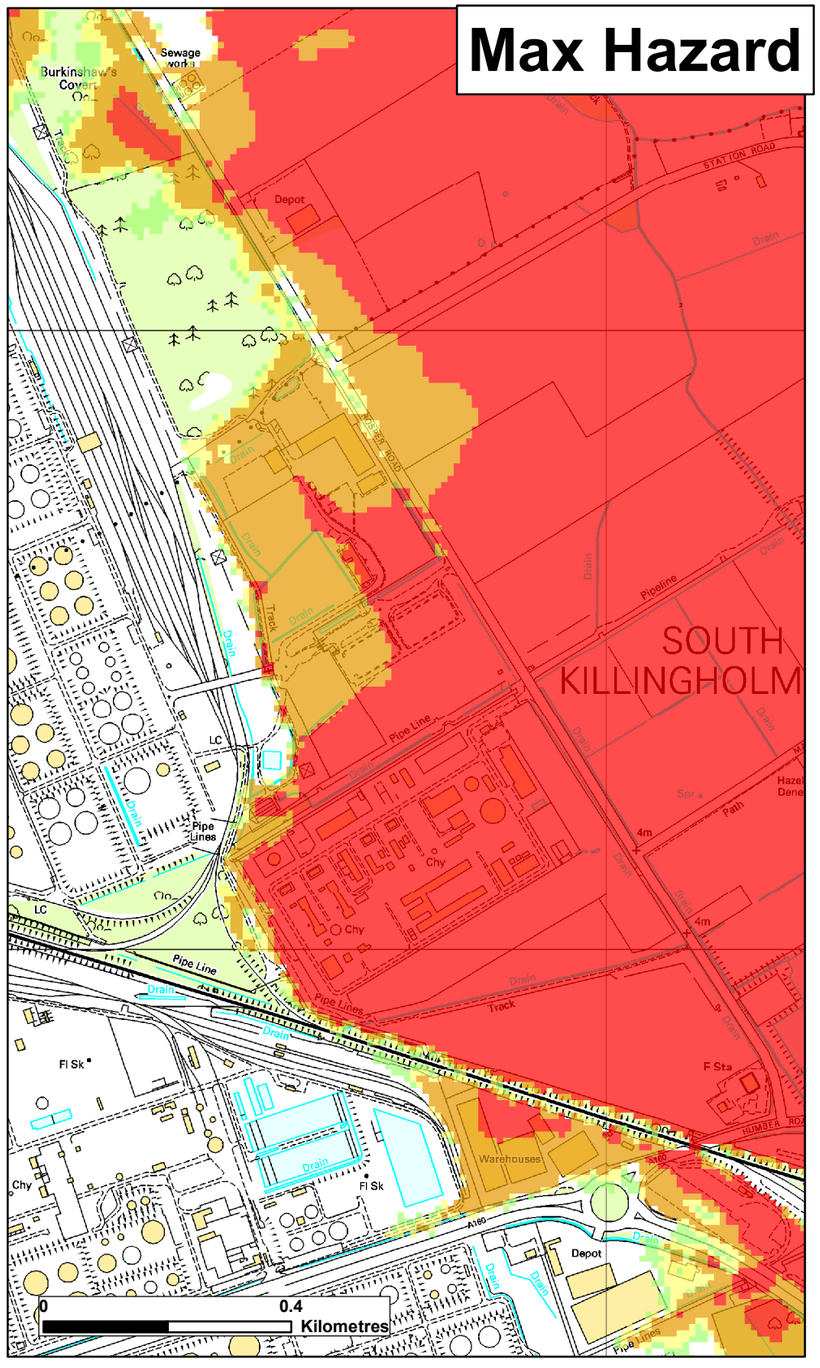

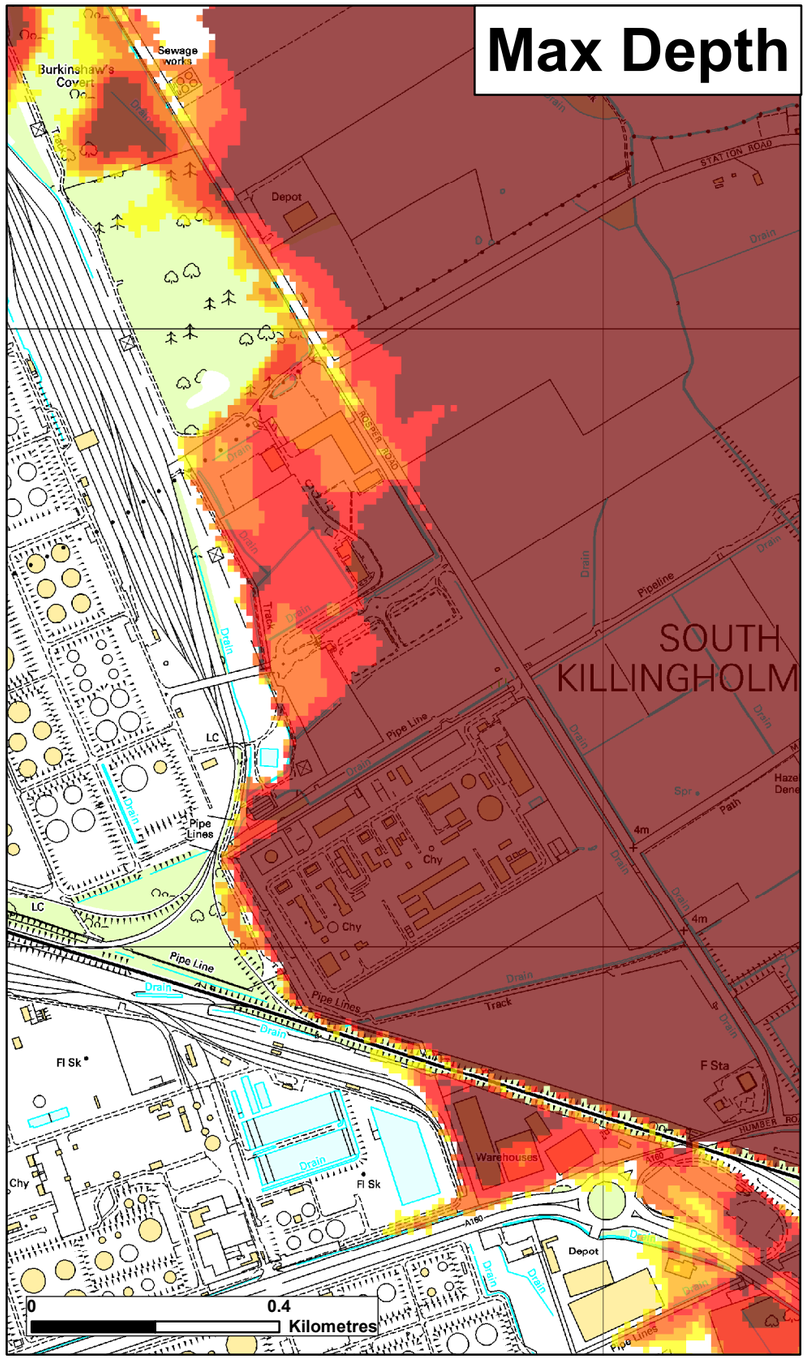

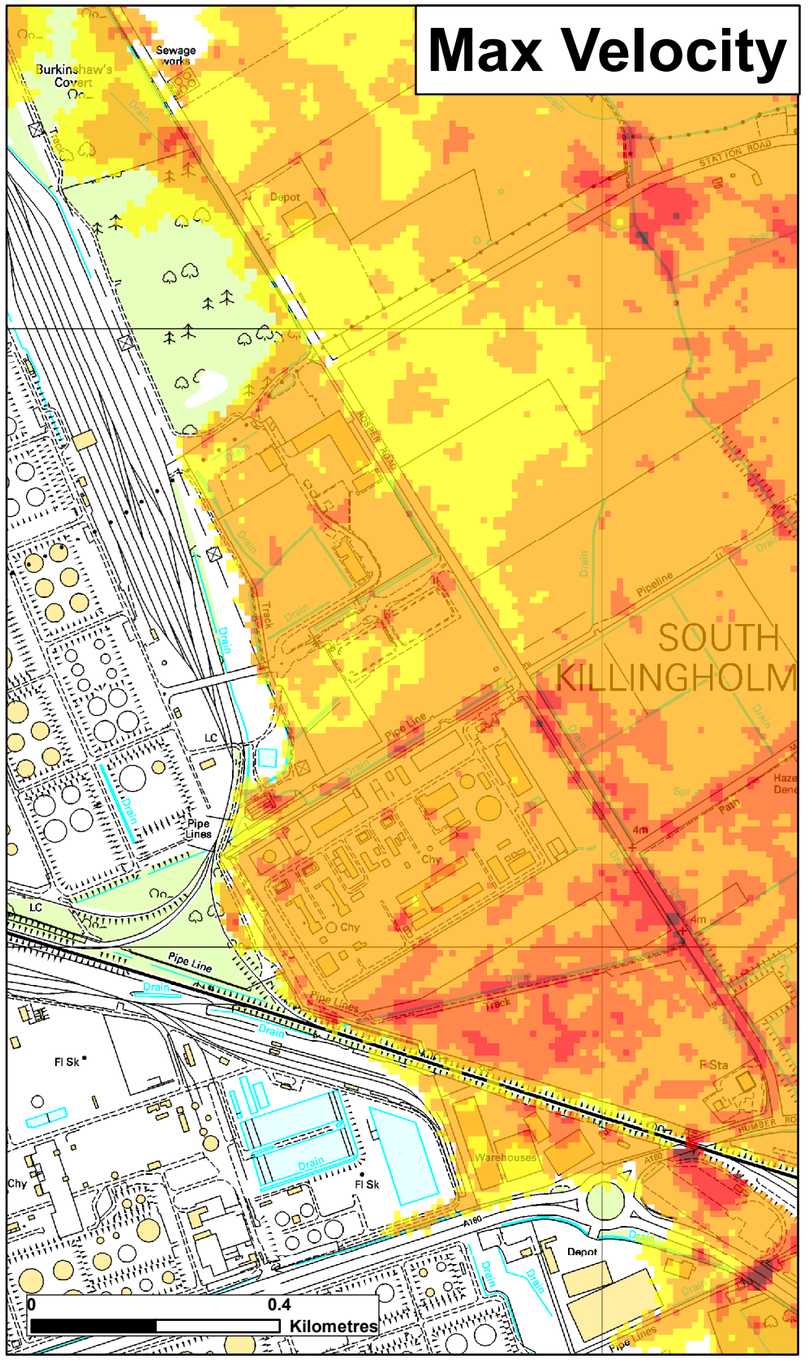

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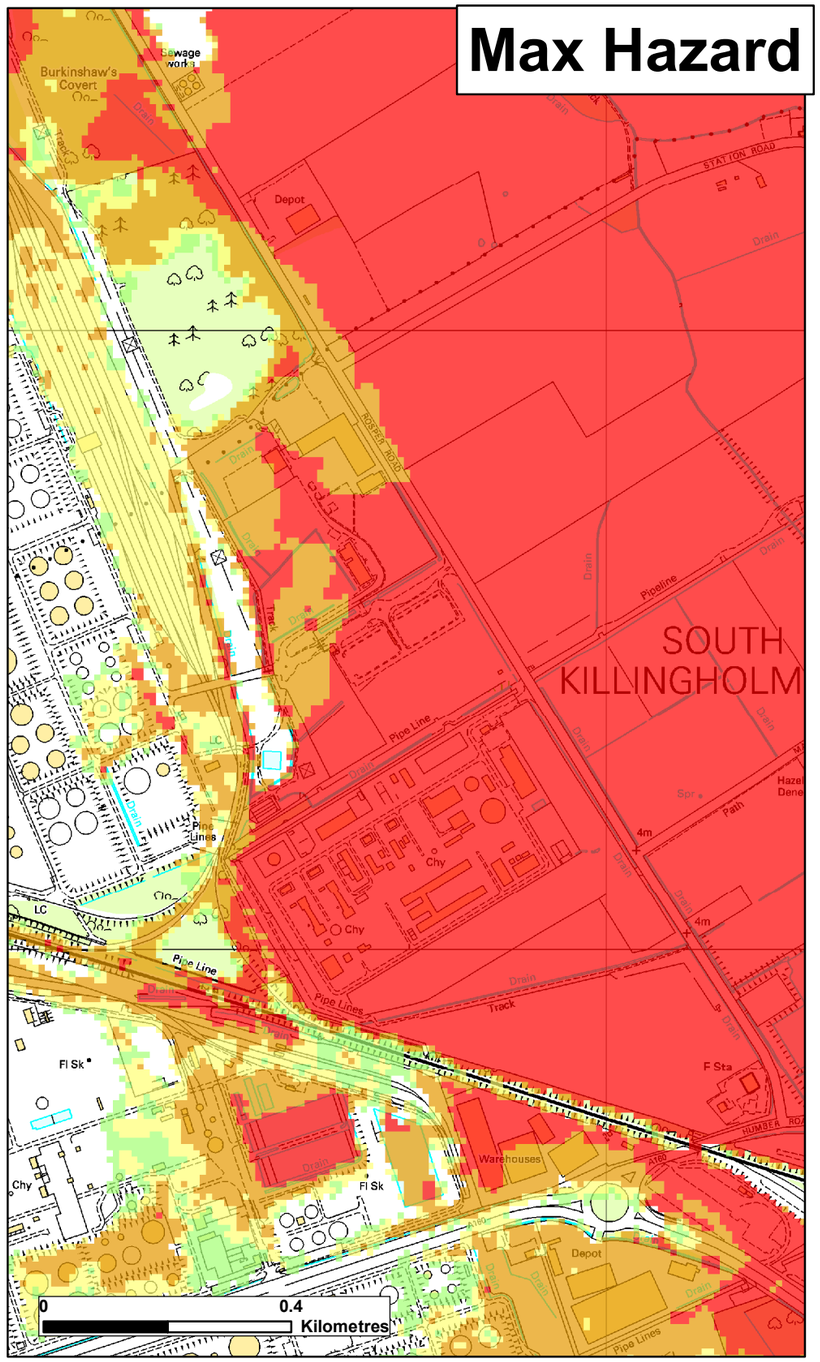

