

REPORT

Boston Alternative Energy Facility

Client: Alternative Use Boston Projects Ltd

Reference: I&BPB6934-RH002R001F01

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Executive Summary

1. The Boston Alternative Energy Facility (BAEF) project centres on an energy recovery plant to generate approximately 102 MWe (gross) of renewable energy. It is proposed that it will deliver approximately 80 MWe (net) to the national grid. The energy recovery plant will be a Gasification facility. The facility will use refuse derived fuel (RDF) as a feedstock to generate energy. This cutting-edge technology contributes to Government sustainable energy targets to achieve an 80% reduction in carbon emissions by 2050.
2. Gasification is a method of generating power. The process uses a carefully controlled restricted oxygen supply into a closed system to convert the carbon-based materials in the feedstock directly into a synthetic gas (syngas). This in turn is then used to produce electricity.
3. In summary, the BAEF will operate as follows:
 - Bales of feedstock will arrive at the facility by ship via the adjacent River Witham (known as the Haven).
 - The feedstock will be unloaded onto a wharf (within the Haven) and transferred to a materials processing facility where it will be shredded to the right size, with any non-organic material (including recyclable glass and metal) removed.
 - The processed feedstock will then be transferred via sealed conveyor to the gasification fuel bunker. The material will be fed into the gasifier at a controlled rate.
 - Gasification uses a high temperature chemical conversion process to convert the organic fraction into synthetic gas (or 'syngas') which in turn is used to produce electricity by recovering heat in a boiler.
 - The flue gas is subjected to an intensive treatment process to ensure that it does not contain unacceptable levels of emissions in accordance with Best Available Techniques (BAT) and the Industrial Emissions Directive (IED). The treated flue gas is then discharged via a stack to atmosphere.
 - The flue gas will be continuously monitored via the continuous emissions monitoring system (CEMS).
 - The ash material left over from the chemical conversion process will be mixed with a binding material (for example clay) in a high temperature kiln to produce a lightweight aggregate product, which is used as a construction material.
 - The lightweight aggregate product will be removed from the facility by ship.
4. The Development Consent Order (DCO) application for the proposed BAEF project will seek consent for all of these elements. In addition, temporary works, access and associated infrastructure necessary for the construction and operation of the project will be included.
5. This Environmental Impact Assessment (EIA) Scoping Report has identified the likely potential for significant effects to arise from the construction, operation and decommissioning of the BAEF. The following bullet point list identifies the specialist main topic assessments that are proposed to be scoped into the EIA assessment. Some sub-topic issues within these main topic areas are proposed to be scoped out. These are identified as sub-bullets in the list below:
 - Cultural Heritage
 - Direct impacts upon buried archaeological remains; and Direct impacts upon above ground heritage assets during operation are proposed to be scoped out of assessment.



- Landscape and Visual Impact
 - Noise and Vibration
 - vibration effects during operation are proposed to be scoped out of assessment.
 - Contaminated Land, Land Use and Hydrogeology
 - Ecology
 - Effects associated with of Invasive species, Dormice, Great-Crested Newt and White Clawed Crayfish are proposed to be scoped out of assessment.
 - Surface Water, Flood Risk and Drainage Strategy
 - Assessment of effects further downstream to the Wash Inner Water Body are proposed to be scoped out of assessment.
 - Air Quality
 - Marine Ecology and Fisheries
 - The impact of operation of the wharf facility are proposed to be scoped out of assessment.
 - Estuarine and Geomorphology Processes
 - Effects on the geomorphology processes within The Wash are proposed to be scoped out of further assessment
 - Navigation
 - Transport
 - Socio-Economics
 - Tourism is proposed to be scoped out of assessment.
 - Climate change.
6. A Waste Assessment report will be included as a technical appendix.
7. For the purpose of the EIA for BAEF the Health Impact Assessment (HIA) will be met through the Air Quality chapter in the form of a technical report that will be appended to the ES. Other health effects will be covered in the relevant topic chapters where appropriate.
8. The detailed assessments for each of these topics will be undertaken in accordance with standard guidance and best practice and reported in the final Environmental Statement (ES), which will be submitted with the DCO application. Where significant effects are identified, mitigation measures will be described where possible to reduce the residual effects.
9. Consideration will be given to potential effects on The Wash Ramsar and SPA site, and The Wash and North Norfolk Coast SAC to meet the requirements of the Habitats Directive. A Habitats Regulations Screening Assessment will be completed in the early stages of the Preliminary Environmental Impact Report (PEIR) process.
10. The following entire topics are proposed to be scoped out of the assessment:
- Aviation and Radar.
 - Risks of Major Accidental Events.
 - Sunlight / Daylight.
 - Environmental Wind.
 - Lighting.
11. The EIA will be completed by competent experts using best practice and following appropriate guidance. This Scoping Report outlines the potential receptors that would be considered during the

Project related



EIA and the planned approach to characterising the existing environment, assessing potential effects associated with the BAEF and developing mitigation measures.

12. Consultation will be ongoing with stakeholders throughout the EIA and DCO application process. BAEF Project Team is committed to engaging with the community and stakeholders.



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1 Introduction

1.1 Project Background

- 1.1.1 The Boston Alternative Energy Facility (BAEF) will be developed and funded by Alternative Use Boston Projects Ltd (AUBP) (the 'Applicant'). AUBP is a privately-owned company with a track record in delivering renewable energy.
- 1.1.2 The BAEF is proposed to be located at Riverside Industrial Estate, Boston, Lincolnshire. The Riverside Industrial Estate is adjacent to the tidal River Witham (known as The Haven) and down-river from the Port of Boston.
- 1.1.3 The BAEF project centres on an energy recovery plant that will generate approximately 102 MWe (gross) of renewable energy. It is proposed that it will deliver approximately 80 MWe (net) to the national grid. The energy recovery plant will be a Gasification facility. The facility will use a refuse derived fuel (RDF) as the feedstock to generate energy. This cutting-edge technology contributes to Government sustainable energy targets to achieve an 80% reduction in carbon emissions by 2050. The RDF will be sourced from UK suppliers and will comprise 'black bag' waste from householders and the residual output from material recycling facilities that cannot be recycled further. Therefore, the facility will not divert any source-segregated or co-mingled recyclate from being recycled.
- 1.1.4 As the proposed facility will generate over 50MWe of energy it is a nationally significant infrastructure project (NSIP), and therefore requires a Development Consent Order (DCO) under the Planning Act 2008. The DCO application will be submitted to the Planning Inspectorate (PINS), who will determine the application.
- 1.1.5 The BAEF comprises an energy generation facility. The energy will be recovered from the organic component of the feedstock. This type of facility is not listed in Schedule 1 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations). The BAEF would be a Schedule 2 development (Paragraph 3. Energy industry (a) *industrial installations for the production of electricity, steam and hot water (projects not included in Schedule 1 to these Regulations)*). In consideration of the nature of the BAEF and the associated elements, the Applicant has determined that an EIA will be required without a request for a formal Screening Opinion and will be submitting an Environmental Statement with the DCO application for the proposed development.
- 1.1.6 This Scoping Report formally notifies the Secretary of State in writing under regulation 8(1)(b) of the EIA Regulations that that the Applicant proposes to provide an Environmental Statement in respect of the proposed development.
- 1.1.7 The BAEF is in the pre-application stages of the DCO process, which requires an Environmental Impact Assessment (EIA) formed of a Preliminary Environmental Information Report (PEIR) and an Environmental Statement (ES).
- 1.1.8 Royal HaskoningDHV ('RHDHV') has been commissioned by AUBP to provide leadership of the DCO process and produce the environmental documentation necessary to ascertain more detailed projections of the proposed scheme's impacts on all environmental receptors.



1.2 The Purpose of this Document

1.2.1 The BAEF constitutes a project falling within the definition of a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 by virtue of the BAEF requiring the building, commissioning and operating of an onshore generating station with an energy generating capacity of greater than 50 MWe. Consent for the BAEF would therefore require a Development Consent Order (DCO). The process of EIA is governed by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations'). As mentioned above, the BAEF is considered to be an 'EIA development' for the purposes of the EIA Regulations. Accordingly, the DCO application will be accompanied by an Environmental Statement (ES), prepared in accordance with the EIA Regulations.

1.2.2 This Scoping Report gives an overview of the environmental baseline, the potential impacts and effects associated with the construction, operation and maintenance (O&M) and decommissioning of the BAEF. It will also provide guidance on how the EIA process will be progressed. The report will make recommendations, supported by evidence, regarding the issues that the Applicant proposes to exclude (scope out) of the EIA, to allow a focus on the key issues.

1.2.3 Regulation 10(1) of the EIA Regulations, enables the Applicant to seek a Scoping Opinion from the Secretary of State on the information to be included in an Environmental Statement (ES). This report supports a request for a formal EIA Scoping Opinion from the Secretary of State. A request made under Regulation 10(1) must provide the following information:

- a plan sufficient to identify the land;
- a description of the Proposed Development, including its location and technical capacity;
- an explanation of the likely significant effects of the development on the environment; and
- such other information or representations as the person making the request may wish to provide or make.

1.2.4 The Planning Inspectorate (PINS) provides guidance on the appropriate level of information that should be presented in a Scoping Report in '**Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements**' (Version 6, Dec 2017). This Scoping Report has been produced in accordance with Advice Note 7. PINS recommends that the Scoping Report should include the following information:

- The Proposed Development
 - an explanation of the approach to addressing uncertainty where it remains in relation to elements of the Proposed Development e.g. design parameters;
 - referenced plans presented at an appropriate scale to convey clearly the information and all known features associated with the Proposed Development;
- EIA Approach and Topic Areas
 - an outline of the reasonable alternatives considered and the reasons for selecting the preferred option;
 - a summary table depicting each of the aspects and matters that are requested to be scoped out allowing for quick identification of issues;
 - a detailed description of the aspects and matters proposed to be scoped out of further assessment with justification provided;
 - results of desktop and baseline studies where available and where relevant to the decision to scope in or out aspects or matters;



- aspects and matters to be scoped in, the report should include details of the methods to be used to assess impacts and to determine significance of effect e.g. criteria for determining sensitivity and magnitude;
 - any avoidance or mitigation measures proposed, how they may be secured and the anticipated residual effects;
- Information Sources
 - references to any guidance and best practice to be relied upon;
 - evidence of agreements reached with consultation bodies (for example the statutory nature conservation bodies or local authorities); and
 - an outline of the structure of the proposed ES.
- 1.2.5 Statutory stakeholders will provide responses to this Scoping Report which will inform the Scoping Opinion, and will guide the progression of the EIA for the BAEF.
- 1.2.6 The objectives of this report are to:
- Describe the proposed study and the study area of the BAEF including its alternatives.
 - Identify environmental topics which can be scoped out of the EIA because significant environmental effects are unlikely to occur because of the Proposed Development;
 - Establish the availability of existing baseline data;
 - Define a survey and assessment framework from which a comprehensive EIA spanning those environmental topics which are likely to experience significant environmental effects can be undertaken;
 - Invite statutory and non-statutory consultees to comment on the proposed EIA, in terms of:
 - The likely significant environmental effects which require assessment;
 - The assessment methodology for each environmental topic proposed to be scoped into the EIA process;
 - Sources of information;
 - Issues of perceived concern; and
 - Any other areas which should be addressed in the assessment.
- 1.2.7 It should be noted that the Scoping Report has been produced using currently available information in relation to the site and the proposed development. However, the design of the BAEF is still evolving and will continue to do so throughout the EIA process. This is important as it allows an iterative design process to be followed which takes account of environmental issues and community engagement and allows for the incorporation of mitigation measures into the proposals. Therefore, minor changes to the proposals between the scoping of the EIA and the submission of the application should not necessarily require the EIA to be fully re-scoped. The assessment scopes presented here relate to the general principles of the proposals rather than the specifics; hence the scope can accommodate minor amendments to the site and the proposals.

1.3 The Applicant

- 1.3.1 Alternative Use Boston Projects Ltd (AUBP) is a privately-owned company. AUBP's core business is Energy from Waste, specifically renewable electricity projects producing "Green Energy".
- 1.3.2 The company team has been involved in industrial development at the site in Boston, Lincolnshire since 2004. In March 2005 planning consent was obtained for a Special & Clinical Waste Processing Plant, with conditions discharged and construction started. In 2010 consent was



obtained for a 12MWe Gasification Power Station that would process waste wood (known as Boston Biomass Plc) with enabling works carried out during 2013. This facility is currently undergoing commissioning and is close to completion (as at May 2018).

- 1.3.3 AUBP has future aspirations for the site that includes carbon capture, where the carbon dioxide (CO₂) from the plant will be captured to deliver high grade CO₂ for industrial use.

1.4 Structure of the Scoping Report

1.4.1 This Scoping Report is structured as follows:

- Chapter 2 provides a description of the proposed development;
- Chapter 3 discusses the alternatives considered and the reasons for selecting the preferred option;
- Chapter 4- sets out the relevant policy and legislation;
- Chapter 5 provides the general EIA methodology and the way information will be provided and presented within the Environmental Statement (ES);
- Chapter 6 sets out the proposed main environmental topics which we propose to be scoped into the EIA process and any specific sub-topic issues that can be scoped out;
- Chapter 7 provides an overview and reasoned justification as to why several main environmental topics are proposed to be scoped out of the EIA process;
- Chapter 8 provides a summary of the findings of the Scoping Report.

1.5 Preliminary Stakeholder Consultation

1.5.1 Consultation with relevant consultees is necessary to discuss issues of concern about the potential impacts of the proposed scheme. This is to ensure they are identified at an early stage of the DCO application process and can be investigated thoroughly. Preliminary stakeholder consultation has formed part of the Scoping stage of the DCO application, with meetings and an introduction to the BAEF with the following consultees:

- Engagement with PINS – January 2018.
- Engagement with Port of Boston – February 2018.
- Engagement with Lincolnshire County Council and Western Power Distribution – March 2018.
- Engagement with Boston Borough Council and the Environment Agency – April 2018.



2 Project Description

2.1 Site Location and Description

- 2.1.1 The Site is located to the south of Boston town and east of the Riverside Industrial Estate. The eastern site margins are defined in part by a sea defence bank along The Haven (the tidal waterway of the River Witham between The Wash to the east and Boston town). A mixture of large and small industrial and business units is located to the north, west and south of the site. An overhead powerline on pylons traverses the site from north to south and bisects BAEF site.
- 2.1.2 The site comprises of former agricultural fields bounded by drainage ditches and forms part of a wider emerging industrial / commercial area, as defined by local planning documents.
- 2.1.3 The site is located within National Character Area 46: The Fens, the Reclaimed Saltmarsh Landscape Character Type and Welland to Haven Reclaimed Saltmarsh Landscape Character Area (LCA). However, the area is significantly influenced by urban/ industrial features including electricity pylons, industrial units, cranes and gantries at the Port of Boston.
- 2.1.4 Current access to the site is gained via the Riverside Industrial Estate's existing road network from Nursery Road. In the longer-term, access to the site is also intended to be gained from Bittern Way, which will be possible once the consented link road from Bittern Way has been completed.
- 2.1.5 The Boston Biomass Plc gasification plant that is currently close to completion and is in commissioning phase (as at May 2018) is on the eastern border of the BAEF area.
- 2.1.6 A waste management facility (operated by Mick George) that processes construction and demolition waste is located to the west of the proposed waste storage facility and wharf elements of the proposed development. The Mick George facility processes waste wood that will be used as feedstock for the Boston Biomass Plc gasification facility mentioned above.
- 2.1.7 A new household waste recycling centre is being built to the south west of the BAEF area, with access off Nursery Road. This site is close to completion (as at May 2018). To the south of the BAEF area there is a material recycling facility (operated by Lincolnshire County Council) that processes household waste from South Lincolnshire (Boston and South Holland). Boston Borough Council and Lincolnshire County Council have both raised interest in the potential for the BAEF to receive 'blag bag' waste sourced from Lincolnshire. The North Hykenham facility, which is currently used to recover energy from Lincolnshire's residual waste is close to capacity.
- 2.1.8 A water main transects the Site from the south-west corner to the north-east corner. It is proposed that this water main is diverted to avoid the main footprint of the proposed gasification plant. Details of the proposed diversion route for this main will be confirmed later in the design stage for the development.
- 2.1.9 There are several public rights of way that cross the BAEF area. A permanent diversion will be required for Macmillan Way, where it follows the line of the flood defence embankment within the BAEF area. The PEIR and ES will identify the precise extent of the affected footpaths and the proposed diversion strategies.

2.1.10 The proposed site for the marine facilities is located on the River Witham (known as the Haven at this point down to the entrance to the Wash), approximately 750m downstream from the existing Port of Boston (measured from the entrance to the impounded basin, the Wet Dock, to about the centre of the site).

2.1.11 The Haven is contained within flood banks in good condition at approximately 6.8m above Ordnance Datum (OD). Typical dimensions across the River at the site are:

- From the edge of the flood defence to the centre of the channel 80m
- Width of base of channel (from site drawing) 20m
- From edge of flood defence to MHWS (from site drawing) 30m

2.1.12 This is illustrated in **Figure 2.1**.

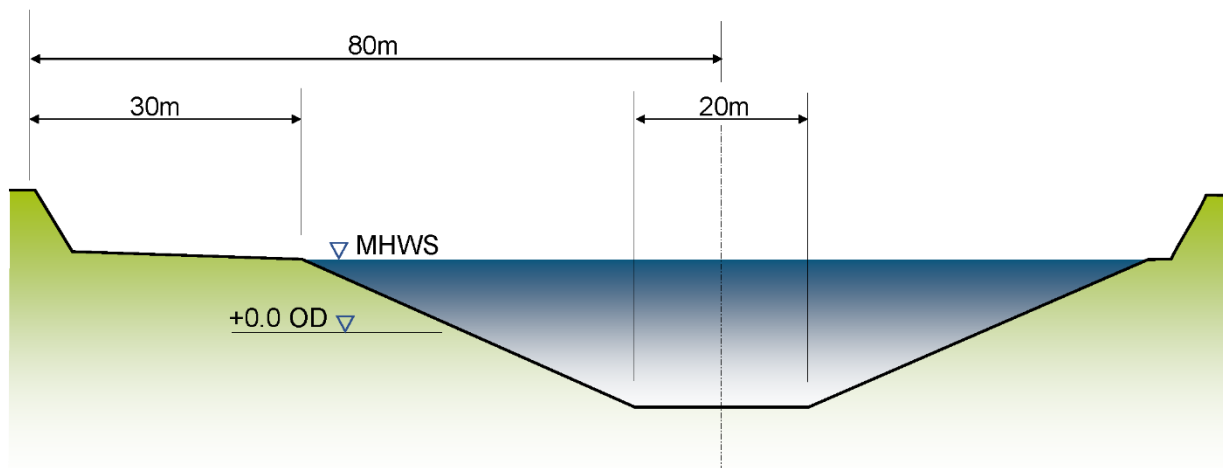


Figure 2.1 Indicative cross section through river at site. Note that vertical scale is different to horizontal

2.1.13 The navigation channel is not dredged at this point. The bed level changes over time. It tends to silt up normally, but erodes when large water volumes are discharged from the land via the sluices upstream. This will not occur at high tides, so will not affect the vessel manoeuvring.

2.1.14 A water main runs under the river at the northern end of the site. This will be avoided by the proposed marine facilities.

2.1.15 There are no existing buildings within the Site that will require demolition.

Allocation

2.1.16 The site forms part of a larger area of land that has been allocated for employment (industrial and commercial) development with reference to the saved policies of the adopted Boston Borough Local Plan 1999 and emerging South East Lincolnshire Local Plan (Draft 2016 – submitted to the Secretary of State in June 2017 and currently in Examination Phase).

2.1.17 Policy SL3 (Waste Site and Area Allocations) identifies the proposal site lies within the allocated area referred to as WA22-BO which has been assessed as a potential suitable location for broad range of open and enclosed industrial facilities reflecting the nature of the established uses of the area and also the large area still available for development. Although the Riverside Industrial Estate is allocated for such development, the use of gasification was not specifically identified,



although 'Energy Recovery' was. The BAEF will be used to generate energy recovered from the gasification on organic material in the feedstock.

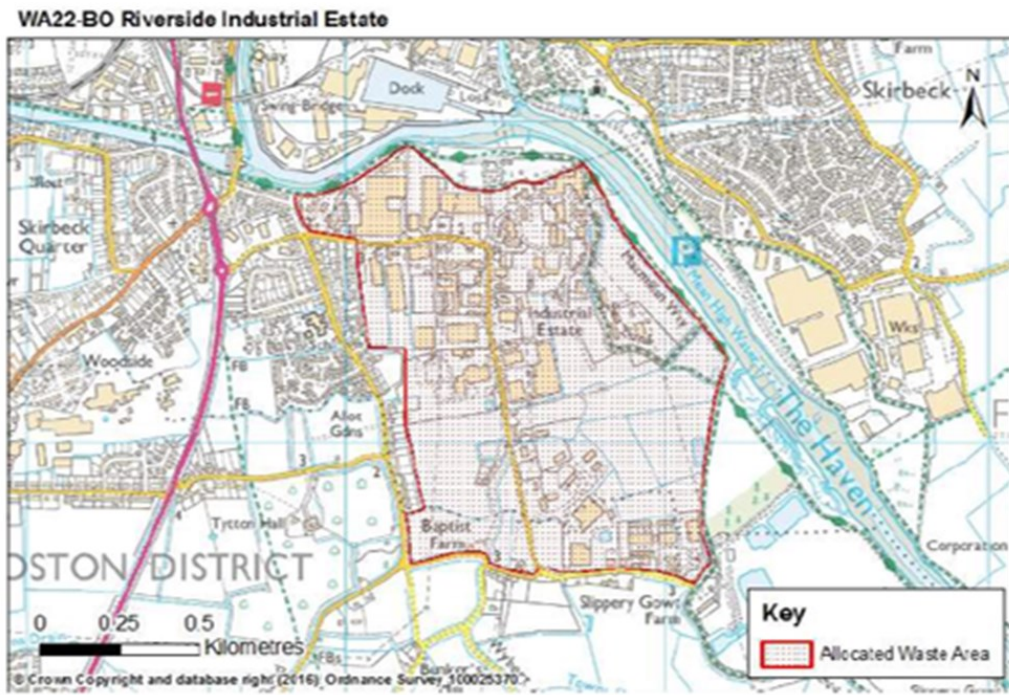


Figure 2.2 – Allocation of Riverside Industrial Estate, Boston



2.2 The Proposed Development

- 2.2.1 BAEF is a proposed energy recovery plant, with associated development, which will deliver 80MW of renewable energy to the national grid. The associated development includes a lightweight aggregates manufacturing plant, a new wharf, and a feedstock checking, processing and storage facility to support in the operational phase of the gasification process.
- 2.2.2 The BAEF will be designed to operate for an expected period of at least 25 years after which ongoing operation will be reviewed and if it is not appropriate to continue operation the plant will be decommissioned.
- 2.2.3 The BAEF will comprise a range of buildings and structures the tallest of which will be the gasification plant exhaust stack and the proposed lightweight aggregate plant stack. The height of these features will be confirmed by detailed modelling of the exhaust plumes to ensure that there is no unacceptable impact to human health and the environment. It is anticipated that these features will not be taller than St Botolph's church (known as 'The Stump'), which is an important landscape feature in Boston and at 83m is the tallest parish church to its roof in England.
- 2.2.4 Gasification is a technology that uses a high temperature chemical conversion process to convert organic material into synthetic gas which in turn is used to produce electricity. When in operation, BAEF will generate enough energy to power up to 185,000¹ UK homes. This cutting-edge technology provides significant environmental benefits compared to landfilling residual waste, and contributes to Government sustainable energy targets to achieve an 80% reduction in carbon emissions by 2050.
- 2.2.5 At this scale, the BAEF would constitute a Nationally Significant Infrastructure Project (NSIP). Therefore, AUBP is required to pursue a Development Consent Order (DCO) for the power generation facility and associated development.
- 2.2.6 The BAEF will be located adjacent to Riverside Industrial Estate on the bank of the Haven in Boston, Lincolnshire.
- 2.2.7 The proposed elements of the BAEF are indicatively identified on the Zoning Plan (see **Figure 2.3** below).

¹ The 2011 Census identifies that the average UK house uses 3.1MW energy in a year. So, as an approximation, if the facility is operating at 300 days per year, 80 MW hour export would be equivalent to $(300 \times 80 \times 24) / 3.1 = 185,000$ homes (185,806).

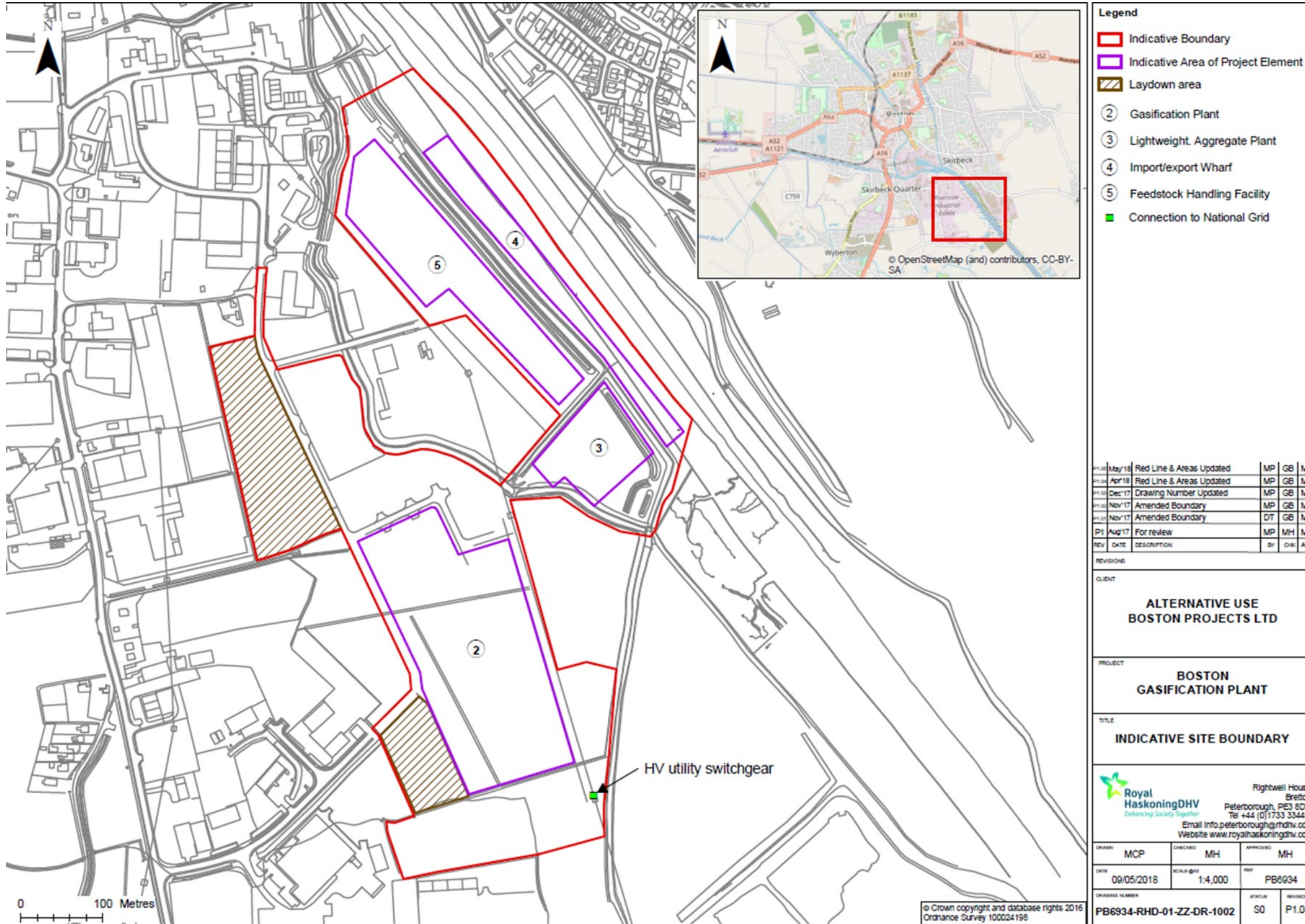


Figure 2.3: Indicative boundary and elements of the BAEF



- 2.2.8 The BAEF will use a refuse derived fuel (RDF) as a feedstock to generate energy. The RDF will be sourced from UK suppliers and will comprise 'black bag' waste from householders and the residual output from material recycling facilities that cannot be recycled further. Therefore, the facility will not divert any source-segregated or co-mingled recyclate from being recycled. The facility will process approximately one million tonnes of feedstock per year.
- 2.2.9 The feedstock will be delivered to BAEF sealed in plastic wrapped bales by ship, via the Haven. The bales will be offloaded onto a wharf at the site for temporary storage. They will then be transferred within the site to the feedstock processing facility. Here, the feedstock will then be shredded to the right size and sorted to remove inorganic material (including recyclable glass and metal). The remainder will be transferred via sealed conveyor to the bunker of the gasification facility.
- 2.2.10 The gasification facility will heat the processed feedstock to produce a gaseous fuel (synthetic gas or 'syngas'). The syngas will be used to generate heat via boiler that produces high pressure steam used to power steam turbines. Some of this green energy is used to power the plant (this is called 'parasitic load'), whilst the remainder (approximately 80 MWe) is distributed into the national grid. The residual ash from the gasification plant will be processed on site to produce a lightweight construction aggregate, which is a marketable product. This will be exported via ship.
- 2.2.11 Waste air pollution control residues will be removed from the facility by road for disposal, unless they can be used in the aggregate manufacturing process, subject to agreement with the Environment Agency.
- 2.2.12 In summary, the process will run as follows:
- Bales of RDF will arrive at the facility by ship on the Haven.
 - The RDF will be unloaded onto the wharf and transferred to a simple feedstock processing facility where it will be shredded to the right size, with any non-organic material (including recyclable glass and metal) removed.
 - The shredded feedstock will then be transferred via sealed conveyor to the gasification bunker, then fed into the gasifier at a controlled rate.
 - Gasification uses a high temperature chemical conversion process to convert the organic fraction of the feedstock into synthetic gas which in turn is used to produce electricity by recovering heat in a boiler.
 - The flue gas is subjected to an intensive treatment process in accordance with Best Available Techniques (BAT) and the Industrial Emissions Directive (IED) to ensure that it does not contain unacceptable levels of emissions. The treated flue gas is then discharged via a stack to atmosphere.
 - The flue gas will be continuously monitored via the continuous emissions monitoring system (CEMS).
 - The ash material left over from the chemical conversion process will be mixed with a binding material (for example clay or dredged silt) in a high temperature kiln to produce a lightweight aggregate product.
 - The lightweight aggregate product will be removed from the facility by ship.
 - Air pollution control residues will be removed by road for disposal.



2.2.13 The following provides a description of the power generation facility and associated elements of the DCO that follows the logical flow of material through the BAEF:

Wharf

2.2.14 The proposed wharf (ship loading and unloading facilities), comprises an approximately 350m to 400m long docking facility, loading and offloading equipment (cranes), storage and internal road links. The purpose of the wharf is to connect the BAEF by water to provide for delivery of feedstock and the dispatch of lightweight aggregate by ship. Ships will access The Haven via The Wash. Using ships to transport materials will significantly reduce the operational impacts of the BAEF on the local road network.

2.2.15 The feedstock will be sourced from UK suppliers and will comprise 'black bag' waste from householders and the residual output from material recycling facilities that cannot be recycled further. Therefore, the facility will not divert any source-segregated or co-mingled recyclate from being recycled. The material will be dispatched to the BAEF from ports most likely located on the East coast of the UK. No feedstock will be imported to the UK from overseas.

2.2.16 The power generation facility will process approximately one million tonnes of feedstock per year. The feedstock will be delivered in bales wrapped in plastic of approximately 1.85 m³, weighing approximately 1.3 to 1.5 tonnes. The bales will be handled by hydraulic cranes equipped with clamps, to transfer the bales to temporary storage pending processing. The bales will be transferred from storage via a conveyor or internal vehicle.

2.2.17 The lightweight aggregate would be loaded onto the ships using a mobile conveyor fed by forward loading shovel via a hopper.

2.2.18 Given the different physical properties of the bales and the aggregate and how they will be handled, the wharf facility will be constructed with one area focussing on the bales and the other on the lightweight aggregate.

2.2.19 Arriving vessels must navigate up the River Witham to the proposed berth over high tide, and leave over high tide. They will probably be turned in the existing Port of Boston, as there is not enough room to create a turning area at the Site. The vessels could be turned on arrival or departure, depending on which is more convenient at the time.

2.2.20 The Port of Boston has two sets of berths, those in an enclosed dock and those on the river. Vessels using the river berths have to sit on the bed at low tide as there is insufficient water depth. Such berths are called NAABSA, 'not always afloat but safe aground'. The BAEF will have NAABSA berths.

2.2.21 The berth would be set parallel to the waterway. The distance from the berth to the centre of the channel would be set taking into account the following factors:

- Minimising the volume of dredging, i.e. as close as possible. This is not just to reduce the capital costs but also to reduce the volume of any ongoing maintenance dredging;
- Providing a safe clearance between a berthed vessel and other vessels passing along the channel.

2.2.22 Initial considerations are that a safe clearance of around two times the beam would be suitable, i.e. the berthing line would be about 40m from the edge of the channel, say 60m from the centre of the channel, which is approximately 20m from the existing flood defence. More specific dimensions would be confirmed in a navigation risk assessment as part of the PEIR and ES.

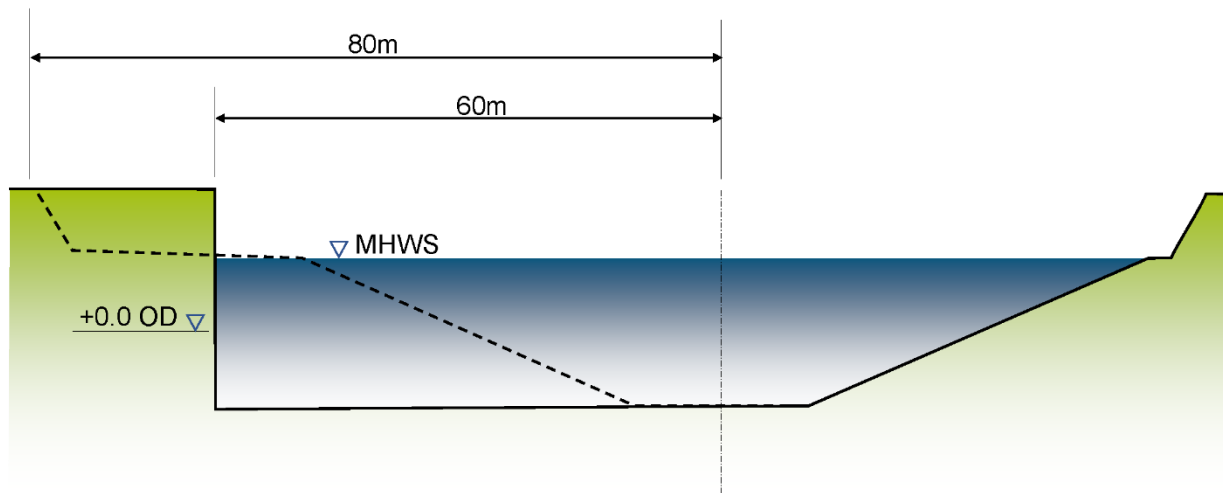


Figure 2.4 Typical cross section showing current indicative cross-section as black dotted line

2.2.23 The Table below gives the existing maximum sizes that can call at the Port. These will be used to define the parameters of vessels that visit the proposed wharf for the BAEF:

Table 2.1: Port of Boston vessel parameters

	Length	Beam	Draught	Comment
Inside the dock	119m	13.6m	5.5m	The length is fixed by the space required to turn the vessel. The beam is fixed by the width of the entrance.
River berths	90m	15.5m	5.5m	

2.2.24 However, the following should be noted:

- Vessels with 5.5m draught can only access the port at Spring tides. At Neap tides, the draught is limited to around 3.5m, due to the depth of the Haven;
- Vessels are generally turned inside the Port of Boston even if they use a River berth. While there is a turning area outside the dock, it is smaller. Therefore, the beam of the vessels is effectively limited to 13.6m, the limit on entering the dock.
- The Harbour Master has verbally advised that any vessel with a gross tonnage (GT) greater than 2,400 tonnes must use a tug.

2.2.25 Given the draft restrictions and tidal nature, we anticipate using vessels of:

- Draft 3.5 - 4m.
- Length 90 - 100m.
- Beam 13 - 15m.



- 2.2.26 These vessels would be able to hold around 2,500 tonnes of feedstock bales. Similar sized vessels would also be used to transport the lightweight aggregate.
- 2.2.27 With an approximate inbound quantity of one million tonnes, 400 ships will be required to deliver the feedstock. Assuming an outbound quantity of approximately 400,000 tonnes aggregate, 160 ships will be required to export the material from the BAEF. This leads to a total quantity of approximately 560 ships per year, which represents 11 (10.7) per week.
- 2.2.28 The wharf facility will have two berths for receiving feedstock; and one berth for loading aggregate, to allow for acceptable occupancy rates.
- 2.2.29 The temporary storage area will be in the open and measures will be adopted to prevent pollution caused by loose feedstock being blown by the wind; and also to ensure there are no odour issues when it is temporarily stored. The feedstock would be transferred for processing on a 'first in first out' basis. No material would be stockpiled for longer than three months.
- 2.2.30 The stockpiles of feedstock will be managed so that they are compliant with the Environment Agency's guidance on fire prevention plans. For the feedstock piles, the maximum height allowed is 4 metres and the maximum length or width allowed (whichever is the longest) is 20 metres. The maximum stockpile size is 450m³. A minimum of 6m separation must be in place between stockpiles and the site perimeter and buildings and other combustible materials.
- 2.2.31 A quarantine area will be provided to temporarily store contrary material pending removal from site. The area will be large enough to hold at least 50% of the volume of the largest pile and will have a separation distance of at least 6 metres around the quarantine area from any other material, the site perimeter and buildings.
- 2.2.32 The temporary storage area will accommodate approximately three to four days of feedstock (based upon the rate of flow of feedstock through the gasifier) pending transfer into the feedstock processing facility.

Feedstock Processing Facility

- 2.2.33 The proposed reception and storage facility will take receipt of the feedstock having been received from the wharf.
- 2.2.34 The facility will be able to accommodate and process approximately one day's worth of feedstock (based upon the rate of flow of feedstock through the gasifier) pending transfer into the gasification plant.
- 2.2.35 The feedstock bales will be loaded into a primary shredder, which will chop and shred the plastic wrap and the contents of the bale to a reduced a maximum particle size of less than 100 mm in 3 dimensions with 90% less than 75 mm in 3 dimensions.
- 2.2.36 The shredded material will be passed through a fines screen to remove inert fines material defined as less than 5 mm in any dimension. This material has little to no calorific value and is removed from the feedstock for removal off-site.
- 2.2.37 Ferrous and non-ferrous materials (for example wire) will be removed from the feedstock by magnets and eddy-current separation. Heavy three-dimensional inert materials such as stones



and glass will also be removed to ensure a consistent feedstock specification that does not contain more than a total 2% by weight of non-combustible materials such as rocks, dirt, glass, metals etc.

- 2.2.38 Rejects such as inert material fines and metal will be collected separately for removal off-site by road; and the appropriate options for recovery or disposal will be assessed in accordance with the waste hierarchy.
- 2.2.39 The prepared feedstock will be transferred into the gasification plant tipping hall via a sealed tunnel conveyor.
- 2.2.40 The facility will operate in an enclosed environment using odour control measures to ensure no unacceptable odour is released. The building will be suitably insulated to ensure no unacceptable noise levels are experienced outside the building.

Gasification Plant

- 2.2.41 Gasification is a method of generating energy that can be converted into power. It does not involve combustion; the facility is not a traditional incinerator.
- 2.2.42 Gasification converts the organic content of the feedstock to a usable synthetic gas (or syngas) by a high-temperature chemical conversion process. The combination of heat plus a limited supply of air (oxygen) into the gasifier causes the feedstock to decompose or break down into simple gaseous molecules such as carbon monoxide, hydrogen and methane. The syngas is converted to power in a secondary combustion chamber via a steam cycle to produce electricity.
- 2.2.43 The gasification plant is a proposed three line fluidised bed staged gasification (FBSG) facility with associated power station. A fluidised bed system consists of fluid-solid mixture that exhibits fluid-like properties, which promotes high levels of contact between gases and solids that are introduced into it via a high surface area. The facility will use approximately one million tonnes of an annual feedstock that has been processed, to generate approximately 102 MWe of renewable electricity. Some of the power will be used to enable the functioning of the gasification plant and approximately 80 MWe will be exported to the National Grid for distribution via an 132 kV grid connection point on-site.
- 2.2.44 Future aspirations for the site include the connection of each FBSG line to a carbon dioxide (CO₂) recovery plant, each recovering CO₂ for reuse in various industries. However, the CO₂ recovery does not form part of the DCO application because the CO₂ markets have yet to be established.



Figure 2.5: Indicative image of a gasification plant



- 2.2.45 The processed feedstock is transferred from the processing facility via sealed conveyor into the reception hall. The reception hall is kept under negative pressure by the gasifier fans to avoid odour escaping from the building. Approximately three to four days of feedstock (based upon the rate of flow of feedstock through the gasifier) will be held in the reception hall.
- 2.2.46 The feedstock is transferred into metered bins which accurately measure the input quantity of feedstock material and evenly distributes it to the fluidised bed. At each of the gasifiers, four metering bins feed to opposite sides of the gasifier (two on each side) which accurately measures the feed material and evenly distributes across the fluidised bed to create the good gasification conditions.
- 2.2.47 The gasifier consists of fluidised bubbling bed gasification area, (filled with a special sand), bed recirculation and cleaning equipment. A gas monitoring system adjusts the feeding of lime stone to the bed to control acidic components, mainly sulphur, in the fuel, as well as injecting ammonia water to suppress nitrous oxide emissions.
- 2.2.48 In the fluidised bed gasification zone the feedstock is broken down by the constantly moving sand, this hot environment gasifies the volatile components of the fuel providing a synthesis gas (syngas), containing various hydrocarbons and carbon monoxide. The heat for the gasification process in the bed is up to 800°C.
- 2.2.49 The bed sand grinds the fuel particles smaller and smaller until all the energy has gone. The Ash from the feedstock is then carried by the fluidising air towards the flue gas cleaning section of the system. The incombustible solid particles like glass and metal are removed from the bed via bed cleaning system.
- 2.2.50 All material extracted from the bed is inert and can be recirculated.
- 2.2.51 The produced syngas flows to the burning section of the gasifier where a dedicated two-stage fan system injects air to the syngas stream igniting the gas. In the thermal oxidation zone the oxidation reaction of the syngas increases the temperature of the gases over 950°C, which thermally breaks down potential contaminants in the syngas. The hot combusted flue gas (comprising water vapour, air, and carbon dioxide, plus non-hazardous fly ash residue) is routed to the boiler section of the plant for heat recovery.
- 2.2.52 A Selective Non-Catalytic Reduction (SNCR) system is located in the upper vessel vapour space to provide the initial reduction of nitrogen oxides (NOx). Aqueous urea is injected through multiple injection nozzles into the vapour space of the vessel where temperatures are controlled within the range of 1600-1800°F (approximately 870-980°C). Air is drawn into the system to provide additional cooling around the injection nozzles.
- 2.2.53 A concept image of the gasifier unit is provided below:

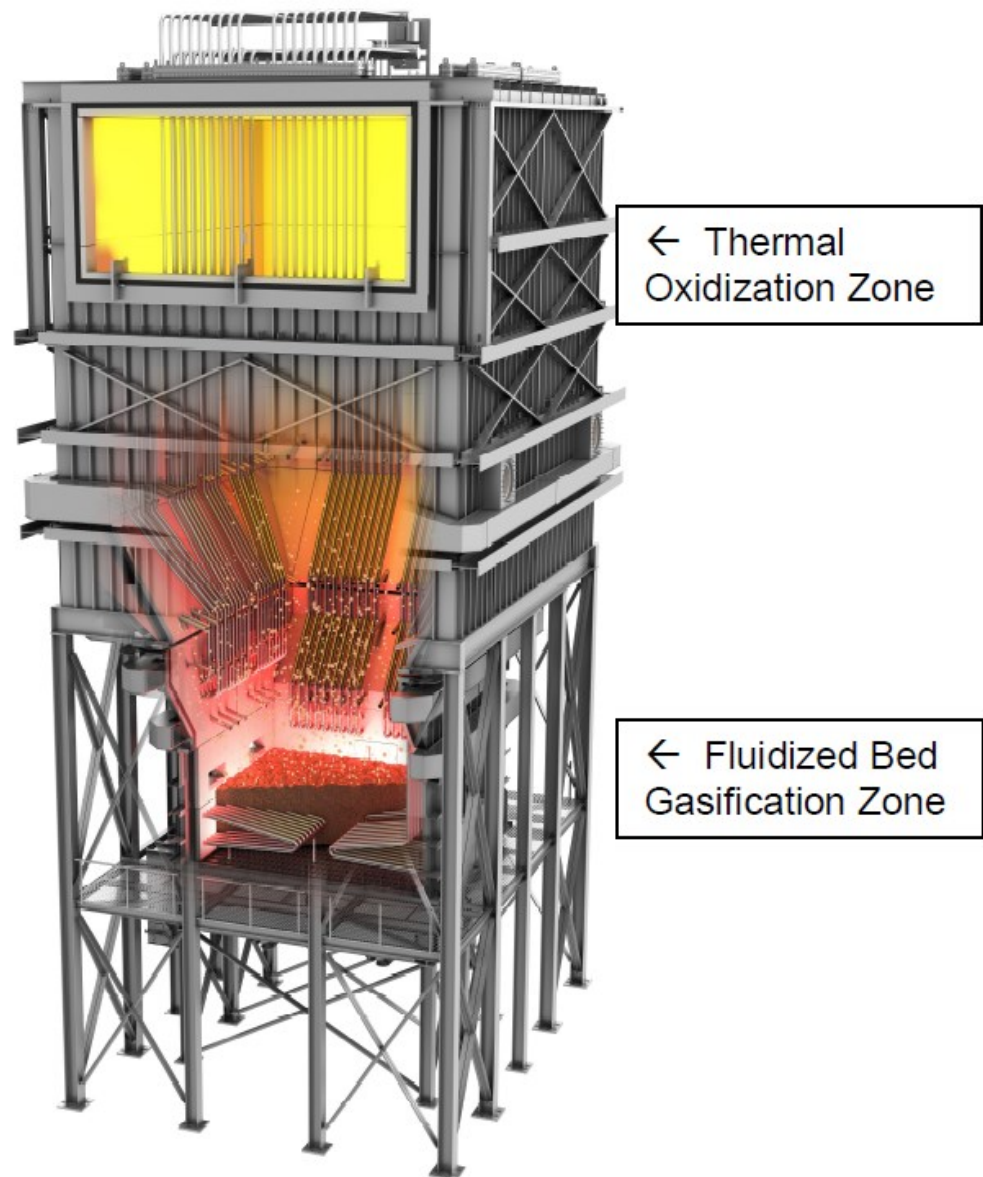


Figure 2.6: Indicative concept image of a gasifier unit



- 2.2.54 The hot flue gases from the gasifier pass over various bundles of tubes that form a heat transfer surface to enable the release of heat to the water within, which turns into steam inside the tubes. The tube material, arrangement in the boiler and all other aspects of the boiler are purpose designed to accept the heat released from the syngas.
- 2.2.55 Some ash is carried away from the gasification process along with the combusted syngas, some of this ash is collected in the boiler section and the rest is collected in the economiser section.
- 2.2.56 The first gas cleaning section is after the boiler where most of the solid particles are removed by creating a downward cyclone effect.
- 2.2.57 The 45 bar steam generated in the boiler is also superheated up to 400°C. After the cyclone stage, the gases (which are still around 400°C) go through economiser section of the boiler, releasing more heat to a recycling water section which increases the efficiency of the system. Flue gas flows downward so ash is captured and removed at the bottom of the unit. Feedwater flows counter-current or upward to prevent steam bubbles from being trapped. Ash cleaned from the tubes falls into the ash hoppers and is constantly removed.
- 2.2.58 It is anticipated that 25% (approximately 250,000 tonnes) of the annual input feedstock will become residual material to be removed from the gasifier. This will comprise two main types: the residual ash, which forms approximately 80% of the residual mass (200,000 tonnes); and air pollution control residues, which forms approximately 20% of the residual mass (50,000 tonnes). The residual ash is classified as non-hazardous waste.
- 2.2.59 The cooled gases exiting from the economizer section of the boiler go to the pollution control system in a spray tower where chemicals, typically hydrated lime and activated carbon, are injected to the gas flow to capture any residual emissions (Heavy metals, sulphur dioxide, hydrogen chloride, particulates, etc.). The final treatment stage is a bag filter, which filters the last ash / dust emissions from the combusted waste gas.
- 2.2.60 The residual air pollution control residues (APC residues) are collected in a hopper. These residues are likely to be classified as hazardous waste due to elevated levels of heavy metals and high alkalinity.
- 2.2.61 Induced draft fans draw the cleaned gases to the stack, where on-line Continuous Emission Monitoring System (CEMS) provide continual monitoring of the exhaust gasses to ensure the overall system is running well within the Industrial Emissions Directive (IED) Emission limits.
- 2.2.62 The 400°C / 45bar steam is routed to the steam turbines, where the hot high-pressure steam rotates the turbine shafts, these shafts rotate electrical generators, generating approximately 102 MWe of electricity per year.
- 2.2.63 After all the energy in the steam turbine is released for electricity production, the cooled steam is routed to air cooled condenser, where the steam is cooled further and turned back to water. This condensed water is pumped to feed water tank, from where it is pumped back to the boiler via an economiser (thereby closing the steam – water circuit).
- 2.2.64 The residual ash from the gasifier will be used as a feedstock for the Lightweight Aggregate Plant (see Lightweight Aggregate Plant section below).



- 2.2.65 A conservative case has been assumed that the APC residues would require disposal to a hazardous waste treatment plant and landfill. This represents the conservative case because it would require lorry movements to remove the APC residues from site to an off-site waste management facility. However, alternative site-based options are potentially feasible, including the use of APC residues together with the residual ash in the Lightweight Aggregate Plant; or use of one dedicated line in the Lightweight Aggregate Plant to produce aggregate using APC residues alone (see below). Both of these options would require demonstration to the Environment Agency that the processes represent the Best Available Techniques (BAT). These will be confirmed following negotiation with the Environment Agency during the Preliminary Environmental Information Report stage of the DCO application.
- 2.2.66 A schematic of the gasification process is provided overleaf

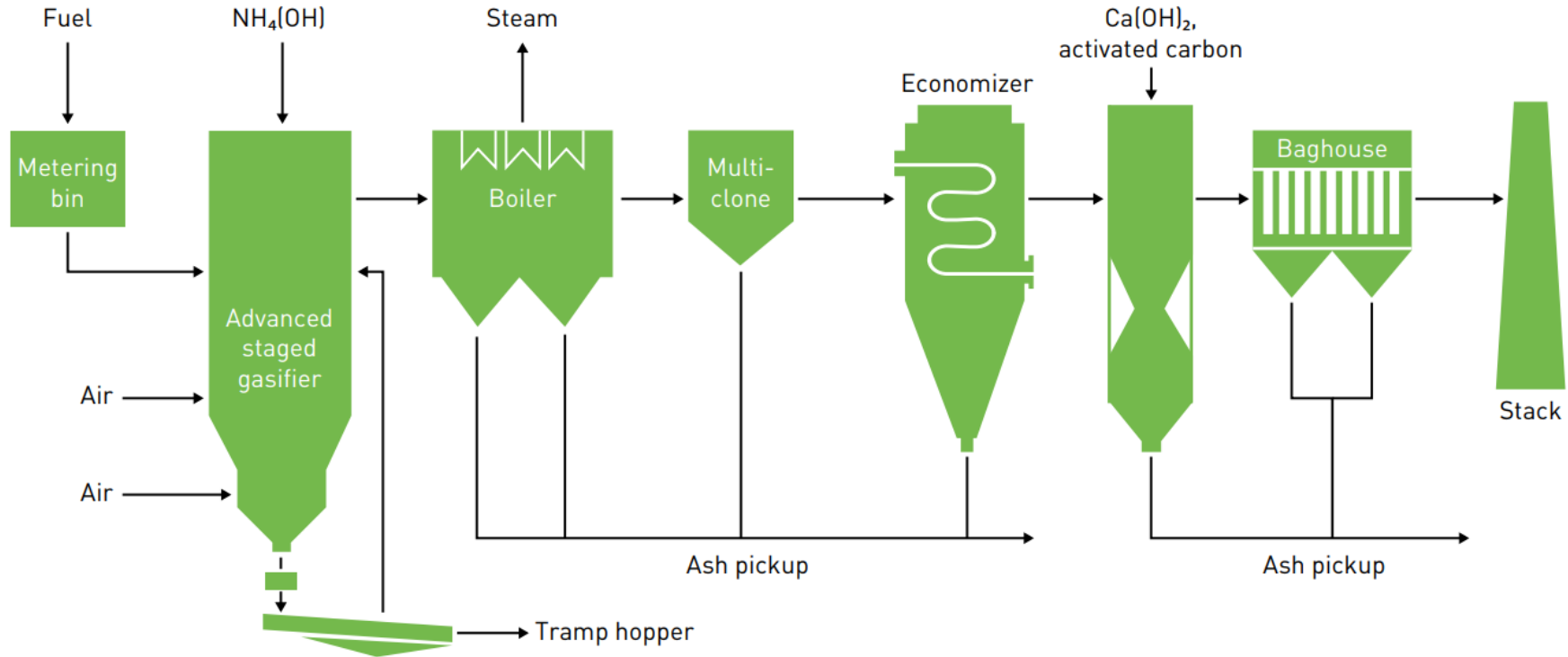


Figure 2.7 Schematic of the gasification process

Lightweight Aggregate Plant

- 2.2.67 The Light-Weight Aggregate Plant (LWA) is a high temperature kiln that will use the by-product ash from the gasifier to produce a usable lightweight aggregate product and additional steam.
- 2.2.68 The LWA will be a four-line plant, with a footprint of approximately 80m by 35m. The facility is proposed to be located in the eastern part of the Site; and will have a dedicated berth on the wharf for loading the lightweight aggregate product for export by ship to UK or international markets.
- 2.2.69 Lightweight aggregates have been manufactured since the 1930s utilising mainly bloatable clays, low carbon pfa (ash from coal fired power stations) and selected shales. The basic process is to form pellets and then sinter (melt) the material in either a rotary kiln or on a Sinterstrand.
- 2.2.70 Traditional aggregate manufacturing processes must be very selective of the materials used. The LWA will incorporate a Trefoil Process. This process uses a triple-lobed rotary kiln and the technology of combining materials to form pellets to be fired. The Trefoil Process enables a much wider range of materials to be used because the trefoil shape allows an even distribution of heat to the feedstock material as the kiln rotates.
- 2.2.71 The main source material will be the residual ash from the gasification plant. This will be mixed with a binder material in the Trefoil Process to form the aggregate.
- 2.2.72 The LWA plant is also capable of accepting the air pollution control residues (APC residues) from the gasification plant into the Trefoil Process. This would ensure that no APC residues would need to be removed from site for disposal. However, initial discussions with the Environment Agency raised concern that such a use must be demonstrated to be an appropriate waste management technique and must meet BAT requirements. This must show the technique is appropriate.

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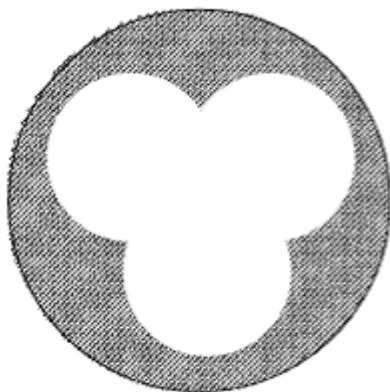


Figure 2.8: Schematic image of trefoil kiln shape



- 2.2.73 Clay and / or silt is used in the process primarily as a binder to give strength to the pellet but it also sinters (i.e. compacts and forms the solid mass of material by heat or pressure without melting) to become part of the filler material in the fired aggregate. Depending on the material the minimum required for the binding function is determined by laboratory test firings. For general purposes 10% is used. The amount of the binder can be increased depending on the pelletising process used.
- 2.2.74 The ash is thoroughly mixed with binder material in accurately metered quantities. This mix is formed into pellets, with controllable variation in size between 4mm and 20mm. It is important to keep the density of the green pellets as low as possible. Dense pelletising processes will inhibit the passage of oxygen to the “fuel” within the pellet during firing.
- 2.2.75 The formed pellet needs to be dried before entering the kiln to prevent it from bursting. The rolling of an outer “egg shell” skin is an important part of the process. When pellets are dried they will usually shrink proportionally to the moisture content lost. With a successful “egg shell” rolled onto the pellet in a polishing drum (closing the outer pores of the green pellet) there will be virtually no loss in size when dried. This is important for both the looseness of compaction within the pellet (allowing easy access of combustion air) and it is the start of the formation of a lighter aggregate. The pellet will be dried from approximately 20% moisture to less than 3% moisture. This drying process will use heat energy available from the process.
- 2.2.76 The dried pellets are transferred to a pellet buffer prior to firing. The purpose of the storage is to enable immediate control over feed rate.
- 2.2.77 When entering the kiln zone, the volatiles in the pellet mix will be released. It is important to ensure that there is sufficient excess oxygen at this stage to allow the volatiles to combust in the kiln zone where the energy release will assist on the heating of the pellet rather than in the kiln ductwork.
- 2.2.78 The kiln will have a progressive heat gradient from about 500°C at the feed to just under 1,200°C at 75% of the kiln length from the feed, falling to 1,000°C at the kiln discharge point. The incoming combustion air needs to be controllable and should be pre-heated using energy from the plant (i.e. from aggregate cooling and pellet dryer air).
- 2.2.79 The aggregate needs to be cooled before going to stockpile. The energy is recovered from this cooling process and used in the plant
- 2.2.80 The plant will operate in accordance with BAT and will be required to meet the standards of the Industrial Emissions Directive (IED). The exhaust emissions from the kiln will be held at a temperature of >850°C for a minimum of two seconds to ensure complete burn out. Following this the exhaust gas needs to be rapidly cooled to prevent the formation of dioxins. The exhaust gases from the kiln will be treated via an air pollution control system to remove contaminants and will discharge to atmosphere via a stack. The LWA will operate in accordance with an Environmental Permit.
- 2.2.81 The residues from the baghouse system can be recirculated back into the system.



- 2.2.82 Aggregates from the Trefoil process can be formed with a density in the range of 350-1000 Kg/m³, typically approximately 550 to 650 kg/m³. One of the major advantages of the Trefoil process is the ability to control product with these ranges. Aggregates with a very low density although having a low strength, will fetch a premium price for use in lightweight building blocks where thermal insulation is of prime importance. The density of the aggregate is fixed by the materials used. In general terms, the more ash, the stronger the aggregate but at the same time the density will increase. The Trefoil process adds another dimension in that the burn-out of the biodegradable material within the aggregate when fired produces an aerated structure making the aggregate lighter but not necessarily weaker, this a major step forward.
- 2.2.83 The lightweight aggregate will be stored outside in bays pending transfer to ships via a dedicated berth at the wharf. A conveyor system is the preferred method of moving the product from the storage area to the vessel. The conveyor will be fed by a forward loading shovel via a hopper. The conveyor will move along the vessels and will be able to move vertically to reduce noise, dust and damage to the pellets.
- 2.2.84 A simplified schematic of Trefoil Process is provided overleaf:

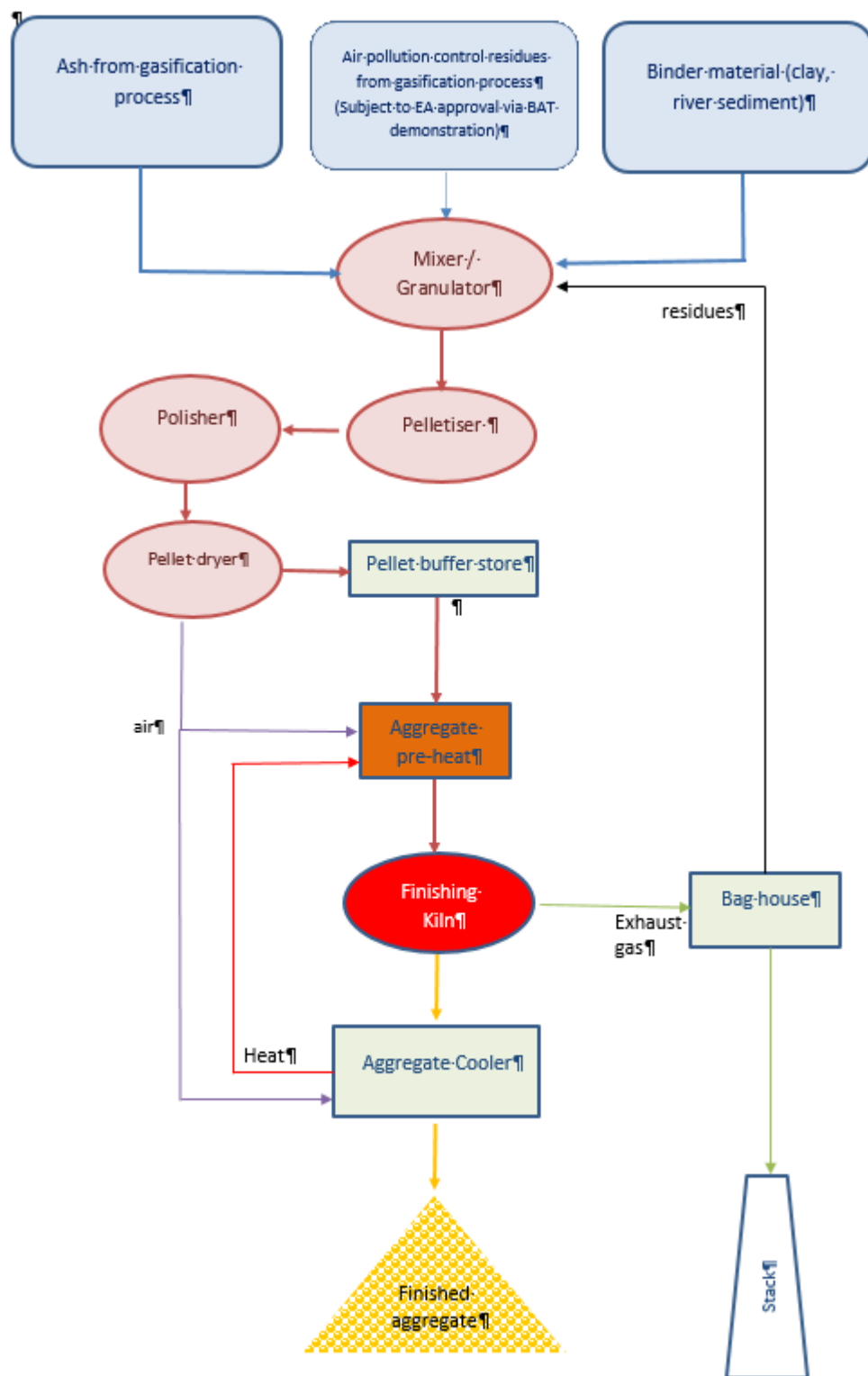


Figure 2.9: schematic of Trefoil Process



Grid connection

- 2.2.85 A grid connection point is proposed to be located within the Site to facilitate the net export of 80MWe (plus an additional 5MW). The proposed connection point and substation is located in the south-east corner of the Site. The grid connection infrastructure will include a primary substation to convert the 132kV to 11kV. An additional overhead tower located in the south-east corner of the Site, may need to be constructed (by Western Power Distribution) to manage the connection to the grid system.
- 2.2.86 A detailed programme of Connection Works and infrastructure needs will be confirmed following further discussions with Western Power Distribution.

Additional information

- 2.2.87 The DCO application for the proposed BAEF project will include the elements described above. In addition, temporary works and associated infrastructure necessary for the construction and operation of the project shall be included.
- 2.2.88 The ES will provide further details of the proposed construction activities and their anticipated duration, along with an indicative programme of the works.
- 2.2.89 Details of construction phasing and proposed construction methods are in the process of being developed. A draft Construction Environmental Management Plan (CEMP) will be prepared and submitted with the DCO application. This will set out principles, controls and management measures to be implemented during the construction phase to manage potential significant effects.
- 2.2.90 Contracts with companies involved in the construction works will incorporate environmental control, health and safety regulations and current guidance with the intention that construction activities are sustainable and that all contractors involved with the construction stages are committed to agreed best practice and meet relevant environmental legislation.
- 2.2.91 It is anticipated that temporary construction laydown areas will be required for the construction of the BAEF. These areas are included within the Indicative Application Boundary (as shown on the plan submitted with this Scoping Request).
- 2.2.92 All construction works will adhere to the Construction (Design and Management) Regulations 2015 (CDM).

Decommissioning

- 2.2.93 For the purpose of the EIA and in order to allow a decommissioning assessment to be presented in the ES, an assumption has been made that the BAEF will have an operational lifetime of 25 years, which is a typical assumption for such facilities. However, it should be noted that it is common for such developments to be operational for longer periods. In the case of the BAEF, a decision would be made at the appropriate time as to whether it would be 're-powered' after 25 years based upon an investment decision considering the market conditions prevailing at that time. If the operating life were to be extended the BAEF would be upgraded and re-permitted in line with the legislative requirements at that time.
- 2.2.94 At the end of its working life, the facility would be decommissioned and removed and the Site reinstated to an agreed condition.
- 2.2.95 For the purposes of this request, any decommissioning phase is assumed to be of a similar



duration to the construction phase. Therefore, environmental effects are expected to be of a similar level to those during the construction phase.



3 Assessment of Alternatives

3.1.1 The EIA Regulations require an ES to include:

3.1.2 '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.'

3.1.3 The EIA Regulations do not expressly require that an applicant considers alternatives.

3.1.4 In determining to use the Site for the location of the BAEF the Applicant took the following factors into account:

- the Site is ideally located directly adjacent to a navigable watercourse;
- the Site benefits from being allocated as a proposed development area (including for the generation of power by energy recovery);
- the Site has the benefit of an existing on-site grid connection;
- the Applicant has the benefit of experience and history in the development of power-generation in the vicinity of the Site, having secured planning permission for the adjacent gasification plant which is now being developed by Aviva;
- The Applicant has strong links with the major landowner in the vicinity of the Site. As a result, the Applicant has been able to secure the vast majority of the land and rights necessary to construct and operate the BAEF and limited further third-party land / rights acquisitions will be required.

3.1.5 The ES will fulfil the requirements of the EIA Regulations through identifying the reasonable alternatives considered by the developer and explain the main reasons for the choices made (to the extent that reasonable alternatives were considered).



4 Policy and Legislation

4.1 UK Planning Legislation and National Policy

4.1.1 This section provides a summary of the key legislative and policy drivers that underpin and support the BAEF.

The Planning Act 2008

4.1.2 The Planning Act 2008 is the primary legislation that established the legal framework for applying for, examining and determining applications for Nationally Significant Infrastructure Projects (NSIPs), considering the guidance in National Policy Statements. NSIPs are usually large-scale developments such as power generating stations, electricity lines, waste and water developments or pipelines. They require a development consent order (DCO) which allows permission to construct and operate, governed by the Planning Act 2008.

4.1.3 Planning Act 2008, the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009, the Overarching National Policy Statement for Energy (EN-1) and the National Policy Statement for Renewable Energy Infrastructure (EN-3) together set out the overarching DCO process and obligations for renewable forms of energy infrastructure. This includes projects generating energy using advanced thermal technologies, such as gasification facilities with a generating capacity of greater than 50 megawatts (MW).

National Policy Statements

4.1.4 The policy framework for examining and determining applications for NSIPs is provided by National Policy Statements (NPSs). Section 104 of the Planning Act 2008 requires the Secretary of State to determine applications for NSIPs in accordance with any relevant NPS, unless:

- it would lead to the UK being in breach of its international obligations
- It would be in breach of any statutory duty that applies to the Secretary of State;
- It would be unlawful;
- the adverse impacts of the development outweigh its benefits; or
- it would be contrary to any Regulations that may be made prescribing other relevant conditions.