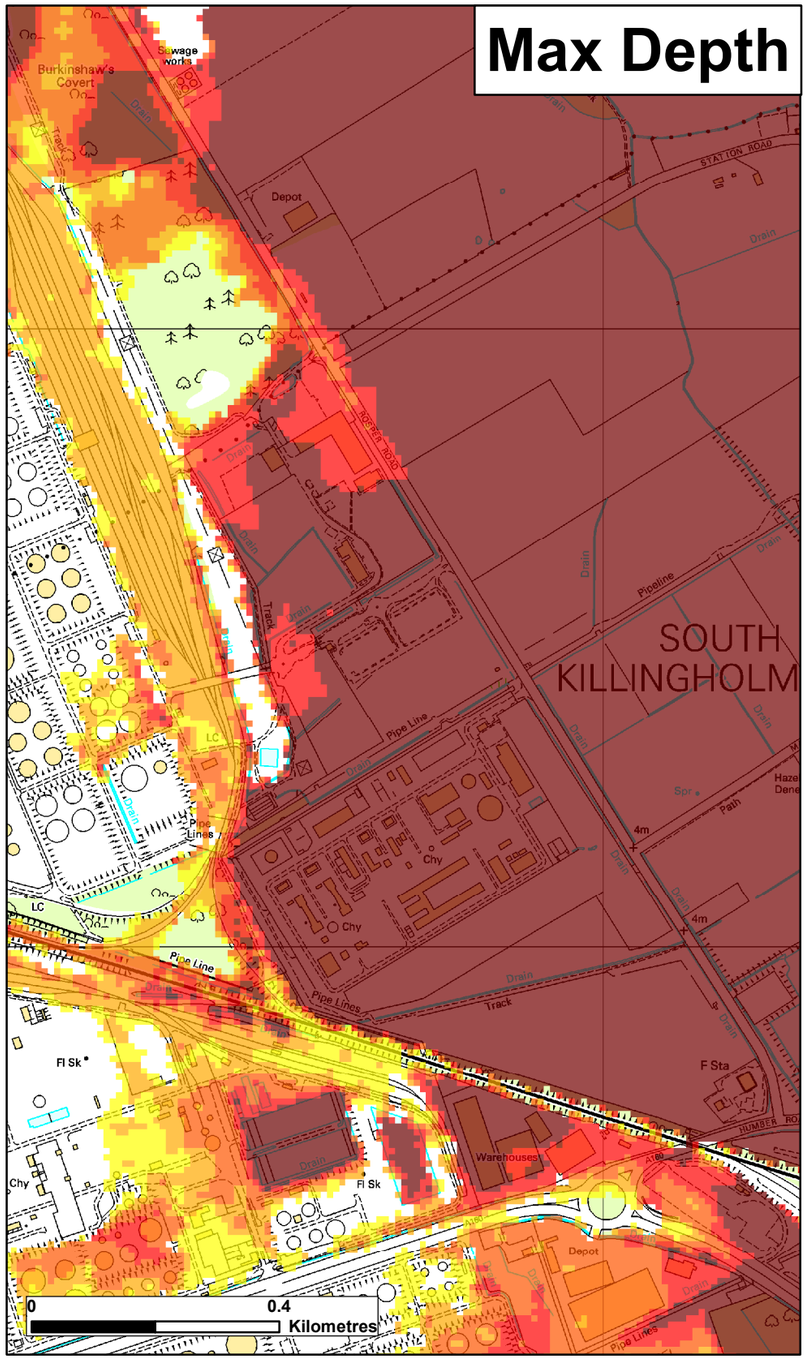

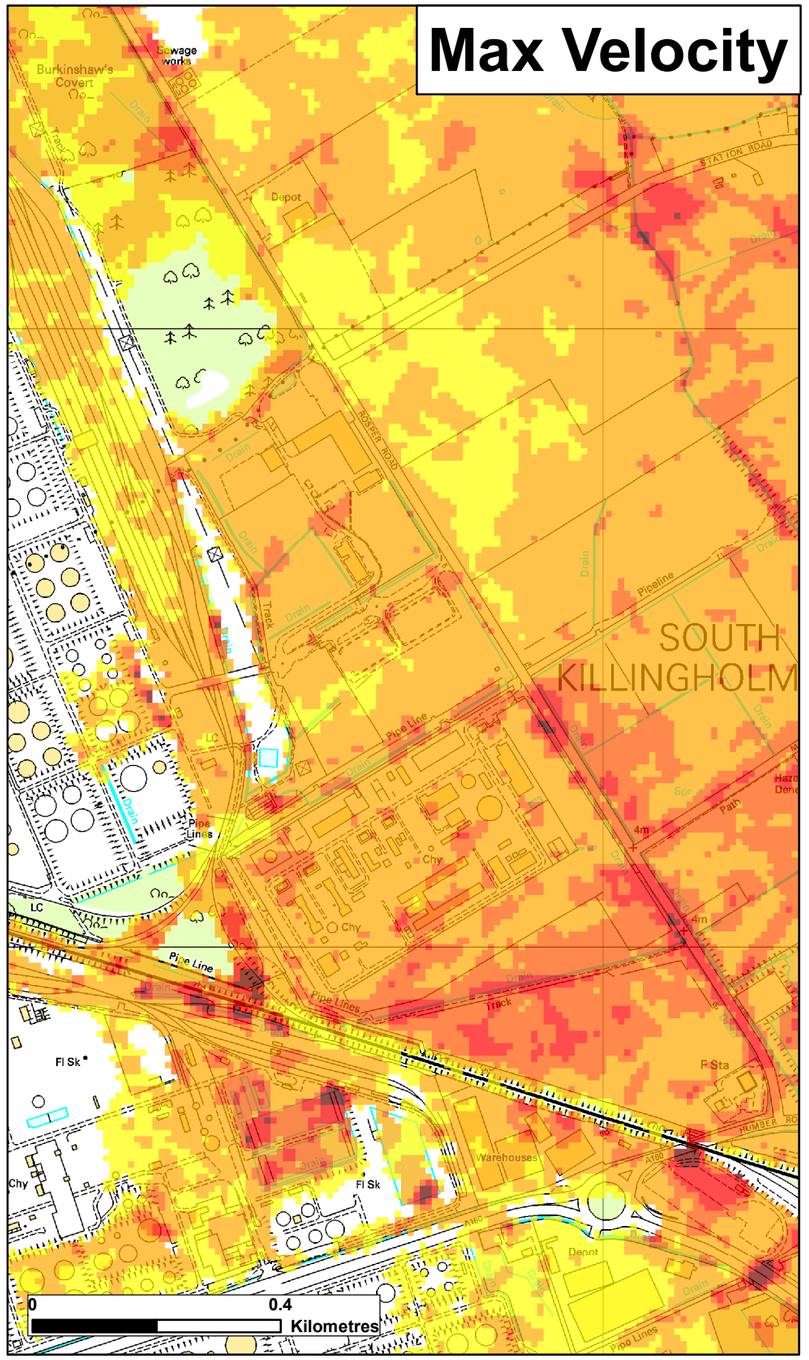

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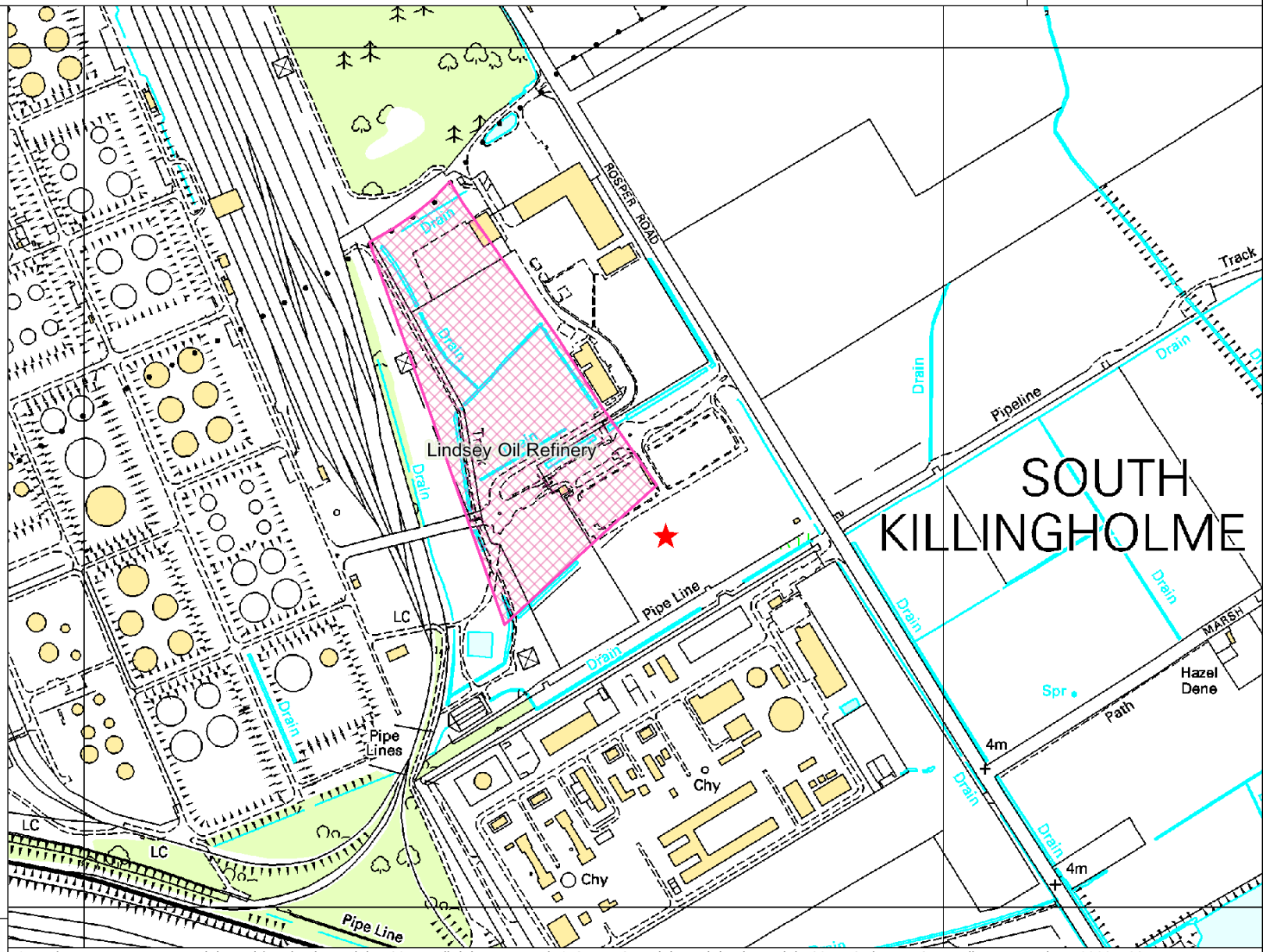
VPI Immingham - ARCOM enquiry

Environment Agency

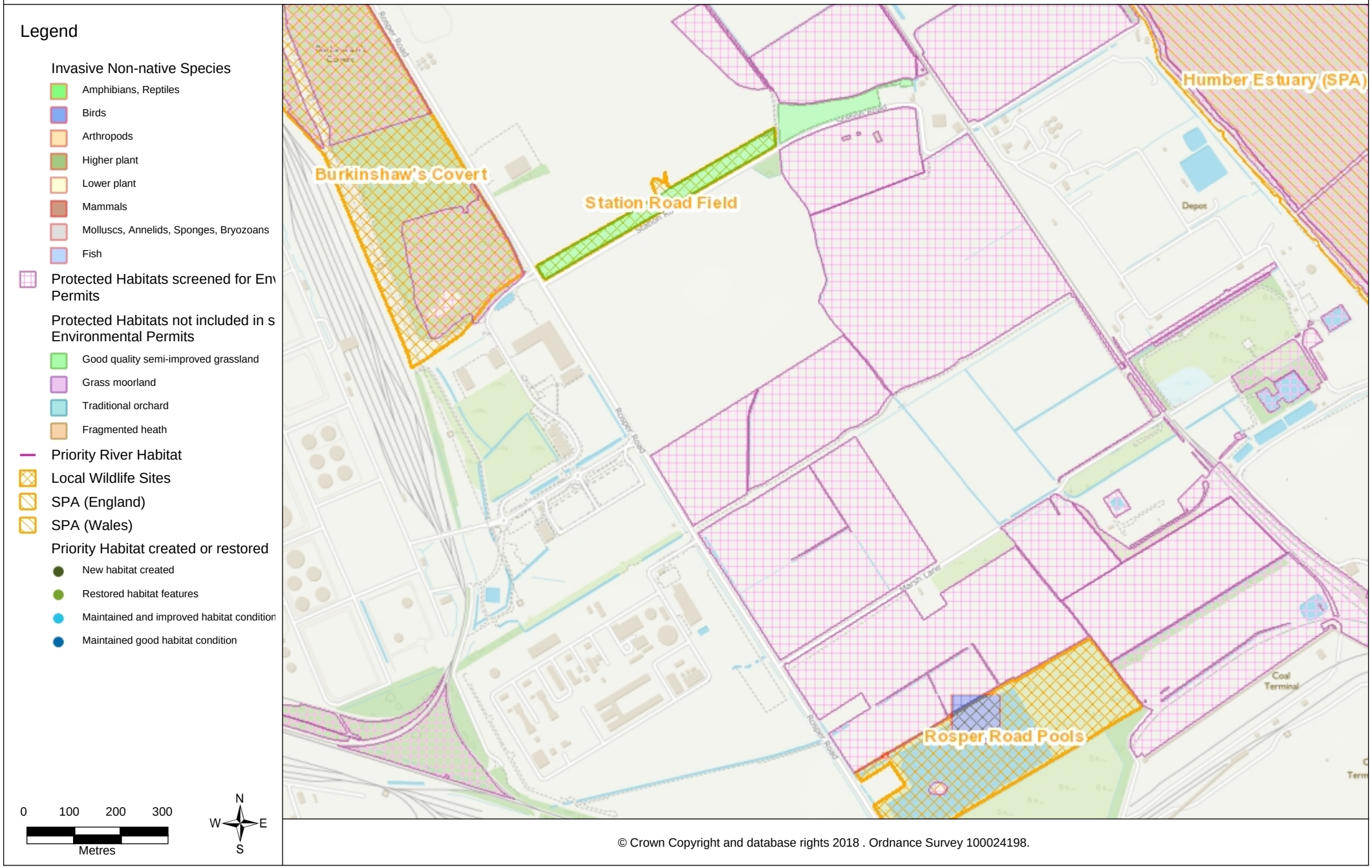
Legend

- Authorised Landfill Sites
- Historic Landfill Sites



Designations centred on 516677, 417430 created Jan 2018 CCN/2018/73227

Environment Agency



Annex 3 – North Lincolnshire Council Consultation

Somerton, Joanne

From:	Barrie Onions <Barrie.Onions@northlincs.gov.uk>
Sent:	25 January 2018 10:38
To:	Somerton, Joanne
Cc:	Billy Green; Rod Chapman; Sam Cross; Craig Fotheringham
Subject:	Fw: Data consultation Request - VPI Immingham: Flood Risk Information
Attachments:	VPI Immingham Data Request NLC.pdf

Hi Joanne

You should be aware that flood guidance in the form of a SFRA and Development and Food Guidance can be found on our web site. The SFRA is in the policy section and the other guidance is under the planning application submission guidance. I can confirm that as you state the site lies in EA Flood Zone 3a (and combined SFRA Flood Zone 2/3a). Should you require any SFRA maps please let me know.

Your many questions relate to drainage issues so I have passed your request onto the Council's Drainage Team to answer.

The Drainage Team will answer direct to you or pass onto me to send to you.

Kind Regards

Barrie

Barrie Onions
Senior Planning Officer
Spatial Planning
Planning & Regeneration
Places Directorate
North Lincolnshire Council
Tele - 01724 297571
Email - barrie.onions@northlincs.gov.uk

From: Spatial Planning
Sent: 22 January 2018 10:01
To: Barrie Onions
Subject: Fw: Data consultation Request - VPI Immingham: Flood Risk Information

Barrie,

You will probably be able to answer some of the questions raised in this info request. I'm not sure who else it has been circulated to as it seems just to be sent to Spatial Planning.

Regards
Craig

Spatial Planning Team

Economy & Growth
Business Development
North Lincolnshire Council
Civic Centre
Ashby Road
Scunthorpe
DN16 1AB

Tel: 01724 297
E-mail: spatial.planning@northlincs.gov.uk

From: Somerton, Joanne <joanne.somerton@aecom.com>
Sent: 19 January 2018 16:24
To: Spatial Planning
Cc: Lowe, Richard; Sangster, Malcolm
Subject: Data consultation Request - VPI Immingham: Flood Risk Information

Dear Sirs

Please find attached a data consultation request for information to inform a flood risk assessment for a proposed development on a site located at South Killingholme. A site location plan is included to the rear of the attached correspondence.

If you require further information please do not hesitate to contact me.

Kind Regards

Jo Somerton

Joanne Somerton (MSc, BSc)
Principal Flood Risk Specialist, Water & Flood Management, UK & I
D +44-01132045028
M +44-07917503650
joanne.somerton@aecom.com

AECOM
2 City Walk
Leeds, LS11 9AR, United Kingdom
T +44-01133916800
aecom.com

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Somerton, Joanne

From:	Billy Green <Billy.Green@northlincs.gov.uk> on behalf of LLFAdrainageteam <LLFAdrainageteam@northlincs.gov.uk>
Sent:	08 February 2018 11:51
To:	Somerton, Joanne
Cc:	Guy Hird; Richard Wright; Barrie Onions
Subject:	Fw: Data consultation Request - VPI Immingham: Flood Risk Information
Attachments:	VPI Immingham Data Request NLC.pdf; NLC SuDS Guidance Published document.pptx

Hi Joanne

With reference to your recent request for information I reply as follows: -

1) Surface Water or Groundwater Flooding in area - We are not aware of any within the vicinity of the development.

2) Historical Flooding of Watercourses within the area - We are not aware of any within the vicinity of the development. The site lies within an Internal Drainage Board may be able to assist (copied into this email) Ref: 9A Drain

3) Information on Sewer Surcharging - We are not aware of any within the vicinity of the development (Anglian Water need to be contacted with respect to this).

4) Surface Water & SuDS compliance Please refer to our Local SuDS and Flood Risk Guidance Document. The need to comply with the 1 in 100 year plus CC flood event and consideration/implementation of the various SuDS methods relevant to the size of development. The existing site V's the proposed site discharge rates and is the site brownfield or greenfield?

5) Mitigation measures - restriction from the site at greenfield run off rate.

The Environment Agency would need to be consulted with respect to fluvial flood risk and finished floor levels etc

Please contact me if you require further information.

Kind Regards,

North Lincolnshire Council Flood Risk Team
Lead Local Flood Authority

Community Services
Places Directorate
8-9 Billet Lane
Scunthorpe
DN15 9YH
Tel: 01724 297522

Note: For all future correspondance via email, please reply to LLFAdrainageteam@northlincs.gov.uk

---

From: Billy Green
Sent: 07 February 2018 16:03
To: LLFAdrainageteam
Subject: Fw: Data consultation Request - VPI Immingham: Flood Risk Information

Regards

Billy Green
Drainage Projects Manager
Flood Risk Team
Transport, Highways & Environment
Highway & Community Services
North Lincolnshire Council

Highways and Neighbourhood Services Depot
8/9 Billet Lane
Scunthorpe
DN15 9YH

Tel: 01724 297522

From: Somerton, Joanne <joanne.somerton@aecom.com>
Sent: 07 February 2018 12:02
To: Billy Green
Subject: RE: Data consultation Request - VPI Immingham: Flood Risk Information

Billy

Please find attached the consultation request sent to Barrie attached.