4.1.5 In July 2011, the Secretary of State for the Department of Energy and Climate Change ('DECC' which was recently replaced by the Department for Business, Energy and Industrial Strategy (BEIS)) designated a number of NPSs relating to nationally significant energy infrastructure.

4.1.6 The NPSs that are considered to be relevant to the Project include:

- Overarching National Policy Statement for Energy (EN-1); and
- National Policy Statement for Renewable Energy Infrastructure (EN-3).



- 4.1.7 Part 4 of EN-1 sets out a number of ‘assessment principles’ that must be considered by applicants and the Secretary of State in preparing and determining applications for nationally significant energy infrastructure. General points include (paragraph 4.1.2); the requirement for the Secretary of State, given the level and urgency of need for the infrastructure covered by the energy NPSs, to start with a presumption in favour of granting consent for applications for energy NSIPs. This presumption applies unless any more specific and relevant policies set out in the relevant NPS clearly indicate that consent should be refused or any of the considerations referred to in Section 104 of the 2008 Act (noted above) apply.
- 4.1.8 Paragraph 4.1.3 of EN-1 states that in considering any project, and in particular, when weighing its adverse impacts against its benefits, the Secretary of State should take into account:
- Its potential benefits, including its contribution to meeting the need for energy infrastructure, job creation and any long-term or wider benefits; and
 - Its potential adverse impacts, including any long-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.
- 4.1.9 Paragraph 4.1.4 of EN-1 continues by stating that within this context the Secretary of State should take into account environmental, social and economic benefits and adverse impacts, at national, regional and local levels.
- 4.1.10 Electricity generation from renewable sources of energy is an important element in the Government’s development of a low-carbon economy. There are ambitious renewable energy targets in place and a significant increase in generation from large-scale renewable energy infrastructure is necessary to meet the 15% renewable energy target (see Section 3.4 of EN-1).
- 4.1.11 In addition to a number of the assessment principles and generic impacts covered by EN-1 (where relevant to fossil fuel generating stations); EN-3 sets out the factors (e.g. factors influencing site selection) and ‘assessment and technology specific’ considerations to be taken into account in the preparation and assessment of applications for renewable energy infrastructure; including relevant environmental matters, such as, amongst others, noise and vibration, landscape and visual, air quality, water quality, soil and geology, transport, and biodiversity.
- 4.1.12 The generation of renewable energy from waste is covered in section 2.5 of EN-3 which refers (section 2.5.9) to the use of solid recovered fuel from waste (SRF). For the purposes of this Scoping report, SRF as referenced in EN-3 is the same as RDF, and henceforth, RDF (or ‘feedstock’) will be used for consistency.
- 4.1.13 Gasification combustion technology is covered within the scope of EN-3, however, EN-3 is not concerned about the technology used, more the policies that the technology will be required to adhere to (EN-3, section 2.5.11).
- 4.1.14 EN-3 states that throughput volume is not in itself a factor in the decision-making process, however, the potential adverse impacts that may result of high throughput volumes must be balanced against the net benefits of the thermal conversion of the waste to energy.
- 4.1.15 EN-3 states in section 2.5.25 that Government policy encourages multi-modal transport and there is an expectation that fuel and residues are transported by water or rail routes where possible. The location for the BAEF was specifically determined on the basis that the feedstock could be imported by ship and the aggregate product could be exported by ship.



4.1.16 The following represents the assessment principles for renewable energy infrastructure applications set in EN-3:

- **National designations** - sites with nationally recognised designations (Sites of Special Scientific Interest, National Nature Reserves, National Parks, the Broads, Areas of Outstanding Natural Beauty and Registered Parks and Gardens), consent for renewable energy projects should only be granted where it can be demonstrated that the objectives of designation of the area will not be compromised by the development, and any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits
- **Air Quality and Emissions** – EN-3 refers to compliance with the Waste Incineration Directive (WID) and the Large Combustion Plant Directive (LCPD). Both of these Directives were superseded by the Industrial Emissions Directive (IED) in 1 January 2016. Where a proposed renewable energy facility meets the requirements of IED and will not exceed the local air quality standards, the proposed power station should not be regarded as having adverse impacts on health (EN-3 section 2.5.43).
- **Landscape and visual** – EN-3 states (section 2.5.50) that Good design that contributes positively to the character and quality of the area will go some way to mitigate adverse landscape/visual effects. Development proposals should consider the design of the generating station, including the materials to be used in the context of the local landscape to ensure that the design of the proposed generating station is of appropriate quality and minimises adverse effects on the landscape character and quality.
- **Noise and vibration** – EN-3 states (section 2.5.56) that consent should not be granted where the proposed development fails to meet the noise criteria set in EN-1 section 5.11.9. These require that the development avoids significant adverse impacts on health and quality of life from noise; that there is appropriate mitigation to minimise other adverse impacts on health and quality of life from noise; and where possible, contribute to improvements to health and quality of life through the effective management and control of noise.
- **Odour, insect and vermin infestation** - Insect and vermin infestation may be a particular issue with regard to storage of fuels for renewable energy power generating stations as they may be attracted to biodegradable feedstock stored and processed at the facility. Odour is also likely to arise during the reception, storage and handling/processing of incoming feedstock and the application must set out appropriate measures to minimise impacts on local amenity from odour, insect and vermin infestation.
- **Waste management** – EN-3 requires that an assessment of the proposed development should be undertaken to ensure that it accords with the waste hierarchy and is of an appropriate type and scale so as not to prejudice the achievement of local or national waste management targets in England. The ES will set out (in a technical appendix) the extent to which the proposed development contributes to the recovery targets set out in relevant strategies and plans, considering existing capacity. The proposed development should also consider the disposal requirements for residues from the proposed gasification plant. The BAEF will look to use on-site processing to transform the residues into an aggregate product. Section 2.5.81 of EN-3 identifies that substantial positive weight should be given to development proposals that have a realistic prospect of recovering residues.
- **Water quality and resources** – EN-3 requires that the application should demonstrate that appropriate measures will be put in place to avoid or minimise adverse impacts of abstraction and discharge of cooling water. The BAEF will use air-cooled condensers, therefore, this is considered to represent minimal risk.



4.2 The need for the proposed development

- 4.2.1 The UK is committed to generate at least 15% of energy demand from renewable energy sources by 2020 and by 2050 to further reduce carbon emissions by 80%. The proposed BAEF infrastructure would provide a sustainable and renewable form of energy recovery, to contribute towards meeting renewable targets and carbon emissions and is in line with the requirements of NPS EN-1 and EN-3.
- 4.2.2 The Government's Waste Strategy for England 2007 introduced stringent targets for increasing recycling and reducing landfill. This was reinforced National Waste Management Plan for England in July 2013. The key aim of the Waste Management Plan for England was to set a direction towards a zero-waste economy as part of the transition to a sustainable economy. In particular, this means using the "waste hierarchy" (waste prevention, re-use, recycling, recovery and finally disposal as a last option) as a guide to sustainable waste management.
- 4.2.3 The **EU action plan for the Circular Economy** sets a target to reduce landfill to a maximum of 10% of municipal waste by 2030; and will also provide concrete measures to promote re-use and stimulate industrial symbiosis - turning one industry's by-product into another industry's raw material.
- 4.2.4 Development that includes energy from biomass and/or waste with power generation of >50 megawatts (MW) is covered by EN-3. The policies set out in EN-3 are additional to those on generic impacts set out in EN-1 and do not replace them; and should be considered together with EN-1 policies.
- 4.2.5 Section 2.5.2 of EN-3 states that "*The recovery of energy from the combustion of waste, where in accordance with the waste hierarchy, will play an increasingly important role in meeting the UK's energy needs. Where the waste burned is deemed renewable, this can also contribute to meeting the UK's renewable energy targets. Further, the recovery of energy from the combustion of waste forms an important element of waste management strategies in both England and Wales.*"
- 4.2.6 In particular, EN-1 sets out the Government's conclusion that there is a significant need for new major energy infrastructure (see Section 3.3 of EN-1). EN-1 Section 3.4 includes assessments of the need for new major renewable energy infrastructure. In the light of this, the need for infrastructure covered by EN-3 has been demonstrated and the BAEF can help meet this need.

4.3 Other policy matters that may be important and relevant

National Planning Policy Framework

- 4.3.1 The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied. One of the main aims of the Framework is to ensure policies and Local Plans favour sustainable development. There are 12 core planning principles which planning should follow which include:
- Empowering local people through succinct local and neighbourhood plans which are up to date;
 - Enhance and improve places;
 - Support sustainable economic development;
 - Ensure high quality design and good standard of amenity;
 - Consider the separate roles and characters of different areas;



- Support low carbon future, consider flood risk and coastal change; encourage reuse of existing resources including conversion of existing buildings and encourage the use of renewable resources;
- Contribute to conserving and enhancing the natural environment and reducing pollution;
- Encourage effective use of land by reusing land that has been previously developed (brownfield land), provided it is not of high environmental value;
- Promote mixed use of development;
- Conserve heritage assets in a manner appropriate to their significance;
- Make full use of public transport, walking and cycling and focus development in areas which can be made sustainable; and
- Take account of and support local strategies to improve health, social and cultural wellbeing.

National Planning Policy for Waste

4.3.2 The National Planning Policy for Waste sets out detailed waste planning policies and aims to deliver the UK's waste ambitions through:

- Delivery of sustainable development and resource efficiency, including provision of modern infrastructure, local employment opportunities and wider climate change benefits, by driving waste management up the waste hierarchy;
- Ensuring that waste management is considered alongside other spatial planning concerns, such as housing and transport, recognising the positive contribution that waste management can make to the development of sustainable communities;
- Providing a framework in which communities and businesses are engaged with and take more responsibility for their own waste, including by enabling waste to be disposed of or, in the case of mixed municipal waste from households, recovered, in line with the proximity principle;
- Helping to secure the re-use, recovery or disposal of waste without endangering human health and without harming the environment; and
- Ensuring the design and layout of new residential and commercial development and other infrastructure (such as safe and reliable transport links) complements sustainable waste management, including the provision of appropriate storage and segregation facilities to facilitate high quality collections of waste.

Waste Management Plan for England (2013)

4.3.3 The key aim of The Waste Management Plan for England (2013) is to work towards a zero-waste economy as part of the transition to a sustainable economy. The wastes covered by the plan are municipal waste, industrial (including agricultural) and commercial waste, construction and demolition waste and hazardous waste.

4.3.4 The Plan includes using the 'waste hierarchy' (waste prevention, re-use, recycling, recovery and finally disposal as the last option) as a guide to sustainable waste management. One aim is to have the appropriate waste reprocessing and treatment infrastructure at all levels of the waste hierarchy.

4.3.5 The 'Proximity Principle' as established in the Waste Framework Directive, requires waste to be disposed of, or recovered in one of the nearest appropriate installations, by means of the most appropriate methods and technologies to ensure a high level of protection for the environment and public health. The Directive also requires Member States to move towards the aim of self-



sufficiency in waste disposal and recovery of waste.

- 4.3.6 Over three million tonnes of RDF is exported from England alone, to northern continental Europe and Scandinavia for energy recovery. Therefore, in line with the proximity principle, the BAEF seeks to move the recovery of energy to closer to the point of production and ensure that England is more self-sufficient in managing its own waste.

Local Planning Policy

- 4.3.7 NPS EN-1 recognises that local development plan documents may be both important and relevant to decision making, however, in the event of conflict with an NPS, it is expected that the latter will prevail.

- 4.3.8 The following policies will be considered during the EIA process:

Boston Borough Local Plan (adopted 1999) (saved policies):

- 4.3.9 The policies referred to below have been 'saved' following the 27th September 2007 deadline.
- Policy G1 is a keynote policy that relates to all new development. It states that: '*Planning permission will only be granted for development which will not substantially harm the amenities of other nearby land users or residents, or the general character of the area because of its nature, scale, density, layout, appearance or level of traffic generation.*'
 - Policy G2 is a general development policy that concerns the preservation of wildlife and landscape resources.
 - Policy G3 concerns foul and surface water disposal.'
 - Policy G4 concerns safeguarding the water environment.
 - Policy G6 concerns Vehicle and pedestrian access
 - Policy G8 relates to air and soil resources
 - Policy G10 concerns external lighting schemes.
 - Policy C17 relates to sites of local nature conservation interest.
- 4.3.10 ED1 in the 'interim plan, February 2006' identifies the Riverside Industrial Estate, Boston to be an area in which planning permission will be granted for employment development, comprising business, general industry, storage or distribution development.

South East Lincolnshire Local Plan

- 4.3.11 Boston Borough Council are producing a new Local Plan jointly with South Holland District Council and Lincolnshire County Council. The South-East Lincolnshire Local Plan was submitted to the Secretary of State on 23 June 2017 and is now at examination stage. The Local Plan will guide development in South East Lincolnshire over the next twenty years, and will be very important in shaping how the area changes over this period. It will identify opportunities for growth and will set out clear guidance on what planning applications will be permitted.

The Lincolnshire Minerals and Waste Local Plan (2016)

- 4.3.12 The Waste Local Plan promotes the reduction in waste disposal to landfill, and an increase in waste prevention/ minimisation, ensuring waste is reused, recycled, composed or subjected to energy recovery. In accordance with Planning Practice Guidance, the Council will not prescribe waste management technologies to deal with specific waste streams, to allow flexibility in the development of new and emerging waste technologies.



4.3.13 The majority of the policies of the Waste Local Plan relate to waste management facilities (defined in the Plan as “Facilities associated with the processing and disposals of waste materials”). The purpose of the proposed facility is to generate energy. However, given that the feedstock comprises residual material, the following policies in the Waste Local Plan are of some relevance:

- Policy W3: Spatial Strategy for New Waste Facilities.
- Policy W4 sets out locational criteria for New Waste Facilities.
- Policy WLP12 concerns proposals seeking to generate energy from waste.
- Policy DM1 - The County Council will take a positive approach in favour of sustainable development contained in the National Planning Policy Framework.
- Policies DM2 to DM16 inclusive, identify subject-specific requirements for new waste development, such as emissions, heritage assets, landscape and townscape, biodiversity and ecology etc.

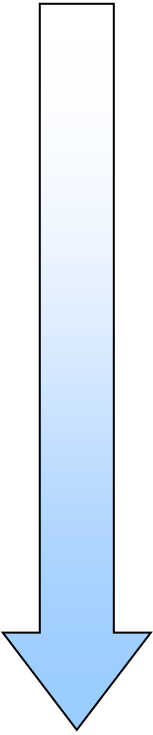


5 Approach to EIA

5.1 The EIA Process

- 5.1.1 The process of EIA for projects falling under the Planning Act 2008 is governed by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, the “EIA Regulations”. The EIA Regulations implement EC Directive 2011/92/EU, as amended by Directive 2014/52/EU, into domestic legislation.
- 5.1.2 The BAEF falls within Schedule 2 part 3a of the EIA Regulations. Given the location, scale and nature of the proposed development, notwithstanding the selection criteria in Schedule 3 of the EIA Regulations, it is considered that BAEF may have the potential to give rise to significant effects on the environment.
- 5.1.3 The EIA Regulations set out the requirements for undertaking an EIA, and Regulation 14 and Schedule 4 detail the required information for inclusion in an ES.
- 5.1.4 The BAEF EIA will identify and assess the likely significant effects in respect of the construction, operational and decommissioning phases of the BAEF. The EIA process is shown in **Table 5.1** and will be broken down into a Preliminary Environmental Information Report (PEIR) stage; and an Environmental Statement (ES) stage, allowing for stakeholder engagement to inform the proposed development.

Table 5.1 The EIA Process

Stage	Task	Aim/objective	Work/output (examples)
Scoping study	Scoping	Scoping to identify the potentially significant direct and indirect impacts of the proposed scheme.	Appropriate level of information on proposals and approach. Environmental Scoping Report Preliminary consultation with key consultees. Targets for specialist studies.
EIA 	Consultation	Consult with statutory and non-statutory organisations and individuals with an interest in the area and the proposed scheme.	Local knowledge and information.
	Primary data collection	To characterise the existing environment.	Background data including existing literature and specialist studies.
	PEIR	Initial assessment of likely significant effects	Publication of preliminary assessment in the PEIR
	Specialist studies	To further investigate those environmental parameters which may be subject to potentially significant effects.	Specialist reports.
	Impact assessment	To evaluate the existing environment, in terms of sensitivity. To evaluate and predict the impact (i.e. magnitude) on the existing environment. To assess the significance of the predicted impacts.	Series of significant adverse and beneficial impacts.
	Mitigation measures	To identify appropriate and practicable mitigation measures and enhancement measures.	The provision of solutions to minimise adverse impacts as far as possible Feedback into the design process, as applicable.
	Environmental Statement	Production of the ES in accordance with EIA guidance, including reporting the residual (post-mitigation) likely significant impacts.	Environmental Statement.

5.2 EIA Screening

5.2.1 Given the nature and scale of the BAEF, it was decided that an EIA Screening Opinion would not be sought from PINS. A decision was made by the Applicant to undertake an EIA process and produce an ES voluntarily which will form part of the DCO application suite of documents.

5.3 EIA Scoping

5.3.1 Whilst every ES should provide a full factual description of the development, the emphasis of Schedule 4 (of the EIA Regulations) is on the “main” or “significant” environmental effects to which a development is likely to give rise.

5.3.2 Where relevant, the environmental topics set out within this Scoping Report provide an outline of the proposed approach to assessment and the potential environmental effects. The PEIR and ES will provide an objective analysis of the likely significant environmental effects and highlight the key issues relevant to the decision-making process and enable stakeholder engagement.



- 5.3.3 A programme of community engagement/consultation will be undertaken as part of the post-Scoping phase to allow statutory and non-statutory consultees to submit their views and participate in the decision-making process.

5.4 Assessment of Impacts

- 5.4.1 The assessment of impacts will be balanced and guided by both EIA specialists and technical specialists using available data, new data, experience and expert judgement. A matrix approach will be used to provide a consistent framework and system of common tools and terms.

Determining Receptor Sensitivity and Value

- 5.4.2 Receptor value considers for example whether the receptor:

- Is rare;
- Has protected or threatened status;
- Has importance at a local, regional or national scale; and
- Has a key role in ecosystem function (in the case of biological receptors).

- 5.4.3 To assess receptor sensitivity, the ability of the receptor to adapt to change, tolerate and/or recover potential impacts will be considered. The time required for recovery of receptors is key in determining receptor sensitivity. Therefore, overall receptor sensitivity will be determined by considering a combination of value, adaptability, tolerance and recoverability and applying professional judgement and/ or past experience.

Predicting the Magnitude of Impacts

- 5.4.4 The significance of an impact is predicted through establishing the magnitude and probability of the impact through consideration of:

- Scale or spatial extent
- Duration (short term to long term)
- Frequency; and
- Nature of change relative to the baseline.

Evaluation of Significance

- 5.4.5 After the sensitivity and magnitude have been established, the impact significant will be predicted by using quantitative or qualitative criteria. To aid assessment of impact significance, a matrix, such as the one in **Table** will be used where possible. **Table** provides the definitions of significance proposed to be used in the assessment process.

- 5.4.6 To ensure that the definition of impacts is relevant to each topic, a description of the approach to impact assessment and the interpretation of significance levels will be provided within each section of the ES.

5.4.7

Table 5.2 Impact significance matrix

		Negative Magnitude				Beneficial Magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

Table 5.3 Definitions of impact significance

Impact Significance	Definition
Major adverse	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and/or breaches of legislation.
Moderate adverse	Intermediate change in receptor condition, which are likely to be important considerations at a local level.
Minor adverse	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.
Minor beneficial	This impact is of minor significance, but has been assessed as having some environmental benefit.
Moderate beneficial	This impact is assessed as providing a moderate gain to the environment.
Major beneficial	This impact is assessed as providing a significant positive gain to the environment.

Confidence

5.4.8 Once an assessment of potential impact has been made, it is necessary to provide a confidence value to the assessment. This is based on a simple scale of high-medium-low, where high confidence assessments are made based on robust evidence with lower confidence assessments being based, for example of extrapolation and use of proxies.

5.5 Mitigation

5.5.1 The EIA Regulations require an ES to contain: 'a description of the measures envisaged to



prevent, reduce and where possible offset any significant adverse effects on the environment. To reduce significant environmental impacts to acceptable levels, or to enhance the environment, mitigation measures will be proposed and discussed with the relevant authorities.

5.5.2 Mitigation takes many forms and in summary can be classified as follows:

- Primary Mitigation – this type of mitigation can best be described as modifications to the location or design of the development made during the pre-application/design phase that are an inherent part of the project and do not require additional action to be taken. Examples include reducing the height of a development to reduce visual impact, or identifying a key habitat or feature that should remain unaffected by the development's layout and operation e.g. retaining an un-improved grassland area in situ as part of an open space strategy;
- Secondary Mitigation – this type of mitigation can best be described as actions that will require further activities to achieve the anticipated outcome. An example includes describing certain lighting limits which will be subject to the submission of a detailed lighting layout as a condition of approval.

5.5.3 The Scoping Report will identify the proposed mitigation measures for the main or significant impacts or effects identified in each topic. This is provided as a brief paragraph for each receptor or in table form.

5.5.4 The full extent of the required mitigation measures will not be apparent until assessment finalised but it is important to identify potential mitigation measures at this stage (based on professional judgement) so that they can either be incorporated within the design or set out within the project description.

5.6 Assessing Residual Impacts

5.6.1 Once mitigation measures have been identified, impacts will be re-assessed and the residual impacts will be described. There will be a description of where mitigation measures have not been proposed and an explanation of why the impact cannot be reduced.

5.7 Cumulative Impact Assessment

5.7.1 A Cumulative Impact Assessment (CIA) forms part of the EIA process, which considers the cumulative impacts of other developments alongside the impacts of the proposed scheme. Plans and projects which should be considered in the CIA, according to the Planning Inspectorate Advice Note 17, include:

- Projects that are under construction;
- Permitted applications, not yet implemented;
- Submitted applications not yet determined;
- Projects on the Planning Inspectorates Programme of Projects;
- Development identified in relevant Development Plans;
- Sites identified in other policy documents as development reasonably likely to come forward.



- 5.7.2 Consultation will take place with key stakeholders to determine the appropriate local schemes to consider in the cumulative impact assessment.

5.8 Consultation

- 5.8.1 The Planning Act 2008, and secondary legislation including the EIA Regulations, set out the statutory requirements for consulting with prescribed consultees and the local community (as required by Sections 42 and 47 of the Planning Act 2008).
- 5.8.2 In accordance with its statutory duties, AUBP will undertake statutory consultation including the publication of a PEIR during the pre-application phase of the project.
- 5.8.3 Consulting and engaging with statutory and non-statutory stakeholders on EIA matters is likely to result in benefits for the project and the stakeholders, through drawing out information which may not otherwise have been revealed, and providing AUBP with an opportunity to address potential concerns. In accordance with Section 49 of the Planning Act 2008, AUBP will have regard to any consultation responses and feedback it receives in the in the process of the BAEF's design development and the assessment of the likely significant environmental effects.
- 5.8.4 In addition to the statutory consultation, AUBP is proposing to undertake non-statutory consultation in order to engage and identify any solvable issues earlier in the development stages of the BAEF.

5.9 Monitoring

- 5.9.1 The EIA Regulations require "*the monitoring of any significant adverse effects on the environment of proposed development*". The ES will make clear which, if any, effects are both adverse *and* significant and therefore require monitoring.
- 5.9.2 Regulation 21(3) of the EIA Regulations states that the Secretary of State should:
- (b) take steps to ensure that the type of parameters to be monitored and the duration of the monitoring are proportionate to the nature, location and size of the proposed development and the significance of its effects on the environment; and*
- (c) consider, in order to avoid duplication of monitoring, whether any existing monitoring arrangements carried out in accordance with an obligation under the law of any part of the United Kingdom, other than under the Directive, are more appropriate than imposing a monitoring measure.*



- 5.9.3 Schedule 4 to the EIA Regulations identifies that an ES should identify '*any proposed monitoring arrangements*'. Accordingly, the ES will provide details of proposed monitoring to clearly identify the any proportionate monitoring that is proposed in relation to any significant adverse effects that have been identified and reported.

5.10 Preliminary Environmental Information Report

- 5.10.1 Regulation 12(1)b of the EIA Regulations requires an Applicant to set out how it intends to publicise and consult on 'preliminary environmental information' relating to a proposed NSIP. Regulation 12(2) of the EIA Regulations defines preliminary environmental information as '*the information which has been compiled by the applicant, and is reasonably required for the consultation bodies to develop an informed view of the likely significant effects of the development (and of any associated development)*'.
- 5.10.2 In respect of the BAEF, the PEIR will be published as part of the statutory consultation process which will be undertaken in accordance with the Planning Act 2008.

5.11 Environmental Statement

- 5.11.1 The EIA process undertaken by AUBP's consultant team will be reported in an ES which will describe the proposed development and set out the policy background and context; provide comprehensive details on the EIA methodology used; detail any mitigation and enhancement measures that are incorporated or proposed; set out the assessment of likely significant environmental effects and provide a schedule of proposed monitoring arrangements. The ES will present the residual effects, and an assessment of the cumulative effects and in-combination effects as described in Section 6 below. A Non-Technical Summary (NTS) of the ES will be provided as required by paragraph 9 of Schedule 4 to the EIA Regulations.

5.12 Competent EIA Experts

- 5.12.1 Regulation 14 of the EIA Regulations requires that the developer 'must ensure that the environmental statement is prepared by competent experts'. In accordance with Regulation 14, the ES will be accompanied by a statement setting out the relevant expertise and qualifications of the consultants who are preparing the ES.



6 Potential Significant Environmental Effects – Topics to be Scoped into the EIA

6.1 Assessment

6.1.1 This section identifies the environmental topics scoped into the EIA, the potential effects and the approach proposed to undertake the topic assessments.

6.1.2 A series of high level desk-based assessments were conducted by technical specialists to inform the Scoping report. The specialists employed professional judgement by drawing on information available in the public domain to establish both potential receptors and potential impacts arising from the BAEF during both the construction and operational phases of development.

6.2 Cultural Heritage

Baseline Conditions

6.2.1 An initial high-level study has identified several heritage constraints near the proposed development, although no specific asset was identified within the Site.

6.2.2 The key heritage constraints to consider are:

- The setting of the Grade II listed Slipper Gowt Sluice (Listed Building 480797);
- The character and setting of the historic landscape/seascape; and
- The setting of St Botolph's Church, which is located in Boston town centre to the north of the Haven.

6.2.3 The BAEF area is considered to have low potential for archaeological features due to recent activity within the Riverside Industrial Estate, however, there may be potential for unknown buried archaeological remains and deposits located onshore, within the tidal mud banks of the foreshore and within The Haven.

Potential Environmental Effects

Construction Phase

6.2.4 Potential impacts to heritage assets to be considered during construction are:

- Potential buried archaeological remains caused by construction activities within the footprint of the onshore development facilities;
- Marine heritage assets and deposits within the wharf development footprint;
- Changes to sediment transport which could have an indirect impact upon marine heritage assets;
- The setting of designated and key non-designated terrestrial and marine heritage assets on a temporary basis for the duration of the construction phase, including Slipper Gowt Sluice and St Botolphs Church; and
- The setting of the historic landscape/seascape on a temporary basis for the duration of the construction phase.

Operation Phase



- 6.2.5 During the operational phase, the key impacts to heritage assets to be considered are:
- Changes to sediment transport or localised scour which could have an indirect impact upon marine heritage assets;
 - Impacts upon the setting of designated and key non-designated terrestrial and marine heritage assets, including Slipper Gwot Sluice and St Botolphs Church; and
 - Impacts upon the setting of the historic landscape/ seascape.
- 6.2.6 There will be no physical impacts to potential buried archaeological remains or palaeo-environmental deposits during the operation phase as any such impacts would have occurred during the construction phase.
- 6.2.7 The completed development could permanently alter the setting of built heritage assets and the historic landscape which could result in an impact upon their heritage significance.

Cumulative Impacts

- 6.2.8 Cumulative impacts that should be considered are;
- The potential for any unknown heritage assets to be directly or indirectly impact by other proposed projects within the vicinity of the BAEF where a boundary is shared between the project; and
 - The potential for multiple developments to affect the setting of heritage assets and the historic landscape/ seascape.

Mitigation

- 6.2.9 The information obtained from the desk-based study and evaluation stages would inform the EIA process. A staged approach to archaeological evaluation and mitigation would be undertaken; this will involve the production of a desk-based assessment which will assess the significance of known heritage assets, and their settings, and the potential to uncover buried archaeological remains which are, at present, unknown.
- 6.2.10 The archaeological evaluation approach will be discussed and agreed with the Lincolnshire County Council Historic Environment Service and Historic England, where required. The methodology for each type of investigation would be set out within a survey specific Written Scheme of Investigation (WSI), where required.
- 6.2.11 Impacts to both known and potential archaeological receptors will be addressed through the application of embedded mitigation.
- 6.2.12 Unavoidable impacts to potential receptors will be addressed through a series of agreed mitigation measures to reduce the scale of the impact, such as preservation by record (archaeological excavation), once impacts have occurred and been identified.

EIA Approach

- 6.2.13 During the EIA, a Preliminary Cultural Heritage Assessment will be undertaken for the BAEF to establish the historic environment baseline and identify the potential heritage constraints. The assessment will be undertaken in accordance with the *Standard and Guidance for Historic Environment Desk-Based Assessments* (Chartered Institute for Archaeologists, 2014).



6.2.14 To inform the Cultural Heritage Assessment the following methodology will be undertaken:

- A full search of the Lincolnshire Historic Environment Record (HER) for known designated and non-designated heritage assets within the site and a pre-defined study area;
- A search of the National Heritage List for England for recorded of designated heritage assets within the site and a pre-defined study area;
- A search of the United Kingdom Hydrographic Office (UKHO) for records of wrecks and obstructions within the site and a pre-defined study area (including 'dead' and salvaged wrecks that are no longer chartered as navigational hazards);
- A search of recorded heritage assets and documented losses from the National Record of the Historic Environment (NRHE);
- A review of existing desk-based information including The Boston Barrier Tidal Project Cultural Heritage Chapter (Environment Agency, 2016), and the Archaeological Desk Based Assessment Report (Allen Archaeology, 2010) and the Archaeological Evaluation Report for Boston 1 (Archaeological Project Services, 2010);
- A review of any data from geotechnical site investigations; and
- An initial settings assessment for designated and key non-designated heritage assets and the historic landscape/seascape character.

6.2.15 Consultation with the Archaeological Advisor to Boston Borough Council and Historic England will be undertaken to agree the method for establishing importance of heritage asset, significance criteria, magnitude of impact and evaluation of significance. The study area for the desk-based study and settings assessment will be confirmed along with the key heritage constraints and other projects to be considered as part of the Cumulative Impacts Assessment. Results from the assessment will be used to establish the historic environment baseline and identify the potential heritage constraints.

Conclusion

Potential impacts	Construction	Operation
Direct impacts upon buried archaeological remains	✓	X
Direct impacts upon above ground heritage assets	✓	X
Indirect impacts through the alteration of the settings of built heritage assets	✓	✓
Indirect impacts through the alteration of the setting of the historic landscape	✓	✓
Cumulative impacts	✓	✓

scoped in (✓) and scoped out (X)



6.3 Landscape and Visual Impact

Baseline Conditions

- 6.3.1 A desk-based study and preliminary site visit was conducted to provide a commentary of the potential landscape and visual effects of the proposed development. The study comprised an assessment of available data including the Boston Barrier Tidal Project Landscape and Visual chapter (Environment Agency, 2016). The assessment was used to establish the proposed baseline environment and the potential landscape and visual impacts of the project for consideration during the scoping stage.
- 6.3.2 The site is located to the south of Boston town and east of the Riverside Industrial Estate. The eastern site margins are defined in part by a sea defence bank along The Haven (the tidal waterway of the River Witham between The Wash to the east and Boston town) and the waste gasification development - Boston Biomass Plc, currently close to completion. A mixture of large and small industrial and business units is located to the north, west and south of the site. An overhead powerline on pylons traverses the site from north to south and bisects the Boston Biomass Plc facility and the proposed development.
- 6.3.3 The site comprises of former agricultural fields bounded by drainage ditches and forms part of a wider emerging industrial / commercial area, as defined by local planning documents.
- 6.3.4 The site and environs are located within the National Character Area 46: The Fens, an area of landscape extending from the north of Boston to Peterborough and Cambridge in the south. The area is essentially flat with open skies and distinct pattern of drainage ditches and dykes. The Landscape Character Assessment of Boston Borough (BBC, July 2009) includes the site within the Reclaimed Saltmarsh Landscape Character Type and Welland to Haven Reclaimed Saltmarsh Landscape Character Area (LCA). Land is reclaimed from the sea and is surrounded by sea banks. The Welland to Haven Reclaimed Saltmarsh LCA is of *moderate* sensitivity to change with views towards new developments being difficult to restrict from sensitive view receptors within the area. Landscape areas in proximity to Boston are considered less sensitive due to urban influences. The borough landscape assessment identifies that new development should be concentrated around existing settlements or development around the outskirts of Boston to prevent fragmentation or loss of rural landscape.
- 6.3.5 Initial site observation concurs with the overall summary of key landscape characteristics identified in existing publications. However, landscape character in proximity to the site is very significantly influenced by urban / industrial features. Overhead electricity pylons dominate the skyline, particularly in views north from the site where very tall pylons take the cables across The Haven. Views towards the famous landmark tower of St Botolphs Church in Boston (referred to as 'The Stump') are entirely compromised by intervening electricity pylons, industrial units, cranes and gantries at the Port of Boston.
- 6.3.6 Landscape areas to the east of the site, across The Haven, are notably more rural in character with large open arable fields and generally more extensive views. Large industrial units on the eastern banks of the Haven are often prominent in views west, with pylons and cranes clearly seen above the skyline. Landscape areas to the south and west are similarly rural in character. Field and drainage patterns are smaller in scale and less rectilinear. Hedgerows, shelterbelt planting and mature trees within property and residential hamlets often restricts the extent of



views. Pylons, overhead cables on timber poles, industrial units and the Boston 1 building and site cranes remain a feature in these local views.