Kind Regards

Jo Somerton

Joanne Somerton
Principal Flood Risk Specialist, Water and Flood Management, UK & I
D +44-0113-2045028
M +44-079170503650
joanne.somerton@aecom.com

From: Billy Green [mailto:Billy.Green@northlincs.gov.uk]
Sent: 06 February 2018 16:42
To: Somerton, Joanne; Barrie Onions
Cc: Rod Chapman; Sam Cross; Craig Fotheringham; LLFAdrainageteam
Subject: Re: Data consultation Request - VPI Immingham: Flood Risk Information

Hi Barrie / Joanne

Can you please attached the data consultation request and email it to LLFA Dainage Team email...
Regards

Billy Green
Drainage Projects Manager
Flood Risk Team
Transport, Highways & Environment
Highway & Community Services
North Lincolnshire Council

Highways and Neighbourhood Services Depot
8/9 Billet Lane
Scunthorpe
DN15 9YH

Tel: 01724 297522

From: Somerton, Joanne <joanne.somerton@aecom.com>
Sent: 06 February 2018 16:30
To: Barrie Onions
Cc: Billy Green; Rod Chapman; Sam Cross; Craig Fotheringham
Subject: RE: Data consultation Request - VPI Immingham: Flood Risk Information

Dear All

I am writing to follow up on the data consultation request sent on 19th January with regards the above site (see email train below).

I have received a response from Barrie with regards flood risk information, however, I am still waiting for a response from the Council's Drainage Team.

Please can you advise as to when to expect a response?

Kind Regards

Jo Somerton

Joanne Somerton
Principal Flood Risk Specialist, Water and Flood Management, UK & I
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M +44-079170503650
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Sent: 25 January 2018 10:38
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Cc: Billy Green; Rod Chapman; Sam Cross; Craig Fotheringham
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Subject: Fw: Data consultation Request - VPI Immingham: Flood Risk Information

Barrie,

You will probably be able to answer some of the questions raised in this info request. I'm not sure who else it has been circulated to as it seems just to be sent to Spatial Planning.

Regards
Craig

Spatial Planning Team
Economy & Growth
Business Development
North Lincolnshire Council
Civic Centre
Ashby Road
Scunthorpe
DN16 1AB

Tel: 01724 297
E-mail: spatial.planning@northlincs.gov.uk

From: Somerton, Joanne <joanne.somerton@aecom.com>
Sent: 19 January 2018 16:24
To: Spatial Planning

Cc: Lowe, Richard; Sangster, Malcolm
Subject: Data consultation Request - VPI Immingham: Flood Risk Information

Dear Sirs

Please find attached a data consultation request for information to inform a flood risk assessment for a proposed development on a site located at South Killingholme. A site location plan is included to the rear of the attached correspondence.

If you require further information please do not hesitate to contact me.

Kind Regards

Jo Somerton

Joanne Somerton (MSc, BSc)
Principal Flood Risk Specialist, Water & Flood Management, UK & I
D +44-01132045028
M +44-07917503650
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Please think before you print- North Lincolnshire Council greening the workplace.
This e-mail expresses the opinion of the author and is not necessarily the view of the Council. Please be aware that anything included in an e-mail may have to be disclosed under the Freedom of Information Act and cannot be regarded as confidential. This communication is intended for the addressee(s) only. Please notify the sender if received in error. All Email is monitored and recorded.
Please think before you print- North Lincolnshire Council greening the workplace.

Strategic Flood Risk Assessment
Map 25
Compartment 1T3 Immingham and North Killinholme Breach Hazard

KEY

- Council Boundary
- Pumping Stations
- Historic Flood Complaints
- Main River Watercourse
- Significant Ordinary Watercourse
- Flood Defences
- Sub Compartment Boundary
- Breach Location
- Outside Study Area

Degree of Flood Hazard from Level 2 Assessment

- Negligible (Hazard Rating = 0)
- Low (Hazard Rating = 0 - 0.75)
- Moderate (Hazard Rating = 0.75 - 1.25)
- Severe (Hazard Rating = 1.25 - 2)
- Extreme (Hazard Rating >2)
- Undefined (No Level 2 Assessment)
- Covered by Breach Hazard Map 24

N

1:20000

Sub Compartment - 3

Sub Compartment - 2

Sub Compartment - 1

North Lincolnshire

North East Lincolnshire

0 1 2 kilometres

Annex 4 – North East Lindsey IDB Consultation

Somerton, Joanne

From:	Guy Hird <Guy.Hird@witham3idb.gov.uk>
Sent:	19 February 2018 16:25
To:	Somerton, Joanne
Cc:	Billy Green; Darren Scott
Subject:	FW: North East Lindsey IDB: Data Consultation Request - VPI Immingham, South Killingholme
Attachments:	VPI Immingham Data Request NELIDB.pdf; NELDB map.pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

ND-3864-2018-PLN

Jo

North East Lindsey IDB: Data Consultation Request - VPI Immingham, South Killingholme

My comments in response to your questions are in red. I have attached a map the Board maintain watercourses near the site 9 is South Killingholme Drain and 9A is South Killingholme Drain Branch 1.

- Identify which drains/ watercourses fall under the jurisdiction of the North East Lindsey IDB; see attached map.
- Confirm if any of the drains/ watercourses are regulated by pumping; none, the watercourse that serves the site has a gravity discharge to the Humber.
- Provision of a catchment map for the North East Lindsey IDB drains/ watercourses; see attached map.
- Whether any of the drains/ watercourses have defences/ embankments; the watercourses do not have banks.
- Any known flooding issues (historical flood levels, extents data, flood maps); no information, you should contact the EA for their data.
- Easements required relating to drains/ watercourses maintained by North East Lindsey IDB; the Board byelaw distance is 7m.
- Indication of acceptable discharge rates of surface water to the drains; and agree with North Lincolnshire Council.
- Any other information that is relevant or should be considered in the FRA (predicted climate change impacts
etc.).

AECOM also require the following information:

- Details of surface water and/ or groundwater abstractions in the area local to the Site; no information, this is not something the Board deals with.
- Details of any pollutant incidents. no information, this is not something the Board deals with.

Regards

Guy Hird
Engineering Services Officer

Witham First District Internal Drainage Board
Witham Third District Internal Drainage Board
Upper Witham Internal Drainage Board
North East Lindsey Drainage Board
J1 The Point,
Weaver Road,

LINCOLN,
LN6 3QN.
01522 697123

From: Somerton, Joanne [mailto:joanne.somerton@aecom.com]
Sent: 18 January 2018 5:02 PM
To: Enquiries <Enquiries@witham3idb.gov.uk>
Cc: Lowe, Richard <richard.lowe@aecom.com>; Sangster, Malcolm <Malcolm.Sangster@aecom.com>
Subject: North East Lindsey IDB: Data Consultation Request - VPI Immingham, South Killingholme

Dear Sirs

Please find attached a data consultation request for flood risk information to inform a Flood Risk Assessment for a proposed gas fired power station at a site in South Killingholme. A location map is included in the data consultation request.

If you require further information please do not hesitate to contact me.

Kind Regards

Jo Somerton

Joanne Somerton (MSc, BSc)
Principal Flood Risk Specialist, Water & Flood Management, UK & I
D +44-01132045028
M +44-07917503650
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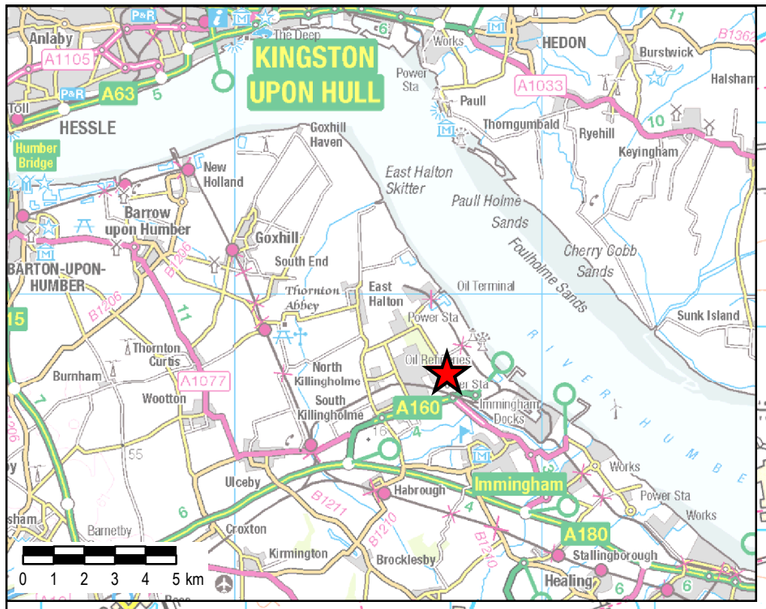
Legend
EA Main River
NEL Watercourses
North_East_Lindsey_IDB_Boundary
10A
10
10B
9A
9
8G
8D
8
The Lookout
Station House
Hazel Dene
A160
Contains OS data © Crown Copyright and database right 2017



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

Red Line Boundary

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
SITE LOCATION

Drawn	Checked	Approved	Date
JW	BB	MS	20/04/2018

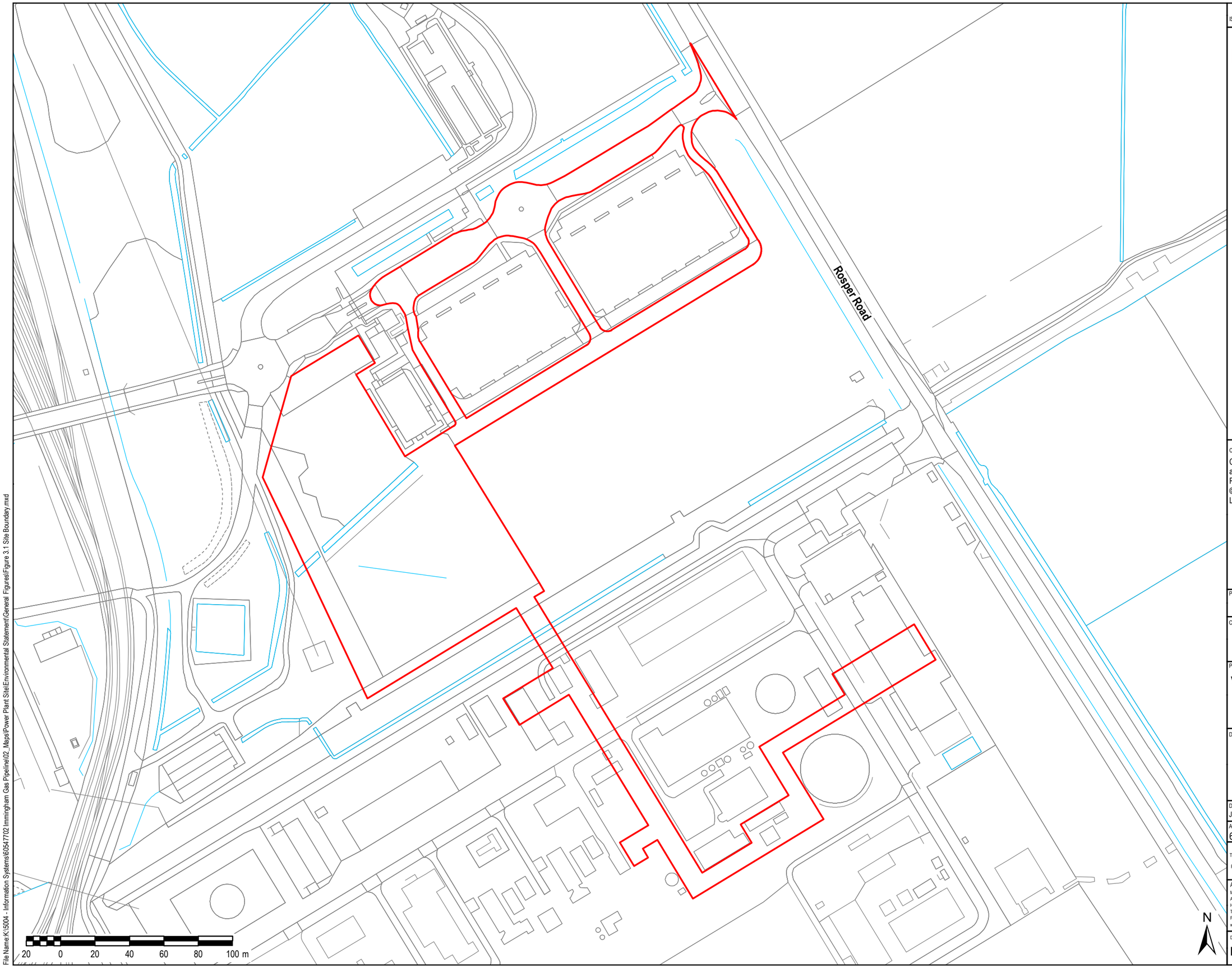
AECOM Internal Project No.	Scale @ A3	Inset Map
60547702	1:30,000	/ 1:200,000

AECOM
Midpoint
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number
FIGURE 1.1

Rev

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\General Figures\Figure 1.1 Site Location.mxd



File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\General Figures\Figure 3.1 Site Boundary.mxd

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LEGEND

Red Line Boundary

Purpose of Issue

FOR INFORMATION

Client

VPI IMMINGHAM

Project Title

VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title

SITE BOUNDARY

Drawn	Checked	Approved	Date
JW	BB	MS	20/04/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:2,000

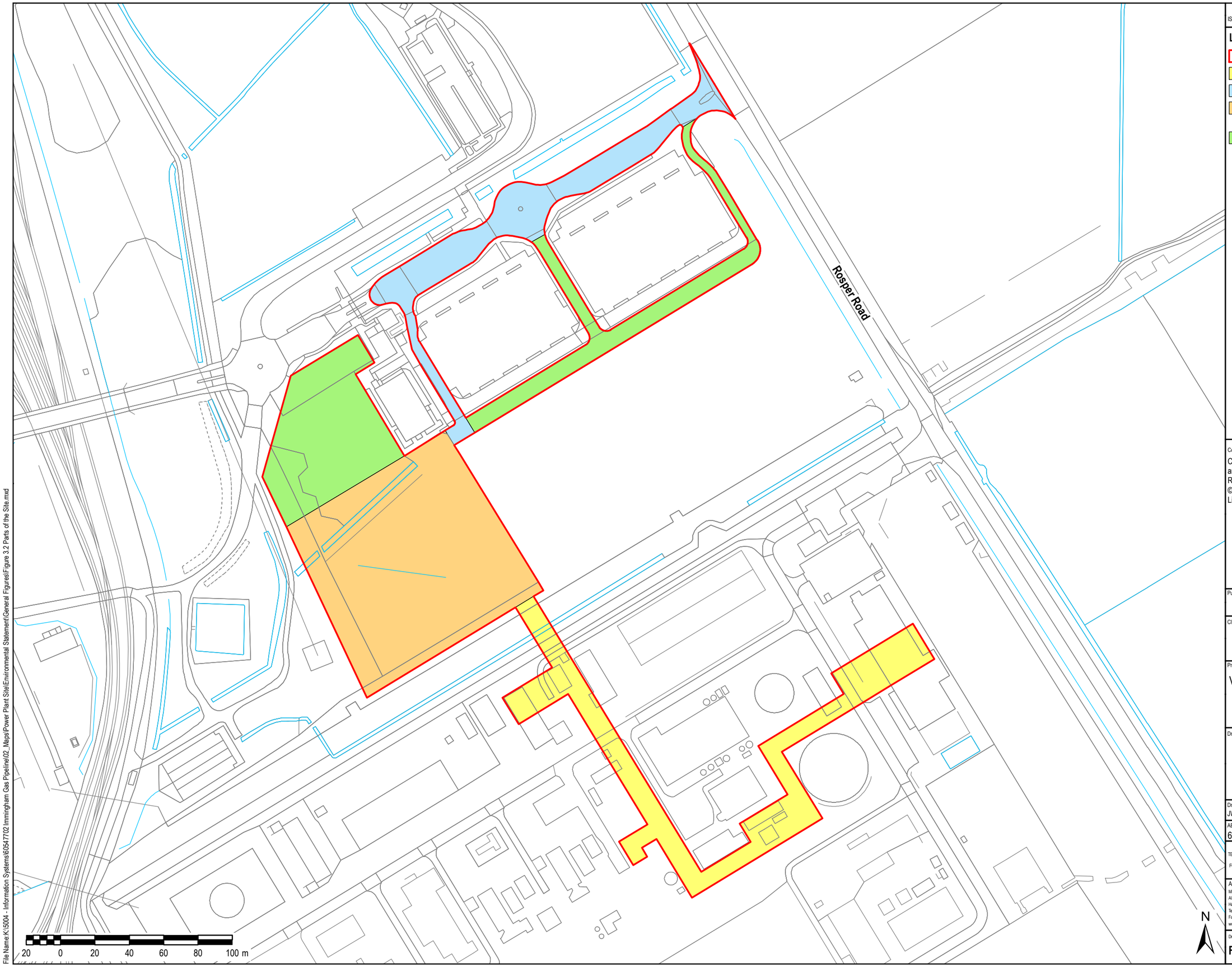
AECOM
Midpoint
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

AECOM

Drawing Number

FIGURE 3.1

Rev



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LEGEND

- Red Line Boundary
- Gas and Electricity Connections
- Permanent Site Access
- Proposed Power Plant Site
- Temporary Construction Laydown Area and Temporary Construction Access

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
PARTS OF THE SITE

Drawn	Checked	Approved	Date
JW	BB	MS	20/04/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:2,000

AECOM
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Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
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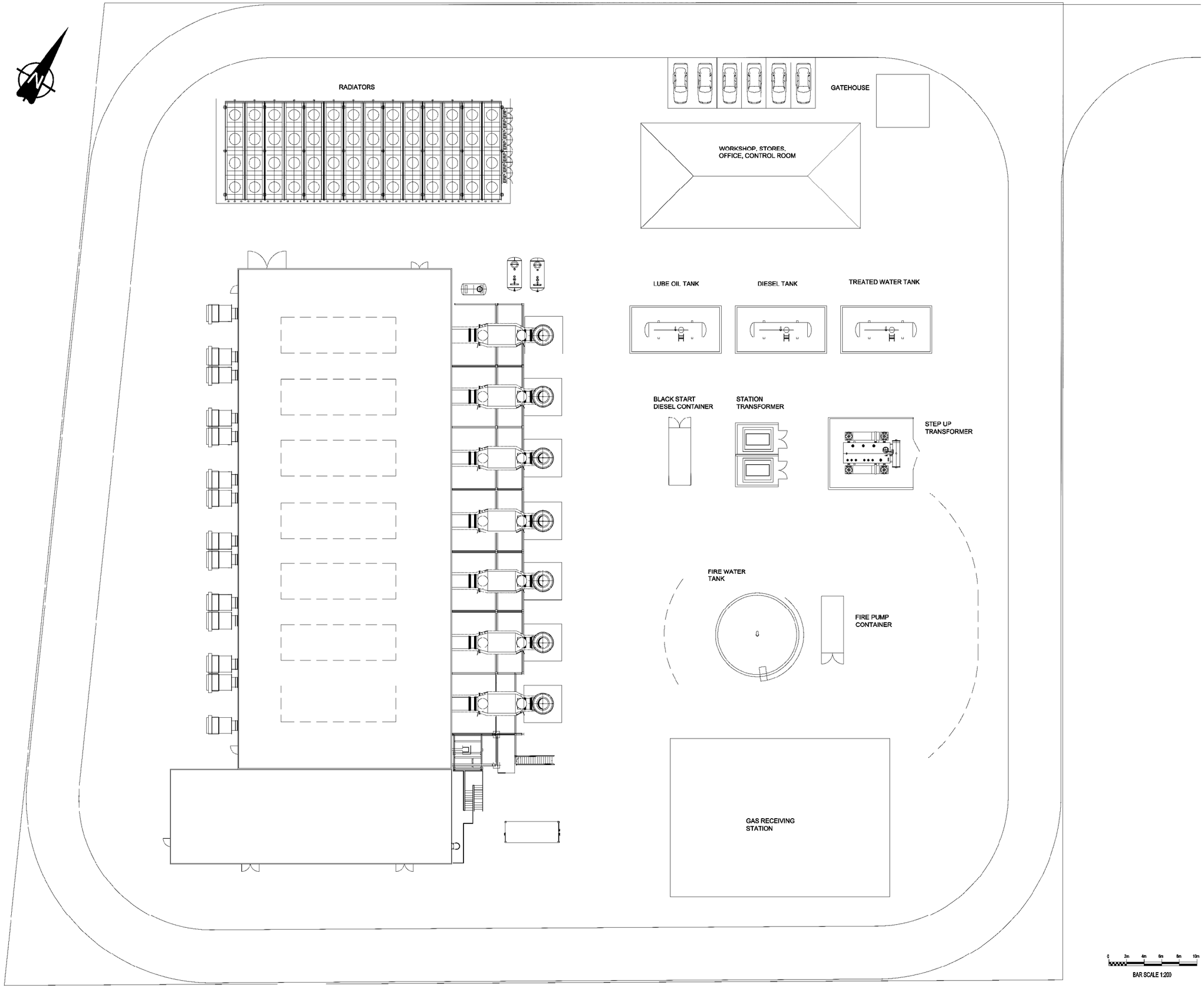
Drawing Number
FIGURE 3.2

Rev

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\General Figures\Figure 3.2 Parts of the Site.mxd



File Name:I:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\General Figures\Figure 4.1b Indicative layout B - Single engine house configuration.mxd

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Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
INDICATIVE LAYOUT A : SINGLE ENGINE HOUSE CONFIGURATION

Drawn	Checked	Approved	Date
JW	BB	MS	25/04/2018

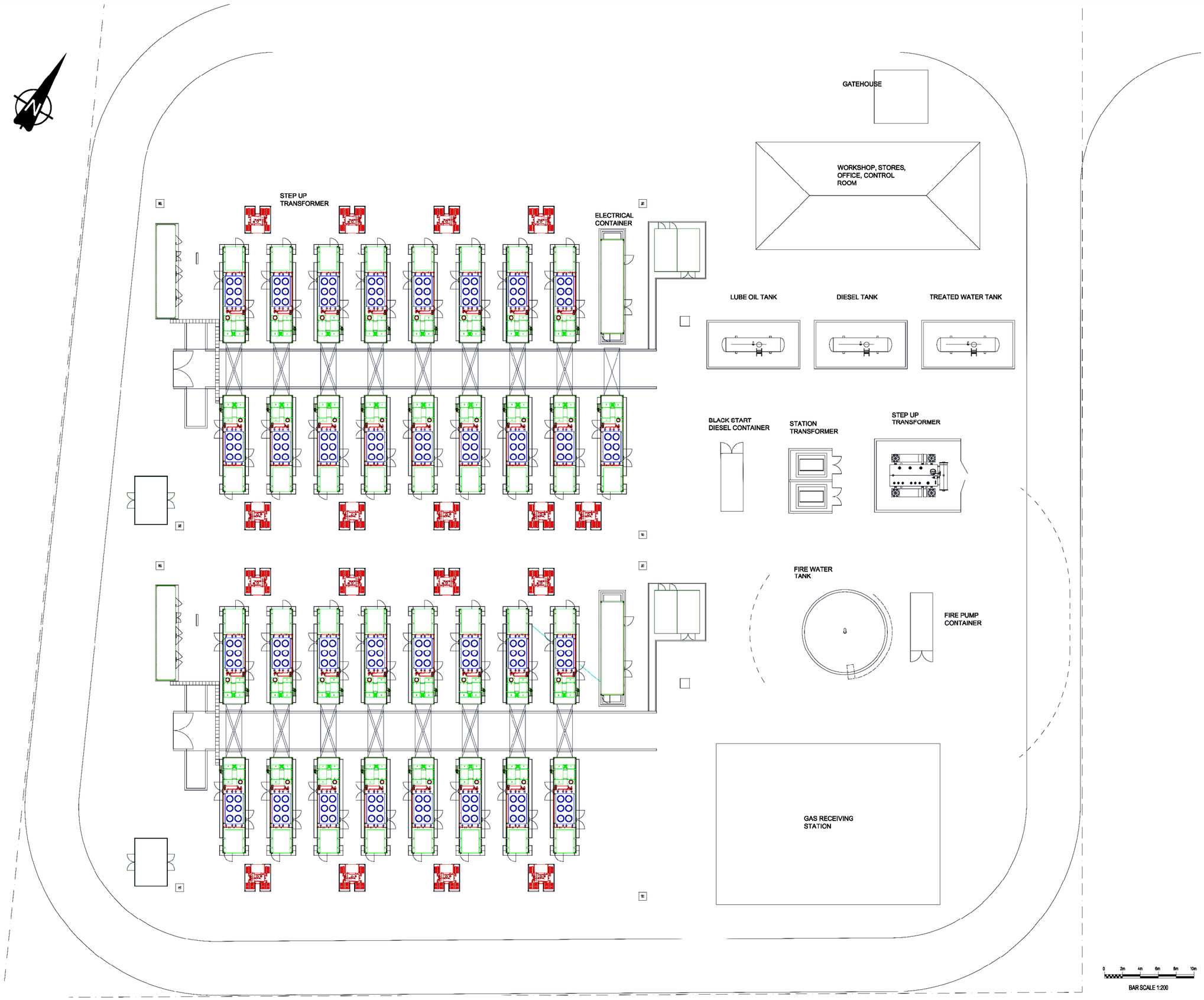
AECOM Internal Project No.
60547702

Scale @ A3

AECOM
Midpoint
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number
FIGURE 4.1A

Rev



File Name:I:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\General Figures\Figure 4.1a Indicative layout A - Multiple engine array configuration.mxd

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Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
INDICATIVE LAYOUT B : MULTIPLE ENGINE ARRAY CONFIGURATION

Drawn	Checked	Approved	Date
JW	BB	MS	25/04/2018

AECOM Internal Project No.
60547702

Scale @ A3

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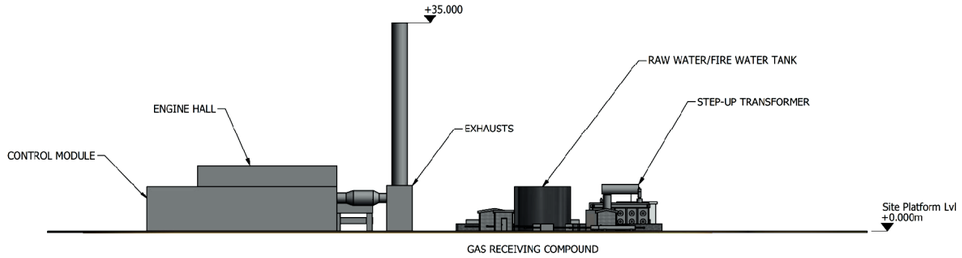
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

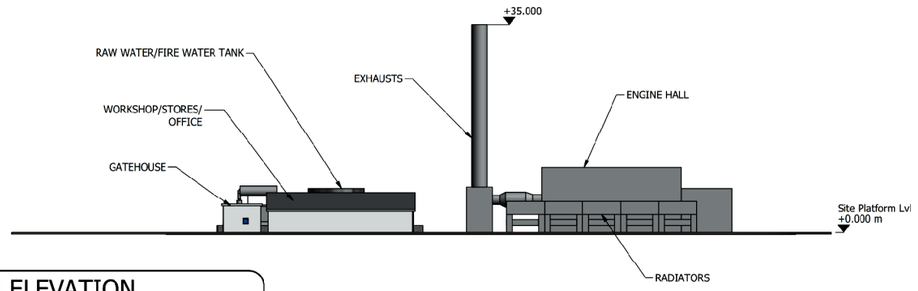
Drawing Number
FIGURE 4.1B

Rev

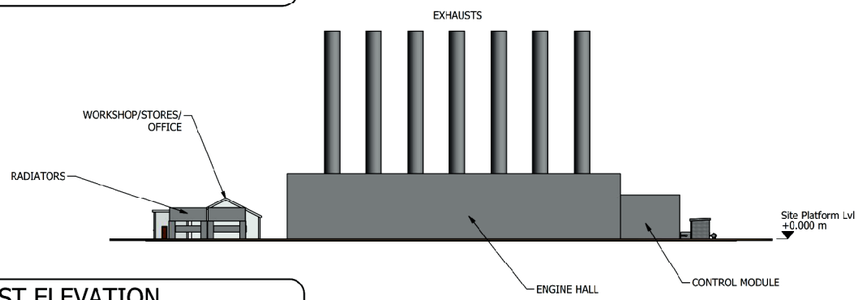
NOTE
FOR CLARITY, SECURITY FENCES AROUND THE GAS RECEIVING STATION AND SITE BOUNDARY ARE NOT SHOWN ON THESE ELEVATIONS



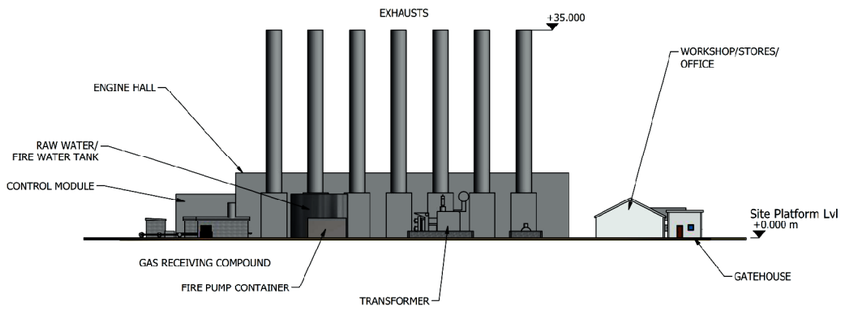
SOUTH ELEVATION
1:500



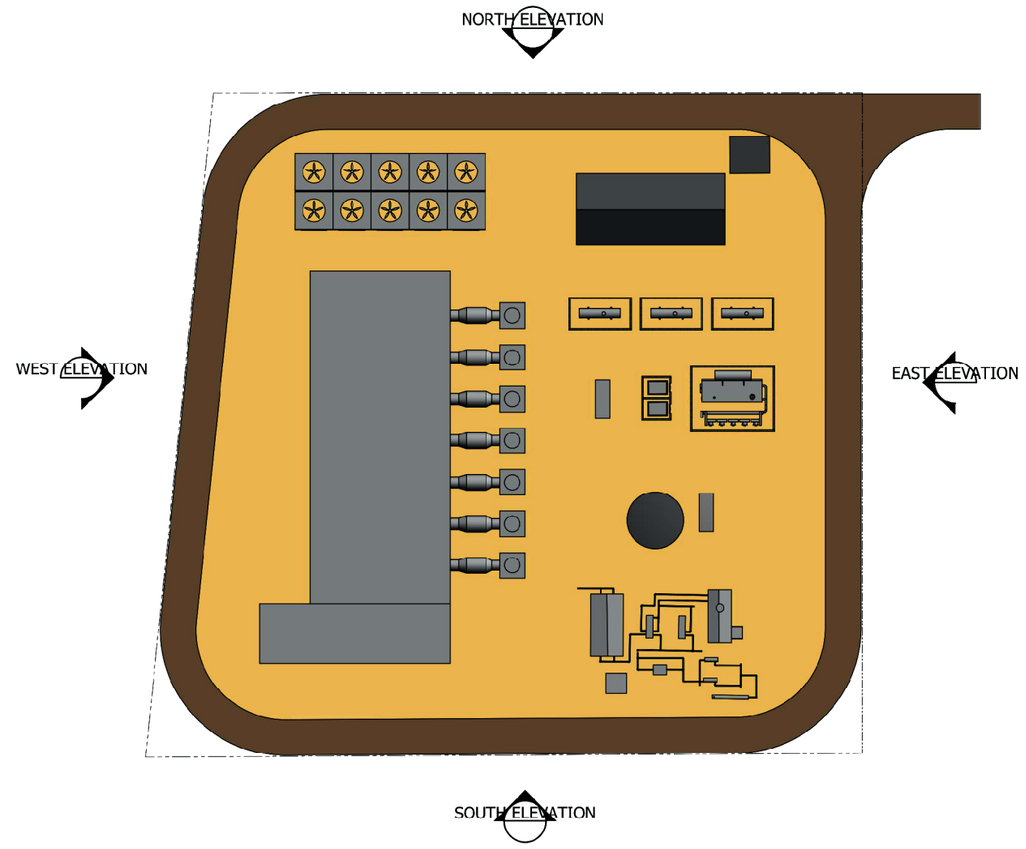
NORTH ELEVATION
1 : 500



WEST ELEVATION
1 : 500



EAST ELEVATION
1 : 500



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Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
INDICATIVE ELEVATIONS A : SINGLE ENGINE HOUSE CONFIGURATION

Drawn	Checked	Approved	Date
JW	BB	MS	25/04/2018

AECOM Internal Project No.	Scale @ A3
60547702	

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Fax (01256) 310201
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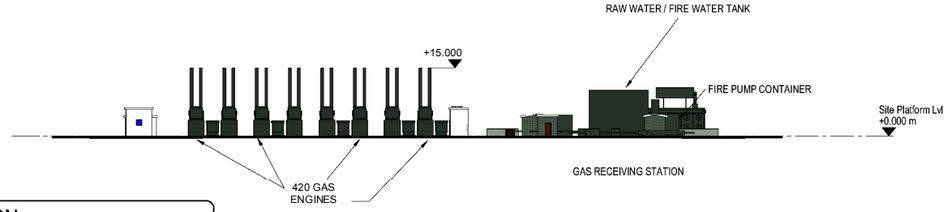
Drawing Number
FIGURE 4.1C

Rev

File Name:I:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\General Figures\Figure 4.1d Indicative elevations B Single engine house configuration.mxd