6.3.7 In terms of the overall visual resource within the site and its environs, views are often substantially or partially affected by industrial and infrastructure features mentioned above. The flat landscape affords very few elevated vantage points and minor topographical or intervening built / vegetative features significantly restrict the extent of views. The raised landform of a landfill site to the south of the site is prominent in certain views and forms a local visual horizon. The sea bank to the east of the site, in combination with a tall hedgerow, creates a strong visual barrier in ground level views from the site.

6.3.8 In the absence of many topographical features offering an elevated vantage point, and several manmade and natural assets offering ground-level screening services, the assessment has identified few receptors of landscape and visual impacts. However, a few receptors are deemed sensitive to the impact of the project, so for the purposes of the scoping assessment these receptors are included here.

Receptors

6.3.9 The assessment considers the sensitivity of potential receptors of landscape and visual impacts because of the proposed development. High sensitivity visual receptors that would potentially be affected by the BAEF include:

- Users of the local public footpath network that run alongside The Haven, including the Macmillan Way (a long distance footpath that extends from Boston to Dorset) that runs along the top of The Haven sea bank, therefore users are afforded slightly elevated and more extensive views across the landscape. The Macmillan Way passes the eastern boundary of the site;
- Residents within approximately 1 km of the site to the west and scattered groups of properties along narrow lanes to the south and southwest of the site;
- Residents at Fishtofts, a village approximately 2 km to the east;
- Users of Havenside Country Park and Local Nature Reserve, to the south east of the site alongside the eastern bank of The Haven;
- Users of The Haven; and
- Users of the Route 1 Sustrans long distance cycle route that passes to the west of the site.

Potential Environmental Effects

6.3.10 For the purpose of Environmental Impact Assessment 'significant' effects are considered to be *moderate* or *major* effects (either adverse or beneficial).

Construction Phase

6.3.11 Potential impacts to landscape and visual receptors would arise during the construction phase due to the presence of construction plant and operatives, lighting during night-time working and the movement of construction equipment. Tall cranes would be a feature in both local views and those across the wider landscape. Cranes may include red air obstruction warning lights. Predicted impacts would be short term, although may include significant effects upon certain close range visual receptors.

Operational Phase



Landscape Character Effects

6.3.12 The site and its immediate environs are strongly influenced by the presence of industry and industrial infrastructure. The BAEF would not significantly affect existing local landscape character. Proposed tall buildings and the stack would be prominent across a relatively wide area of landscape to the east, south and west. There would be adverse effects upon wider landscape character although these are not anticipated as being significant effects.

Visual Effects

6.3.13 The combination of flat landscape and existing features within the landscape (built or vegetative) limits the extent of local views and the overall extent that the development may be visible within the landscape; its Zone of Theoretical Visibility (ZTV). The BAEF would be visible intermittently from within relatively extensive areas of landscape. Taller structures would be seen against the skyline and in silhouette, albeit in context of existing industrial structures and infrastructure. The stack and associated plume may be visible across a very wide landscape area although at distance no significant adverse effects are anticipated.

6.3.14 Certain close range views (e.g. from public rights of way in immediate proximity to the development) are predicted to be subject to the highest degree of adverse impact. Views would be in context of existing industry and development. Views from residential property within 1km may also experience notable adverse impact.

Cumulative Effects

6.3.15 Cumulative effects will be considered in the cumulative impact assessment and limited to emerging development or development with planning permission (subject to agreement with the LPA).

Considerations

Landscape Planning Designations

6.3.16 There are no landscape related planning or other landscape designations pertaining to the site. Designated features to consider in proximity to the site will include the following:

- Conservation Areas within Boston and Skirbeck;
- Listed buildings near to the Site;
- Footpaths;
- Public open spaces; and
- Trees with tree protection orders.

6.3.17 Regard will be given to local planning policy relating to landscape and visual issues. St Botolphs Church in Boston is a Grade 1 listed building and the tower is a regional landmark. Planning policy relates to proposed development that... will not '*obstruct a public view of St Botolph's Church, or which would challenge the visual dominance of the church*'.

Mitigation

6.3.18 Measures to reduce identified landscape and visual effects will include the consideration of external colour and appearance of built structures, building 'massing', external lighting design and



the provision of adequate areas of woodland planting within the site.

6.3.19 Woodland planting would not be effective in screening views to upper sections of taller structures. The main plant buildings and stack would remain visible across the wider landscape in the long term. Planting may provide partial screening or filtering of certain close range views towards the development. To be effective, woodland mitigation planting should to be factored in during the early design and assessment stages of the project. 'Off site' planting can be most effective in mitigating specific visual impacts although is unlikely to be agreed or made 'deliverable' for inclusion in the assessment.

EIA Approach

6.3.20 The following potential impacts may be associated with the BAEF:

- Temporary changes to landscape character and views from sensitive receptors in the vicinity of the BAEF during construction and decommissioning; and
- Permanent changes to landscape character and views from sensitive receptors in the vicinity of the BAEF during operation.

6.3.21 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.

6.3.22 A detailed study of the existing landscape components, character and views of the Site and an identified study area will be carried out 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.

6.3.23 This will be supported using photographs as appropriate.

6.3.24 The Applicant will be undertaking consultation with relevant consultees including Lincolnshire County Council, Boston Borough Council and Natural England, in order to define the scope of the LVIA required for the proposed project, including the locations of representative views and photomontages. This would be based on the receptors cited above.

6.3.25 The assessment will be undertaken in accordance with the methods outlined in best practice guidance documents such as:

- The Landscape Institute with the Institute of Environmental Management and Assessment (2013).



Guidelines for the Assessment of Landscape and Visual Impacts. Third Edition;

- Landscape and Seascape Character Assessments published by Natural England and the Department for Environment, Food and Rural Affairs (2014);
- Landscape Institute (2017): Visual representation of development proposals. Technical Guidance Note 02/17
- An Approach to Landscape Character Assessment (2014). Natural England;
- The Landscape Institute (2011). Landscape Institute Advice Note 01/11, Photography and photomontage in landscape and visual impact assessment

Conclusion

- 6.3.26 The sensitivity of landscape and visual receptors means that the BAEF would incur adverse landscape and visual effects in both construction and operation. Significant adverse effects are predicted to be limited to visual receptor locations near the development.
- 6.3.27 It is recommended that the landscape and visual impact assessment is scoped in to the next stage of assessment.

6.4 Noise and Vibration

Baseline Conditions

6.4.1 The existing ambient noise environment around the site is likely to be influenced, both day and night, by road traffic noise on the local road network and noise from nearby commercial/industrial premises in the Riverside Industrial Estate (including Boston 1) and the industrial premises on the opposite side of the river. There are several existing residential noise-sensitive receptors in proximity (some within 200 m) to the BAEF at the following locations:

- Slippery Gowt Lane;
- Heron Way;
- Nursery Road;
- Marsh Lane;
- Wyberton Low Road; and
- Powell Street and River Way on the opposite bank of the Haven.

6.4.2 Havenside Country Park, which is located nearby but on the opposite bank of the river to the site, is a potential receptor in respect of noise impacts. It is envisaged that these receptors may be adversely affected by both construction-related and operation-related activities.

Baseline Monitoring

6.4.3 To characterise the existing noise climate within the vicinity of the Boston Gasification Scheme a baseline noise survey was undertaken at the receptor locations between 24th and 30th August 2017. This was conducted in accordance with current guidance including BS4142:2014 method for rating and assessing industrial and commercial sound and BS7445:2003 description and measurement of environmental noise. This will be used within the assessment for the Proposed Development. It is, however, anticipated that additional monitoring will be required to reflect the specific site layout and any development that has been built or is in construction since the baseline survey.

Residential Receptors

6.4.4 Baseline noise measurements have been conducted at the nearest identified sensitive receptors and adjacent corresponding site boundary locations. These locations and their corresponding 'Boundary ID' are shown in **Figure 6.1**.

Table 6.1 Baseline Noise Monitoring Locations

Usage	Street	Receptor ID	Boundary ID
Residential	Ivy House Slippery Gowt Lane	STR1	B1
Residential	Anacary Marsh Lane	STR2	B2
Residential	Beeston Farm Nursery Road	STR3	B3
Residential	Lodge/ Bank View Powell Street	STR4	n/a
Residential	No. 21 River Way	STR5	n/a



- 6.4.5 The noise measurements were conducted with Sound Level Meters (SLMs) mounted on tripods at a height of between 1.2 m and 1.5 m above ground level and 3.5 m away from any reflecting surface other than the ground, i.e. in free-field conditions. The instruments were calibrated before and after the survey using a portable calibrator. No significant deviation in the calibration level was observed.
- 6.4.6 The surveys were conducted during periods of weather favourable for noise measurements, i.e. no rainfall and wind speeds below 5m/s.
- 6.4.7 For all measurement locations during the noise survey SLMs were set to record the following:
- LAeq – the equivalent continuous sound pressure level over the measurement period. This parameter was standardised as pertinent for land use within BS 7445;
 - LMax – the maximum sound pressure level occurring within the defined measurement period;
 - LA90 – the sound pressure level exceeded for 90% of the measurement period and is indicative of the background noise level;
 - LA10 - the sound pressure level exceeded for 10% of the measurement period. The LA10 index is used within the Calculation of Road Traffic Noise (CRTN) as an appropriate descriptor of traffic noise.
 -
- 6.4.8 Long term monitoring was undertaken at receptor measurement positions STR1 – STR3 for 5 days between Friday 25th and Wednesday 30th of August 2017.
- 6.4.9 At measurement positions STR3 and STR4 long term monitoring was conducted between 24th and 25th as no suitably secure location could be found to leave equipment for the full five day duration.

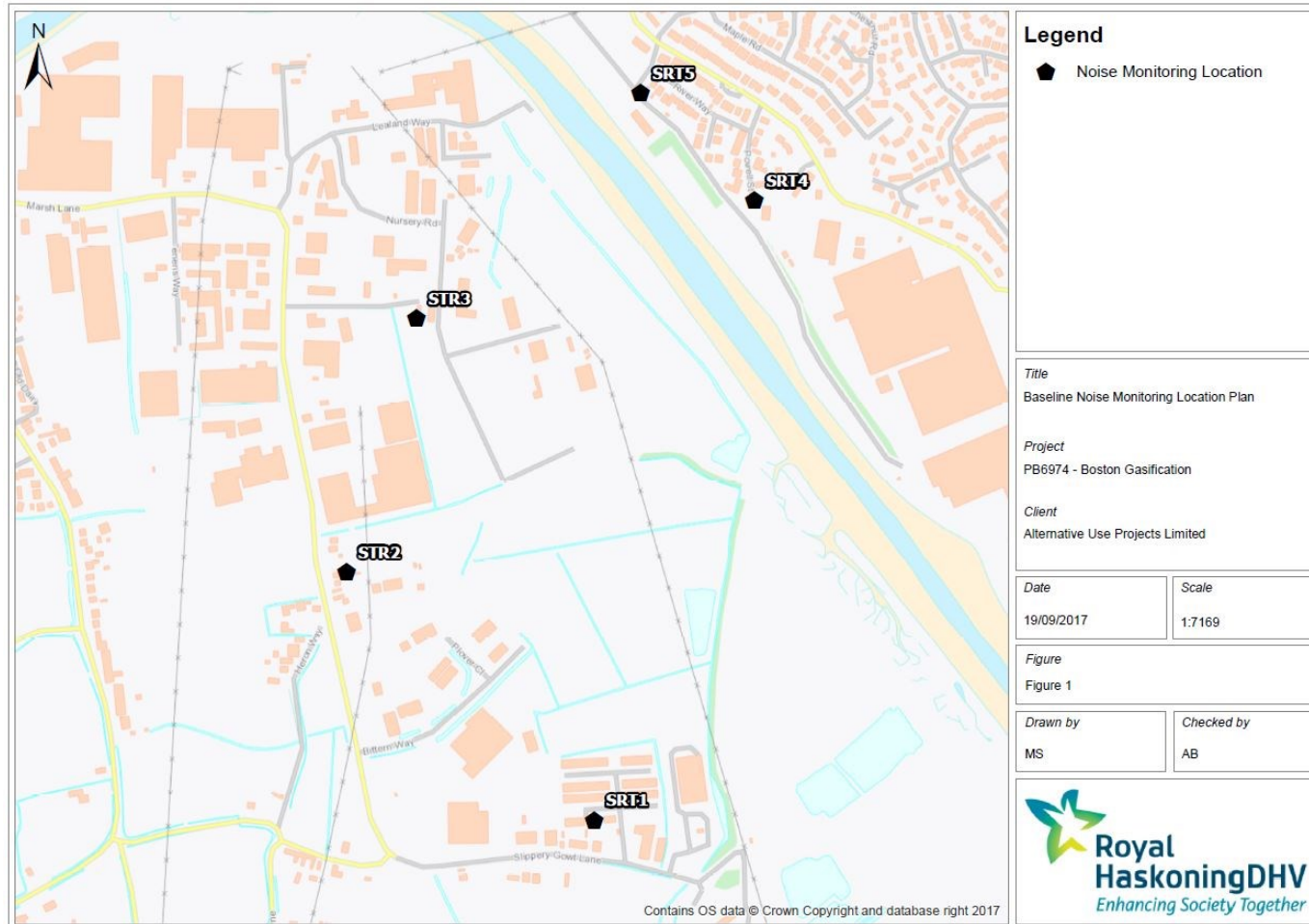


Figure 6.1 Noise Monitoring Locations



6.4.10 The baseline noise data showed that Number 21 River Way had the highest background noise level, and Slippy Gowt Lane the lowest (**Figure 6.2**).

6.4.11 The full results for the noise monitoring survey are provided in **Appendix A1**.

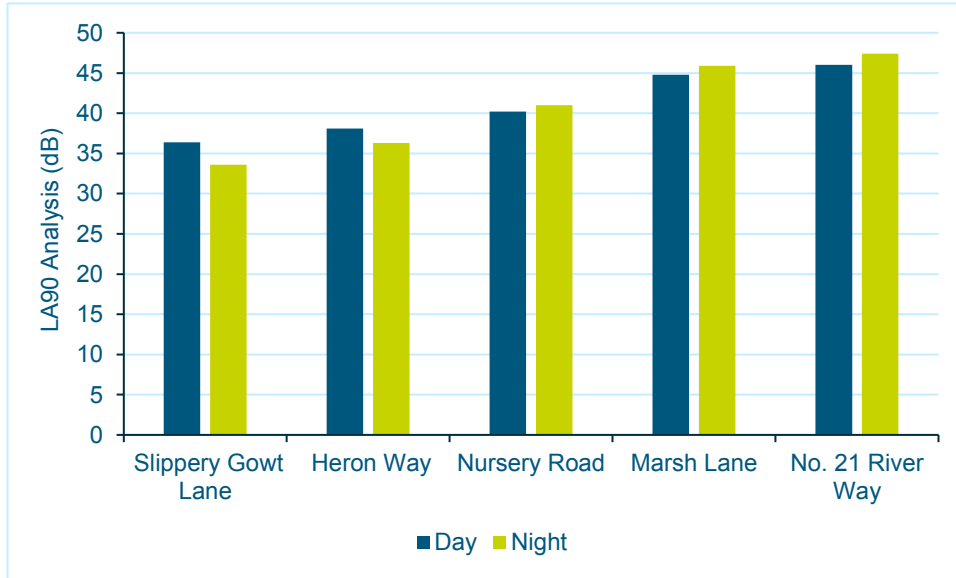


Figure 6.2 Average Baseline Noise Data

Boundary Measurements

6.4.12 Boundary measurements were conducted on an attended basis between the 24th and 25th August consisting of three $L_{Aeq,15min}$ measurements at each location during the daytime, evening and night time periods. The baseline data obtained at the boundary measurement locations is shown in **Figure 6.3**.

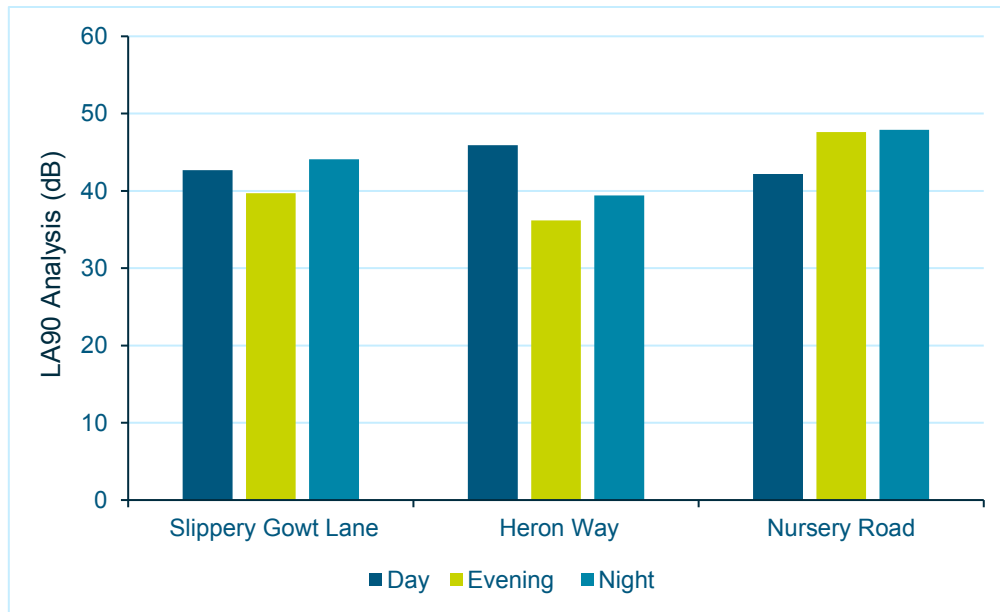


Figure 6.3 Baseline Noise Data (Boundary Locations)

Potential Environmental Effects

Construction Phase

6.4.13 The potential impacts on the sensitive receptors identified during construction are noise and vibration arising from:

- Construction activities associated with site preparation (mainly earthworks);
- Activities associated with the construction of the wharf (piling, excavation, dredging);
- Construction activities for the gasification power station, lightweight aggregate manufacturing plant and waste checking and storage facility; and
- HGVs servicing the construction phase, delivering or removing materials (including spoil and fill) and plant.

6.4.14 Constraints to construction activities will likely include the restriction of working hours and controls on particularly noisy activities such as piling and dredging to mitigate the impacts on receptors. In addition, vibration will only be considered as an issue where significant piling works are required, which will be confirmed when further details of the construction process are developed.

Operation Phase

6.4.15 During the operational phase of the BAEF, the potential noise and vibration effects identified on the receptors are:



- Vessel noise and loading/ unloading activities at the wharf;
- Noise from the waste checking and storage facility, including from vehicles/plant and waste movements;
- Noise from the lightweight aggregate manufacturing facility;
- Noise from the gasification power station including from internal processes (turbines) and from external plant (fans, compressors etc.); and
- Noise from vehicle movements within, to and from the site.

Mitigation

- 6.4.16 Local Authorities are keen to minimise disturbance to amenity. Therefore, working hours for any element of the process that occurs externally (potentially the wharf operations and vehicle/plant operation within the site) could be restricted by requirement.
- 6.4.17 More flexibility is given for internal processes but it is likely that the Local Authority will seek to ensure that the sound insulation provided by buildings is adequate for the level of noise generated by any internal processes. Particular attention will also be given to any externally mounted plant (which is likely to require attenuation) and to gaps and openings within the building facades.
- 6.4.18 The consented Boston Biomass project is subject to restrictions on the level of noise experienced at receptors (levels were expected to not exceed measured background at the receptors) and it is likely that these restrictions will be imposed on this scheme. Any noise limit from the BAEF will have to consider cumulative noise from the Boston Biomass project

EIA Approach

- 6.4.19 The scope of the noise and vibration assessment will be:
- Identification of nearest noise sensitive receptors;
 - Liaison with Local Authorities' Environmental Health Officer(s) to agree scope and methodology of noise assessment, including any required additional monitoring or revisions to baseline noise monitoring survey;
 - Establishment of baseline noise levels in the locality; and
 - Assessment of the impact of predicted noise levels at the nearest noise sensitive receptors from the construction, operation and decommissioning of the proposed power generation facility and associated connections, including:
 - Construction noise and vibration (including construction traffic on public roads); and
 - Operational noise and vibration (including site traffic on public roads).
- 6.4.20 Noise and vibration issues would be assessed using the guidance contained in BS 5228:2009+A1:2014, which defines the accepted prediction methods and source data for various construction plant and activities.
- 6.4.21 Construction noise and vibration impacts would be based on the likely construction programme and associated activities
- 6.4.22 Operational impacts would include noise impacts associated with the wharf, waste storage, waste processing facility, gasification plant and the lightweight aggregate plant. The guidance and methodology contained in BS 4142:2014 would be used to assess noise



impacts arising from the proposed development.

- 6.4.23 The operational noise impact of the BAEF will be predicted using computer noise modelling software (SoundPLAN, Cadna-A or bespoke), based on information on plant layout, and the operating conditions and the levels of noise generated by plant items and vehicles, as provided by the Applicant. The modelling software enables a detailed implementation of the proposed equipment and buildings, existing surrounding buildings and ground features.

Conclusion

- 6.4.24 Adverse noise impacts are anticipated to be experienced during both construction and operation, therefore, noise will be scoped in to the EIA process.
- 6.4.25 Adverse vibration impacts will be experienced during the construction phase from piling activities. Therefore, vibration assessment will be scoped in for construction. However, impacts during operation are not expected to be significant. Therefore, vibration impacts during operation will be scoped out of the EIA process.



6.5 Contaminated Land, Land Use and Hydrogeology

Baseline Conditions

- 6.5.1 An initial desk-based study established the baseline to inform the potential contaminated land, land use and hydrogeology effects relating to the proposed development.
- 6.5.2 A Preliminary Risk Assessment (PRA) was completed in accordance with the recommended approach detailed in the Contaminated Land Report 11 (DEFRA and Environment Agency, 2004. Model Procedures for the Management of Contaminated Land, R & D Publication CLR11). The PRA aims to identify whether there are potentially unacceptable risks to human health of the environment posed by the BAEF and the immediate surroundings, which warrant further investigation. The PRA is provided in **Appendix A2** to this document.
- 6.5.3 As part of the PRA process, a site walkover survey was also undertaken on 16 August 2017 to verify current conditions at the site.

Current Land Use

- 6.5.4 The BAEF site comprises mostly semi-improved grassland, situated between an industrial estate and The Haven. The main land uses near the site include: a recycling centre (the Mick George facility), several footpaths along the BAEF site boundaries and overhead powerlines crossing the site. Furthermore, the existing flood defences along the river or infilled historical channels have the potential to contain infill material of unknown composition.
- 6.5.5 The classification of soil within the BAEF site boundaries is ALC grade 1 (Excellent) (ALC, 2011) and are described as loamy and clayey soils of coastal flats with naturally high groundwater. The soils are of moderate natural fertility (National Soil Resources Institute, 2017).

Historical Land Use

- 6.5.6 The site was used as arable land in the past (evidence of ploughing still visible on the ground). Potentially contaminative historical land use information is summarised for the site in **Table 6.2** and for the surrounding area (within 1km), in **Table 6.3**. The information was determined from historical Ordnance Survey maps contained within the Envirocheck Report.

Table 6.2 Historical Land Use: On-site.

Map Dates	On-site Features
1888	Throughout this period the site remains undeveloped, possibly forming part of an agricultural holding associated with Battery Farm. A drainage channel appears to pass through the site. There are saltings shown on the map along the river bank and in BAEF area. An embankment marked as Roman Bank runs through the site.
1906	No significant change
1938	No significant change
1951	No significant change
1956	No significant change



1967 - 1984	No significant change
1967 - 1984	No significant change
1973-1974	No significant change
1985	No significant change
2000	Electricity overhead cable running along the site boundary

Table 6.3 Historical Land Use: Off-site

Map Dates	Off-site Features	Distance	Direction
1888	Pump	250m	South-west
	Boston docks and dock railway	500m	North-west
	Iron works	250m	North
	Boston Union Works	500m	North
1906	Riffle Range	250m	South-east
	Iron works shown as disused	250m	North
	Saw Mill	500m	North
1938	Wood Mills	500m	North-east
	Hydraulic Engine House	750m	North-west
	Timber slip	500m	East
1950 - 1951	No significant change		
1956	No significant change		
1967 - 1984	Warehouses (no further detail presented)	100m	West
1968 - 1971	Plastic factory	200m	West
	Concrete works and box factory	500m	West
1973-1974	Poultry houses	250m	West
	Timber Yard	250m	West
	Timber Yard	250m	East
	Works and Depot	500m	East
	Hydraulic Engine House and timber slip no longer shown on the map replaced by a large timber yard	750m	North-west
	Wood Mill no longer shown on the map	500m	North-east
1985	Factory (no further detail presented)	0m	West
	Depot	100m	West
	Warehouses, works (no further detail presented), abattoir and factories	250- 1000m	West
	Works (no further detail presented)	250m	North



Map Dates	Off-site Features	Distance	Direction
1993	Tanks	150m	West
2000	Riverside industrial estate	50-1000m	West
	Factory (no further detail presented)	500m	East
	Substation	500m	North
	Depot	250m	South
	Abattoir	50m	West
	Timber yard no longer shown on the map	750m	North-west

Geology

6.5.7 The geology beneath the BAEF site is comprised of Oxfordian Age Ampthill Clay Formation of the Ancholme Clay Group, which is a mudstone (BGS, 2017). The superficial deposits are described as Tidal Flat deposits (**Table 6.4**).

Table 6.4 Geology

Stratum	Unit	Description
Superficial Deposits	Tidal Flat Deposits	Normally a consolidated soft silty clay, with layers of sand, gravel and peat.
Bedrock	Ampthill Clay Formation	Mudstone, mainly smooth or slightly silty, pale to medium grey with argillaceous limestone (cementstone) nodules; some rhythmic alternations of dark grey mudstone in the lower part; topmost beds are typically pale grey marls with cementstone.

6.5.8 A ground investigation was undertaken at the Boston Biomass Plc site in 2012 to the east of the BAEF site. (Geotechnical Engineers & Report, 2012). At each of the borehole locations, the underlying natural strata was represented by a sequence of Tidal Flat or Alluvial deposits (clay, silt and sand) underlain by Glacial Till. The Glacial Till comprised firm to stiff, greenish brown, mottled lightly grey, silty, slightly sandy clay containing chalk and flint. This rested on a band of wet medium dense greenish brown and yellowish silty sand with coarse gravels. The band was underlain by boulder clay. Occasionally, lenses of sand were encountered and also hard stony layers (**Table 6.5**).

6.5.9 There are no mineral safeguarding areas located within or under the BAEF site.

Table 6.5 Boston 1 Ground Investigation borehole logs (Geotechnical Engineers & Report 2012).

Borehole	Depth [m bgl)	Description
BH 1	0-0.35	Topsoil / disturb ground
	0.35-5.6-	Tidal Flat Deposits / Alluvium
	5.6-14.95	Glacial Till / Boulder Clay
BH2	0-0.3	Topsoil
	0.3-5.8	Tidal Flat Deposits / Alluvium
	5.8-15	Glacial Till / Boulder Clay



BH 3	0-0.23	Topsoil
	0.23-7	Tidal Flat Deposits / Alluvium
	7-14.95	Glacial Till / Boulder Clay
BH 4	0-0.3	Topsoil
	0.3-6	Tidal Flat Deposits / Alluvium
	6-14.95	Glacial Till / Boulder Clay

Radon Gas

- 6.5.10 The presence of radon gas is assessed in the UK according to the number of homes likely to be above the Action Level (200 Bq m⁻³). Under building regulations, the requirement for protection measures (described in BRE, 2015) in the construction of new buildings, conversions or extensions is dependent on Radon Potential.
- 6.5.11 BGS data indicate that the site is located within a lower probability radon area (less than 1% of homes above the Action Level) therefore no protective measures are required.

Hydrogeology

- 6.5.12 The Environment Agency has classified the Tidal Flat Deposits and Ampthill Clay Formation that underlie the BAEF site as Unproductive Strata; rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
- 6.5.13 Environment Agency groundwater vulnerability maps indicate the site is located within an area of low groundwater vulnerability. This indicates that surface soils may provide some protection to groundwater from pollution and are likely to be characterised by low leaching soils and/or the presence of low permeability drift deposits.
- 6.5.14 Perched groundwater was encountered at Boston Biomass plc site within the alluvial deposits at depths around 3.5 m bgl (Geotechnical Engineers & Report, 2012). Groundwater was also encountered at the base of alluvial sequence and within the upper weathered layers of the glacial deposits at the depths around 7 m bgl. It is anticipated that the groundwater flow is likely to be from the west to the east (towards the Haven). The groundwater and surface watercourses on site is likely in hydraulic continuity.
- 6.5.15 BGS flood risk information indicates that the site is not located within an area with potential for groundwater flooding.
- 6.5.16 There are no licensed groundwater abstractions on site or within 1 km of the site. Note that the data search has not included identification of unlicensed water supplies abstracting less than 20 m³ of water per day.
- 6.5.17 Groundwater Source Protection Zones (SPZs) are defined around abstraction boreholes used for potable water supply, to delineate the area where release of a contaminant into the aquifer could impact on the abstraction. The site does not lie within a published SPZ and none are present within 1km.

Hydrology and Drainage

- 6.5.18 There are drainage channels located along the site boundaries and crossing the site. Most of the drains are culverted. The Haven is located to the east of the site and is a tidal river. The watercourse flows in a south easterly direction into the Wash approximately 7 km to the southeast. The Haven is part of the Witham transitional water body (GB530503000100). The water body was classified by the ES as being of 'bad' overall potential in 2015.
- 6.5.19 There are no on-site licensed surface water abstractions. There are seven licensed surface water abstractions within 1.0 km of the site:
- Four at 313 m to the south-west (water may be abstracted from a river or stream reach, or a single point used for amenity purposes).
 - One at 323 m to the east (water may be abstracted from a stream).
 - One at 507 m to the south-west (water may be abstracted from a stream).
 - One at 655 m to the north-west (water may be abstracted from the river and used for general washing/process washing).
- 6.5.20 Note that the data search has not included identification of unlicensed water supplies abstracting less than 20 m³ of water per day.

Land Quality

- 6.5.21 One authorised and two historical landfill sites exist directly to the south east of the BAEF site. Waste received by this landfill encompasses inert, industrial, commercial, household and special waste (this is a historic term referring to hazardous waste). Reports demonstrate that four significant historic pollution incidents have occurred within the vicinity of the site, involving contaminated water, specific waste materials, and oils and fuels, with one of these (involving contaminated water) occurring within the proposed site boundary in February 2010.
- 6.5.22 Regulatory information relating to potentially contaminative activities near the site has been summarised in **Table 6.6**.

Table 6.6 Regulatory Information

Environmental Records	On-site	0-250m	Description
Discharge Consents	0	9	No discharge consents on site. Nine licensed discharge consents are recorded within 250m including: sewage discharges (final/treated effluent, storm overflow/storm tank), storm sewage overflow, trade discharges, discharge of other matter- and freshwater stream/river discharges. Between 250m and 1km licensed discharge consents are recorded at 22 separate locations including: sewage discharges (final/treated effluent, storm overflow/storm tank), storm sewage overflow, trade discharges, discharges of other matter, miscellaneous discharges and freshwater stream/river discharges.
Pollution Incidents to controlled waters	0	7	One significant incident and six minor incidents within 250m of the site, involving vegetable washings, oils – diesel, crude sewage and chemicals – solvents, all into surface waters (drains or directly into the Haven). Four significant incidents and 23 minor incidents were recorded between 250m and 1km of the site. The incidents involved oils, organic wastes and crude sewage, all into surface water (drains or directly into The Haven or its tributaries).

Project related



Environmental Records	On-site	0-250m	Description
Substantiated Pollution Incidents	0	1	<p>One significant incident to land and water 65m to the north. Pollutants included contaminated water: firefighting run-off. This incident is likely to be up hydraulic gradient of the site.</p> <p>Four significant incidents occurred between 250m and 1km of the site, involving asbestos waste, gas and fuel oils and vegetable washings.</p>
Registered landfill, historic landfill or other waste disposal sites	0	5	<p>Two historic landfills located immediately adjacent to the south-east of the BAEF area. Both registered as Boston Landfill Site operated by Lincwaste Limited. The landfill sites overlap. Deposited waste included:</p> <ul style="list-style-type: none"> - Site 1 inert industrial, commercial, household and special waste, and liquid sludge. - Site 2 special waste (a historic term for hazardous waste). <p>One historic landfill site within 250m of the site (located to the east). Deposited waste included: commercial and household waste, and liquid sludge.</p> <p>Two historic landfill sites:</p> <ul style="list-style-type: none"> - At 343m of the site. Deposited waste included inert waste. - At 852m west of the site. Deposited waste included inert waste. <p>These sites are likely to be up hydraulic gradient of the site.</p> <p>Two registered landfill sites within 250m of the site (located to the east). Authorised Waste include:</p> <ul style="list-style-type: none"> - animal processing wastes, bentonite drilling mud, bonded asbestos, empty used containers, fibrous asbestos, food processing wastes/starch, industrial effluent treatment sludge, interceptor pit wastes. - Category A inert waste - solid, or granular material which either does not decompose or decomposes only very slowly and is virtually insoluble in water. - Category B semi inert waste - solid, or granular or broken materials which either may decompose slowly, or are only slightly soluble in water. - Category C putrescible waste - materials which may decompose and may consist in part of soluble matter which could cause pollution if allowed to enter ground or surface water systems. <p>Two registered landfill sites between 250m and 1km of the site:</p> <ul style="list-style-type: none"> - At 387m to the east. Authorised Waste include Category A inert waste. - At 933m to the west. Authorised Waste include Category A inert waste.
Licensed waste management facilities (transfer, treatment and disposal sites)	0	3	<p>Three Licensed Waste Management Facilities within 250m of the site:</p> <ul style="list-style-type: none"> - at 68m to the north of the site (Vehicle Depollution Facility). - at 96m to the north-west of the site. Authorised waste include Household, Commercial and Industrial (HCI) waste and asbestos. - at 234m (household, commercial and industrial transfer stations). <p>Nine Licensed Waste Management Facilities between 250m and 1km located to the west, south and southeast of the site, including HCI waste transfer stations, metal recycling site, physical treatment facility and co-disposal landfills sites.</p>
Integrated Pollution Prevention and Control authorisations	0	2	<p>Two within 250m associated with:</p> <ul style="list-style-type: none"> - incineration of non-hazardous waste (likely to be downgradient of the BAEF area). - waste landfilling (likely to be located up gradient of the BAEF area).