NOTE
FOR CLARITY, SECURITY FENCES AROUND THE GAS RECEIVING STATION AND SITE BOUNDARY ARE NOT SHOWN ON THESE ELEVATIONS



SOUTH ELEVATION
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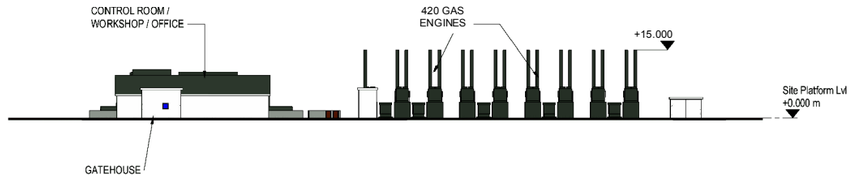
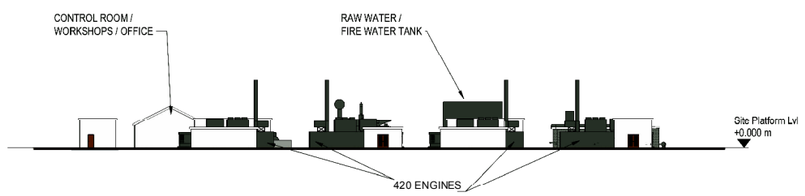


NORTH ELEVATION
1 : 500



WEST ELEVATION
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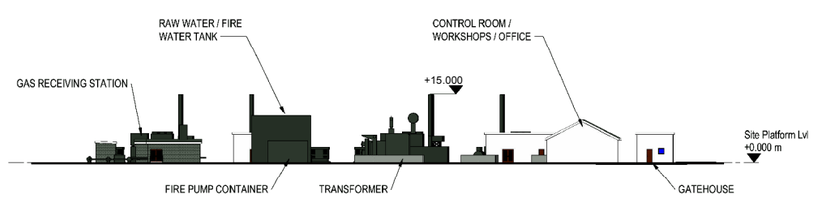
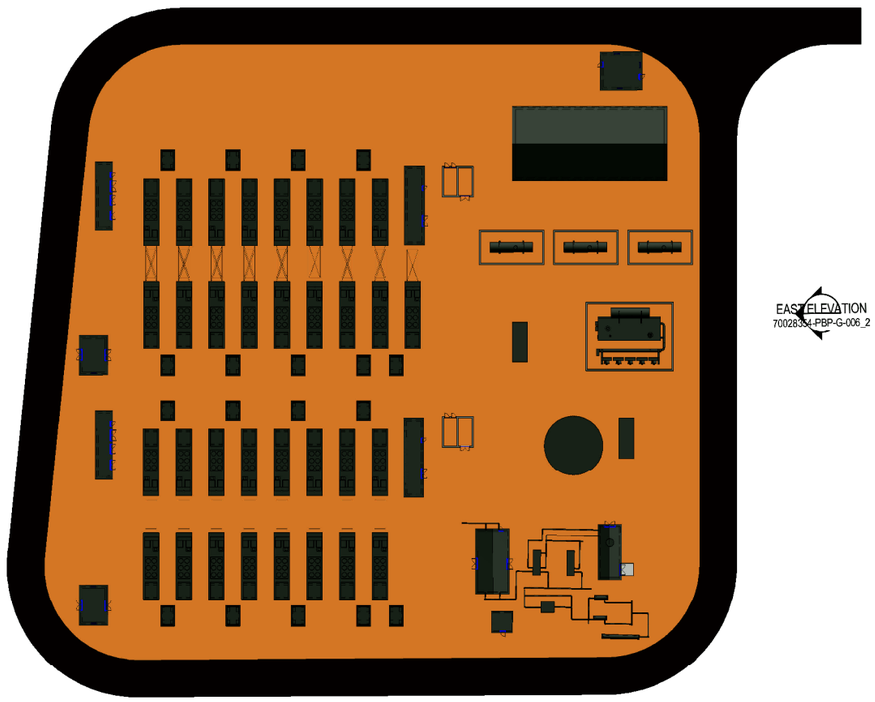


EAST ELEVATION
1 : 500



KEY PLAN
Scale 1:500

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Drawing VPI-WSP-Z1-00-C-M3-006
70028354-PBP-G-006_2 - ELEVATIONS
supplied by WSP - Revision A February 2018

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A'
ENVIRONMENTAL STATEMENT
VOLUME II

Drawing Title
INDICATIVE ELEVATIONS B :
MULTIPLE ENGINE ARRAY
CONFIGURATION

Drawn	Checked	Approved	Date
JW	BB	MS	30/04/2018

AECOM Internal Project No.	Scale @ A3
60547702	

AECOM
Midpoint
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number
FIGURE 4.1D

Rev

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\General Figures\Figure 4.1c Indicative elevations A - Multiple engine array configuration.mxd

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Legend

- Site Boundary
- Receptor Location
- Local Wildlife Site
- Special Area of Conservation - Humber Estuary
- Special Protection Area - Humber Estuary
- Site of Special Scientific Interest - Humber Estuary

Receptor ID	Receptor Name
R1	Hazel Dene
R2	Church Lane
R3	Station House
R4	Old Vicarage
R5	Manor Farm
R6	Westfield Farm
R7	Staple Road
R8	Humber Road
R9	East End Farm
R10	Immingham
R11	Station Road
E1a to E1i	Humber Estuary
E2	North Killingholme Haven Pits
E3	Eastfield Railway
E4	Burkinshaws Covert
E5	Station Road Fields
E6	Rosper Road Pools

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
AIR QUALITY STUDY AREA AND RECEPTOR LOCATIONS

Drawn	Checked	Approved	Date
EC	JW	HW	27/04/2018

AECOM Internal Project No.: 60547702
Scale @ A3: 1:20,000

AECOM
2 City Walk
Leeds
LS11 9AR
T +44-133-391-6800
http://www.aecom.com/

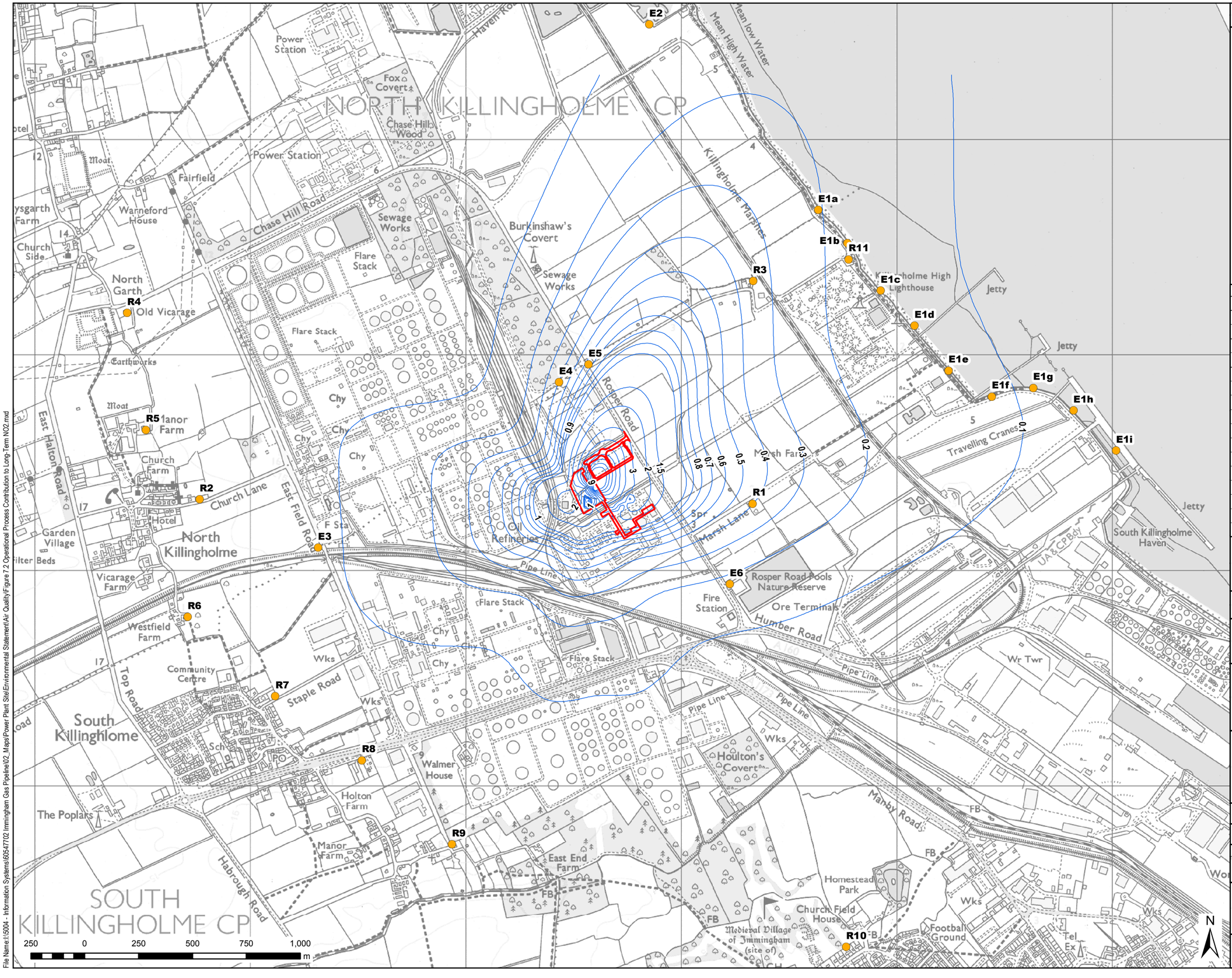
Drawing Number
FIGURE 7.1

Rev

0 0.25 0.5 0.75 1 Km

N

File Name:I:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Air Quality\Figure 7.1 Study Area and Receptor Locations.mxd



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

Legend

- Site Boundary
- Receptor Location
- Long-Term NO_2 Concentrations (µg/m³)

Receptor ID	Receptor Name
R1	Hazel Dene
R2	Church Lane
R3	Station House
R4	Old Vicarage
R5	Manor Farm
R6	Westfield Farm
R7	Staple Road
R8	Humber Road
R9	East End Farm
R10	Immingham
R11	Station Road
E1a to E1i	Humber Estuary
E2	North Killingholme Haven Pits
E3	Eastfield Railway
E4	Burkinshaws Covert
E5	Station Road Fields
E6	Rosper Road Pools

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
OPERATIONAL PROCESS CONTRIBUTION TO LONG-TERM NO_2 CONCENTRATION (µg/m³)

Drawn	Checked	Approved	Date
TD	DH	HW	27/04/2018

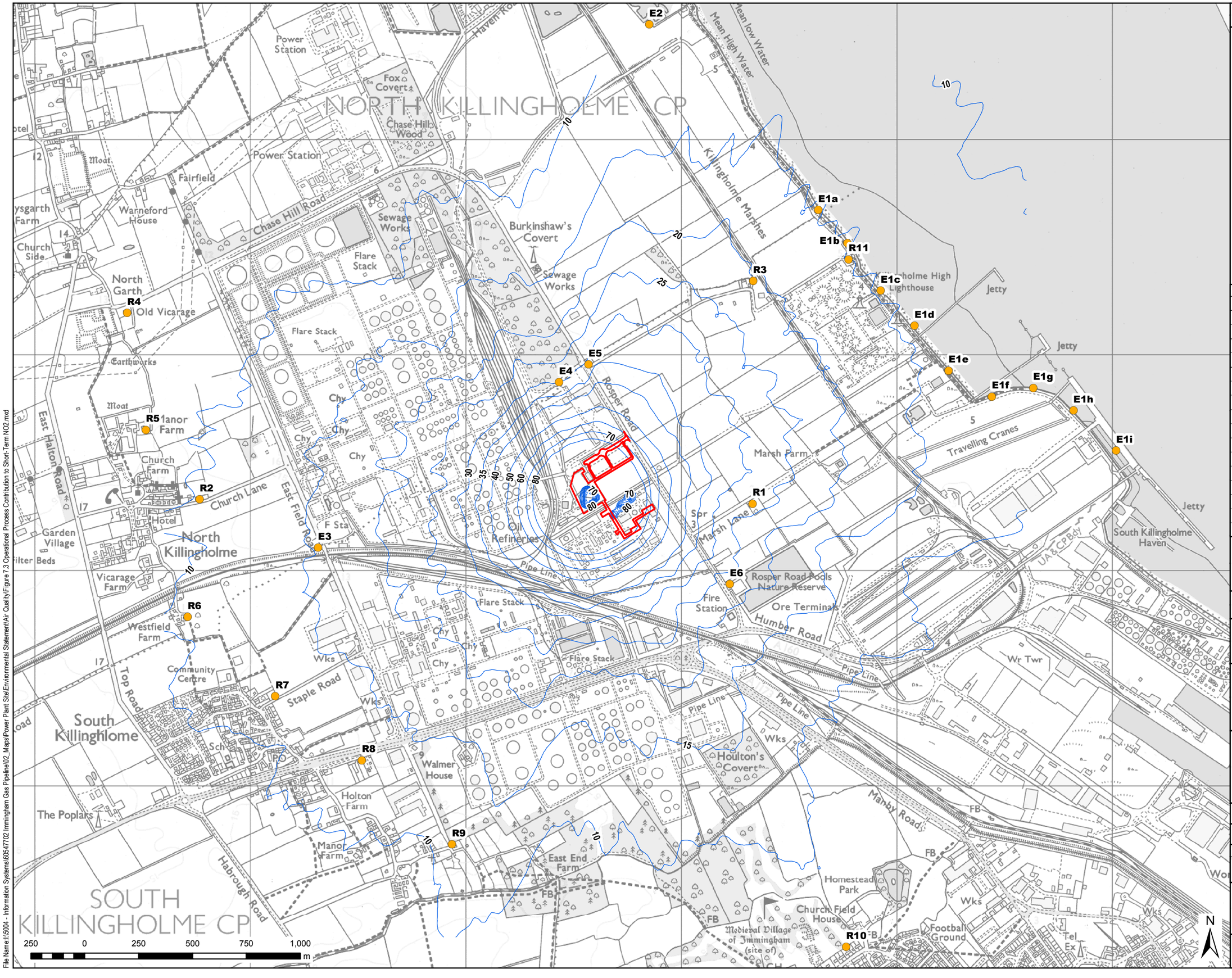
AECOM Internal Project No.	Scale @ A3
60547702	1:16,000

AECOM
2 City Walk
Leeds
LS11 9AR
T +44-133-391-6800
http://www.aecom.com/

Drawing Number
FIGURE 7.2

Rev

File Name:I:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Air Quality\Figure 7.2 Operational Process Contribution to Long-Term NO2.mxd



File Name:i:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Air Quality\Figure 7.3 Operational Process Contribution to Short-Term NO2.mxd

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

Legend

- Site Boundary
- Receptor Location
- Short-Term NO_2 Concentrations ($\mu g/m^3$)

Receptor ID	Receptor Name
R1	Hazel Dene
R2	Church Lane
R3	Station House
R4	Old Vicarage
R5	Manor Farm
R6	Westfield Farm
R7	Staple Road
R8	Humber Road
R9	East End Farm
R10	Immingham
R11	Station Road
E1a to E1i	Humber Estuary
E2	North Killingholme Haven Pits
E3	Eastfield Railway
E4	Burkinshaws Covert
E5	Station Road Fields
E6	Rosper Road Pools

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
OPERATIONAL PROCESS CONTRIBUTION TO SHORT-TERM NO_2 CONCENTRATION ($\mu g/m^3$)

Drawn	Checked	Approved	Date
TD	DH	HW	27/04/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:16,000