Project related



Environmental Records	On-site	0-250m	Description
			Within 1km there are six authorisations located to the south and south east of the site, all associated with waste landfilling.
Local Authority Pollution Prevention and Control authorisations	0	7	<p>Within 250m there are 7 authorisations including:</p> <ul style="list-style-type: none"> - blending, packing, loading and use of bulk cement at 166m southwest (in operation). - processes for the manufacture of particleboard and fibreboard at 229m northeast, 232m northeast and 235m northeast, Three different operators but located under the same address (two authorisations revoked, one in operation) - manufacture of timber and wood-based products at 232m northeast and 235m northeast, two different operators under the same address (one authorisation in operation) - combustion of fuel manufactured from/or comprised of solid waste in appliances between 0.4-3MW thermal input at 235m NE (authorisation in operation) <p>There are 12 authorisations between 250m and 1km north, northeast and northwest of the site, including authorisations for blending, packing, loading and use of bulk cement, wood combustion processes, treatment and processing of animal or vegetable matter, paper coating and textile, and fabric coating of finishing processes.</p>
Hazardous substances consents and handling notifications	0	0	Two consents for explosive site at 810m northwest and 745m southwest for ammonium nitrate and ammonium nitrate compounds (where nitrogen content is more than 28% by weight) or aqueous ammonium nitrate solutions (where concentration of ammonium nitrate is more than 90% by weight).
Prosecutions relating to Authorised Processes	0	1	<p>One associated with failure to comply with packaging waste regulations at 149m west.</p> <p>Three between 250m and 1km northwest of the site, associated with knowingly keeping transferring and disposing of controlled waste on land not in accordance with a waste management licence and failure to comply with packaging waste regulations.</p>
Prosecutions Incidents to Controlled Waters	0	0	None present within 1km.
Licensed radioactive substances	0	0	None present within 1km.
Fuel sites	0	0	One closed petrol station is present at 943m east.
Contemporary Trade Directory records (active and former)	0	75	<p>Within 250m of the site there are 75 entries including (mostly located north and north west of the site):</p> <ul style="list-style-type: none"> - Bus & Coach Operators & Stations - Meat – Wholesale - Electric Motor Sales & Service - Domestic Appliances - Servicing, Repairs & Parts - Distribution Services - Abrasive Products - Manufacturers & Distributors - Printing Equipment Manufacturers - Pallets, Crates & Packing Cases - Garage Services - Printers - Wood Recycling - Scrap Metal Merchants



Environmental Records	On-site	0-250m	Description
			- Waste Disposal Services - Car Dealers Between 250m and 500m there are 23 records. Between 500m and 1km there are 44 records.

Potential Sources of Contamination

- 6.5.23 A Preliminary Conceptual Site Model (PCSM) has been completed to identify and assess the potential sources of contamination, potential pathways by which the contaminant has the potential to cause harm, and receptors which may be sensitive to the impact from the contamination. Where all three of these factors are present, a pollutant linkage exists and potential impacts and effects can occur.
- 6.5.24 Potential on-site sources of contamination are identified in **Table 6.7**. Current and historical activities within 1 km of the site may have released contaminants into the ground and subsequently into the site via groundwater. These are identified in **Table 6.8**.

Table 6.7 Potential On-Site Sources of Ground Contamination

Potential Source	Potential Associated Contaminants
Sand and gravels as well as construction wastes are being stored in the Boston 5 area.	Unknown potential contaminants of concern (PCOC) might be associated with the waste materials stored at the site.
Embankments	Unknown infill material might have been used to construct the embankments. PCOCs might contaminants such as asbestos, metals, their compounds, oils, and fuels and many others.

Table 6.8 Potential Off-site Sources of Ground Contamination

Potential Source	Potential Associated Contaminants
Boston Recycling Centre	One significant substantiated pollution incident occurred at the site in 2010. The pollutants include contaminated water (firefighting run-off). PCOC associated with this site could include heavy metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile and semi-volatile organic compounds (VOCs and SVOCs), phenols, cyanides, ammonium, chlorides and sulphates, as well as Per- and poly-fluorinated alkyl substances (PFAS) associated firefighting foams.
Landfill sites and transfer stations	Landfill sites have potential to be associated with various contaminants including asbestos, heavy metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile and semi-volatile organic compounds (VOCs and SVOCs), phenols, cyanides, ammonium, chlorides and sulphates.
Former Timber yard sites	Timber yard activities may be associated with contaminants such heavy metals, inorganic elements and compounds like chlorates and sulphates and PAHs.
Former Slaughterhouse	The activities at sites might be associated with very wide range of contaminants including solvents (kerosene are the usual solvents (isopropanol, ethyl acetate, xylene, toluene and chlorinated solvents), acids, particularly hydrochloric or sulphuric, and alkalis as well as hydrocarbons and heavy metals.



Former Concrete works	The activities at sites might be associated with very wide range of contaminants including inorganic compounds, pulverised fuel ash (PFA), bitumen, kerosene and other organic compounds.
Former Plastic Factory	The activities at sites might be associated with very wide range of contaminants including metals, metalloids and their compounds, inorganic ions (phosphates and borates), organic solvents and compounds.
Industrial Estate and Industrial Premises including Boston Union Works and Hydraulic engine house	The Trade Directory entries and authorisation records indicate the presence of a range of activities including: <ul style="list-style-type: none"> - Engineering- potentially associated with contaminants such as fuel and lubricating oils, degreasing solvents and metals. - Bus depot - Depot may be associated with very wide range of contaminants including hydrocarbons and other organic compounds. - Garages - PCOC associated with these industries include hydrocarbons, VOCs (MTBE chlorinated hydrocarbons), SVOCs, heavy metals (zinc, copper and lead) and PAHs into the ground. - Tanks – PCOC include hydrocarbons. - Paper and Printing services - potentially associated with contaminants such as oils, solvents, metals and other inorganic compounds.
Boston docks and rail	Ship construction, maintenance and repair activities may have been source of contaminants such as heavy metals, hydrocarbons, phenols and pesticides. The railway activities may be potentially associated with contaminants such as asbestos, metals, metalloids and their compounds, acids, inorganic and organic chemicals.
Electricity substation	An electricity substation is shown on the maps south of the proposed works which may be associated with contaminants including Polychlorinated Biphenyls (PCBs).
Iron works	The PCOCs include heavy metals (arsenic, chromium, lead and tin), volatile hydrocarbons, PAHs, ammonia, cyanide and sulphates.

6.5.25 Potential contaminants of concern include:

- Metals and metal compounds;
- Petroleum hydrocarbons;
- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile and semi-volatile organic compounds (VOCs / SVOCs)
- Phenols
- Polychlorinated biphenyls (PCBs)
- pulverised fuel ash (PFA)
- Inorganic contaminants (e.g. ammonia, arsenic, cyanides, sulphides, phosphates); and
- Asbestos

6.5.26 The PCSM and Qualitative Risk Assessment are presented below in **Table 6.9**.

Table 6.9 Preliminary Conceptual Site Model and Qualitative Risk Assessment

Source	Pathway	Receptor	Qualitative Assessment
Potential on-site sources of soil and	Dermal contact, ingestion, inhalation	Construction workers Site users (staff and	The documentary research indicates that the site is undeveloped, however PCOC may be present at the site as result of the storage of construction wastes and material used to construct embankments. Such PCOC could represent an unacceptable risk to construction



Source	Pathway	Receptor	Qualitative Assessment
groundwater contamination		visitors / maintenance workers)	<p>workers/ maintenance workers. Any construction/ maintenance undertaken on the site could result in the potential exposure of site operatives if contaminated soil is present. However, it is likely that short term risks associated with construction/ maintenance could be managed through the use of personal protective equipment and appropriate working practices. Furthermore, it should be assumed that, asbestos might be encountered within the embankment infill material.</p> <p>The site end use will be commercial and it is anticipated that the majority of the site will be covered by hardstanding. However, there is a potentially unacceptable risk to future users of the site, who could be exposed to PCOC in landscaped areas or as result of the migration of volatile contaminants (if present) into buildings.</p> <p>Based on the information currently available we consider that feasible pollutant linkages may be present at the site and further targeted assessment is required to establish the presence and extent of PCOC. The results of any assessment would be used to update the qualitative assessment, feed into contractor's risk assessment for construction works, help to inform the potential for reusing excavated material and potential off-site disposal routes and provide information on baseline conditions for any site condition report which will be required as part of the permitting process.</p>
	Leaching and groundwater transport	Surface waters Groundwater resources	<p>The site is located adjacent to The Haven and drainage ditches and culverts are present in the site and along site boundaries. The documentary research indicates that the site is undeveloped, however PCOC may be present at the site as result of the storage of construction wastes and material used to construct embankments. Precipitation over time may have exacerbated the leaching of PCOC potentially resulting in impacts to surface water and groundwater. However, impacts to surface waters or groundwater are unlikely to be significant based on the following rationale:</p> <ul style="list-style-type: none"> the embankments are likely to have been in place for many years and any ongoing leaching of PCOC is likely to be minimal the on-site storage of construction wastes appears to be of small scale the soil deposits are likely to be of low permeability thereby minimising the potential for horizontal and vertical migration should contaminants impact the surface water the dilution potential is likely to be sufficient to minimise detrimental impacts on water quality The Environment Agency data suggests that the site is underlain by unproductive strata There are no groundwater abstractions for potable supply within 1km of the site The site is not located within a groundwater source protection zone <p>It would be prudent to undertake some targeted ground investigation and sampling to confirm this qualitative assessment. The results of any assessment would be used to update the qualitative assessment, feed into contractor's risk assessment for construction works, help to inform the potential for reusing excavated material and potential off-site disposal routes and provide information on baseline conditions for any</p>



Source	Pathway	Receptor	Qualitative Assessment
			site condition report which will be required as part of the permitting process.
	Physical transport by surface runoff or due to erosion	Surface waters	During construction, there is a risk that runoff from exposed made ground or spoil heaps during construction could transport contaminated sediments or dissolved contaminants to surface waters via the on-site or highway drainage system, resulting in potentially unacceptable risks to controlled waters. However, it is likely that short term risks associated with construction would be managed through the use of appropriate working practices in line with current best practice.
Potential off-site sources of groundwater contamination	Groundwater migration	Surface waters Groundwater resources Groundwater on-site	<p>A number of current and historical potentially contaminative land uses have been identified on land surrounding the site. It is anticipated that the local groundwater flow is likely to be from the west to the east and that there is the potential for contaminated groundwater to migrate from adjacent sites located to the west and northwest of the proposed works including recycling centre and activities associated with the Riverside Industrial Estate. Migration in groundwater of potential contaminants from these sites could have impacted the quality of groundwater beneath the site, and could represent an unacceptable risk to construction/ maintenance workers and future site users.</p> <p>The superficial and bedrock deposits underneath the site have been classified as Unproductive Strata (by the Environment Agency (Tidal Flat Deposits, Amphill Clay Formation) and groundwater vulnerability maps indicate the site is located within an area of low groundwater vulnerability. However, a ground investigation undertaken on the adjacent site encountered perched groundwater within the alluvial deposits. Groundwater was also encountered at the base of alluvial sequence and within the upper weathered layers of the glacial deposits. At this stage it is not known whether the perched groundwater encountered represent a continuous water body or localised discontinuous water bodies.</p> <p>It is likely that potential risks to construction/ maintenance workers can be managed via the use of personal protective equipment and appropriate working practices. Site users are unlikely to come into contact with surface/ groundwater, however volatile contaminants may represent a risk if present and are able to migrate and accumulate in confined spaces.</p> <p>It would be prudent to undertake some targeted ground investigation and sampling to confirm this qualitative assessment. The results of any assessment would be used to update the qualitative assessment, feed into contractors risk assessment for construction works, and provide information on baseline conditions for any site condition report which will be required as part of the permitting process.</p>
Ground gases and vapours	Gas generation and transport	Construction workers, Future site users	There are two historic landfill sites immediately adjacent to the site. Landfill gas generated during decomposition of waste deposits have the potential to migrate via permeable deposits and accumulate in confined space and may represent a risk to human health. Whilst such risks can be mitigated against during construction and operation, given the close proximity of the sites it would be prudent to undertake some on site monitoring to establish if this potential pollutant linkage is active.



Source	Pathway	Receptor	Qualitative Assessment
			It would, therefore be prudent to undertake some targeted ground investigation and monitoring to confirm this qualitative assessment. The results of any assessment would be used to update the qualitative assessment, feed into contractors risk assessment for construction works, and provide information on baseline conditions for any site condition report which will be required as part of the permitting process.

Potential Environmental Effects

6.5.27 Previous site investigations have not identified any concentrations of contaminants over commercial or industrial soil guidance values (Mott MacDonald, 2015), however, further investigations are recommended. There exists potential for contamination to be present at the site from historical and current industrial use of the site and the surrounding area.

Construction Phase

6.5.28 Potential on-site sources of soil and groundwater contamination from storage of construction wastes and material used to construct embankments could represent an unacceptable risk to construction/ maintenance workers. The potential pathways would be through dermal contact, ingestion or inhalation through any contaminated soil present.

6.5.29 A further potential impact to construction workers is the risk that runoff from exposed made ground or spoil heaps during construction could transport contaminated sediments or dissolved contaminants to surface waters via the on-site or highway drainage system, resulting in potentially unacceptable risks to controlled waters (the Haven for example).

6.5.30 If there is migration of potential contaminants into groundwater beneath the site this could affect construction and maintenance workers, as well as to adjacent sites.

6.5.31 There will be a permanent loss of historic agricultural land during both the construction and operational phase.

Operation Phase

6.5.32 Potential on-site sources of soil and groundwater contamination could provide an unacceptable risk to future users of the site in landscaped areas or because of the migration of volatile contaminants (if present) into buildings.

6.5.33 There is a risk of potential migration of off-site groundwater contamination, which could be a risk if volatile contaminants are able to migrate and accumulate in confined spaces. However, site users are unlikely to come into contact with surface/ groundwater.

6.5.34 Landfill gas generated during decomposition of waste deposits have the potential to migrate via permeable deposits and accumulate in confined space and may represent a risk to human health.

Mitigation

6.5.35 Any short-term risks associated with soil and groundwater contamination can be managed



through the use of personal protective equipment and appropriate working practices.

- 6.5.36 At this stage, no additional mitigation measures are expected to be needed beyond those embedded in the design of the proposed project. Embedded mitigation is likely to include the following development and compliance of a Code of Construction Practice (CoCP). A draft CoCP will be submitted as part of the DCO.
- 6.5.37 Good environmental practices during construction works will be followed in accordance the Environment Agency's Pollution Prevention Guidance (PPG1, PPG5, PPG6, PPG21 and PPG22). Although this guidance was formally withdrawn in December 2015, it continues to represent a robust approach to managing pollution incidents on site to reduce the probability and impact of leaks and spills.
- 6.5.38 A written scheme dealing with contamination of any land and groundwater will be submitted and approved by the Local Planning Authority before any part of the project commences. The scheme will be based upon the Model procedures for the management of land contamination (CLR11).

EIA Approach

- 6.5.39 Further analysis of information acquired in a more detailed data search shall be required during the EIA phase to ascertain with greater certainty the sensitivities of receptors and magnitude of impacts presented by the proposed scheme.
- 6.5.40 The approach to assessment will be completed in general accordance with the approach recommended in Contaminated Land Report 11 (DEFRA and Environment Agency, 2004). This will identify whether there are potentially unacceptable risks to human health or the environment posed by the site and the immediate surroundings,
- 6.5.41 The Environment Agency / Department of Environment Model Procedures for the Management of Land Contamination (CLR 11) document recommends a phased or tiered approach to risk assessment. The first phase (Tier 1) comprises a preliminary qualitative assessment comprising four stages as follows:
- Hazard Identification – identifying potential contaminant sources on and off the site.
 - Hazard Assessment – assessing the potential for unacceptable risks by identifying what pathways and receptors could be present, and what pollutant linkages could result (forming the Conceptual Site Model).
 - Risk Estimation – estimating the magnitude and probability of the possible consequences (what degree of harm might result to a defined receptor and how likely).
 - Risk Evaluation – evaluating whether the risk needs to be, and can be, managed.



6.5.42 The Tier 1 assessment is informed by the Phase 1 desk study encompassing a review of the available historical and geo-environmental information following the guidelines outlined for 'Preliminary Investigations' in Section 6 of BS10175:2011 Investigation of potentially contaminated sites – Code of practice. The information obtained and considered in the desk study will include historical Ordnance Survey maps, geological maps and memoirs, hydrological and hydrogeological records, environmental databases, coal mining and mineral extraction records and the results of site investigations carried out previously in the vicinity of the site. The desk study is reported in **Appendix A2**.

6.5.43 The purpose of the EIA assessment will be to build on the desk study:

- To refine the environmental setting of the site, particularly with regard to ground conditions including local geology, hydrology and hydrogeology;
- To identify historic use or current potential sources of contamination and how these may affect the proposed scheme or indeed the wider environment;
- To refine the Conceptual Site Model (CSM) of the site. This would be carried out in line with requirements of the Environmental Protection Act Part 2A source-pathway-receptor 'pollutant linkage' methodology;
- To refine the geotechnical appraisal of the site and identify any site constraints and potential risks; and
- To characterise, where possible, constraints and development considerations, including recommendations for further investigations, assessments and mitigation.

6.5.44 The potential effects during the construction stage and the operational development will be evaluated and appropriate mitigation measures identified. This will include an assessment of the effects of any proposed remediation works and the potential effects of the development activities on sensitive receptors such as groundwater, site workers and end-users. Significance criteria in accordance with the overall EIA approach will be applied and the residual impacts once mitigation has been applied will be presented.

6.5.45 This will be carried out in discussion with Boston Borough Council to agree the appropriate methodology for assessment.

Conclusion

6.5.46 The assessment of impacts relating to ground conditions, soils and contamination should be scoped into the EIA assessment.



6.6 Ecology

Baseline Conditions

- 6.6.1 An environmental baseline with respect to the ecological receptors within and in proximity to the Site was ascertained using information gleaned from a desk-based review; and an Extended Phase 1 Habitat Survey carried out on 16 August 2017. The baseline was used to determine the potential impacts of the construction and operation of the BAEF on the ecological features identified. The Extended Phase 1 Habitat Survey report is reproduced in **Appendix A3** to this document.
- 6.6.2 The desk-based review considered data from several sources including:
- The Boston Barrier Tidal Project Ecological Chapter (Environment Agency, 2016);
 - Discharge of Planning Conditions relating to ecology for the Boston Power Station (Scarborough Nixon Associates, 2012);
 - GroundSure Agricultural Review (GroundSure, 2014);
 - The Multi-Agency Geographic Information for the Countryside (MAGIC) website (www.magic.gov.uk);
 - The National Biodiversity Network (NBN) online database (NBN Atlas; www.nbnatlas.org) for any records of protected, notable or invasive species within 2km (5km for bat species) of the sites.;
 - Ordnance Survey (OS) maps for a search for water bodies within 250m of the sites;
 - Google Earth aerial imagery reviewed to assist in identifying any other notable habitats within the sites and their surrounding areas; and
 - The UK Biodiversity Action Plan (UK BAP), Local BAP and the list of Habitats and Species of Principal Importance for Biodiversity in England was reviewed to identify habitats and species of conservation concern that may be present within the sites and their surrounding areas.
- 6.6.3 The Extended Phase 1 Habitat Survey involved a site survey within the study area plus a buffer distance specific to the species being considered. The site survey involved searches for the presence, likely presence or absence of species including:
- Great crested newts within the Site and up to 250 m from its boundary;
 - Badger *meles meles* within the Site and 30 m from its boundary;
 - Water voles, otters and white clawed crayfish;
 - Bats within the study area;
 - Reptiles within the study area;
 - Birds within the study area;
 - Invertebrates within the study area;
 - Other protected species (e.g. dormice *Muscardinus avellanarius*) within the study area; and
 - Invasive species within Schedule 9 of the Wildlife and Countryside Act 1981.



- 6.6.4 Surveys involved searches for suitable nesting or roosting sites, hibernacula, setts, feeding and breeding sites, and other tell-tale signs of the presence of protected species. The outcome of the site survey is summarised below.

Designated Sites

Statutory Designated Sites

- 6.6.5 The Site is not located within a statutory or proposed statutory site of importance for nature conservation. Havenside Local Nature Reserve (LNR) is located approximately 140m north-east of the Site at its closest point on the northern bank of the Haven (tidal River Witham).
- 6.6.6 The Havenside LNR is 33.1 ha in area, defined as a main habitat of coarse or rank grassland habitats, with additional habitats of new native plantation, scrub, semi-improved neutral grassland, improved grassland, ditch, pond, coastal grazing marsh, marsh, and reedbed. The LNR comprises a long man-made sea bank dating from the 19th Century. The component areas are:
- A raised bank of plantation and meadow at the western end;
 - Triangular area of rough grassland and newly planted trees;
 - Grazed grassland with drainage ditches and ponds;
 - Older sea bank with dense scrub; and
 - An amenity area centred on the Pilgrim Fathers memorial with amenity grassland, two small ponds and wet grassland.
- 6.6.7 The mosaic of woodland, grassland and wetland is very valuable in the local context and of significant value to local bird, mammal and invertebrate populations. The linear nature of the site provides a good wildlife corridor through Boston.
- 6.6.8 Given the separation of the Site from this LNR by the Haven, it is assessed that the BAEF will not directly impact upon this designated site. However, the BAEF has the potential to indirectly impact upon the species listed for this site's importance (i.e. oystercatcher *Haematopus ostralegus*, barn owl *Tyto alba*, bats, and common seal *Phoca vitulina*) (BBC, 2015) via noise and visual disturbance.

Non-Statutory Designated Sites

- 6.6.9 The Site is not located within a non-statutory or proposed non-statutory site of importance for nature conservation. Within 2km of the Site, there are three Local Wildlife Sites (LWS). These are Havenside (LWS (located approximately 140m north-east of the Site at its closest point on the northern bank of the Haven), South Forty Foot Drain LWS (located approximately 1.4km north-west of the Site), and Slippery Gowt Sea Bank LWS (located approximately 500m east of the Site).
- 6.6.10 The South Forty Foot Drain LWS is listed as comprising “a man-made watercourse and bankside communities. The bankside vegetation comprises rough neutral grassland, scrub and trees. The site is a good corridor linking the centre of Boston with the wider countryside.”
- 6.6.11 The Slippery Gowt Sea Bank LWS is listed as comprising “a rough grassland bank, landside only, adjacent to the Haven and associated tracts of saltmarsh. The site mainly comprises



a rough grassland bank between the bank top and footpath and the drain which occurs between the waste site and the bank. The area supports Boston horsetail which occurs (or has occurred in the past) all the way along the landward bank, including the area that was stripped in 2006-07. This is the only site for this species in Greater Lincolnshire.”

Habitats

6.6.12 The Extended Phase 1 Habitat Survey recorded the following habitats within the Site:

- Semi-improved neutral grassland with scattered scrub (comprising species such as bramble *Rubus fruticosus*, teasel *Dipsacus spp.*, and nettle *Urtica dioica*);
- Area of tall ruderals (comprising predominantly nettle);
- Areas of scattered and dense scrub;
- Species poor intact hedgerow;
- Species rich hedgerow with trees;
- Areas of amenity grassland;
- Areas of bare ground (hard standing and areas of rubble);
- Areas of bare ground (with scattered scrub);
- Semi-natural broadleaved woodland;
- Dry ditches (drainage channels);
- Marginal vegetation; and
- Running water (brackish).

The location of these habitats is shown on **Figure 2, Appendix A3**.

6.6.13 There is no ancient woodland within the Site.

6.6.14 The north-eastern extent of the proposed developments adjoins Coastal Saltmarsh and Mudflat Priority Habitat. The BAEF will involve a localised loss of these habitats to accommodate the proposed wharf facilities on the Haven for feedstock delivery. This loss of Priority Habitat would account for a very small proportion of the overall saltmarsh and mudflat habitat locally. Impacts upon these habitats and associated mitigation measures will need to be considered further during the construction and operation phases of the BAEF to identify opportunities that result in no net loss of these Priority Habitats.

Invasive Species

6.6.15 There are several recent records of invasive species, including Japanese knotweed (recorded November 2009, approximately 1.2km from the Site) and giant hogweed (recorded August 2013, approximately 0.65km from the Site), within 2km of the Site, although none within the Site.

6.6.16 No invasive plant species were recorded within the Site during the 2017 Extended Phase 1 Habitat Survey. Consequently, no further surveys and/or mitigation measures are required and as such not considered further in this report.

Legally Protected and Notable Species

Badgers

6.6.17 There are five recent records of badger within 2km of the Site, the most recent being February 2016, although none within the Site. The closest record is approximately 900m



west of the Site at its closest point, recorded in October 2007.

- 6.6.18 There is suitable habitat for badger in the Site, including woodland, scrub and hedgerows. However, no evidence of badger was recorded within the Site during the survey. Furthermore, as the Site comprises largely open grassland area, and is subject to regular human disturbance, it is considered unlikely that badgers utilise the Site for residence. Therefore, no further surveys are required but general ecological awareness, as detailed in **Section 5.6 of Extended Phase 1 Habitat Survey**, is recommended to minimise any potential impacts upon the local badger population within the wider area.

Water Voles

- 6.6.19 There are 27 recent records of water vole within 2km of the Site, the most recent being May 2014, although none within the Site. The closest record is approximately 800m west of the Site at its closest point, recorded in October 2007.
- 6.6.20 The ecological chapter of the Boston Barrier Tidal Project Environmental Statement (ES) (Environment Agency, 2016) notes disused burrows, likely to be water vole, have been previously recorded along the South Forty Foot Drain (over 2km north-west of the Site) with the potential for water voles to also be present in brackish ditches and saltmarsh pools in the area.
- 6.6.21 There are a series of ditches within the Site, although all dry at the time of the survey (during water vole breeding season). Therefore, these were assessed as sub-optimal for water vole (**TN4, Figure 2, Appendix A3**). As such, no further surveys are required but general ecological awareness, as detailed in the Extended Phase 1 Habitat Survey, is recommended to minimise any potential impacts upon water voles if present in the wider area.

Otters

- 6.6.22 There are no recent records of otter, within 2km of the Site, although there are records of otter on the River Witham north of Boston over 2km from the Site.
- 6.6.23 The ecological chapter of the Boston Barrier Tidal Project ES (Environment Agency, 2016) notes that there are no suitable features for otter holt building on the River Witham (north of the Site) due to a lack of bankside features that would provide suitable cover, and high levels of human disturbance.
- 6.6.24 The tidal River Witham does not provide suitable holt building habitat for otters within the Site due to a lack of bankside features that would provide suitable cover (**TN6, Figure 2, Appendix A3**). Furthermore, the ditch network within the Site was dry, and therefore, assessed as sub-optimal for otters. However, otters may utilise the tidal River Witham for commuting in the wider area. As such, general ecological awareness is detailed in the Extended Phase 1 Habitat Survey to minimise potential impacts to otters if in the wider area.

Great Crested Newts and White Clawed Crayfish

- 6.6.25 There are no recent records for great crested newts or white clawed crayfish within 2km of the Site.



- 6.6.26 Several ephemeral ponds, fed by the tidal River Witham, are present along the footpath adjoining the Haven at the north-east extent of the Site (**TN7, Figure 2, Appendix A3**). A Habitat Suitability Index Assessment (HSI) confirmed these water bodies to be of 'poor' suitability for great crested newt. Although this habitat suitability score is not a replacement for more detailed surveys, it is considered that great crested newts are unlikely to be present within the Site due to the poor quality of this habitat, and lack of suitable surrounding terrestrial habitat (with the River Witham creating a barrier to movement, and the surrounding terrestrial habitat lacking suitable shelter and being prone to flood events).
- 6.6.27 The River Witham waterbody was assessed as sub optimal white clawed crayfish due to the absence of suitable habitats for burrowing and refugia, whilst the ditch network within the Site does not provide habitat (i.e. flowing water) suitable for white clawed crayfish.
- 6.6.28 Therefore, in combination with the absence of suitable aquatic and terrestrial habitat within the Site, it is unlikely that great crested newts and white clawed crayfish are present within the Site. Therefore, no further surveys and/or mitigation measures are required and consequently these species are not considered further in this report and are recommended to be scoped out of the EIA process.

Bats

- 6.6.29 There are 44 records of bat species within 2km of the Site, including records of Daubenton's bat *Myotis daubentonii*, Noctule bat *Nyctalus noctula*, Brown Long-eared bat *Plecotus auritus*, and Common Pipistrelle *Pipistrellus pipistrellus*, although none are within the Site itself. The closest record is approximately 400m north-east of the Site at its closest point.
- 6.6.30 There few suitable buildings within the Site. There are several trees within the Site which were assessed from the ground using binoculars during the Extended Phase 1 Habitat Survey for their suitability to support roosting bats. The hedgerows and areas of woodland are assessed as providing suitable foraging and/or commuting habitat for bat species (**TN2 and TN5, Figure 2, Appendix A3**).
- 6.6.31 No evidence of bat roost potential was noted within the trees at the Site.
- 6.6.32 It is understood that existing vegetation (i.e. trees and hedgerows) would be retained as part of the proposed development, therefore resulting in no removal of suitable foraging/commuting habitat for bat species. As such, no further surveys are required but mitigation measures will need to be considered during the construction and operational phases of the BAEF to minimise impacts to local bat populations.

Reptiles

- 6.6.33 There are no recent records of reptile within 2 km of the Site.
- 6.6.34 During the 2017 Extended Phase 1 Habitat Survey, the Site was assessed as having potential to support common reptile species should they be present in the wider area. In particular the areas of tall ruderals, hedgerow habitats and scattered scrub adjacent to semi-improved grassland and bare ground (with scattered debris and rubble piles) were noted to provide suitable basking, refugia and foraging habitat (**TN3, TN5 and TN8, Figure 2, Appendix A3**). It is understood at the time of writing this report that some of these areas



of vegetation, bare ground and debris/rubble piles will require removal to facilitate the proposed development. As such, mitigation measures will need to be considered during the construction and operational phases of the BAEF to minimise impacts to local reptile populations.

Dormice

- 6.6.35 There are no recent records of dormice within 2km of the Site.
- 6.6.36 No evidence of dormice or suitable habitat was recorded during the 2017 Extended Phase 1 Habitat Survey. It is therefore, considered unlikely that this species is present within the Site and consequently no further surveys and/or mitigation measures are required and as such this species is not considered further in this report and are recommended to be scoped out of the EIA process.

Birds

- 6.6.37 There are several records Schedule 1 bird species within 2km of the Site, including records of Goshawk *Accipiter gentilis*, Kingfisher *Alcedo atthis*, Garganey *Anas querquedula*, Ruff *Calidris pugnax*, Little Ringed Plover *Charadrius dubius*, Marsh Harrier *Circus aeruginosus*, Montagu's Harrier *Circus pygargus*, Peregrine *Falco peregrinus*, Hobby *Falco Subbuteo*, Black-tailed Godwit *Limosa limosa*, Red Kite *Milvus milvus*, Black Redstart *Phoenicurus ochruros*, Avocet *Recurvirostra avosetta*, Firecrest *Regulus ignicapilla*, and Barn Owl *Tyto alba*.
- 6.6.38 Bird species recorded within the Site during the 2017 Extended Phase 1 Habitat Survey included blackbird *Turdus merula*, common gul *Larus canus*, magpie *Pica pica*, sparrow *Passer domesticus* and woodpigeon *Columba palumbus*. Mediterranean Gull *Larus melanocephalus*,
- 6.6.39 The trees, woodland, hedgerows, areas of scattered scrub and tall ruderals within the Site are assessed as being suitable to support common nesting bird species. A relic common birds nest was recorded within the area of woodland at the eastern extent of the Site (**TN1, Figure 2, Appendix A3**), although no evidence of active nests was noted at the time of the survey. Therefore, no further surveys are required but mitigation measures will need to be considered during the construction and operational phases of the BAEF to minimise impacts to local bird populations.

Aquatic and Terrestrial Invertebrates

- 6.6.40 The grassland, scrub, trees and woodland on site may support common species of terrestrial invertebrates. The tidal River Witham and mudflats may also provide suitable habitat for common species of aquatic invertebrates.
- 6.6.41 No further surveys are required for invertebrate species but mitigation measures are recommended during the construction and operational phases of the BAEF to minimise impacts to invertebrate populations.

Summary of Potential Ecological Receptors

The following potential ecological receptors have been identified; as detailed in **Table 6.10**. For each potential ecological receptor identified, a description is also provided along with a high-level

assessment of the potential for impact.

Table 6.10 Potential ecological receptors

Category	Potential receptor	Description	Potential impact (Yes/No)	Data sources
Statutory designated nature conservation sites	SSSI, NNR, SAC, SPA, Ramsar	None within 2km of the sites – no potential for impact	No	MAGIC; (GroundSure, 2014)
	Havenside Local Nature Reserve (LNR)	Located approximately 140m NE of Site 5 at its closest point on the northern bank of the Haven watercourse.	Yes – works could disturb species for which the site is noted (e.g. oystercatchers), although no direct impacts upon LNR.	
Non-Statutory designated nature conservation sites	<i>Data request required to identify Local Wildlife Sites (LWS) and other non-statutory designated sites. This will be undertaken as part of the Preliminary Ecological Assessment.</i>			
Habitats of Importance	Coastal Saltmarsh and Mudflat Priority Habitat	The eastern edge of the BAEF adjoin Coastal Saltmarsh and Mudflat Priority Habitat.	Yes –	MAGIC
Protected species	Water voles	Extract from Environment Agency (2016) report: <i>“The Environment Agency (personal communication) recorded disused burrows likely to be water vole (Arvicola amphibius) along the South Forty Foot Drain. Water voles could also be present in the brackish ditches and pools in the saltmarsh habitat and has been recorded in the area (Environment Agency, 2014 and personal communications from Environment Agency).”</i>	Yes – may be present within wider area.	Environment Agency (2016); NBN



Category	Potential receptor	Description	Potential impact (Yes/No)	Data sources
	Birds	The proposed developments at Sites 4 and 5 adjoin intertidal habitats with the potential to support bird species.	Yes - the intertidal habitats have potential to support foraging water-bird species (both in the summer and winter)	Environment Agency (2016)
	Bats	Structures within the proposed working areas appear unsuitable for bat roosting potential (as per site photographs), although bat species may be present in the wider area.	Yes – species may be present in wider area	Photographs; NBN; Scarborough Nixon Associates (2012); Google Earth
	Reptiles	Some suitable reptile foraging, refugia, sheltering and basking within working areas (as per site photographs)	Yes – potential impact upon suitable habitats	Photographs; Google Earth
	Great crested newts	Extensive series of ditches within proposed working areas and wider area. However suitability is considered low due to saline/brackish nature of water bodies described in Environment Agency (2016) report.	No	Environment Agency (2016); MAGIC
Invasive species	Japanese knotweed	Previously recorded in wider area (not with works area) in 2016.	NO.	Environment Agency (2016)

Potential Environmental Effects

6.6.42 Due to the presence of important habitats and the detection of protected species in the area, several potential impacts have been identified on ecological receptors near the Site.

Construction Phase



- 6.6.43 Indirect disturbance from construction activities on notable species within Havenside LNR (including *Haematopus ostralegus* oystercatchers);
- 6.6.44 Direct and indirect damage on Coastal Saltmarsh and Mudflat Priority Habitat border sites from construction activities.
- 6.6.45 Disturbance to any identified protected species (bats, birds, reptiles and aquatic and terrestrial invertebrates).
- 6.6.46 Dust, noise and light disturbance during site clearance and/or construction.

Operation Phase

- 6.6.47 The BAEF adjoins intertidal habitats with the potential to support foraging water-bird species.
- 6.6.48 There is a potential impact upon the extensive series of ditches within the proposed working areas and the wider area, which could impact upon potential great crested newts. However, the suitability of the habitat is considered to be low due to the saline/ brackish nature of the water bodies described in Environment Agency (2016) report.
- 6.6.49 There is the potential for Japanese knotweed within the proposed working area, as it has previously been recorded in the wider area in 2016, however, none was observed during the walk-over of the site in 2017.
- 6.6.50 The BAEF has the potential to indirectly impact upon the species listed for the Havenside LNR, located approximately 140m north-east of the Site at its closest point on the northern bank of the Haven (tidal River Witham), including oystercatcher, barn owl, bats, and common seal via noise and visual disturbance.

Mitigation

Statutory Designated Sites

- 6.6.51 Liaison with Boston Borough Council's Biodiversity Officer should be undertaken prior to works to assess the impact upon the integrity of the LNR.
- 6.6.52 Site contractors working on the wharf construction will be made aware of potential impacts of their work on common seal, explaining what this species look like, that works should cease if one is identified and the contractors' legal obligations with respect to this species.

Habitats

- 6.6.53 The BAEF will involve a localised loss of Coastal Saltmarsh and Mudflat Priority Habitat habitats to accommodate the proposed wharfage facilities on the Haven. This loss of Priority Habitat would account for a very small proportion of the overall saltmarsh and mudflat habitat locally. Impacts upon these habitats and associated mitigation measures will need to be considered further once detailed designs of the proposed wharf are known.
- 6.6.54 Early liaison with the. Boston Borough Council's Biodiversity Officer and Lincolnshire County Ecologist should be undertaken to establish appropriate design and mitigation measures with regards to these habitats. Consultation with the Marine Management



Organisation (MMO) also is likely be required depending on the design of the proposed wharf.

- 6.6.55 The detailed design of the proposed wharf should be sympathetic with regards to habitat loss, where enhancement measures, habitat compensation and creation may all require consideration to result in an overall no net loss in Priority Habitat.

Bats

- 6.6.56 No evidence of roosting bats was noted during the 2017 survey; however, the hedgerows and woodland areas within the Site was assessed as providing potentially suitable foraging and commuting habitat for bat species. Bat species are typically considered to be of high value; however, it is understood that the existing vegetation (i.e. trees and hedgerows) would be retained as part of the BAEF and where possible incorporated within the design. Should this not be the case then further ecological advice should be sought because further surveys (i.e. dusk/dawn emergence/re-entry surveys) may be required.
- 6.6.57 Noise and visual disturbance may result from any night working from the construction or operation of the development. Lights and activity could also interrupt foraging and commuting activity.
- 6.6.58 Mitigation to manage this impact should include the use of low pressure sodium lighting which will be located away from areas that could be used by bat species (i.e. hedgerow and woodland habitats) where possible. All lights should also be pointed away from these features.
- 6.6.59 Consideration should be given to any new lighting required for the BAEF to be designed (where safe and practical to do so) in such a way as to maintain (if not decrease) ambient night time light levels. This could be achieved by following accepted good practice guidance (Institute of Ecological and Environmental Management (IEEM), 2006; BCT and Institute of Lighting Engineers (ILE), 2007), including:
- Low pressure sodium lights are a preferred option to high pressure sodium or mercury lamps, and lights would be directed low with minimal light spillage;
 - Artificial lighting would not directly illuminate any potential bat commuting areas. Similarly, any newly planted linear features around the site boundary would not be directly lit; and
 - Lighting design would be based on general guidance set out in Guidance Notes for the Reduction of Obtrusive Light GN01:2011 (Institute of Lighting Professionals (ILP), 2011).
- 6.6.60 Enhancement measures for bats should also be incorporated into the development designs if possible, for example the inclusion of bat bricks or bat boxes. In addition, opportunities to incorporate additional planting should be incorporated within the design, with species of plants that attract insects (e.g. oxeye daisy and yarrow) being planted to encourage bats to forage within and around the Site.

Reptiles

- 6.6.61 There is potential for reptiles to be present within the working areas with regards to the proposed development. A reptile sensitive clearance methodology (under ecological supervision) will therefore be implemented prior to any construction works within the footprint of the proposed development. This will ensure that any reptiles are safeguarded



from the construction process.

- 6.6.62 The reptile sensitive methodology involves habitat manipulation followed by a destructive search. Habitat manipulation will be carried out a maximum of one week prior to works commencing on site. Any potential sheltering features will be inspected (visually and by hand) before entire removal by an ecologist. Any reptiles present can then be rescued and moved to an identified and suitable location (which has been identified prior to works commencing). Any vegetation removal works should start from the furthest extent so that any reptiles, should they be present, can move into an area that will not be accessed or disturbed by the works. All arisings should be removed from the works area immediately and either taken off-site, or placed in a predetermined location well away from the works area (and any access). A method statement for these actions will be prepared by an ecologist in advance of any works starting on site. This work would be undertaken within the reptile activity season (March – October inclusive).

Birds

- 6.6.63 The Site contains suitable nesting bird habitat, such as areas of scattered and dense scrub, trees and hedgerows. The bird species recorded within the Site are common species and are therefore considered to be of low value.
- 6.6.64 All birds, their nests and eggs are protected by the Wildlife and Countryside Act 1981 (as amended) and it is an offence to intentionally take, damage or destroy the nest of any wild bird whilst it is in use or being built. Should there be a requirement for vegetation to be removed during the nesting bird season (March to August inclusive), a check of any vegetation to be removed would be required. An ecologist will need to check the area for nesting birds a maximum of 48 hours prior to the commencement of the works. Active nests and their associated vegetation/location must remain until young birds have left the nest and during this period an alternative approach to the works must be undertaken. Enhancement measures for these species (e.g. owl and other bird species boxes) should be considered within the designs where possible to provide suitable habitat for species and ecological benefits.

General Ecological Awareness

- 6.6.65 No evidence of badgers (e.g. setts, faeces, etc.), water voles, or otters was noted during the 2017 survey, although there is potential for these species to utilise the wider area for commuting and foraging.
- 6.6.66 As such, it is recommended that a toolbox talk with respect to these species is provided to the construction workers prior to construction. This will need to include:
- Legislation and legal obligations regarding these species;
 - Field signs to look out for; and
 - Who to contact in the event of discovering the presence of these species.
- 6.6.67 With regards to badgers, all excavations shall be covered when not working on site to avoid potential harm to badgers. Exit routes shall be provided to allow a route of escape.
- 6.6.68 With regards to otter, all vehicles should be checked each morning before ignition and



movement prior to works to ensure no otters are laying up under the vehicles overnight. Any excavations dug should include an exit ramp overnight to ensure that should any otter fall into them can escape.

- 6.6.69 If a badger sett or evidence of otter or water vole is discovered during the works, works should cease and a suitably qualified ecologist consulted immediately.

Aquatic and Terrestrial Invertebrates

- 6.6.70 The BAEF should consider the potential to integrate suitable habitat for invertebrate species in its design. This could include measures such as a varied planting regime comprising scrub fringes such as hawthorn, field maple, blackthorn and ivy, which provide sheltered elevated temperatures for invertebrates, foraging areas for predatory wasps, and nectar and pollen for flower-dependant invertebrates.

EIA Approach

- 6.6.71 The ecological assessment will be managed by a Chartered Ecologist in line with current ecological best practice and guidance, such as (but not limited to) the Guidelines for Ecological Impact Assessment in the United Kingdom (CIEEM, January 2016), Guidelines for Ecological Report Writing (CIEEM, December 2015) and BS42020 Biodiversity – a code of practice for planners and developers.
- 6.6.72 All relevant UK and EU legislation relating to wildlife will be considered.
- 6.6.73 . Field surveys of protected species to be scoped in shall be carried out in accordance with the relevant guidelines. The scope of ecological assessment for the EIA will be agreed with Natural England and Boston Borough Council / Lincolnshire County Council prior to commencement.
- 6.6.74 For receptors not being advanced to the EIA stage, a general ecological awareness shall be instilled in the contractors regarding the habitats of importance and other protected species that may potentially be encountered during construction works.
- 6.6.75 Liaison will be pursued with Boston Borough Council's Biodiversity Officer should be undertaken prior to works to assess the impact on Havenside LNR.

Conclusion

- 6.6.76 Statutory designated nature conservation sites (Havenside LNR), bats, birds, reptiles, and aquatic and terrestrial invertebrates will be scoped in to the next stage of assessment.
- 6.6.77 In conclusion, several key considerations in relation to the impacts on ecological receptors should be taken into account going forward and during the works of the project and be scoped into the EIA process. These considerations are:
- Havenside LNR;
 - Coastal Saltmarsh and Mudflat Priority Habitat; and
 - Protected species (bats, birds, reptiles, and aquatic and terrestrial invertebrates).
- 6.6.78 Assessment of Invasive species, Dormice, Great-Crested Newt and White Clawed Crayfish can be scoped out of EIA assessment.



6.7 Surface Water, Flood Risk and Drainage Strategy

Baseline Conditions

Surface Water

- 6.7.1 A preliminary desk-based review of existing data and a Water Framework Directive (WFD) Compliance Assessment were conducted to assess the impact of the Project on surface water issues. An initial desk-based review considered several data sources to identify and assess receptors and potential impacts, including:
- The Boston Barrier Tidal Project Surface Water and Flood Risk Chapter (Environment Agency, 2016);
 - GroundSure Agricultural Review (GroundSure, 2014);
 - The Catchment Data Explorer;
 - Ordnance Survey (OS) maps for a search for surface water bodies within the vicinity of the sites, and
 - Black Sluice Internal Drainage Board map of district.
- 6.7.2 The WFD was transposed into national law by means of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. These regulations have recently been replaced by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The WFD Regulations provide for the implementation of the WFD, from designation of all surface waters (rivers, lakes, transitional (estuarine) waters, coastal waters and ground waters) as water bodies, to the requirement to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP).
- 6.7.3 There is an extensive network of drainage systems within the vicinity of the BAEF sites (Black Sluice IDB, 2017; Environment Agency, 2016; GroundSure, 2014). It is yet unknown whether these assets are Internal Drainage Board drains. The River Witham immediately adjoins the eastern extent of the proposed development. In addition, the Wash Inner waterbody is located approximately 7 km downstream of the proposed works.

Flood Risk and Drainage Strategy

- 6.7.4 A brief review of available information in relation to the flood risk and drainage strategy of the site for the BAEF was undertaken. This high-level review identified the receptors and potential impacts of the project on the flooding risk and drainage strategy, and informed an environmental baseline. The data sources consulted during this high-level review include:
- Boston Biomass Plc Flood Risk Assessment (2009); and
 - Flood risk and climate change policy, guidance and legislation.
- 6.7.5 The flood risk and climate change policy, guidance and legislation has progressed significantly since 2009 and now requires more rigorous assessment of flood risk.
- 6.7.6 The BAEF is located within Flood Zone 3, downstream of the proposed Boston Barrier (Flood Control Structure) on the River Witham. The River Witham is tidal at the location of the site; therefore, flooding is most likely to be influenced by tidal processes (Figure 6.4). The River Witham is a 'Main River' that is under the jurisdiction of the Environment Agency.



Figure 6.4 a – (Left) Surface Water Flood Risk and b – (right) Flood Risk from Rivers and Sea
(Source: Environment Agency – <https://data.gov.uk> Accessed: 10/08/2017)

- 6.7.7 Online mapping tools provided by the Environment Agency suggest the site is subject to some surface water flood risk, although this is not particularly extensive. The surrounding area of ‘Ordinary Watercourses’ are part of the managed Black Sluice Internal Drainage Board (IDB) area.
- 6.7.8 The level of groundwater is considered likely to be relatively shallow and groundwater emergence associated with tidal and fluvial flood events is possible. However, the IDB activity and tide cycles will both tend to reduce the likelihood of groundwater causing flooding in isolation.
- 6.7.9 The risk of reservoirs, canals and other raised bodies of water is low.
- 6.7.10 The Boston Barrier has just entered into the initial stages of construction at the time of writing this Scoping Report. The site is not likely to be significantly affected by the construction of the Boston Barrier either in a positive or negative manner, although this would be confirmed and evidenced in the EIA.

Potential Environmental Effects

Surface Water

- 6.7.11 This section outlines several potential mechanisms of impact upon surface waters and the Witham WFD water body because of the proposed development. Receptors/elements have been identified; as detailed in **Table 6.11**, with a description along with a high-level assessment of the potential for impact.

Table 6.11 Surface water receptors

Category	Potential receptor	Description	Potential impact (Yes/No)	Data sources
Surface waters	Physical state of surface waters	There is an extensive network of drains within the vicinity of the sites. It is unknown if these are IDB drains (to be confirmed during scoping).	Yes – the proposed works have the potential to impact upon surface waters resources (including main rivers and an extensive drainage network) via several mechanisms. Further detail is provided below.	Black Sluice IDB (2017); Environment Agency (2016); GroundSure (2014)
	Biology of surface waters			
	Chemistry of surface waters			
WFD	Witham (GB530503000100) – Transitional water body, Heavily modified. Overall Status – Bad (Biological quality elements – Phytoplankton [Bad])	The Witham water body immediately adjoins the north-eastern extent of sites 4 and 5.	Yes – the proposed works have the potential to impact on WFD water body status via mechanisms for impact upon hydromorphology, physico-chemistry and biology quality elements within the water body during both construction and operation, such as: <ul style="list-style-type: none"> Increased surface water runoff and altered surface flows Increased sediment supply Accidental release of fuels, oils, lubricants, foul waters and construction materials Increased surface water runoff during operation Supply of fine sediment and other contaminants during operation Further detail is provided below.	Environment Agency (2016; 2017)
	Wash Inner (GB530503311300) – Transitional water body, not designated artificial or heavily modified. Overall Status – Moderate.	The Wash Inner water body is located approximately 7km downstream of the proposed work.	No – it is assumed that potential impacts to this water body would be scoped out. This is due to the distance of the water body from the proposed works and the mitigation measures that will be required to be embedded into the development (i.e. to manage run-off, sediment, accidental spills, etc.).	Environment Agency (2016; 2017)

Construction Phase

Increased Surface Water Runoff and Altered Surface Flows

- 6.7.12 The initial site preparation and construction activities associated with the BAEF has the potential to alter surface water flows and drainage patterns and increase surface water runoff.
- 6.7.13 The development of surface infrastructure has the potential to change surface flows and infiltration rates because of changes to land use (i.e. greater proportion of impermeable



surfaces) and alter site runoff characteristics.

- 6.7.14 Soil compaction by construction vehicles could potentially reduce infiltration and increase surface runoff. This change in flow patterns could also result in an impact upon surface water receptors.

Increased Sediment Supply

- 6.7.15 The proposed construction activities involve extensive earthworks and create areas of bare ground by removing surface vegetation cover. This is likely to increase the potential for the erosion of soil particulates, resulting in an increase in the supply of fine sediment to surface watercourses through surface runoff and the erosion of exposed soils.
- 6.7.16 Increased sediment supply could result in increased deposition on the bed of the channel and increase the turbidity of the water column. This could potentially smother existing bed habitats and reduce light penetration, adversely affecting biological quality elements and causing deterioration in water body status.

Accidental Release of Fuels, Oils, Lubricants, Foul Waters and Construction Materials

- 6.7.17 There is the potential for the accidental release of lubricants, fuels, oils and drilling fluid from construction machinery working in and adjacent to surface watercourses, through spillage, leakage and in-wash from vehicle storage areas after rainfall. There may also be the potential for accidental release of foul waters and construction materials (including concrete) into the aquatic system during construction.
- 6.7.18 If a significant leakage or spillage is left unmitigated, there is the potential for adverse impacts upon water quality if these substances enter the adjoining water body. These water quality impacts also have the potential to adversely affect ecology if pollutant concentrations are sufficiently high.

Operation Phase

Increased Surface Water Runoff during Operation

- 6.7.19 The infrastructure associated with the BAEF is likely to result in enduring changes to land use. The change in use from existing agricultural land use would create an increase in impermeable area. Whilst permeable surface treatments will be used where possible, the infrastructure are expected to comprise impermeable surfaces, with associated infrastructure such as roads and other associated developments also comprising impermeable surfaces.
- 6.7.20 There is, therefore, likely to be an increase in surface water runoff from impermeable areas which could impact upon the hydrology (e.g. surface water volumes and flow velocities and potential to increase flood risk to existing development / third party downstream of the Site) of the surface water system and result in permanent changes to geomorphology and physical habitat condition. These could impact upon the geomorphology of surface watercourses by increasing erosion rates and encouraging geomorphological adjustment.

Supply of Fine Sediment and Other Contaminants during Operation

- 6.7.21 The operation of the BAEF could result in the supply of fine sediment, fuels, oils and



lubricants from the road network and other impermeable surfaces, and the supply of foul waters. This could potentially affect the geomorphology and water quality in the surface drainage network.

- 6.7.22 There is potential for an increase in sediment supply to surface waters during operation via mechanisms such as enhanced surface runoff of the sites which could impact upon the geomorphology and surface water quality of the river water bodies, and consequently impact upon aquatic ecology.
- 6.7.23 Furthermore, there is potential for the supply of contaminants to surface waters during operation through surface runoff or accidental spillage or leakage of fuel oils or lubricants from vehicles during operational activities, which could impact upon surface water quality and have subsequent impacts upon biological elements.
- 6.7.24 Due to the distance of The Wash WFD status waterbody from the site of development, no impact is expected. It is considered that appropriate mitigation measures will be incorporated to prevent any impact on this waterbody.

Mitigation

- 6.7.25 Site activities would be conducted in accordance with good practice for the control of water pollution arising from construction activities, and will follow Control of water pollution from construction sites. Guidance for consultants and contractors (C532) (Ciria 2001). These measures would be implemented in a Code for Construction Practice (CoCP document).
- 6.7.26 The good practice requirements of the Pollution Prevention Guidelines (PPG) will also be implemented via the CoCP. (Note: Pollution Prevention Guidance (PPG) documents were withdrawn in December 2015 as the Environment Agency does not provide 'good practice' guidance. However, the PPG are still relevant and provide examples of best practice measures which will be taken into consideration).
- 6.7.27 Suitable flood risk mitigation measures and flood proofing measures; and the potential SuDS options available for the site would be determined by the Flood Risk Assessment.
- 6.7.28 Additional mitigation measures would be discussed and agreed with stakeholders depending on any potential impacts identified during the consultation stages of the DCO application.

EIA Approach

- 6.7.29 NPS EN-1 requires that a DCO ES considers whether the proposed development would have an adverse effect upon the achievement of environmental objectives established under the Water Framework Directive (WFD). A detailed WFD Compliance Assessment will be undertaken as part of the EIA to evaluate the potential impact to WFD water bodies because of the proposed works. It is currently anticipated that WFD matters will be addressed using the framework set out in PINS 'Advice Note 18: The Water Framework Directive (June 2017)' This sets out a three-stage process to be followed during the pre-application phase, comprising screening, scoping and impact assessment.
- 6.7.30 This assessment will:



- Identify water bodies that could potentially be affected by the proposed development.
- Identify activities that could affect WFD water bodies.
- Assess the potential for activities to affect WFD water bodies, both in terms of the Environment Agency's no deterioration policy and WFD water body status.
- Determine the compliance of the BAEF with the requirements of the WFD.

6.7.31 There is no detailed published methodology for the assessment of plans or projects in relation to undertaking WFD compliance assessments across all types of water bodies. There are, however, several sets of guidance that have been developed in relation to undertaking such assessments in the different water body types, predominantly written by the Environment Agency. The most relevant to the BAEF are:

- "Water Framework Directive risk assessment: How to assess the risk of your activity" (Environment Agency, 2016a), which provides guidance for bodies planning to undertake activities that would require a flood risk activity permit.
- "**Water Framework Directive assessment: estuarine and coastal waters**" (Environment Agency, 2017), which provides guidance for undertaking activities within transitional and coastal water bodies.
- "Protecting and improving the water environment: Water Framework Directive compliance of physical works in rivers" (Environment Agency Position Statement 488_10, version 2) and associated supplementary guidance (Environment Agency, 2016c). These internal Environment Agency documents have been produced to guide WFD assessment of new physical modifications to surface waters.

6.7.32 Key features to take into consideration throughout the lifecycle of the BAEF are:

- The biological, chemical and physical character of surface waters near the proposed works, including the extensive network of drains within the site, and the adjoining Witham waterbody; and
- The River Witham WFD waterbody.

Consultation

6.7.33 Consultation with the landowner(s) and the Black Sluice Internal Drainage Board (IDB) is required to establish the status and use of the extensive network of drains within the vicinity of the sites. One IDB drain (Bittern Way Drain, Drain Reference 6/25) adjoins the western extent of the Site.

Flood Risk and Drainage Strategy

6.7.34 A Flood Risk Assessment (FRA) and a Preliminary Drainage Strategy would be produced that is proportionate to the nature and scale of the BAEF and likely to satisfy the requirements of the Environment Agency, IDB, Lead Local Flood Authority (LLFA) and Local Planning Authority (LPA). This would inform the identification of any required mitigation measures. Any works within nine metres of a flood defence will require Flood Defence Consent

Flood Risk Assessment (FRA) and Surface Water Drainage Strategy

- The Environment Agency would be contacted to obtain detailed flood risk information including modelled water levels ('Product 4', which also includes a detailed flood map, historic flood event information, flood defences) and the breach analysis information ('Product 8') packages. It is likely that the Environment Agency will hold additional



information on how the presence and operation of the Barrier may affect the surrounding area. It is expected that sufficient information should be available from the Boston Barrier modelling reports to confirm hydraulic impacts. We do not currently envisage detailed interrogation or updating of any hydraulic modelling scenarios, although that the EIA process will inform whether this might become necessary at a later stage.

- Water company asset data would be assessed to identify the availability and any potential issues associated with the existing surface and foul water sewer network.
- A pre-planning application advice form will be submitted to the Environment Agency to confirm any wider surface water and flood risk requirements.
- The relevant survey information would be collated and reviewed, including topographic surveys, existing site plan and proposed re-development plans/drawings from the client, including the draft masterplan to ascertain the impermeable areas.
- Contact with the LPA, Black Sluice IDB, Lincolnshire County Council as LLFA, and Anglian Water would be made to provide their initial view in relation to flood risk and surface water management, to obtain any historic flood records for the site and records of existing drainage infrastructure.
- The outputs of existing local strategic planning documents and planning policies would be reviewed, including but not limited to the Strategic Flood Risk Assessment, the Local Development plan and others.
- Meetings would be held with the EA, IDB and LLFA prior to the submission of the FRA. Discussions would aim to determine each organisation's initial requirements in both the assessment and management of flood risk, the management of surface water runoff and the rate and location of the surface water discharge. It is likely that surface water drainage would discharge to the River Witham (The Haven) through the Wyberton Marsh area of Black Sluice IDB.
- The FRA would consider the residual flood risk from all sources to the site and understand the risk profile in the extreme (rare) events.
- The FRA would identify the potential future influence of the Boston Barrier on the site once it is constructed.
- Define existing hydrological catchments on the site and determine the existing drainage network through a desk based study.
- Undertake greenfield and brownfield runoff calculations.
- Undertake the allowable discharge calculations.
- Undertake the attenuation storage volume calculations.
- Prepare a surface water calculation sheet.
- Prepare two drawings, one of the existing drainage network and catchments and one drawing of the proposed drainage strategy.
- Liaise with LLFA and IDB to review the proposed drainage strategy to obtain their initial feedback (a second meeting / review is likely to be required depending on the comments provided, given the scale of the development) and feed this into the EIA process.



Conclusion

- 6.7.35 The assessment of impacts to water resources associated with the Witham water body; and a flood risk assessment and surface water drainage strategy would be scoped in to the EIA process.
- 6.7.36 Assessment of impacts further downstream to the Wash Inner Water Body is scoped out of the EIA process due to the distance of the water body from the proposed works and the mitigation measures that will be required to be embedded into the development (i.e. to manage run-off, sediment, accidental spills, etc.).



6.8 Air Quality

Baseline Conditions

- 6.8.1 A high-level desk study was carried out to identify potential receptors and the likely sensitivities associated with the proposed works during the construction and operational phases.
- 6.8.2 The BAEF site is adjacent to the Haven and 1.5 km to the southeast of Boston town centre. The nearest residential property to the site is situated approximately 250m to the northeast, adjacent to the northern boundary of the Haven, and 330m to the west on Marsh Lane. In addition, there are also residential dwellings near Boston Port, which may be used as a turning circle by vessels using the facility.
- 6.8.3 There are two statutory designated air quality management areas (AQMAs) which have been declared by Boston Borough Council (BBC) for exceedances of the air quality objective for NO₂. Haven Bridge (on the A16 John Adams Way) was declared in 2001 and Bargate Bridge (on the A16 Spilsby Road) was declared in 2005.
- 6.8.4 The AQMAs were designated due to traffic emissions in Boston town centre; and if the project gives rise to material changes in road traffic flows on the A16 and town centre ring road, the receptor location within the AQMAs would need to be considered in the assessment.
- 6.8.5 Current monitoring suggests that there are continued exceedances of air quality objectives within the Haven Bridge AQMA, but not within Bargate Bridge AQMA once results are corrected for distance (Annual Status Report 17-140, Boston Borough Council 2017).
- 6.8.6 Five designated ecological sites are located within the distance criteria specified in Environment Agency guidance², which are:
- The Wash and North Norfolk Coast Special Area of Conservation (SAC);
 - The Wash Special Protection Area (SPA)
 - Havenside Local Wildlife Site (LWS) / Local Nature Reserve (LNR);
 - South Forty Foot Drain LWS; and
 - Slippery Gowt Sea Bank LWS.
- 6.8.7 Air emissions deposition on these sites would need to be assessed throughout the construction and operational phases of the proposed development.

Potential Environmental Effects

Construction Phase

Dust and Fine Particulate Matter

- 6.8.8 Construction works associated with the BAEF have the potential to effect local air quality conditions due to the release of dust and fine particulate matter (PM₁₀). Institute of Air Quality Management (IAQM) guidance states that an assessment should be considered

² Environment Agency and Defra – Environmental management – guidance. Air emissions risk assessment for your environmental permit 2016



where there are human receptors present within 350m of the construction site and ecological receptors within 50m. Due to the presence of sensitive receptors within these boundaries, the potential impact of dust and PM₁₀ and PM_{2.5} emissions during the construction phase will be assessed.

Vehicle Emissions

- 6.8.9 The methods for transportation of construction goods, materials and staff are currently unknown, however it is likely that a combination of road vehicles and vessels would be used for this purpose. Road traffic movements are likely to include construction workers and Heavy Goods Vehicle (HGV) that will use the local road network near the site. Vessels that may be required during the construction phase include ships and dredgers, and are likely to operate within The Haven channel and potentially use Boston Port as a re-fuelling point or to manoeuvre to the site.
- 6.8.10 Road vehicle and vessel movements generated during the construction phase will give rise to an increase in pollutant emissions and the potential effects at the identified human and ecological receptors near the site will need to be considered. Therefore, a dispersion modelling study of exhaust pollutant emissions associated with road traffic vehicles and vessels will be carried out as part of the assessment.

Odour

- 6.8.11 It is understood that dredging would be required in the construction phase for the development of the wharf facility. There is potential for odour to be generated during dredging works if capital dredging of undisturbed sediments is required. The decomposition of biological material in an anaerobic environment can produce odorous gases, such as hydrogen sulphide. Dredging activities can release these gases, which may impact upon nearby receptor locations, however, it is considered that the likelihood of significant odour emissions from sediment will be low due to the mobility of sediment in the Haven at that point. A qualitative assessment of odour emissions associated with dredging works during the construction phase will be carried out.

Operational Phase

Stack Emissions Assessment

- 6.8.12 The release of emissions from the stacks associated with all proposed facilities at the site has the potential to cause adverse impacts to humans and ecological receptors.
- 6.8.13 These will include the combustion products nitrogen oxides and carbon monoxide, for which Air Quality Objectives (AQS) have been set as part of the National Air Quality Strategy, as well as CO₂ and potentially additional trace pollutants. The plant will be designed to comply with the requirements of the Industrial Emissions Directive (IED) and revised BAT Conclusions for power generation plant.
- 6.8.14 The detailed dispersion modelling required to assess this will also need to consider the impact of release from the Boston Biomass facility's stack.
- 6.8.15 In addition, a plume visibility assessment will also be undertaken, which would calculate the percentage of daylight hours where the plume extends beyond the site boundary,



Odour Emissions Assessment

6.8.16 There is potential for odour emissions to be released from the proposed RDF storage, handling and processing facilities at the site. An assessment of the main odour sources at the site will therefore be carried out. The assessment will need to consider the potential periods when the odour control measures are not in operation, when there would be greater potential for the fugitive release of odours.

Operational Phase Transport Exhaust Emissions

6.8.17 RDF feedstock for the power generation facility will arrive at the site via ship and will be unloaded at the wharf; and that lightweight aggregates manufactured at the site will be removed by ship from the wharf. Therefore, there is potential for release of exhaust emissions from the ships travelling to the site on The Haven, manoeuvring into the wharf and berthing during the unloading / loading process. This may lead to an increase in pollutant concentrations at sensitive receptors near the site

6.8.18 Irrespective of the need for feedstock deliveries by ship, it is likely that there will be road traffic movements associated with the site. This includes potential export of air pollution control residues (APC residues) from the gasification facility (should these not be permitted to be used in the manufacture of the lightweight aggregate), staff movements to and from the site, and deliveries of process chemicals and materials. The impact of any increase of combined road traffic movements on the local road network will be considered as part of the assessment, using a detailed dispersion modelling study

Cumulative Impacts

6.8.19 A cumulative assessment will be undertaken with all of the relevant 'planned projects' near the site and other major developments in the locality. Consideration will be given to a cumulative emissions assessment from exhaust stack at the Boston Biomass Plc facility will be carried out. The road traffic and vessels assessment will also account for committed developments which will generate cumulative vehicle and vessel movements within the study area.

Mitigation

6.8.20 Embedded mitigation is likely to include the following:

- Construction and decommissioning works would be undertaken in accordance with best practice measures and proportional to the likely impacts; and
- An Air Quality Management Plan would be developed as part of the CoCP.

6.8.21 Any requirement for additional air quality and dust mitigation measures will be determined through liaison with stakeholders such as the Environmental Health Officer (EHO).

EIA Approach

6.8.22 Baseline air quality conditions will be assessed by evaluation of the most recent Local Air Quality Management (LAQM) reports published by Boston Borough Council. The assessment will also consider the air pollution background concentration maps published by Defra.



- 6.8.23 A risk based approach will be used to assess the impacts of construction activities. The assessment will be carried out in accordance with guidance provided by the Institute for Air Quality Management (IAQM) in the 'Guidance on the Assessment of Dusts from Demolition and Construction, February 2014' document. The dust assessment will also define the suitable level of mitigation required based upon the risk of dust impacts.
- 6.8.24 An initial screening assessment will be conducted to determine positions where detailed assessment of road traffic emissions is required. The assessment will use the screening criteria provided in IAQM & Environmental Protection UK (EPUK), Planning for Air Quality (2015) guidance to determine where detailed assessment of road traffic emissions is required. The technical approach to the air quality assessment will be in accordance with Defra (2016b), Local Air Quality Management Technical Guidance.
- 6.8.25 An atmospheric stack emissions assessment would be undertaken using detailed dispersion modelling to consider the impact of the release of emissions from exhaust stacks associated with all proposed facilities at the site. The detailed dispersion modelling will also need to consider the impact of release from the Boston Biomass Plc facility's stack.
- 6.8.26 The study will be desk-based and will assess the predicted concentrations of combustion pollutants specifically detailed in the IED, which are potentially hazardous to human health and designated habitats sites, at identified receptors (such as residential homes, schools, designated nature sites) within the local area, as well as the potential effect on the nearby AQMAs.
- 6.8.27 The modelling will be based on Emission Limit Values set by the IED and the Best Available Techniques (BAT) under Achievable Emission Levels as appropriate and with the plant 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.
- 6.8.28 The approach to modelling and the models used will be agreed with the relevant key stakeholders, particularly the Environment Agency and Boston Borough Council.
- 6.8.29 The stack emissions assessment of the gasification plant and the lightweight aggregates plant would consider the impact of release air pollutants covered by the Industrial Emissions Directive (IED). A justification of the stack height will be required with regard to ambient air quality, therefore a range of stack heights will be tested in the dispersion modelling study.
- 6.8.30 The design of the gasification facility will incorporate flue gas treatment to achieve the relevant emission limit values (ELV); the assessment could adopt an approach of assuming all releases at the ELVs and also the design criteria release rates, should these differ. In addition, a plume visibility assessment will also be undertaken, which would calculate the percentage of daylight hours where the plume extends beyond the site boundary,
- 6.8.31 From previous project experience, it is likely that that detailed verification of the dispersion modelling will be required by the regulatory bodies. Often the stack emissions assessment is required to be replicated using two separate dispersion models to verify the results. This effectively doubles the number of models that would be built, run and analysed in the



assessment.