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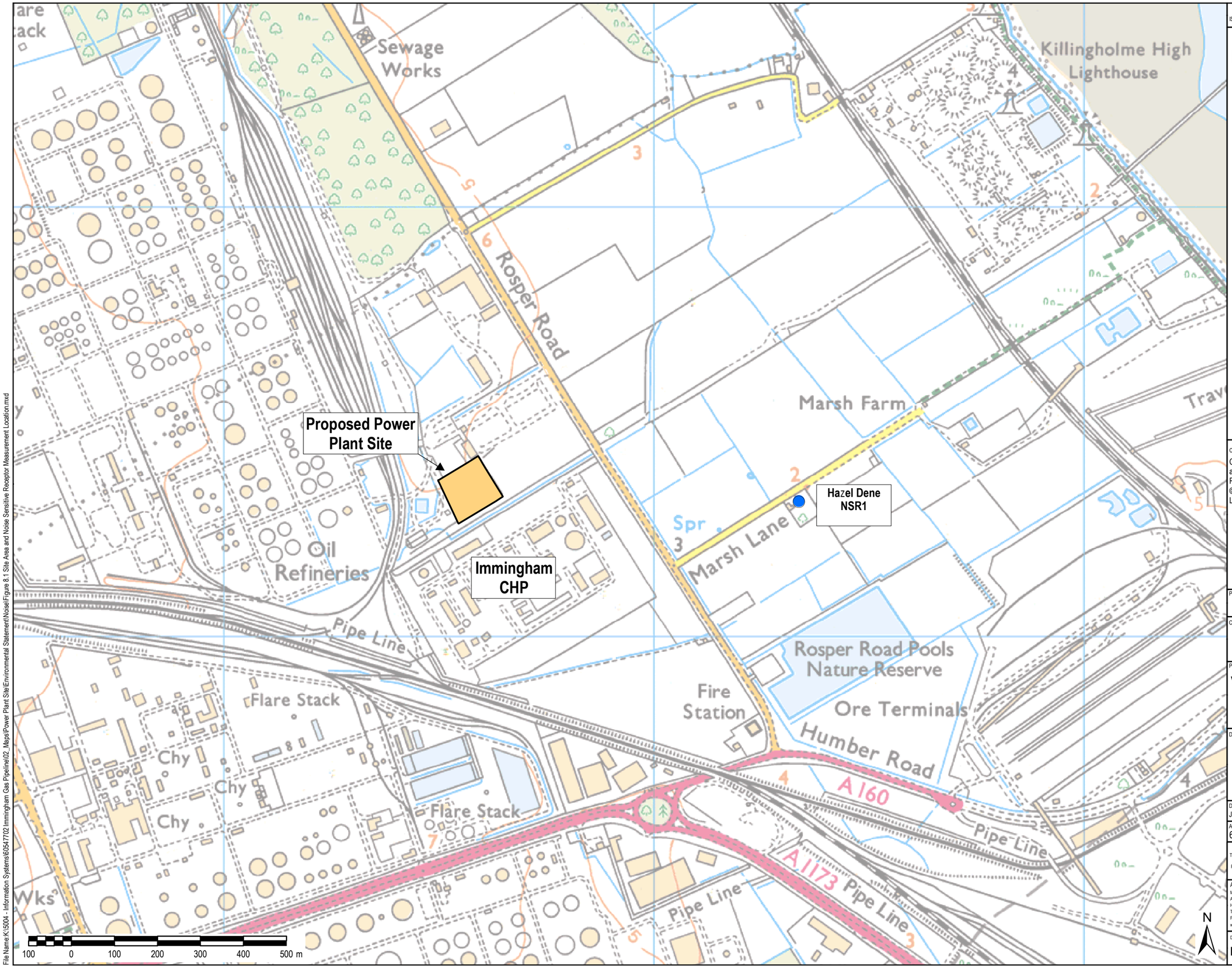
2 City Walk
Leeds
LS11 9AR
T +44-133-391-6800
http://www.aecom.com/

Drawing Number
FIGURE 7.3

Rev



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Proposed Power Plant Site
- Noise Sensitive Receptor Measurement Location

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
SITE AREA AND NOISE SENSITIVE RECEPTOR MEASUREMENT LOCATION

Drawn	Checked	Approved	Date
JW	BB	MS	30/04/2018

AECOM Internal Project No.	Scale @ A3
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Drawing Number
FIGURE 8.1

Rev

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Noise\Figure 8.1 Site Area and Noise Sensitive Receptor Measurement Location.mxd

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Red Line Boundary
- Red Line Boundary Buffer - 5km
- Building
- Woodland
- Zone of Theoretical Visibility

Methodology:
ZTV created with ESRI spatial analyst tools using 2m DTM Lidar from data.Gov.uk; buildings outside of the site sourced from OS Vector Map District and modelled at 7.5m high; woodland sourced from National Forest Inventory 2015 and modelled at 15m high.
Stacks modelled at 35m high.

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
ZONE OF THEORETICAL VISIBILITY

Drawn	Checked	Approved	Date
SM	JW	MS	13/04/2018

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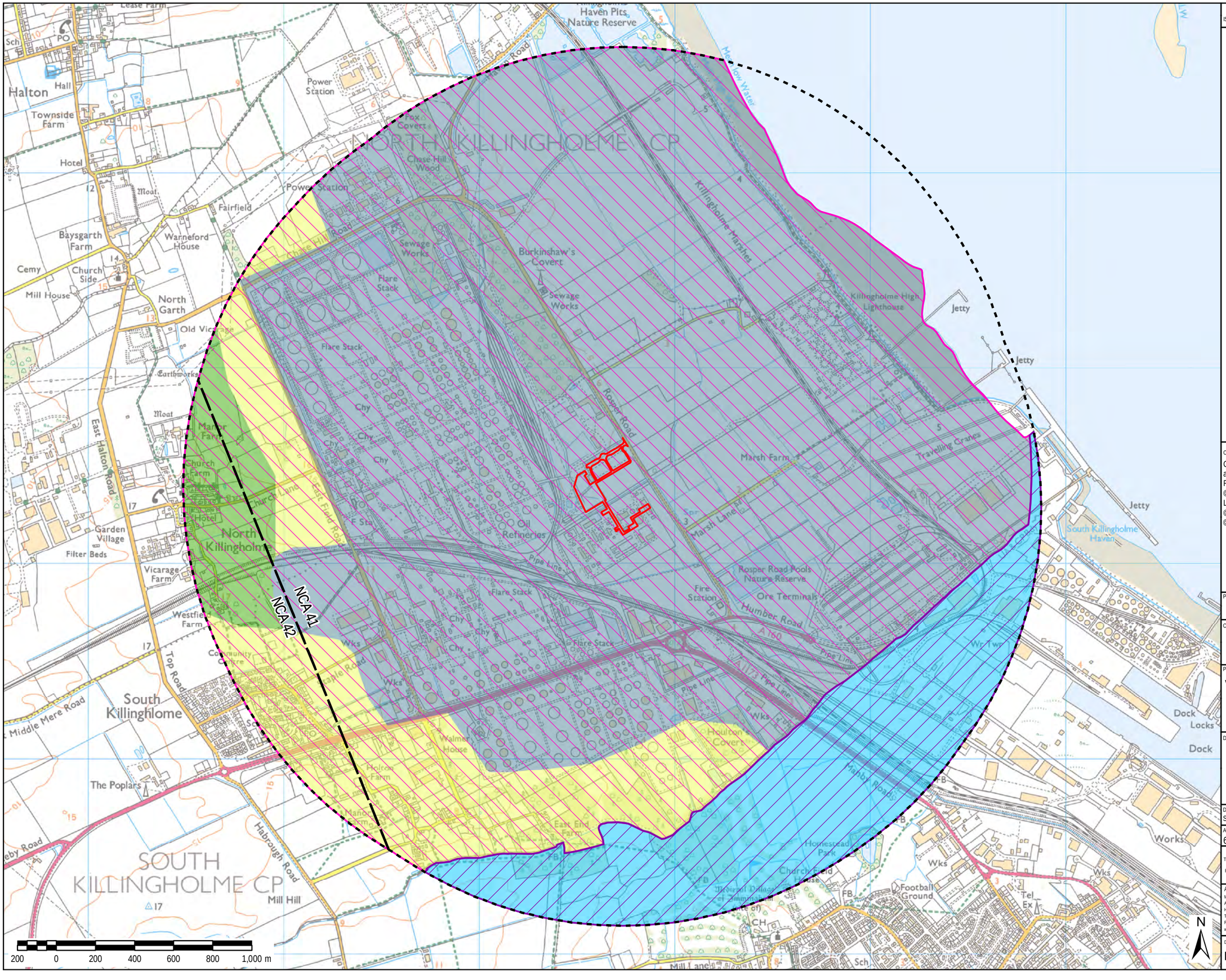
Drawing Number
FIGURE 9.1

Rev

N

500 0 500 1,000 1,500 2,000 2,500 m

File Name:\\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Landscape\Figure 3 - Zone of Theoretical Visibility.mxd



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LEGEND

- Red Line Boundary
- Red Line Boundary Buffer - 2km

National Character Area

NCA 41: Humber Estuary
NCA 42: Lincolnshire Coast and Marshes

Regional Character Area

- Humber Estuary LCA (North East Lincs LCA)
- Humber Estuary LCA (North Lincs LCA)

Local Character Area

North Lincolnshire

- Industrial Landscape – South Humber Bank LLT
- Open Undulating Farmland – South Killingholme LLT
- Wooded Farmland - East Halton, North Killingholme LLT

North East Lincolnshire

- Industrial Landscape LCT

Purpose of Issue: FOR INFORMATION

Client: VPI IMMINGHAM

Project Title: VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title: LANDSCAPE CHARACTER

Drawn	Checked	Approved	Date
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Rev:

File Name:I:\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Landscape\Figure 1 - Character Areas - 2km.mxd

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LEGEND

- Red Line Boundary
- Red Line Boundary Buffer - 2km
- Nev Cole Way Long Distance Footpath

Public Rights of Way

- Byway Open to all Traffic
- Footpath

Purpose of Issue: FOR INFORMATION

Client: VPI IMMINGHAM

Project Title: VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title: PUBLIC RIGHTS OF WAY

Drawn	Checked	Approved	Date
SM	BB	MS	13/04/2018

AECOM Internal Project No.	Scale @ A3
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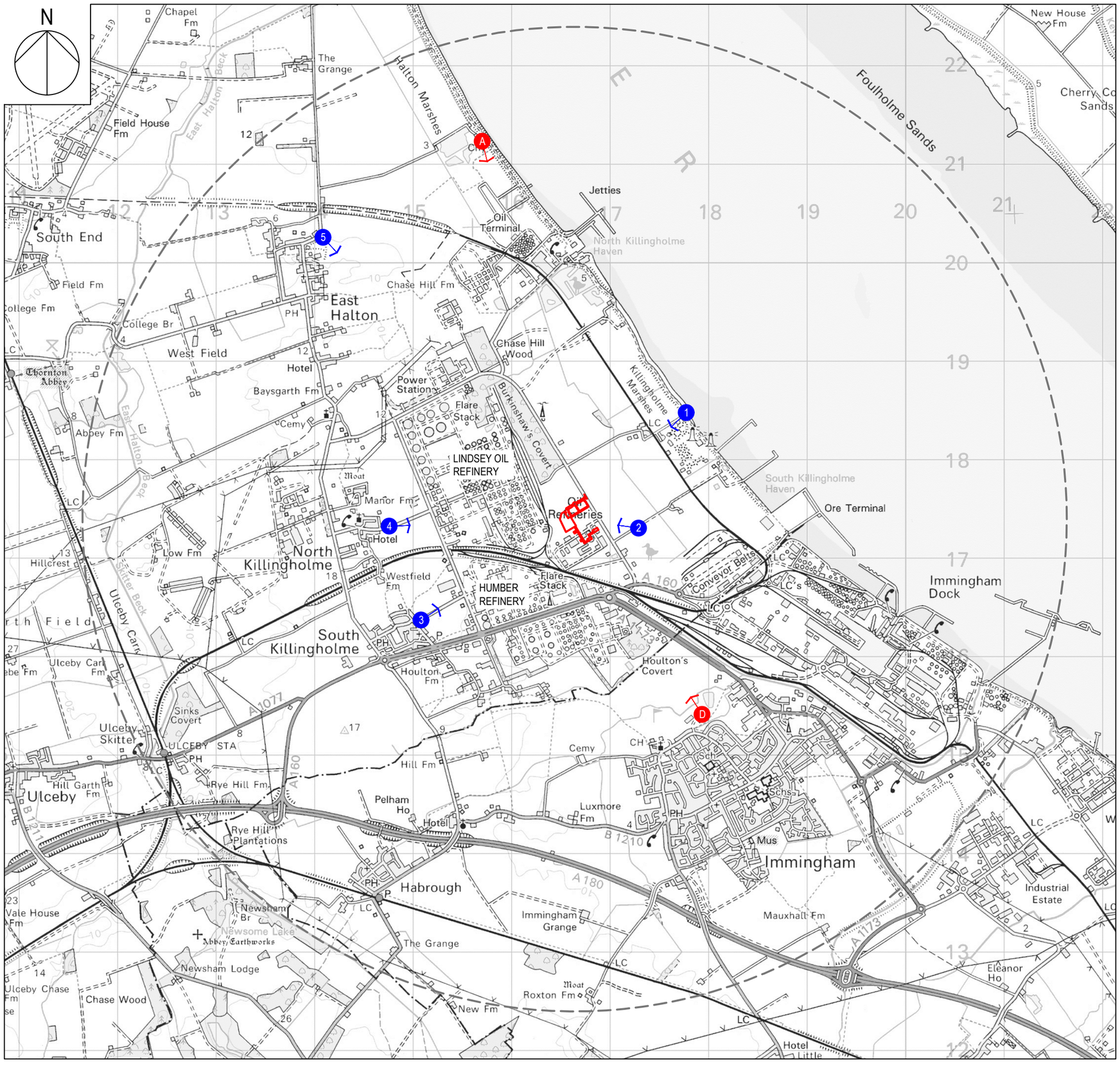
Drawing Number: **FIGURE 9.3**

Rev:

200 0 200 400 600 800 1,000 m

N

File Name:\\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Landscape\Figure 2 - Site Context.mxd



REPRESENTATIVE VIEWPOINTS

VIEWPOINT: 1

Distance to site (km): 1.6
Direction: South-west
Receptor type:
Recreational users of PRoW NKIL 50

Description:
Views over arable farmland to large scale industrial development at Lindsey Oil Refinery.

VIEWPOINT: 2

Distance to site (km): 1.5
Direction: West
Receptor type:
Residential receptors on Marsh Lane / Recreational users of PRoW SKIL 100

Description:
Views over arable farmland to large scale industrial development at Humber Refinery and Lindsey Oil Refinery.

VIEWPOINT: 3

Distance to site (km): 1.9
Direction: East
Receptor type:
Residential receptors on Staple Road, South Killingholme

Description:
Views over arable farmland to large scale industrial development at Scangrit with Humber Refinery beyond.

VIEWPOINT: 4

Distance to site (km): 1.9
Direction: East
Receptor type:
Residential receptors on Church Lane, North Killingholme

Description:
Views over arable farmland to large scale industrial development at Lindsey Oil Refinery.

VIEWPOINT: 5

Distance to site (km): 3.8
Direction: South-east
Receptor type:
Residential receptors on Station Road, East Halton / Recreational users of PRoW EHAL 74

Description:
Views over arable farmland with large scale industrial development of Lindsey Oil Refinery within the foreground.

DISCOUNTED VIEWPOINTS

VIEWPOINT: A

Distance to site (km): 3.9
Direction: South
Receptor type:
Recreational users of PRoW EHAL 50

Description:
Views over ECM Killingholme vehicle delivery site with Dock Ports Killingholme beyond.

VIEWPOINT: D

Distance to site (km): 2.3
Direction: North
Receptor type:
Recreational users of Homestead Park / Residential receptors on Church Lane

Description:
Views over arable farmland to large scale industrial development at Humber Refinery with Lindsey Oil Refinery beyond.

Viewpoints A and D discounted as it was considered during field visits, the Proposed Development would not be visible from these points.

LEGEND

- Red Line Boundary
- 5km Study Area
- Viewpoint Location
- Discounted Viewpoint Location

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
VIEWPOINT LOCATION PLAN

Drawn	Checked	Approved	Date
HB	RB	MS	08/03/2018

AECOM Internal Project No. 60547702
Scale @ A3 1:40,000

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Drawing Number
FIGURE 9.4

Rev

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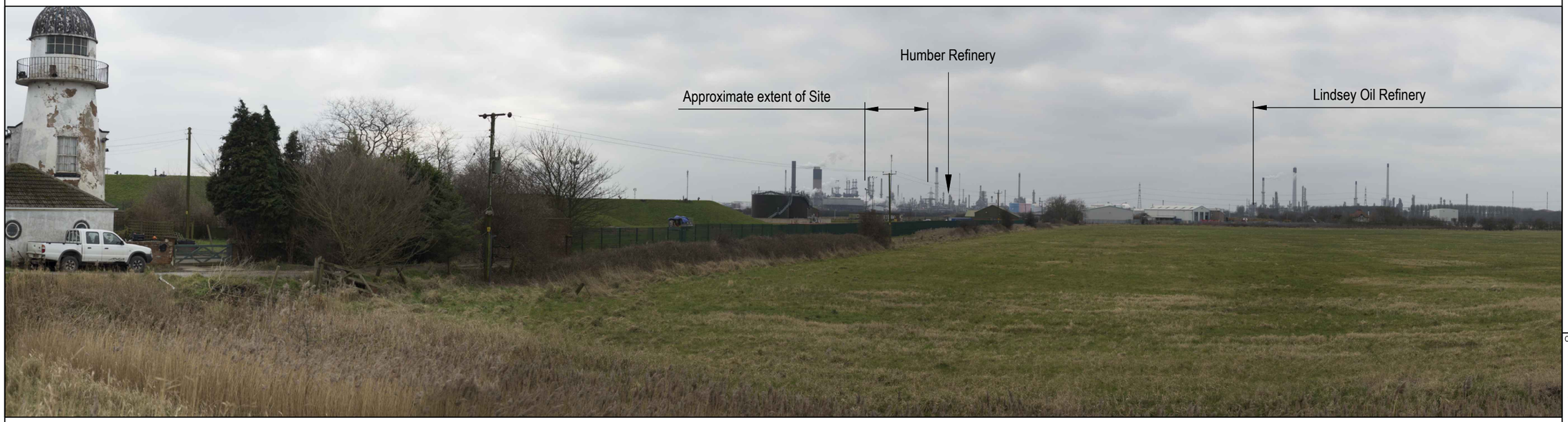

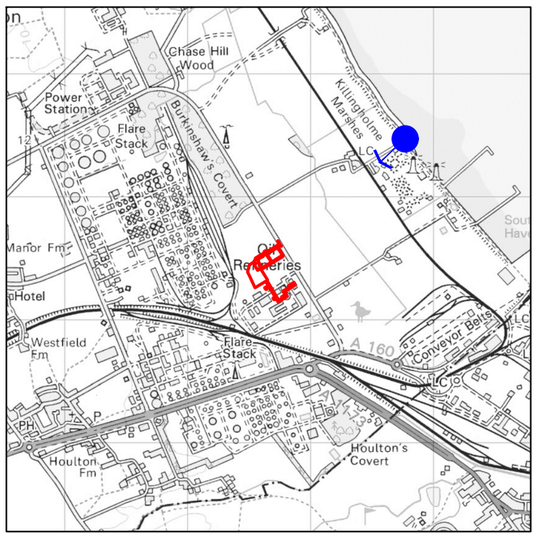

LEGEND

RED LINE BOUNDARY

VIEWPOINT AND DIRECTION OF VIEW

VIEWPOINT:	1
Lat/Long (WGS84):	53°38.9833N 0°13.1788W
Distance to site (km):	1.6
Height (m AOD):	30
Direction:	South-west
Receptor type:	Recreational users of PRoW NKIL 50.
Description:	Views over arable farmland to large scale industrial development at Lindsey oil Refinery.
Date and time:	23/03/18 1200hrs
Camera:	Canon EOS 6D
Lens:	EF50mm f/1.8 STM
Camera height (m AGL):	1.6
Projection:	Reposition
Image size:	93 mm by 354 mm
Paper size:	297 mm by 420 mm (A3)

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
VIEWPOINT 1

Drawn	Checked	Approved	Date
HB	RB	MS	17/04/2018

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FIGURE 9.5

Rev

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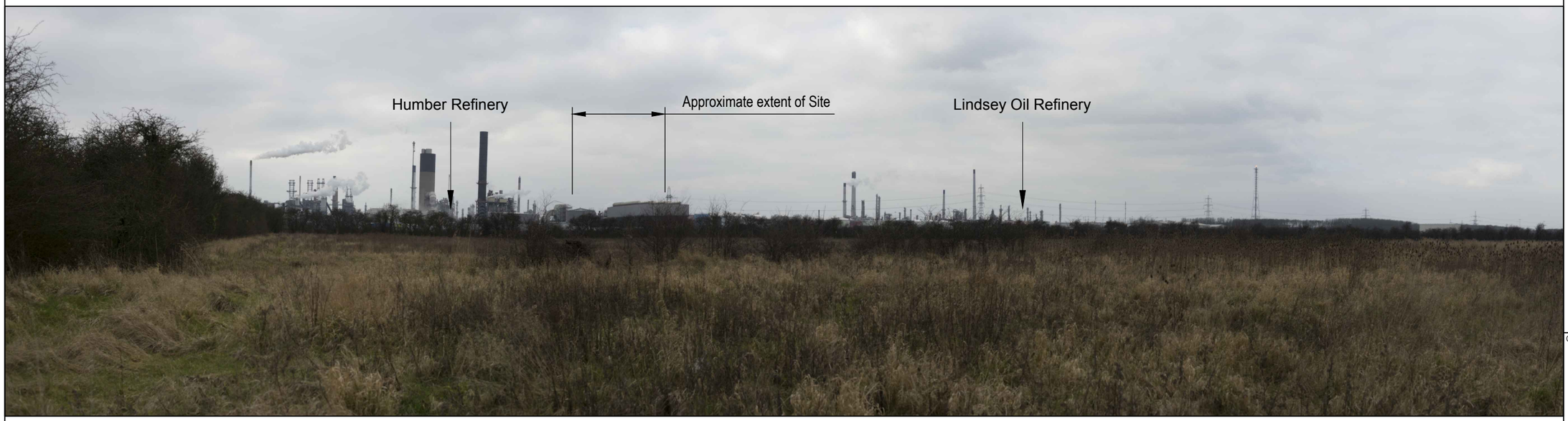

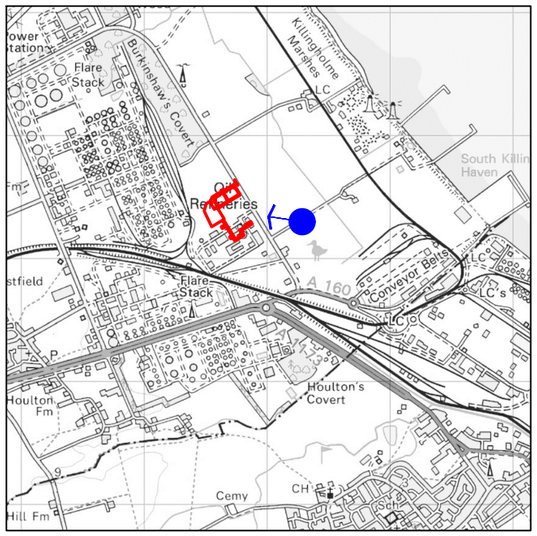

LEGEND

RED LINE BOUNDARY

VIEWPOINT AND DIRECTION OF VIEW

VIEWPOINT:	2
Lat/Long (WGS84):	53°38.4346N 0°13.4362W
Distance to site (km):	10.5
Height (m AOD):	10.5
Direction:	West
Receptor type:	Recreational users of PRoW SKIL 100 and residential receptors on Marsh Lane.
Description:	Views over arable farmland to large scale industrial development at Humber Refinery and Lindsey Oil Refinery.
Date and time:	23/03/18 1300hrs
Camera:	Canon EOS 6D
Lens:	EF50mm f/1.8 STM
Camera height (m AGL):	1.6
Projection:	Reposition
Image size:	93 mm by 354 mm
Paper size:	297 mm by 420 mm (A3)

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Purpose of Issue
FOR INFORMATION

Client
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Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
VIEWPOINT 2

Drawn	Checked	Approved	Date
HB	RB	MS	17/04/2018

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FIGURE 9.6	

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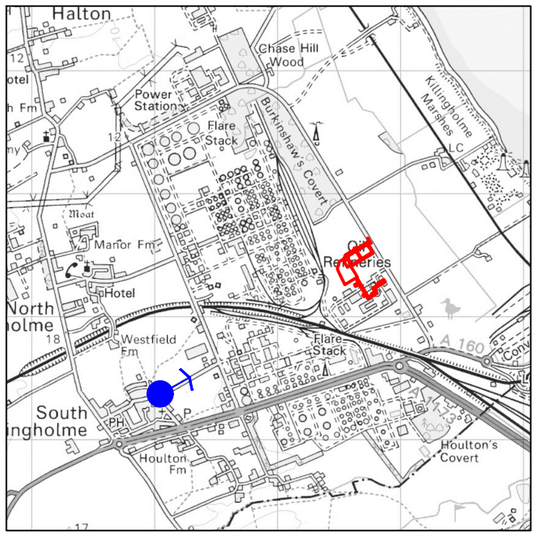

LEGEND

RED LINE BOUNDARY

VIEWPOINT AND DIRECTION OF VIEW

VIEWPOINT:	3
Lat/Long (WGS84):	53°37.9015N 0°15.6024W26.4
Distance to site (km):	1.9
Height (m AOD):	26.4
Direction:	East
Receptor type:	Residential receptors on Staple Road, South Killingholme
Description:	Views over arable farmland to large scale industrial development at Humber Refinery.
Date and time:	23/03/18 1315hrs
Camera:	Canon EOS 6D
Lens:	EF50mm f/1.8 STM
Camera height (m AGL):	1.6
Projection:	Reposition
Image size:	93 mm by 354 mm
Paper size:	297 mm by 420 mm (A3)

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
VIEWPOINT 3

Drawn	Checked	Approved	Date
HB	RB	MS	17/04/2018

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60547702	NOT TO SCALE

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Drawing Number
FIGURE 9.7

Rev

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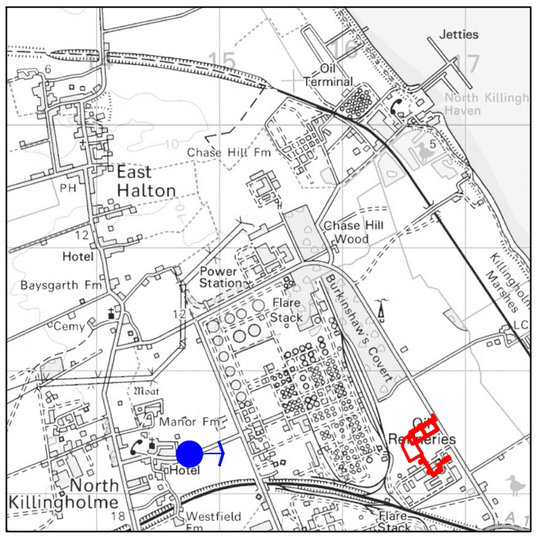

LEGEND

RED LINE BOUNDARY

VIEWPOINT AND DIRECTION OF VIEW

VIEWPOINT:	4
Lat/Long (WGS84):	53°38.3921N 0°15.8932W
Distance to site (km):	1.9
Height (m AOD):	22.1
Direction:	East
Receptor type:	Residential receptors on Church Lane, North Killingholme
Description:	Views over arable farmland to large scale industrial development at Lindsey Oil Refinery and Humber Refinery.
Date and time:	23/03/18 1330hrs
Camera:	Canon EOS 6D
Lens:	EF50mm f/1.8 STM
Camera height (m AGL):	1.6
Projection:	Reposition
Image size:	93 mm by 354 mm
Paper size:	297 mm by 420 mm (A3)

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Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
VIEWPOINT 4

Drawn	Checked	Approved	Date
HB	RB	MS	17/04/2018

AECOM Internal Project No.	Scale @ A3
60547702	NOT TO SCALE

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Drawing Number
FIGURE 9.8

Rev

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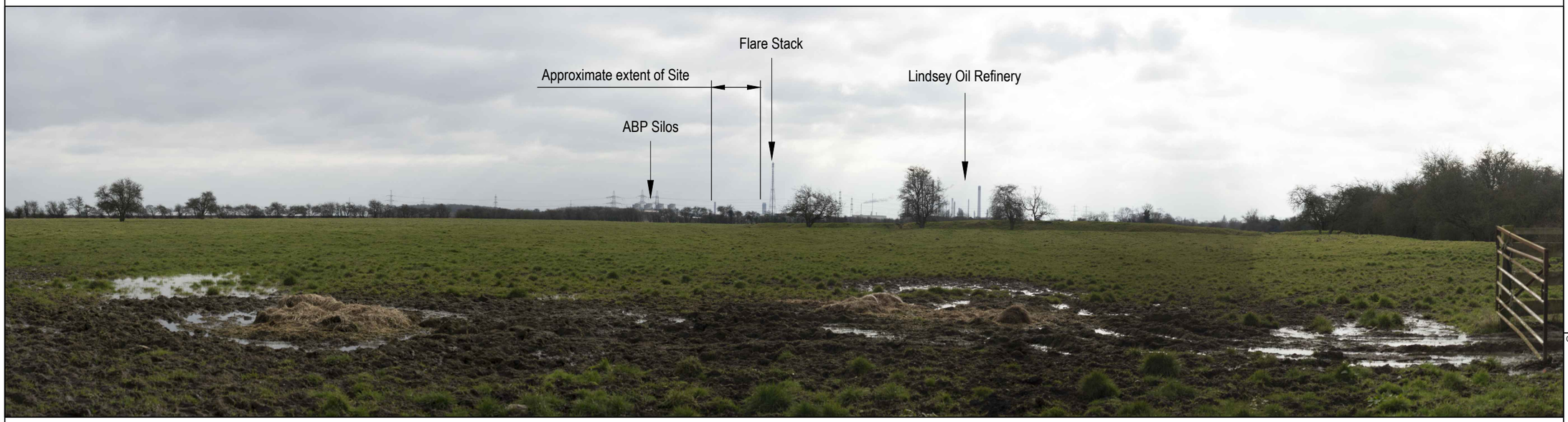

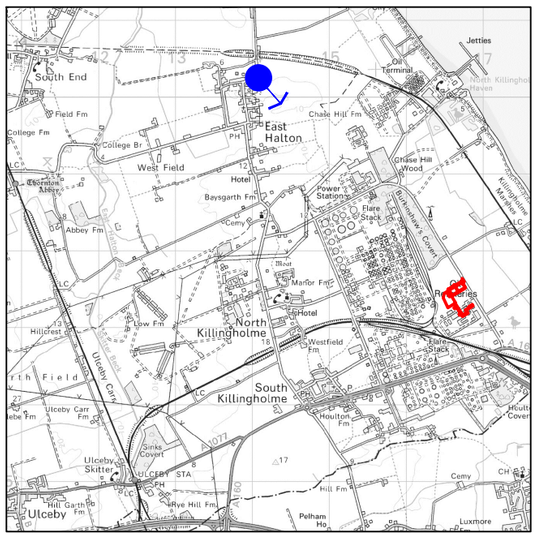

LEGEND

RED LINE BOUNDARY

VIEWPOINT AND DIRECTION OF VIEW

VIEWPOINT:	5
Lat/Long (WGS84):	53°40.0155N 0°16.472W
Distance to site (km):	3.8
Height (m AOD):	25
Direction:	South-east
Receptor type:	Recreational users of PRoW EHAL 74 and residential receptors on Station Road.
Description:	Views over arable farmland with large scale industrial development at Lindsey Oil Refinery partially visible.
Date and time:	23/03/18 1115hrs
Camera:	Canon EOS 6D
Lens:	EF50mm f/1.8 STM
Camera height (m AGL):	1.6
Projection:	Reposition
Image size:	93 mm by 354 mm
Paper size:	297 mm by 420 mm (A3)

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Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
VIEWPOINT 5

Drawn	Checked	Approved	Date
HB	RB	MS	17/04/2018

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FIGURE 9.9

Rev

ISO A3 297mm x 420mm

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EXISTING VIEW

PHOTOMONTAGE

WIREFRAME

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Purpose of Issue

FOR INFORMATION

Client

VPI IMMINGHAM

Project Title

VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title

VIEWPOINT 1 - EXAMPLE LAYOUT A: EXISTING, PHOTOMONTAGE AND WIREFRAME

Drawn	Checked	Approved	Date
HB	RB	MS	17/04/2018

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Drawing Number

FIGURE 9.10

Rev

ISO A3 297mm x 420mm

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EXISTING VIEW

PHOTOMONTAGE

WIREFRAME

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Purpose of Issue

FOR INFORMATION

Client

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Project Title

VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title

VIEWPOINT 2 - EXAMPLE LAYOUT A: EXISTING, PHOTOMONTAGE AND WIREFRAME

Drawn	Checked	Approved	Date
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Drawing Number

FIGURE 9.11

Rev

ISO A3 297mm x 420mm

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EXISTING VIEW

PHOTOMONTAGE

WIREFRAME

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Purpose of Issue

FOR INFORMATION

Client

VPI IMMINGHAM

Project Title

VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title

VIEWPOINT 4 - EXAMPLE LAYOUT A: EXISTING, PHOTOMONTAGE AND WIREFRAME

Drawn	Checked	Approved	Date
HB	RB	MS	17/04/2018

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Drawing Number	Rev
FIGURE 9.12	

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LEGEND

- Red Line Boundary
- Red Line Boundary Buffer - 1km
- North Lincolnshire Monument Point
- North Lincolnshire Monument Line
- North Lincolnshire Ridge and Furrow Orientation
- North Lincolnshire Excavation Event
- North Lincolnshire Monument Polygon

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
KNOWN HERITAGE ASSETS

Drawn	Checked	Approved	Date
SM	BB	MS	02/05/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:10,000