6.8.32 Some of the operational phase air quality studies may only be required for the purposes of the Permit application, and a consenting strategy would be required within the DCO procedures. However, from recent project experience, there will be a significant focus on air quality matters at the planning stage by the Environment Agency, to provide confidence that the facility would be able to operate to meet BAT under an Environmental Permit.

Conclusion

- 6.8.33 The EIA process will incorporate a full detailed air quality assessment during both construction and operation:
- Increase in traffic based air quality pollutant concentrations – human receptor locations and ecological habitats
 - Construction dust impacts – human receptor locations and ecological habitats
 - Operational stack emissions – human receptor locations and ecological habitats
 - Cumulative impacts - human receptor locations and ecological habitats



6.9 Marine Ecology and Fisheries

Baseline Conditions

- 6.9.1 A high-level review to establish the impacts of the BAEF on the marine environment was carried out. Data and resources available in the public domain were considered to identify potential receptors and sensitivities to the impacts presented by the construction and operation of the projects.
- 6.9.2 Estuarine baseline surveys (saltmarsh, fish community, water and sediment quality, phytoplankton and benthic invertebrate community) completed between 2010 and 2014; and previous environmental surveys are available for the study area of the Boston Barrier development.
- 6.9.3 Zones of Influence (Zoi) will be derived to identify the sensitive features to be considered for scoping. These differ depending on the parameter being considered. To inform this high level appraisal, a conservative Zoi for air quality has been set at 10km radiating from the BAEF Site, given the potential for significant emissions (deposition of contaminants). Potential effects due to changes in estuarine processes are limited to the entrance to the Haven (as per the assumptions stated within the Estuarine and Geomorphology processes section) and upstream to the River Witham lock.
- 6.9.4 It is noted that, although a habitat or species in general may be designated as of international or national value, the Witham estuary itself has not received any international or national designations (for example as an SAC, SPA, Ramsar, NNR, SSSI). Only local designations have been identified including aquatic habitats in the estuary (for example Havenside LNR). Based on these considerations and the available information on the status of the habitats in the Project Zoi (tidal Witham) and associated river catchment, the habitats potentially affected by the Project are therefore considered as receptors of regional importance rather than the national.
- 6.9.5 Four designated sites are located within 10 km of the proposed development, including:
- The Wash Special Protection Area (SPA), Ramsar site and Site of Special Scientific Interest (SSSI);
 - The Wash and North Norfolk Coast Special Area of Conservation (SAC);
 - The Wash Natural Nature Reserve; and
 - Havenside Local Nature Reserve.
- 6.9.6 In addition, several habitats of principal importance (and regional importance) were identified, including mudflats and saltmarsh. Saltmarsh is also a priority habitat within the Lincolnshire Biodiversity Action Plan (BAP).
- 6.9.7 Four species of migratory fish have been recorded near the development and therefore expected to be at risk of potential impacts of the development. These species are:
- *Osmerus epeianus* (smelt);
 - *Anguilla anguilla* (eel);
 - *Lampetra fluviatilis* (river lamprey); and
 - *Salmo trutta* (sea trout).



- 6.9.8 It is also noted that the intertidal habitats have the potential to support populations of foraging water-bird species (in both summer and winter), including interest features of The Wash SPA and Ramsar site.
- 6.9.9 Available data on the distribution and presence of invasive invertebrate species has recorded four species in the lower Witham, including:
- *Dikerogammarus haemobaphes* (shrimp);
 - *Hemimysis anomala* (shrimp);
 - *Eriocheir sinensis* (mitten crabs); and
 - *Pacifastacus leniusculus* (signal crayfish).

Potential Environmental Effects

Construction Phase

- 6.9.10 Potential likely significant effects of the BAEF during the construction phase are:
- Loss of estuarine habitats within the footprint of the dock;
 - Loss of estuarine habitats within the dredging footprint;
 - Underwater noise (piling) affecting fish migration;
 - Death/ injury to fish due to underwater noise (piling);
 - Disturbance to water birds from airborne noise, particularly piling;
 - Increased levels of suspended solids from dredging affecting migratory fish, predation by water birds and smothering of benthic habitats;
 - Release of potentially contaminated sediments during dredging;
 - Introduction and spread of invasive species; and
 - Smothering of benthic habitats at offshore disposal site, assuming material is suitable and should offshore disposal be required.

Operation Phase

- 6.9.11 Potential likely significant effects of the BAEF during operation are:
- Loss of estuarine habitats due to changes in estuarine processes affecting erosional and accretion patterns;
 - Increased erosion of the banks of The Haven because of vessel wash;
 - Disturbance to water birds because of increased light levels and increased vessel numbers;
 - Deposition of airborne contaminants from emissions; and
 - Introduction and spread of invasive species.

Mitigation

- 6.9.12 For non-breeding water birds, there would be a permanent loss of a stretch of tidal shoreline habitat as a result of the construction of the wharf and dredging. However, there are large areas of suitable alternative habitats in the locality. Displacement of foraging or roosting birds from the Site associated with noisy activities could be mitigated by:
- Locating construction compounds, stockpiles, and welfare areas away from the mudflats areas;
 - Limit the use of noisy plant, or fit mufflers (if possible) and turn off machinery when not in use



- 6.9.13 To minimise significant adverse effects on sensitive aquatic habitats and associated species, the following mitigation measures may be implemented:
- Implement measures to minimise sediment release during in-channel and bank works according to best practice.
 - Minimise dust generating activities, for example by damping down work areas regularly in dry conditions;
 - Implementation of dredging no-go periods a) in warm weather to avoid impacts (reducing the risk of algae blooms occurrence, during the summer months) and b) to avoid smelt spawning periods (mid-February to the end of March); and
 - All works should adhere to the guidance outlined in the Environmental Good Practice on Site - CIRIA Best Practice Guidelines for construction sites as informed by the PPG guides 'Pollution Prevention PPG01: General guide to the prevention of water pollution and PPG05 on Works and Maintenance in or Near Water'.
- 6.9.14 Increased noise and vibration levels could cause a significant adverse impact to fish. The following mitigation measures would be proposed:
- Limit the use of noisy plant or vehicles and switch off vehicle engines when not in use;
 - Establish operating levels for equipment;
 - Sheet piling activities can be particularly damaging to fish (this is particularly relevant in areas where works would be carried out continuously). Silent sheet piling could be used where appropriate because it produces less vibration than conventional piling methods and very low noise levels. The use of softer alternatives (to hammering) of piling techniques would be used where ground conditions allow. If there is no alternative to the use of percussion, the use of a soft start by beginning piling at a reduced initial blow energy is known to minimise initial effects while allowing potentially affected species to vacate the area before higher energies are used;
 - A toolbox talk would be carried on site by an ecologist before piling activities start to highlight the potential effects of noise and vibration on fish and the importance of using soft start piling techniques; and
 - Piling activities should be avoided during fish migratory periods
- 6.9.15 Dredging no-go periods will be established: Mid-February to Mid-March (to allow smelt spawning); and June to end October – avoiding the peak sea trout and river lamprey migration periods.
- 6.9.16 The construction of the wharf facility would be covered by the requirements of a permit to be issued by the Marine Management Organisation (MMO).
- 6.9.17 The speed of approach of incoming and outgoing ships would be regulated to prevent wash from ships causing changes to the hydrodynamic regime that may result in the erosion of intertidal and shallow subtidal habitats and disturbance to communities downstream of the proposed development.
- 6.9.18 The new wharf will potentially need to be dredged to maintain access to the berthing points. The removal of benthic fauna is unavoidable. However, the communities within this area are regularly subjected to disturbance caused by the release of water from the internal drainage network and there is likely to be relatively rapid recovery. The suspension of sediments is inevitable, the extent depends on magnitude and frequency of dredging,



background water quality, type of material, methods used, channel size and depth, hydrodynamics and the proximity of marine features/sensitive communities. The effects tend to be short term.

6.9.19 The RDF will be received wrapped with plastic sheet in bales and this will minimise non-toxic discharges and emissions to water.

6.9.20 The aggregate will be loaded via conveyor with a reach over the hold of the ship to prevent accidental discharge of the aggregate to water.

EIA Approach

6.9.21 Assessment would be undertaken in accordance with the Chartered Institute of Ecology and Environmental Management's Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2016). The assessment would identify all ecological features that occur within the Zone of Influence (Zoi) of the Project, which is assumed to be within 5km from the Site for Aquatic designated sites.

6.9.22 The EIA would accommodate and assessment of the permanent direct loss of habitat and associated species within the area to be dredged; and the construction site of the proposed wharf. This would include an assessment of the potential risk to fish, zooplankton and benthic invertebrates from dredging and construction due to increased sediment within the water column, and potential for smothering of estuarine benthic species due to subsequent settlement, as a result of the in-channel elements.

6.9.23 It is anticipated that the assessment would be desk-based. The ES for the Boston Barrier A17/2b - Volume 2b: Technical Report: Ecology and Nature Conservation (Environment Agency 2016) provides a recent, detailed assessment of the aquatic population of the River Witham in Boston. This would be used as a source of information to inform the final ES for the proposed development. No additional surveys are anticipated as being required, however, this will be confirmed via stakeholder discussion.

6.9.24 The EIA would include an assessment of the following potential environmental matters associated with ecology and nature conservation:

- Identify the ecological importance of designated sites, habitats and species in the Project area;
- Identify the protected and notable species which may be in the Project area;
- Identify any habitats of principal importance (under Section 41 of the NERC Act 2006) within the Project area;
- Assess the permanent direct loss of habitat and associated species within the area to be dredged
- Assess the potential risk to fish, zooplankton and benthic invertebrates from dredging due to increased sediment within the water column, and potential for smothering of estuarine benthic species due to subsequent settlement;
- Assess the potential temporary impact on fish due to noise and vibration levels associated with construction activities, including changes in flows and turbulence and disturbance;
- Provide details of appropriate mitigation, informed by CIEEM (2016) Guidelines for Ecological Impact Assessment in the United Kingdom; and
- The significance of any residual effects.



- 6.9.25 It is recommended that communication is established with local bird groups, particularly the British Trust for Ornithology (BTO), to request Wetland Bird Survey (WeBS) data for low tide counts at the following site stations:
- Slippery Gowt Pits (35205);
 - Frampton North 60 (35464);
 - Frampton North 23 (36457); and
 - South Forty Foot Drain (35313).
- 6.9.26 A request for information inquiry to the Environment Agency for data on fish species, water and sediment quality, and benthic survey data would be made. Contact with the Centre for Environment, Fisheries and Aquaculture Science (Cefas) via the Marine Management Organisation (MMO) shall also be pursued, to confirm the management options for sediment removed during construction. Consultation with Natural England (NE) will be essential to identify any outstanding data should a Habitats Regulations Assessment be required to accompany the EIA process.
- 6.9.27 It should be noted that in-combination impacts between marine and other topics of the scoping assessment may arise. Interactions between marine and the following topics are possible:
- Estuarine and Geomorphological processes – affecting estuarine habitats;
 - Air quality – deposition of contaminants on sensitive habitats, such as saltmarsh;
 - Navigation – underwater noise, effects on water quality, potential to result in the spread of marine invasive species;
 - Surface water and flood risk – water and sediment quality;
 - Noise and vibration – water bird disturbance; and
 - Landscape and visuals (lighting) – water bird disturbance.
- 6.9.28 To deliver a Cumulative Impacts Assessment, local authorities and the MMO will be consulted to identify other proposed schemes with planning permission.
- 6.9.29 Consideration would be given to potential impacts on The Wash Ramsar and SPA site, and The Wash and North Norfolk Coast SAC in order to meet the requirements of the Habitats Directive. A Habitats Regulations Screening Assessment will be completed.

Conclusion

- 6.9.30 The EIA process should scope in the assessment of impacts to aquatic marine flora and fauna during construction, however, it is not anticipated that detailed survey work would be required due to the availability of current data.
- 6.9.31 The impact of operation of the wharf facility is not anticipated to have any significantly adverse effects given that the Haven is already subject to vessel traffic accessing the Port of Boston.



6.10 Estuarine and Geomorphology Processes

Baseline Conditions

6.10.1 The Port of Boston is a tidally restricted port. The tidal levels given in the 2018 Admiralty Tide Tables are as follows:

- Highest astronomical tide (HAT) +4.73m OD (Ordnance Datum).
- Mean High Water Springs (MHWS) +3.73m OD.
- Mean High Water Neap (MHWN) +1.73m OD.
- Mean Low Water Neap (MLWN) -0.97m OD.
- Mean Low Water Springs (MLWS) -1.57m OD.
- Lowest astronomical tide (LAT) -2.17m OD.

6.10.2 The River Witham downstream of Grand Sluice (known as the Haven), is an estuarine environment that stretches approximately 11km between the upstream tidal extent at Grand Sluice (which is upstream of the Site); and its downstream confluence with The Wash at Tabs Head. The Haven drains to the sea in a generally south easterly direction.

6.10.3 The Haven ("Witham Transitional") (Waterbody ID GB530503000100) is classified as a Heavily Modified Water Body (HMWB) under the WFD, with moderate ecological potential.

6.10.4 There are several existing hydromorphological pressures within the Haven/Witham Transitional including land reclaim, bank reinforcement, channel dredging, tidal river realignment and construction. Furthermore, construction has started on the Boston Barrier development, which will add further pressure.

6.10.5 The flow into the tidal Haven is artificially maintained through sluice structures. The structures are also used to maintain higher water levels in summer months for agricultural benefit; and also to increase discharges downstream during periods of high fluvial flows upstream.

6.10.6 The fluvial flows into the Haven are restricted by the sluice structures, so, the main source of sediment is The Wash, with more sediment being transported into the Haven on the incoming tide compared to the ebb tide. This leads to sedimentation of the channel margins and river bed. High winter fluvial flows and the opening of the sluice structures remove sediment build-up periodically and the Port of Boston has advised that there is no ongoing maintenance dredging carried out in the Haven at the Site.

6.10.7 The Environmental Statement for the Tidal Barrier (Volume 2B Estuarine and Geomorphology Processes) indicates that the maximum currents at the site of the proposed tidal barrier range between 0 and 1 m/s. The currents at the proposed site are likely to be similar.

Potential Environmental Effects

6.10.8 A high level pre-scoping assessment was undertaken to identify and assess the potential impacts, receptors and specific sensitivities of the construction and operation of the BAEF at Boston. The high level study was performed to ascertain the specific impacts to current estuarine and geomorphological processes in The Haven and The Wash. The principal



aspect of the Development which has the potential to affect estuary geomorphology and processes is the proposed wharf.

- 6.10.9 Other elements of the Development may also affect estuary geomorphology and processes, but in a less direct manner (e.g. associated with any intakes, outfalls or surface water drains that connect to The Haven).

Construction Phase

- 6.10.10 Temporary impacts arising from the construction phase of the development identified include:
- Increased disturbance on estuary bed sediments due to construction activities, especially any dredging (if required) at the docking facility or within the navigational channel in The Haven or the approach channel in the Wash; and
 - Alteration to estuary flows and sediment transport regimes due to the presence of any necessary cofferdams, vessels or other restrictions/ blockages in the estuary channel to facilitate construction.

Operation Phase

- 6.10.11 Permanent impacts are envisaged to arise from the operational life of the development, which have the potential to affect estuary geomorphology and processes are:
- Changes in tidal flows and river flows within The Haven due to the physical presence of the docking facility (with and without vessels berthed) or any deepened section(s) of the river channel in The Haven or approach channel(s) in The Wash;
 - Local changes in flow conditions associated with increased abstraction or discharge in The Haven due to additional intakes or outfalls/ drains;
 - Changes in any sediment mobilisation (erosion), transportation and deposition (accretion) patterns associated with the changes in tidal river flows;
 - Changes in the morphology of The Haven associated with the changes in sedimentary processes; and
 - Any maintenance dredging and disposal activities at the docking facility in The Haven and/or within the navigation channel in The Haven and/or within the approach channel in The Wash.

Mitigation

- 6.10.12 It is recommended that bathymetric surveys are undertaken during the construction period, to determine the rate of erosion and deposition. This would act as an early warning, to identify if actual erosion and deposition is exceeding predicted values.
- 6.10.13 Further surveys should be undertaken during construction at intervals of approximately 3-4 months and after any significant fluvial or tidal flood events.
- 6.10.14 It is recommended bathymetric surveys are undertaken during the early life of the wharf, to identify the need for channel maintenance. These would be specific to the project and it is envisaged that they should occur during the first five years of the operational phase at approximately 6 month intervals.



- 6.10.15 Where appropriate, consideration should be given in detailed design to the addition of 'softer engineering solutions' used for erosion control; and to reduce the morphological impact caused by sheet piling.
- 6.10.16 Monitoring of changes to channel morphology is recommended during the early stages of operation of the wharf. Visual observations can be used in tandem with the bathymetric surveys recommended above. Monitoring allows an assessment of whether any predicted effects (determined by modelling) are apparent; and whether different approaches to the proposed mitigation in the ES require adaption.

EIA Approach

- 6.10.17 The current understanding of the project is that no dredging will be required for the BAEF within the approach channel of The Wash. Therefore, effects on the geomorphology processes within The Wash may be scoped out of further assessment.
- 6.10.18 However, impacts on the geomorphology and estuarine processes within The Haven at the Site may only be scoped out from further assessment if all of the following conditions are satisfied:
- The docking facility does not alter the existing alignment of the estuary bank (i.e. there is no reclamation of the estuary);
 - There is no planned capital dredging or envisaged increase in maintenance dredging requirement within the navigational channel of The Haven or at the docking facility;
 - There are no significant changes in abstraction or discharge conditions that could lead to estuary-scale effects; and
 - Environmental best practice is adopted during construction.
- 6.10.19 If all the above conditions are adhered to there is likely to be no resultant effects from the works on the geomorphology and estuarine processes within The Haven or, where effects arise, they would be localised and/or temporary and not of a significant scale. It is considered that, whilst bullets three and four are likely to be met, the construction of the wharf and maintenance of it in operation means that the first two bullets cannot be achieved. Therefore, an EIA would be required to provide further assessment to determine the impacts on geomorphology and estuarine processes at the proposed development.
- 6.10.20 The EIA assessment will be carried out based upon desk-based expert assessment and interpretation. This will be undertaken by a suitably qualified and experience coastal geomorphologist. This work would identify whether detailed modelling would be required to qualify the impacts and identify appropriate mitigation in negotiation with the Harbour Authority.
- 6.10.21 The assessment will draw from the available literature and evidence base, including Chapter 12 'Estuary Processes and Geomorphology' of the Environmental Statement which supported the Transport and Works Act Order application in respect of the recently approved Environment Agency's Boston Barrier scheme. Work undertaken within that chapter (and its supporting appendices) provides much useful background information of relevance to the BAEF, including outputs from a Desk Study and numerical modelling of hydrodynamics and sediment transport.



- 6.10.22 No further data collection relating to The Haven is deemed essential, although any available information on estuary bed sediments (grain size) and baseline tidal and river flows would be obtained from the relevant stakeholders (for example, the Harbour Authority, the Environment Agency) to help characterise the baseline conditions.
- 6.10.23 The assessment will consider the construction and operation phases of the Development, with any decommissioning effects likely to be of a similar type and have similar magnitude of impacts as construction effects.

Conclusion

- 6.10.24 An EIA would be required to provide further assessment to determine the impacts on geomorphology and estuarine processes at the proposed development.
- 6.10.25 Effects on the geomorphology processes within The Wash may be scoped out of further assessment.



6.11 Navigational Issues

Baseline Conditions

- 6.11.1 A review of Chapter 14: Navigational Impact Assessment of the Boston Barrier Environmental Statement (Environment Agency, 2016) was carried out to identify potential navigational issues that would be relevant for the proposed development. Chapter 14 of the Boston Barrier ES was informed by a desk-based study that used available data, numerical modelling, construction information, consultation with the Port of Boston Harbour Master and a site walkover.
- 6.11.2 Information presented in the Boston Barrier Environment Statement is deemed applicable to the BAEF because the document refers to the same area of the River Witham (The Haven) and was produced recently (August 2016). The information gleaned from the ES was used to establish the baseline conditions with respect to navigability in The Haven and The Wash, allowing for the identification of potential impacts and receptors.
- 6.11.3 The Haven is fully tidal and comprised of the section of the River Witham between the Grand Sluice and The Wash. At the Port of Boston (PoB) the Haven is approximately 56 m in width, although the channel width ranges from 20-90 m along its length. The bed level varies between -1.5 mOD at Grand Sluice to -3.3 mOD downstream of the PoB entrance.
- 6.11.4 An asymmetrical semidiurnal tide (i.e. the tidal cycle comprises two high and two low tides of unequal heights each day) controls the sediment regime in The Haven. The tidal regime comprises relatively quick flood tides (5 hours) and longer ebb tides (7 hours), with a spring tidal range of approximately 6.4 m. Ebb flow velocities within the vicinity of the PoB range from 0.2 knots to 1.8 knots during a Mean High Water Spring (MHWS) tidal event.
- 6.11.5 The tidal influence of the North Sea and The Wash is obstructed by the Grand Sluice, which defines the upstream tidal limit of The Haven. Boston Gateway Marina is located upstream of the sluice offering moorings for recreational sailors. To the west The Haven is connected by the Black Sluice lock, which can accommodate vessels up to 21 m long and 6 m wide and has a water retention level ranging from 0 to -0.6 mAOD depending on the season.
- 6.11.6 The navigability of The Haven upstream of the BAEF is constrained by four bridges with limited headroom under bridges at high water and limited under-keel clearance and channel width at low water. A sand bar, known as The Black Buoy Sand, is located at Tab's Head near the entrance to The Haven, and does not impact on the navigability of The Haven.
- 6.11.7 The River Witham is predominantly used by small recreational vessels, fishing vessels and other commercial vessels. The main users of the river include:
- Port of Boston – the Harbour Authority;
 - Boston fishing fleet;
 - Other commercial operators (including tourism); and
 - Recreational – either transient inland waterways users or local recreational navigation users.
- 6.11.8 The operating traffic pattern of the main users of The Haven includes:



- PoB – All ships over 30 m are required to enter the Haven with a pilot on board. Navigation between The Wash and the entrance of the Wet Dock at PoB takes about 1 hour.
- Fishing vessels – mainly depart when water level is rising (flood tide) and return on the falling (ebb) tide.
- Sailing boat and motor boat – Leave on the falling tide passing through Grand Sluice lock at, or soon after, the tide level in the Haven falls below 1.45 mAOD such that they have sufficient time to travel down the Haven, clear the sand bar at Tab's Head and enter The Wash.
 - Return is on the rising tide and is dictated by having sufficient time to clear the sand bar, travel up the Haven and pass through the Grand Sluice lock before the tide level reaches 1.45 mAOD.
- Commercial passenger vessels – Maritime leisure cruises trips generally depart on a rising tide soon after the Grand Sluice lock opens at 0.0 mOD when there is sufficient water draft in the Haven. The boat returns approximately 4.5 hours later on the falling tide and passes through the Grand Sluice lock before it closes at 0.0 mOD.
- Canoe (and non-powered vessel) – Variable.

6.11.9 The Port Information Service is responsible for the control of shipping in the area of the development, including communication and navigation aids. The PoB uses VHF radio to notify ship movements to all users of the waterways

6.11.10 The navigational channel from Tab's Head to Swing Bridge is marked on the right bank with alternating fixed white lights and flashing red lights, and on the left bank with alternating fixed white light and flashing green lights.

6.11.11 It is currently understood that all RDF destined for processing by the BAEF will be delivered by ship; and all lightweight aggregate would be removed from the BAEF by ship. The maximum tonnage for any one vessel is 3500 tonnes, however, the realistic operating tonnage is anticipated to be 2,500 tonnes.

Potential Environmental Effects

Construction and Operation Phase

6.11.12 Potential impacts on the navigability of the Haven and river channels near the BAEF would result from any vessels used during construction; and from the RDF deliveries and the transport of aggregate from the facility, required for the operational phase of the BAEF in combination with the existing Port of Boston traffic and recreational users. The potential impacts include:

- Reduced manoeuvrability and river width;
- Increased river traffic and potential for collision risk; and
- River restrictions.

Mitigation

6.11.13 During construction, a special marking and exclusion zone around the Site and wharf construction would be appropriately signalled in accordance with the requirements of the Harbour Authority. Notices to mariners, as well as Coastguard and UK Hydrographic Office notification would be provided regularly. The zone will be agreed with the Harbour Authority.



- 6.11.14 The contractor employed in respect of the construction of the proposed marine development will ensure regular (daily) communication with PoB and all other relevant authorities in respect of construction and navigational matters.
- 6.11.15 Clearance of construction works would be tidally restricted with significant time constraints on traffic movements. Minimum clearance will be provided at all-times during construction. Where this cannot be provided navigation would be restricted.
- 6.11.16 Appropriate methodology and programming of the works to minimise the duration of construction and dredging impacts would be provided.
- 6.11.17 Safety zones around the construction area will be marked and lit to avoid objects from the construction zone causing damage to passing vessels.
- 6.11.18 The construction of the wharf would be designed so that when docked, the ships would be out of the main river channel to avoid causing restrictions to passing traffic.

EIA Approach

- 6.11.19 The navigational risk assessment will be carried out based upon desk-based expert assessment and interpretation.
- 6.11.20 The assessment will draw from the available literature and evidence base, including Chapter 14: Navigational Impact Assessment of the Boston Barrier Environmental Statement (Environment Agency, 2016). Work undertaken within that chapter (and its supporting appendices) provides much useful background information of relevance to the proposed development. This would be supplemented by consultation with the Harbour Authority; and commercial and recreational users of the Haven from the Port of Boston to the Wash as more detailed information regarding the proposed construction phases for the wharf are identified.
- 6.11.21 The assessment of each impact will be reviewed against the Port of Boston fleet, the fishing fleet, other commercial users such as tour operator and recreational boats, including the non-powered fleet.
- 6.11.22 The assessment will consider the construction and operation phases of the Development, with any decommissioning effects likely to be of a similar type and have similar magnitude of impacts as construction effects.
- 6.11.23 The assessment will cover impacts associated with manoeuvrability, increased river traffic, increased collision risk and reduced river width – the works would include construction activities and new structures within the navigable river channel; and operational requirements would introduce a further 560 ship movements per annum.

Conclusion

- 6.11.24 Due to the impacts on commercial and recreational activities near the BAEF in both construction and operational phases, this topic should be scoped in to the next stage of assessment to fully understand the significance impacts and develop mitigation strategies.

6.12 Transport

Baseline Conditions

- 6.12.1 The A52 and the A16 form the primary routes through Boston.
- 6.12.2 The A52 connects Boston to Grantham and Skegness. The A16 links Boston to Spalding (and extends to Peterborough and the A1 to the south); and also to the A17 connecting to Kings Lynn and East Anglia. Both routes accommodate large volumes of HGV traffic and agricultural vehicles.
- 6.12.3 Access to the site is from the A16 on the southern edge of Boston town at the roundabout with Marsh Lane, which is used by HGVs to access the Riverside Industrial estate where the BAEF is located. The site is currently accessed off Marsh Lane via Lealand Way onto Nursery Road from the north of the site. However, an alternative access point will be available from Marsh Road via Bittern Way from the south-west of the proposed development.
- 6.12.4 There is a network of public rights of way (PRoW) close to and currently running through the BAEF area (see **Figure 6.5**). One of these (Macmillan Way) will require permanent diversion. The Macmillan Way is a long-distance footpath in England that links Boston, Lincolnshire to Abbotsbury in Dorset and follows the right bank of the Haven through the proposed development.

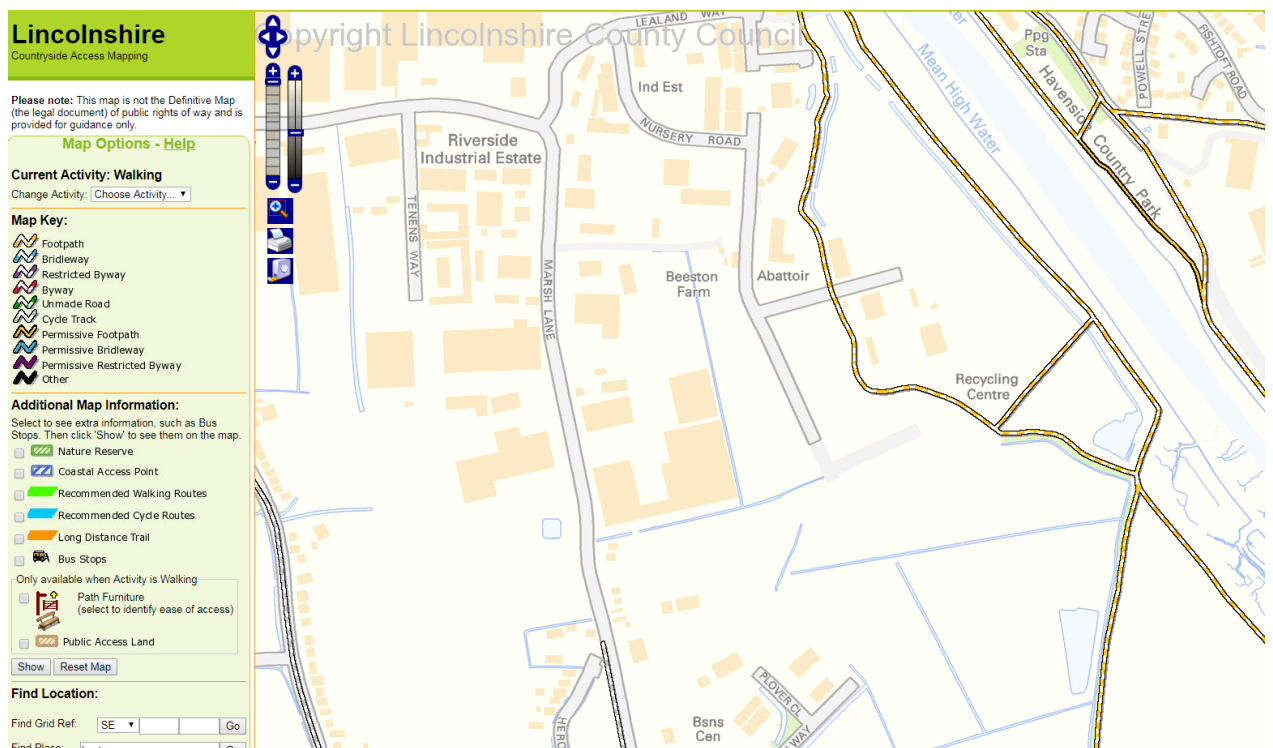


Figure 6.5: Footpaths that bisect the proposed development

- 6.12.5 National cycle route No. 1 passes south on Wyberton Low Road and intersects with Marsh Lane to the west of the BAEF area. There are several active cycle networks in the area

(see Figure 6.6).

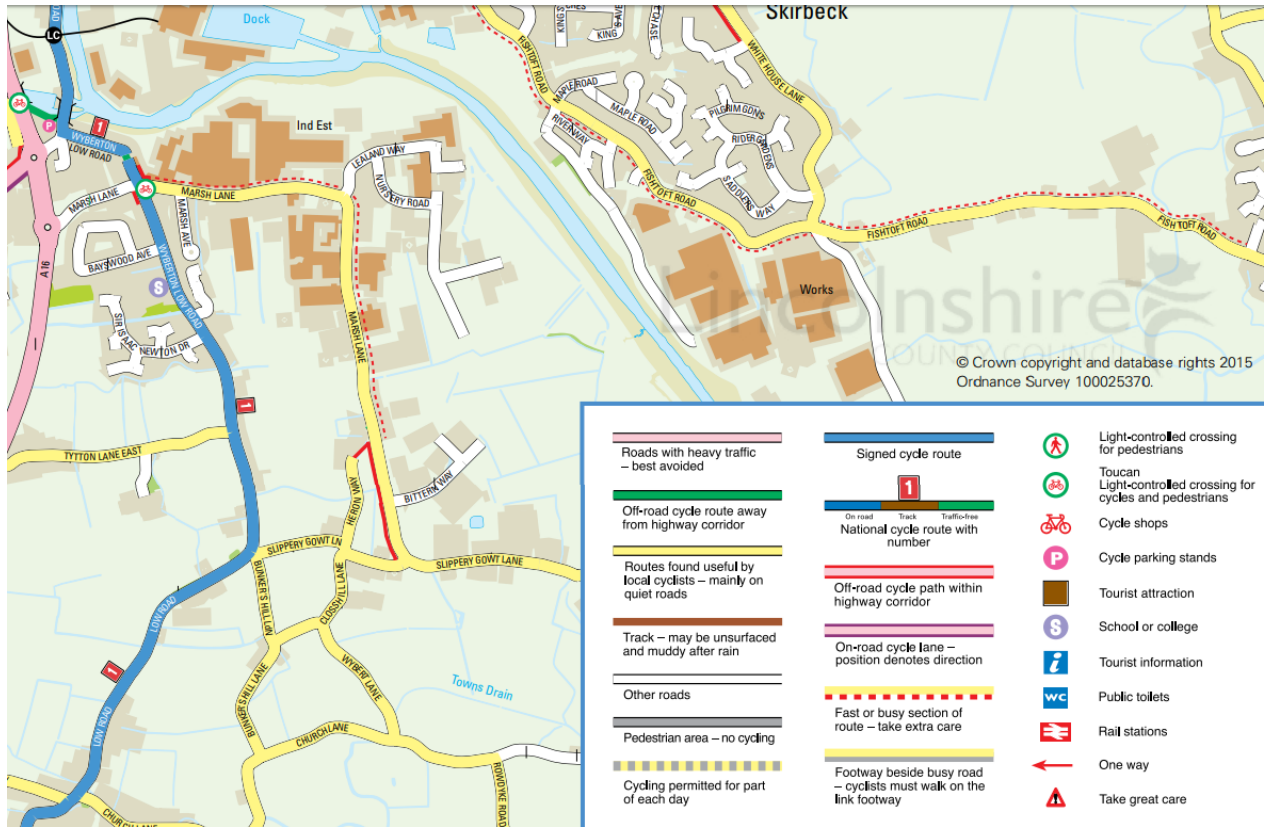


Figure 6.6: Boston Town Cycle Map 2015

(<https://www.lincolnshire.gov.uk/countryside/visiting/visiting-the-countryside/cycling/120948.article> downloaded 11 May 2018)

6.12.6 Given that the BAEF is within an industrial area, tourism near the site is considered to be minimal, with the main focus being in Boston town centre.