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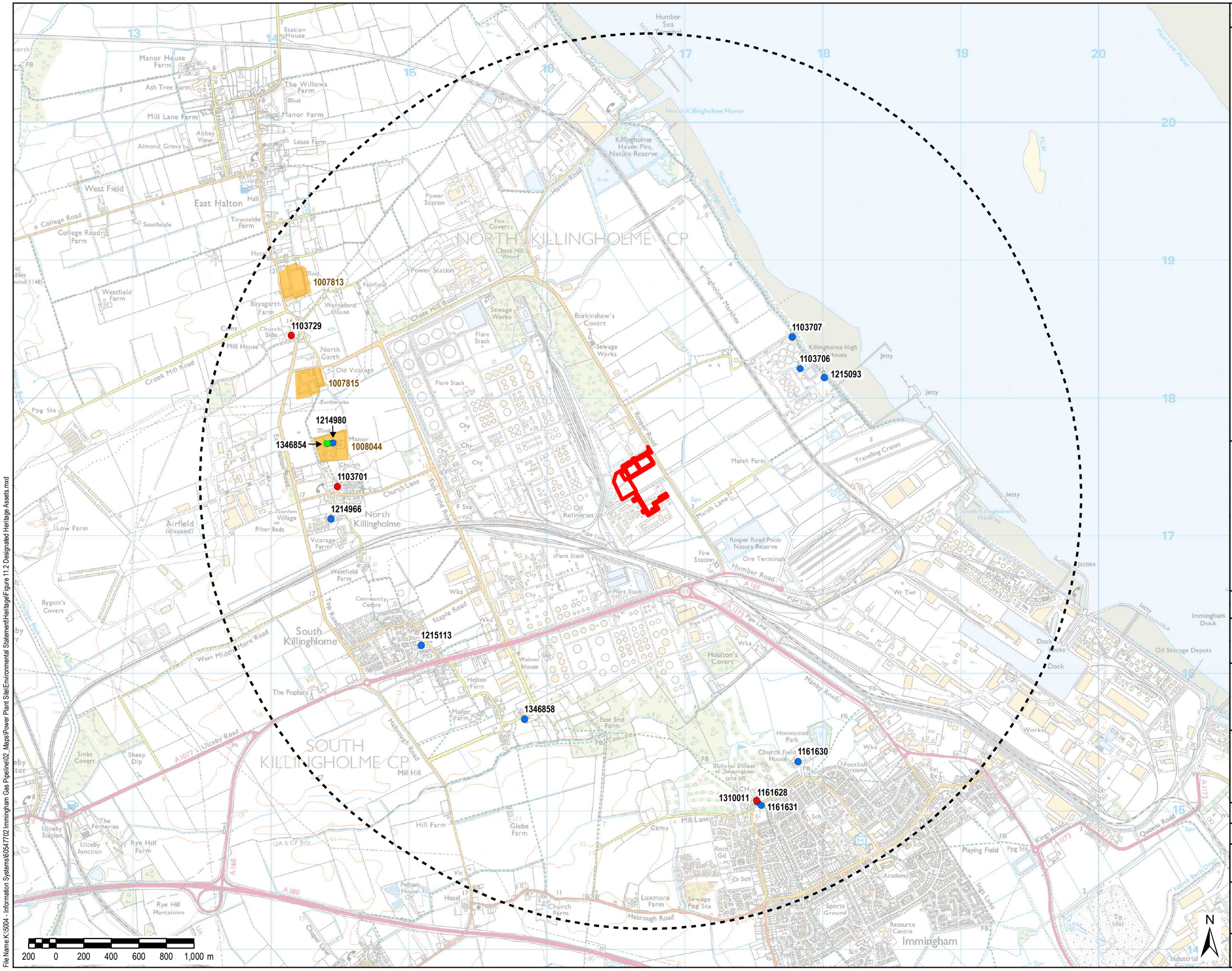
Drawing Number
FIGURE 11.1

Rev

200 0 200 400 600 800 1,000 m

N

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Heritage\Figure 11.1 Known Heritage Assets.mxd



File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Heritage\Figure 11.2 Designated Heritage Assets.mxd

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LEGEND

- Red Line Boundary
- Red Line Boundary Buffer - 3km

Listed Building

- Grade I
- Grade II*
- Grade II

Scheduled Monument

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A'
ENVIRONMENTAL STATEMENT
VOLUME 2

Drawing Title
DESIGNATED
HERITAGE ASSETS

Drawn	Checked	Approved	Date
SM	BB	MS	02/05/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:25,000

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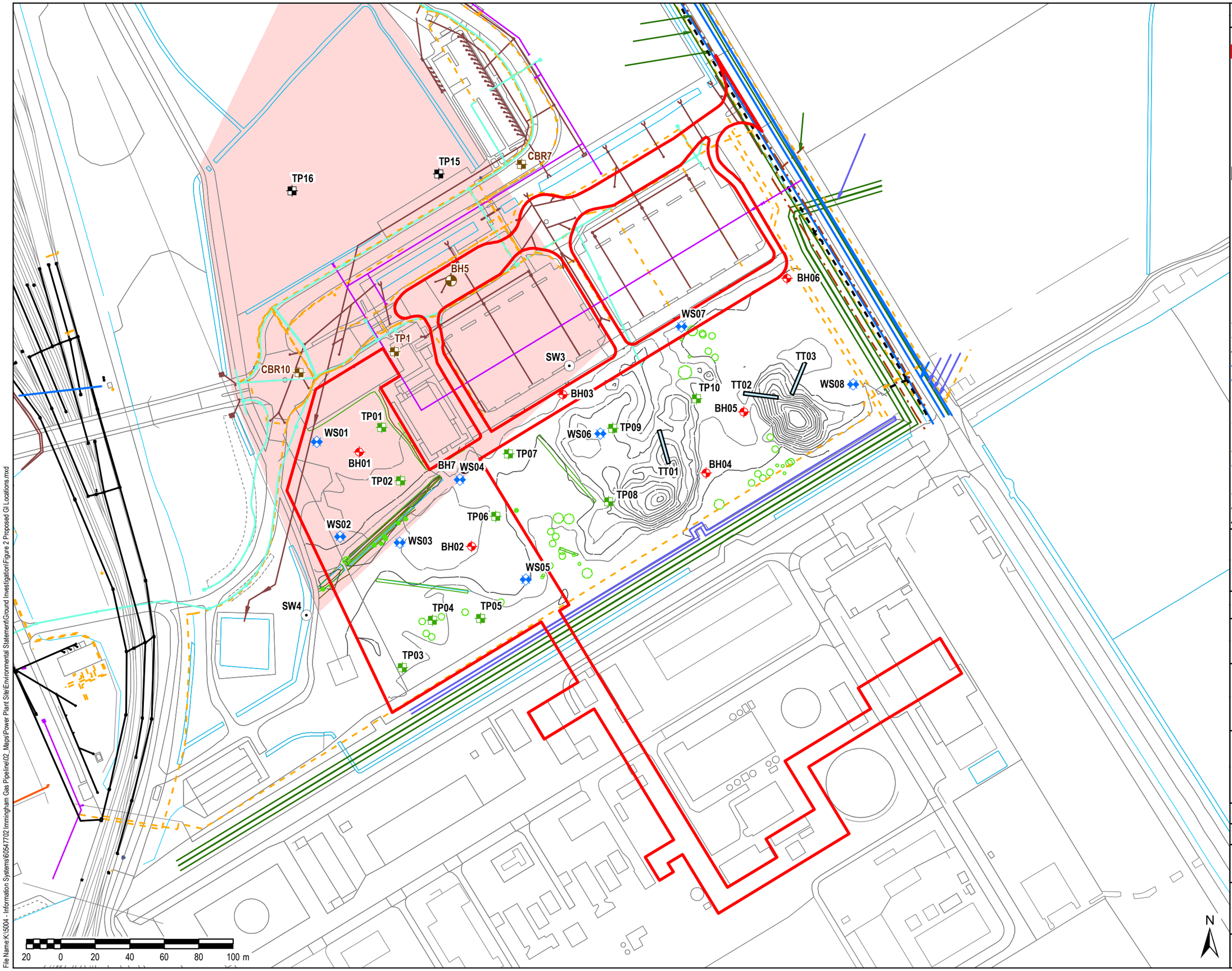
FIGURE 11.2

Rev



File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\Ground Investigation\Figure 2 Proposed GI Locations.mxd

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LEGEND

- Site Boundary
- Approximate Former Sludge Landfarm Boundary

Proposed Exploratroy Hole Locations
- Borehole
- Cone Penetration Test
- Trial Pit
- Window Sample
- Trench

ABB Hole Locations 2006 (Approximate)
- Borehole
- Surface Water Sample
- Trial Pit

Soil Mechanics Hole Locations 2006 (Approximate)
- Borehole
- Trial Pit

Utilities
- 07 Fire Water
- 08 Storm Water Sewer
- 10 Oily Water Sewer
- 11 Drinking Water
- 12 Clean Water
- 13 Underground Cable Route
- 14 Underground Cable Ducting
- 15 Data Cable Routing
- 16 Telephone
- 17 Above Ground Cabling
- 18 Above Ground Pipework
- 19 Underground Process Pipework
- 20 Underground Gas Routing
- Clugston Control Stns
- Manholes

Purpose of Issue
FOR INFORMATION

Client
VPI IMMINGHAM

Project Title
VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title
PROPOSED GI LOCATIONS

Drawn	Checked	Approved	Date
JW	BB	MS	02/05/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:2,000

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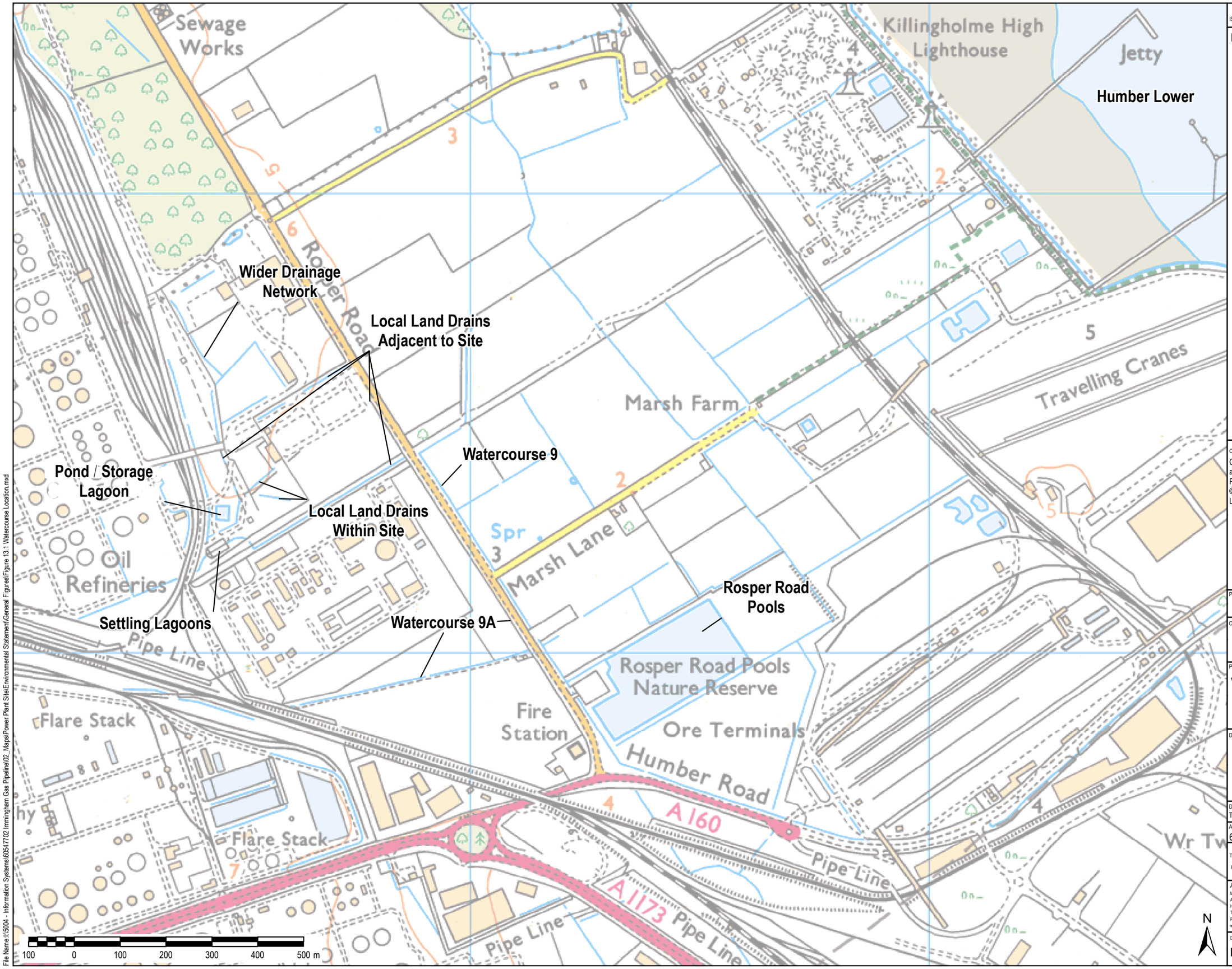
Drawing Number
FIGURE 12.1

Rev



File Name:I:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\General Figures\Figure 13.1 Watercourse Location.mxd

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

Purpose of Issue: FOR INFORMATION

Client: VPI IMMINGHAM

Project Title: VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title: WATERCOURSE LOCATION

Drawn	Checked	Approved	Date
TD	DH	MS	27/04/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:7,500

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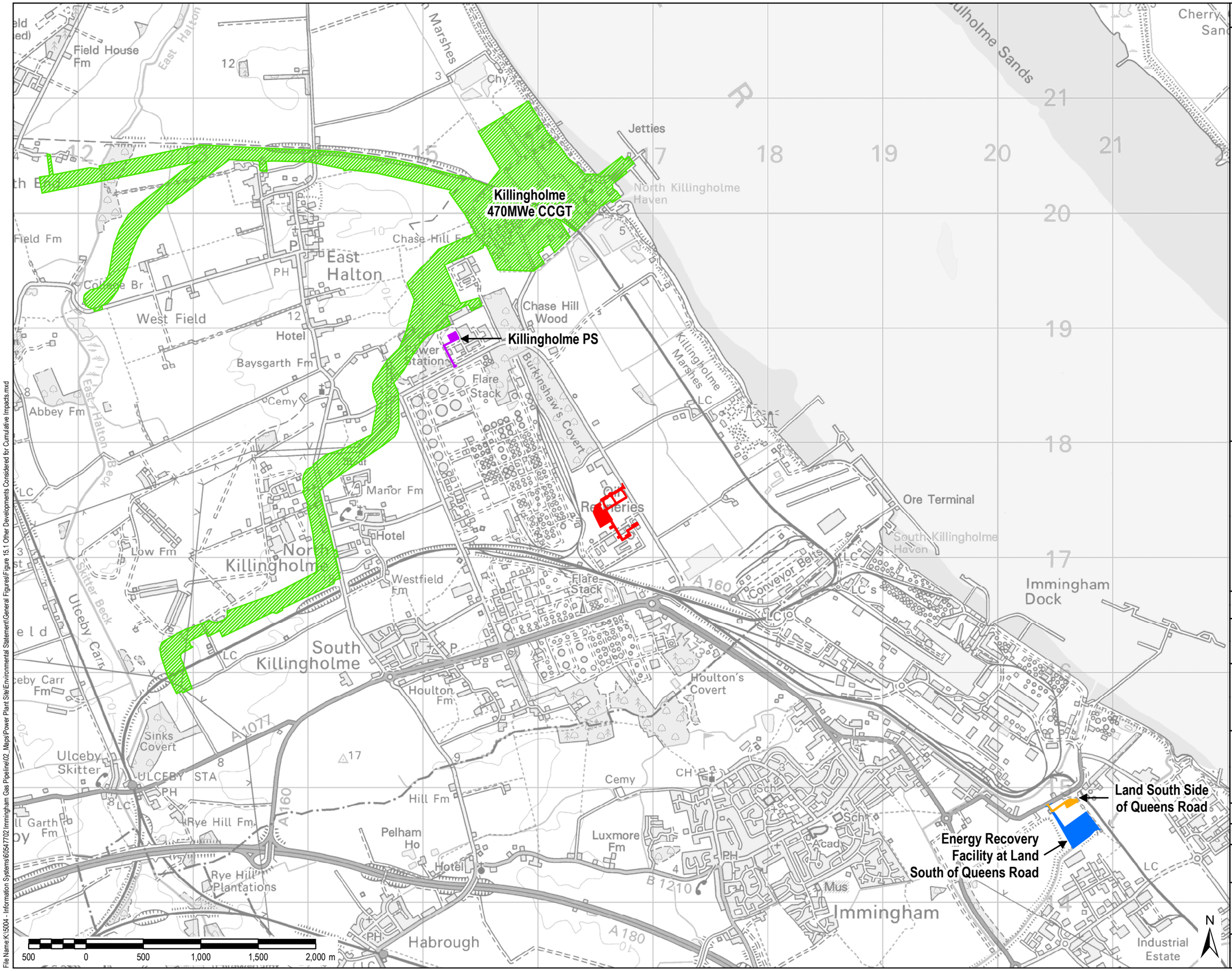
Drawing Number: **FIGURE 13.1**

Rev:



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- Red Line Boundary
- Energy Recovery Facility at Land South of Queens Road
- Land South Side of Queens Road
- Killingholme 470MWe CCGT
- Killingholme PS

Purpose of Issue: FOR INFORMATION

Client: VPI IMMINGHAM

Project Title: VPI IMMINGHAM ENERGY PARK 'A' ENVIRONMENTAL STATEMENT VOLUME 2

Drawing Title: OTHER DEVELOPMENTS CONSIDERED FOR CUMULATIVE IMPACTS

Drawn	Checked	Approved	Date
JW	BB	MS	01/05/2018

AECOM Internal Project No.	Scale @ A3
60547702	1:30,000

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Drawing Number: FIGURE 14.1

Rev:

File Name:K:\5004 - Information Systems\60547702 Immingham Gas Pipeline\02_Maps\Power Plant Site\Environmental Statement\General Figures\Figure 15.1 Other Developments Considered for Cumulative Impacts.mxd