6.12.7 The receptors considered relevant to this assessment are:

- Residential properties
- Local businesses
- Recreational areas
- Cyclists (including National Cycle Routes);
- Pedestrians (including PRoW and footways);
- Public transport users (including bus routes and bus stops); and
- Equestrians.

6.12.8 Relevant effects on recreational boat-users will be considered in the Navigation section.

Potential Environmental Effects

Construction Phase

6.12.9 Throughout the construction phase of the BAEF, it is envisaged there will be potential significant adverse effects on the local road network from increased levels of construction



HGVs and private vehicles operated by the construction contractor's employees commuting to and from the BAEF facility.

- 6.12.10 These would cause potential impacts as a consequence of reduced amenity of the site and surrounding area by closure of public access to the bank of the Haven within the BAEF boundary.
- 6.12.11 Mitigation measures are expected to be implemented to reduce the impacts on congestion and traffic-related issues, including delivery of construction materials by ship.
- 6.12.12 Noise emissions from the construction of the facility have the potential to negatively affect recreational users.

Operation Phase

- 6.12.13 It is deemed likely that there will be minimal impact on traffic-related issues during the operational lifetime of the BAEF caused by the delivery of RDF feedstock because this will be delivered by ship. A similar assumption can be made regarding the export of aggregate from the site because this is proposed to be removed by ship. Thereby, avoiding added vehicle movements on the roads.
- 6.12.14 However, it is likely that there will be road traffic movements associated with the BAEF. This includes potential export of hazardous air pollution control residues from the gasification facility, staff movements to / from the site, and delivery of process chemicals and raw materials. The effect of any increase of combined road traffic movements on the local road network will be considered as part of the assessment.
- 6.12.15 The BAEF will cause a permanent closure of part of the Macmillan Way along the right bank of the Haven within the BAEF boundary. This PRoW would be diverted using existing paths, with the route to be confirmed following stakeholder communication.

Mitigation

- 6.12.16 The following measures are likely to be required to prevent or reduce adverse impacts associated with traffic:
 - Provision of a Construction Traffic Management Plan to define vehicle schedules, construction staff access arrangements including (where relevant) provision of a bus for construction staff to reduce the number of additional vehicle trips, parking restrictions, appropriate signage, delivery arrangements and agreed HGV routing during the construction phase;
 - Restrictions on operational deliveries of raw materials during peak hours;
 - On-site parking at the facility during operation for site personnel and visitors to prevent the parking of cars on public highway; and
 - Increased signage at crossing points at the BAEF facility.
- 6.12.17 During both construction and operation, Macmillan Way will require permanent diversion. Diversion routes will be clearly signed and will follow existing footpaths.



EIA Approach

- 6.12.18 A fully compliant ES chapter and associated DCO documentation would be produced utilising the Guidelines for the Environmental Assessment of Road Traffic (GEART) (Published January 1993 by the Institute of Environmental Assessment)); Volume 11 of the Design Manual for Roads and Bridges (Highways Agency et al) – Environmental Assessment; and Transport PPG as the principal guidelines to inform the development of the application.
- 6.12.19 The guidance provides a framework for the assessment of traffic borne environmental impacts, such as pedestrian severance and amenity, driver delay, accidents and safety; and noise, vibration and air quality.
- 6.12.20 In defining the study area, consideration will be given to the primary routes and locations to be impacted by traffic generated by the Project. These will be discussed and agreed with Lincolnshire County Council (LCC) highways officers.
- 6.12.21 IEMA guidance outlines several key or determining factors or assessment criteria, which are relevant to the assessment of impacts associated with traffic and transport, and include the following:
- Driver delay;
 - Pedestrian delay;
 - Fear and intimidation;
 - Severance; and
 - Pedestrian amenity.
- 6.12.22 The magnitude of impact on the receptors would be assessed against:
- Capacity – including driver delay;
 - Routing – including severance, driver delay and pedestrian delay; and
 - Amenity and access - including pedestrian amenity and fear and intimidation.
- 6.12.23 Following internal agreement, we would engage the relevant planning and highway authorities to seek agreement on the principles of the transport strategy as well as the methodology for assessing the traffic impacts (e.g. study area, data gaps, sensitivity of receptors and significance of effects, modelling and level of assessment).
- 6.12.24 National Policy Statement (NPS) (**Table 6.12**) stipulates the following approach is to be adopted:

Table 6.12 National Policy Statements

NPS Requirement	NPS Reference
If a project is likely to have significant transport implications, the applicant's ES should include a transport assessment, using the NATA/WebTAG methodology stipulated in Department for Transport (DfT) guidance, or any successor to such methodology.	EN-1 Section 5.13.3
Where appropriate, the Applicant should prepare a travel plan including demand management measures to mitigate transport impacts. The Applicant should also provide details of proposed measures to improve access by public transport, walking and cycling, to reduce the need for parking associated with	EN-1 Section 5.13.4



NPS Requirement	NPS Reference
the proposal and to mitigate transport impacts.	

6.12.25 The DfT Transport Assessment guidance referred to in NPS EN-1 has since been replaced with DCLG Planning Practice Guidance (PPG). For the purpose of assessing the project’s impact the relevant PPG is Travel Plans, Transport Assessment and Statements (henceforth simply referred to as the Transport PPG).

6.12.26 The Transport PPG sets out the key principles to be adopted when developing a Transport Assessment as follows:

- proportionate to the size and scope of the BAEF to which they relate and build on existing information wherever possible;
- established at the earliest practicable possible stage of a development proposal;
- be tailored to particular local circumstances.

Conclusion

6.12.27 A transport strategy would be developed by:

- developing a greater understanding on the predicted quantum of material and workforce that would be required for both construction and operation of each of the Elements of the proposed development. This would include the identification of likely (professional judgement) supply chains and outline programme; and
- Establishing the baseline traffic flows for an assumed study area.

6.12.28 Using this information, we would develop an optimum package of “designed –in” mitigation which could include:

- Potential delivery routes, access points and delivery time windows;
- Temporary off-highway haul routes;
- Park and Ride for workers;
- On-site parking restrictions etc.

6.12.29 We would support an internal workshop to facilitate the sharing of such information.

6.12.30 The transport strategy would be informed by the Boston Transport Strategy (2006), which has the following aims that are relevant to the proposed development:

- Reduce car usage for journeys wholly within Boston;
- Reduce delays for traffic on A52/A16 corridor with safe facilities for vulnerable users;
- Improve public transport provision;
- Improve road safety for pedestrians and cyclists, especially near schools;
- Improve air quality in the designated AQMA; and
- Improve cycling and pedestrian management in the town centre.

6.13 Socio-Economics

Baseline Conditions

- 6.13.1 Figures released in 2015 by the Office of National Statistics (ONS) put the overall population figure for Boston at 66,900. Boston has seen its population rise by 7,794 people overall between 2006 and 2016. However, despite thousands moving out of the town in that time, 15,473 migrants have moved in. That means that, in a statistical quirk, immigrants have contributed to 161.9 per cent of the population increase in the last decade
- 6.13.2 Almost one in five people living in Boston are immigrants who have moved to the town during in the past decade in the wake of eight eastern European nations joining the European Union in 2004 and winning rights to travel and work in the UK.
- 6.13.3 Boston Education Statistics are provided below. Boston has a high level of residents with either no qualifications or qualifications equal to 1 or more GCSE at grade D or below, compared to both the county average and the national average.

Table 6.13 Boston Qualifications Profile (Jan 2017-Dec 2017)

Qualifications (Jan 2017-Dec 2017)				
	Boston (Level)	Boston (%)	East Midlands (%)	Great Britain (%)
Individual Levels				
NVQ4 And Above	4,800	11.8	32.1	38.6
NVQ3 And Above	11,000	26.7	52.0	57.2
NVQ2 And Above	19,600	47.7	70.9	74.7
NVQ1 And Above	24,800	60.4	83.6	85.4
Other Qualifications	11,700	28.6	8.2	6.9
No Qualifications	4,600	11.1	8.2	7.7
Source: ONS annual population survey				
Notes: For an explanation of the qualification levels see the definitions section.				
Numbers and % are for those of aged 16-64				
% is a proportion of resident population of area aged 16-64				

- 6.13.4 Boston employment statistics are provided below in **Table 6.14 and 6.15**. Boston's employment profile is marginally higher to the regional (East Midlands) average; but marginally lower than the national average. Boston's occupation profile is dominated by Groups 8 & 9 (Process Plant & Machine Operatives and Elementary Occupations) at more than double the regional average and almost three times the national average. The proportion of workers in senior, professional and technical positions is half that of the regional and national average.
- 6.13.5 The 'ONS Business Register and Employment Survey: open access' data (ONS 2016)

shows that the energy sector has no employment presence based in Boston.

Table 6.14 Boston Employment Profile (Jan 2017-Dec 2017)

All People	Boston (Numbers)	Boston (%)	East Midlands (%)	Great Britain (%)
Economically Active†	33,000	78.3	77.6	78.4
In Employment†	31,500	74.5	74.1	74.9
Employees†	26,600	64.7	64.5	64.0
Self Employed†	4,900	#	9.2	10.6
Unemployed (Model-Based)§	1,500	4.5	4.4	4.4

Source: ONS annual population survey

† - numbers are for those aged 16 and over, % are for those aged 16-64

§ - numbers and % are for those aged 16 and over. % is a proportion of economically active

Table 6.15 Boston Employment by occupation Profile (Jan 2017-Dec 2017)

	Boston (Numbers)	Boston (%)	East Midlands (%)	Great Britain (%)
Soc 2010 Major Group 1-3	6,800	21.5	41.4	45.7
1 Managers, Directors And Senior Officials	#	#	10.7	10.9
2 Professional Occupations	#	#	17.0	20.3
3 Associate Professional & Technical	!	!	13.5	14.4
Soc 2010 Major Group 4-5	6,100	19.3	21.7	20.8
4 Administrative & Secretarial	#	#	10.2	10.3
5 Skilled Trades Occupations	4,800	15.3	11.4	10.3
Soc 2010 Major Group 6-7	4,700	14.8	16.2	16.7
6 Caring, Leisure And Other Service Occupations	#	#	9.2	9.1
7 Sales And Customer Service Occs	#	#	6.9	7.5



Soc 2010 Major Group 8-9	14,000	44.5	20.7	16.9
8 Process Plant & Machine Operatives	4,600	14.7	8.6	6.3
9 Elementary Occupations	9,400	29.7	12.0	10.5
Source: ONS annual population survey				
# Sample size too small for reliable estimate				
! Estimate is not available since sample size is disclosive				
The sample size is too small to allow data to be produced				
Notes: Numbers and % are for those of 16+				
% is a proportion of all persons in employment†				

- 6.13.6 Farm-based agriculture forms a significant contribution to the local economy. The fresh produce and food processing cluster is in an area bounded by Grantham, Sleaford, Holbeach and Boston and centred on Spalding (Greater Lincolnshire Agri-food Sector Plan 2014-2020). Over 1/3rd of UK fresh produce is grown in Lincolnshire and the neighbouring counties of Cambridgeshire, Norfolk and Suffolk making South Lincolnshire the centre of the UK Fresh Produce industry. With a 'farmgate' value of £1.1bn this cluster is estimated to generate a further £3billion of added value through food processing, marketing and logistics.
- 6.13.7 The Boston and South Holland logistics sector is closely linked to the agri-food sector and is a nationally significant location for food chain logistics for both UK and imported products.
- 6.13.8 The majority of businesses in Boston (97%) are classed as 'Micro' or 'Small'

Table 6.16 Boston Business Counts (2017)

	Boston (Numbers)	Boston (%)	East Midlands (%)	East Midlands (%)
Enterprises				
Micro (0 To 9)	1,885	85.3	157,610	88.9
Small (10 To 49)	260	11.8	16,225	9.1
Medium (50 To 249)	50	2.3	2,905	1.6
Large (250+)	15	0.7	650	0.4
Total	2,210	-	177,385	-
Local Units				
Micro (0 To 9)	2,190	80.7	173,690	83.7
Small (10 To 49)	425	15.7	27,150	13.1
Medium (50 To 249)	85	3.1	5,775	2.8
Large (250+)	15	0.6	790	0.4
Total	2,715	-	207,405	-
Source: Inter Departmental Business Register (ONS)				
Note: % is as a proportion of total (enterprises or local units)				

Potential Environmental Effects

- 6.13.9 The BAEF will require large-scale investment and will need to be supported by a substantial supply chain; a proportion of the capital expenditure will add to local, regional and UK-wide income during the lifetime of the project.
- 6.13.10 There will be direct expenditure on key elements of the BAEF as well as further expenditure throughout the supply chain for goods and services some of which will result in indirect economic impacts (e.g. training and education, day-to-day indirect spend from project employees).
- 6.13.11 Effects during construction and operation will include job creation, training and employment retention. Some of the potential economic effects are listed below:
- Direct and indirect creation of jobs throughout construction operation and decommissioning phases of the project;
 - Indirect effects on services, such as infrastructure and housing; and
 - Increased long term security and reliability of supply and more evenly distributed energy generation.



6.13.12 In addition to the beneficial impacts of project expenditure there is also potential to negatively impact upon other industries because of displacement of workers currently employed in other industries.

Mitigation

6.13.13 Economic impacts will vary considerably at each stage, dependent on a range of factors, such as:

- The technologies and infrastructure to be deployed;
- Construction, O&M and decommissioning methodologies;
- Procurement/contracting strategy;
- Availability and capacity of the supply chain;
- Number of workers;
- Where the workers come from; and
- The duration of employment.

6.13.14 Further mitigation measures specific to existing industries e.g. shipping, commercial fisheries, farming and other local businesses will be developed during the EIA in consultation with relevant stakeholders where appropriate.

EIA Approach

6.13.15 The Overarching National Policy Statement for Energy (EN-1) (DECC, 2011a) states that where a project is likely to have an impact on socio-economics at a local or national scale the assessment should consider all relevant impacts. These may include:

- The creation of jobs and training opportunities;
- The provision of additional local services and improvements to local infrastructure;
- The impact on tourism;
- The impact of a changing influx of workers during the different construction, operation and decommissioning phases of the energy infrastructure; and
- Cumulative impacts.

Conclusion

6.13.16 A socio-economic study will be prepared to provide a review of available information such as the ONS. Additional sources include county, district and borough council plans and information. The study will be informed by key stakeholder consultation, including the public.

6.13.17 Given the potential impact on tourism is anticipated to be minimal, this will be scoped out of the socio-economic assessment.



6.14 Health Impacts

- 6.14.1 The EIA Regulations require human health to be considered within the EIA process. For the purpose of the EIA for BAEF, this requirement will be met through the Air Quality chapter and provision of a Health Impact Assessment (HIA) which will be appended to the ES. Furthermore, the consideration of human health will also be considered within the relevant assessments that will be provided in the ES, including flood risk, noise and vibration, traffic and transport, recreation and socio-economics.
- 6.14.2 Potential health related impacts that may result from construction and operation will be defined in the topic specific chapters of the ES, but are expected to include:
- Noise impacts;
 - Dust and other air emissions (including odour);
 - Increase in pests;
 - Hazardous waste and substances;
 - Disruption to local road network (reduced access to services and amenities); and
 - Increased local employment.

6.15 Waste

- 6.15.1 Wastes will be an inevitable consequence associated with the construction and operational phases of the BAEF.
- 6.15.2 The waste hierarchy sets a priority order for dealing with waste to determine the most sustainable management option for all wastes prior to removal from where they are produced or held. Driving waste up the waste hierarchy is an integral part of the National Waste Management Plan for England and National Planning Policy for Waste. It is also a legal requirement to demonstrate that the waste hierarchy has been considered before it is recovered or disposed.
- 6.15.3 There is no industry accepted method for assessing the implications of waste during construction or operation. However, an assessment of wastes will be required following the principles identified in The National Planning Policy for Waste 2014 to demonstrate that:
- the likely impact the BAEF on existing waste management facilities, and on sites and areas allocated for waste management, is acceptable and does not prejudice the implementation of the waste hierarchy and/or the efficient operation of such facilities
 - the BAEF makes sufficient provision for waste management and promotes good design to secure the integration of waste management facilities with the rest of the development and, in less developed areas, with the local landscape; and
 - the handling of waste arising from the construction and operation of development maximises reuse/recovery opportunities, and minimises off-site disposal.



- 6.15.4 The proposed approach will examine the management of waste arising from the construction and operational phases of the proposed development. The proposed assessment methodology would involve assessing the estimated generic quantities of the various waste streams generated and the potential waste management options in accordance with the waste hierarchy and assessing the impact in the context of the capacity of local and regional waste infrastructure.
- 6.15.5 Opportunities for managing waste in accordance with the waste hierarchy would be identified. Measures to ensure compliance with National legislation would be identified, particularly relating to requirements associated with the management of any contaminated material.
- 6.15.6 The Waste Impact Assessment would cover the following:
- Baseline assessment – identification of current waste management practices and the availability/capacity of local and regional waste infrastructure.
 - Construction phase assessment – identification of the predicted types and quantities of waste that would be produced during construction; proposed waste management measures to reduce impacts on receiving waste management infrastructure in accordance with the waste hierarchy.
 - Pre-construction Site Waste Management Plan (SWMP) - quantification of estimated waste arisings and would identify potential savings and measures to minimise waste. Record any decision given to materials resource efficiency in designing and planning the construction, taken before the site waste management plan was drafted on the nature of the project; its design; the construction method or materials employed, to minimise the quantity of waste produced on site. This includes cost-saving elements in design. For each waste produced the SWMP will identify the proposed waste management option, including re-use, recycling, recovery or disposal.
 - Operational phase assessment – identification of the predicted types and quantities of waste that would be produced during operation; waste storage requirements; proposed waste management measures to reduce impacts on receiving waste management infrastructure in accordance with the waste hierarchy.
- 6.15.7 Therefore, it is proposed that a Waste Assessment Approach is included in the EIA as a technical appendix to the ES.

6.16 Climate change

- 6.16.1 The baseline conditions for the Climate assessment – specifically, a greenhouse gas (GHG) impact assessment - will be a business-as-usual scenario whereby the BAEF does not proceed, for those lifecycle stages scoped into the assessment.
- 6.16.2 To align with the requirements of the EIA Regulations 2017 and associated published guidance (IEMA (2015) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation), three separate aspects would be considered in the Climate assessment:
- Lifecycle greenhouse gas (GHG) impact assessment: The effect on climate change of GHG emissions arising from the Proposed Development, including how the project will affect the ability of UK Government to meet reduction targets within its carbon budgets;



- In-combination climate change impact assessment: How the BAEF may impact the overall resilience of the surrounding environment against the predicted impacts of climate change; and
 - Climate change resilience assessment: The resilience of the BAEF to impacts from projected climate change.
- 6.16.3 Due to its nature and purpose, the BAEF is considered likely to result in notable GHG emissions impacts, and given the location on the side of the tidal River Witham, it will be necessary to consider climate change resilience (which will be assessed as part of the Flood Risk Assessment).



7 Non-significant EIA issues

7.1.1 The aim of the EIA Scoping Stage is to focus the EIA on the likely significant effects of the Proposed Development. In so doing, the significance of impacts associated with each environmental aspect becomes more clearly defined, resulting in the possibility of certain aspects being considered 'non-significant'. The following section provides a summary of those issues, which have been considered during the preparation of this Scoping Report, and which are not considered likely to lead to significant environmental effects. It is proposed that these will not be considered in the ES in respect of the BAEF.

7.2 Aviation and Radar

7.2.1 It is not a requirement under the EIA Regulations to undertake an assessment of likely significant aviation effects in respect of the proposed development. NPS EN-1 requires a relevant ES to include an assessment of potential effects when a proposed development may have an effect on civil or military aviation assets.

7.2.2 The Civil Aviation Association (CAA) has a general interest in charting all known structures of 91.4 m (300 feet) or more above ground level. Given none of the proposed buildings or structures are expected to be 91.4 m or more above ground level, an assessment of the potential impacts of the BAEF on aviation is not currently considered to be required and it is proposed that aviation is scoped out of the EIA.

7.2.3 The CAA will however be consulted on the BAEF to review any requirements for aviation lighting on the stack(s). Should taller stacks or cranes be required than currently expected, the need for an aviation assessment will be reviewed accordingly.

7.3 Risks of Major Accidental Events

7.3.1 The EIA Regulations require the ES to provide: '*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*'.

7.3.2 The description of the BAEF in the ES will 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 will be minimised, will be discussed in the relevant chapter of the ES.

7.3.3 Major Accidental events will be covered by a brief risk assessment in the ES, which will include reference to the Applicant's overarching principles of emergency management. The majority of emergency response plans and contingency measures will be dealt with in the Environmental Permit, which is regulated by the Environment Agency. In addition, it is considered that the Health and Safety effects arising from accidents and disasters would be dealt with through relevant industry controls.

7.3.4 For these reasons, it is considered that sufficient controls would be in place to ensure any effects to the environment resulting from accidents or disasters would be reduced to a level



that is not significant. It is therefore considered that this can be scoped out of the ES.

7.4 Sunlight / Daylight

7.4.1 Daylight and sunlight assessments typically consider the effects of a proposed development on levels of light at neighbouring properties and outdoor amenity areas. Development in densely urbanised locations or of a high-rise nature can cause impacts to the levels of light received by adjacent properties. The BAEF is located in an industrial area and is not of a high-rise nature.

7.4.2 Therefore, there would be no potential for issues of overshadowing or light obstruction to the closest residential properties such that an assessment would need to be undertaken to quantify the impact and propose mitigation. It is therefore proposed that this be scoped out of the EIA.

7.5 Environmental Wind

7.5.1 An environmental wind assessment typically assesses the effect of a proposed development on pedestrian comfort and safety as a result of any changes to the local micro climate created by the proposed development. Members of the public using the Macmillan Way and other local PRoWs are already exposed to potentially windy conditions including strong gusts given the open context of the environment along the river.

7.5.2 The BAEF will not comprise buildings of sufficient scale to affect wind flow and dynamics such that significant environmental effects could result. As such, an individual wind assessment would not need to be undertaken for the proposed site and it is proposed that this be scoped out of the EIA

7.6 Lighting

7.6.1 A lighting assessment would typically be undertaken as part of an EIA when there is a likelihood for significant effects to occur to light sensitive receptors. The BAEF site is within a large industrial estate that is subject to levels of existing activity, movement and lighting in dark hours/night.

7.6.2 Any new lighting proposed as part of the development at the site will be in accordance with British Standards, using appropriate design standards and codes of practice set by The Institution of Lighting Professionals (ILP) and The Chartered Institution of Building Services Engineers (CIBSE).

7.6.3 Lighting will be designed to ensure that lighting is appropriate in terms of the potential effects on public realm and site surroundings. As this mitigation can be 'designed-in' to the proposals and secured through appropriate planning controls (DCO Requirement), it is considered that a detailed assessment of lighting is not required as part of the EIA



8 Summary

8.1.1 This EIA Scoping Report has identified the potential for significant effects to arise from the construction, operation and decommissioning of the BAEF. The following bullet point list identifies the specialist main topic assessments that are proposed to be scoped into the EIA assessment. Some sub-topic issues within these main topic areas are proposed to be scoped out. These are identified as sub-bullets in the list below:

- Cultural Heritage
 - Direct impacts upon buried archaeological remains; and Direct impacts upon above ground heritage assets during operation are proposed to be scoped out of assessment.
- Landscape and Visual Impact
- Noise and Vibration
 - vibration impacts during operation are proposed to be scoped out of assessment.
- Contaminated Land, Land Use and Hydrogeology
- Ecology
 - Impacts associated with of Invasive species, Dormice, Great-Crested Newt and White Clawed Crayfish are proposed to be scoped out of assessment.
- Surface Water, Flood Risk and Drainage Strategy
 - Assessment of impacts further downstream to the Wash Inner Water Body are proposed to be scoped out of assessment.
- Air Quality
- Marine Ecology and Fisheries
 - The impact of operation of the wharf facility are proposed to be scoped out of assessment.
- Estuarine and Geomorphology Processes
 - Effects on the geomorphology processes within The Wash are proposed to be scoped out of further assessment
- Navigation
- Transport
- Socio-Economics
 - Tourism is proposed to be scoped out of assessment.
- Climate change.

8.1.2 A Waste Assessment report will be included as a technical appendix.

8.1.3 For the purpose of the EIA for BAEF the Health Impact Assessment (HIA) will be met through the Air Quality chapter in the form of a technical report that will be appended to the ES. Other health effects will be covered in the relevant topic chapters where appropriate.

8.1.4 The detailed assessments for each of these topics will be undertaken in accordance with standard guidance and best practice and reported in the ES. Where significant effects are identified, mitigation measures will be described where possible to reduce the residual effects.

8.1.5 Consideration would be given to potential impacts on The Wash Ramsar and SPA site, and The Wash and North Norfolk Coast SAC in order to meet the requirements of the Habitats Directive. A Habitats Regulations Screening Assessment will be completed in the early



stages of the PEIR process.

8.1.6 The following topics are proposed to be scoped out of the assessment:

- Aviation and Radar.
- Risks of Major Accidental Events
- Sunlight / Daylight
- Environmental Wind
- Lighting



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10 Glossary of terms, abbreviations and acronyms

Terms	Meaning
Air Quality Management Areas	Where national air quality objectives are not achieved the area is declared an Air Quality Management Area
Aggregate	Medium grained particulate material used in construction, including sand, gravel, crushed stone, slag etc.
Asbestos	A heat-resistant fibrous silicate mineral, used in brake linings and fire-resistant and insulating materials
Alternative Conversion Technology	Treatment of residual waste as an alternative to landfill or incineration.
Asymmetrical semidiurnal tide	The tidal cycle comprises two high and two low tides of unequal heights each day
Bat Conservation Trust	Registered British Charity dedicated to the conservation of bats and their habitats in the UK.
Biodiversity Action Plan	Internationally recognised programme which addresses threatened species and habitats and is designed to protect and restore biological systems.
British Geological Survey	Geological survey, aimed at researching earth and environmental processes.
British Trust for Ornithology	Organisation for the study of birds in the British Isles.
Calculation of Road Traffic Noise	Describes the procedures for calculating noise from road traffic.
Calorific Value	The energy contained in a fuel or food, determined by measuring the heat produced by the complete combustion of a specified quantity.
Carbon Capture and Storage	The process of capturing waste carbon dioxide from large point sources, and transporting it to a storage site, and depositing it where it will not enter the atmosphere such as an underground geological formation.
Centre for Environment, Fisheries and Aquaculture Science	Collects, manages and interprets data on the aquatic environment, biodiversity and fisheries.
Chartered Institute of Ecological and Environmental Management	Leading professional membership body representing and supporting ecologists and environmental managers.
Conceptual Site Model	Primary planning tool used in managing contaminated land and groundwater. Representation which sets out the critical pollutant linkages of concern for a particular land contamination problem.
Contract for Difference	Contract between two parties, stipulating that the seller will pay to the buyer the difference between the current value of an asset and its value at contract time.



Cumulative Impact Assessment	Describes the cumulative effects/ impacts of the proposed development.
Department for Environment, Food and Rural Affairs	UK government department responsible for safeguarding our natural environment, supporting our world-leading food and farming industry and sustaining a thriving rural economy.
Department for Transport	Supports the transport network - invests in transport infrastructure.
Development Consent Order	The means for obtaining permission for developments of Nationally Significant Infrastructure Projects (NSIP)
Ecological Potential	For heavily modified water bodies and artificial water bodies, they meet their ecological potential by identifying the impacts affecting the water body, identifying the mitigation measures necessary to ensure the hydromorphological characteristics are consistent with Good or Maximum Ecological Potential and assessing whether those measures have been taken.
Ecological Status	Ecological status is classified in all water bodies, expressed in terms of five classes (high, good, moderate, poor or bad), based on specific criteria and boundaries defined against biological, physico-chemical and hydromorphological elements.
Emission Limit Values	The permissible quantity of a substance contained in the waste gases from a combustion plant which may be discharged into the air during a given period.
Energy Performance Certificates	An Energy Performance Certificate is acquired after an energy performance survey and tells you how energy efficient a building is and gives a rating from A (very efficient) to G (inefficient).
Environment Agency	Established to protect and improve the environment. Responsible for: regulating major industry and waste, treatment of contaminated land, water quality and resources, fisheries, inland river, estuary and harbour navigations, conservation and ecology.
Environmental Impact Assessment	The process of identifying and evaluating likely environmental impacts of a proposed project or development
Environmental Statement	The results of an Environmental Impact Assessment (EIA) are reported in an Environmental Statement (ES).
Environs	The surrounding area or district
European Federation of Waste Management and Environmental Services	European federation representing the private waste and resource management industry across Europe.
Extended Phase 1 Habitat Survey	Designed to map an area under consideration based on the habitats present.
Fine Particulate Matter (PM10)	These particles are <10 microns in diameter and is a major component of air pollution and threatens both our health and our environment.



Flood Risk Assessment	An assessment of the risk of flooding from all flooding mechanisms, the identification of flood mitigation measures and should provide advice on actions to be taken before and during a flood.
Flood Zone 3	Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5) in any year
Fluidisation	A process where granular material is converted from a solid-like state to a fluid-like state.
Fluidised Bed Staged Gasification	This is where the fuel (waste) is 'fluidised' in oxygen and steam or air. This allows the ash to be removed dry, or as heavy agglomerates.
Fly ash	Thermal conversion by-product composed of fine particles
Gasification	Process which converts organic and carbon-containing materials into carbon monoxide, hydrogen and methane.
Geomorphology	The study of landforms, their processes, form and sediments at the surface of the Earth.
Glacial Till	Unsorted material deposited directly by glacial ice and showing no stratification.
Habitat Suitability Index	The first step in evaluating whether a waterbody would be able to support great crested newts. Numerical Index between 0 and 1.0 recorded for each habitat variable. The HIS is then calculated from the scores.
High Temperature Gasifying and Direct Melting System	System which gasifies and melts waste at a high temperature.
Hydromorphology	The physical characteristic of the shape, boundaries and content of a water body.
Industrial Emissions Directive	With relevance to the BAEF, the Directive sets the framework of control mechanisms to prevent or reduce possible negative effects on the environment caused by the gasification process.
Inorganic Contaminants	Elements or compounds which may be natural in the geology or from human activities. They are mineral based compounds such as metals, nitrates and asbestos.
Institute of Air Quality Management	Provides guidance on matters affecting air quality professionals and responding to Government consultations.
Institute of Lighting Professionals	UK and Ireland's largest professional lighting association.
Internal Drainage Boards	Public bodies that manage water levels in some areas where there is a special need for drainage.
Landscape and Visual Impact Assessment	Used to assess the effects of new developments on views and on the landscape.



Landscape Character Areas	Defined by a unique combination of landscape, biodiversity, geodiversity, history and cultural and economic activity.
Landscape Character Assessment	The process of identifying and describing variation in character of the landscape.
Lead Local Flood Authorities	Responsible for developing, maintaining and applying a strategy for local flood risk management in their areas and for maintaining a register of flood risk assets.
Lightweight Aggregate Plant	Plant for the manufacture of lightweight aggregate used to produce lightweight concrete products such as concrete block, structural concrete and pavement.
Lincolnshire Biological Records Centre	Collates wildlife and geological information in Greater Lincolnshire.
Local Nature Reserve	Places with wildlife or geological features that are of special interest locally.
Local Planning Authority	The local authority or council that is empowered by law to exercise statutory town planning functions for a particular area of the United Kingdom.
Local Wildlife Sites	Areas identifies and selected locally using robust, scientifically-determined criteria and detailed ecological surveys.
Made Ground	Man-made deposits such as embankments and spoil heaps on the natural ground surface
Marine Management Organisation	The Marine Management Organisation license, regulate and plan marine activities in the seas around England so that they're carried out in a sustainable way.
Mean High Water Spring	The highest level that spring tides reach on the average over a period of time.
Multi-Agency Geographic Information for the Countryside	Provides authoritative geographic information about the natural environment from across government. Such as, rural, urban, coastal and marine environments across Great Britain.
National Biodiversity Network	Captures wildlife data in a standard electronic form, and integrates data from different sources.
Nationally Significant Infrastructure Project	Large scale developments which require a type of consent known as a "consent order"
Natural England	Government adviser for the natural Environment in England, helps to protect England's nature and landscapes.
National Policy Statement	Produced by the Government, they give reasons for the policy set out the statement and must include an explanation of how the policy takes account of Government policy relating to the mitigation of, and adaption to, climate change.



National Nature Reserve	Designated by Natural England as key places for wildlife and natural features in England.
Ordnance Survey	National mapping agency in the United Kingdom which covers the island of Great Britain.
Per- and poly-fluorinated alkyl substances	A class of manufactured chemicals that has been used since the 1950s to make products that resist heat, stains, grease and water.
Petroleum Hydrocarbons	A broad range of chemicals that comprise oil and products refined from oil, such as gasoline and diesel.
Phenols	Class of chemical compounds consisting of a hydroxyl (-OH) group, bonded directly to an aromatic hydrocarbon group.
Planning Practice Guidance	Sets out government's planning policies for England and how these are expected to be applied.
Polychlorinated Biphenyls	Organic Chlorine Compound which do not readily breakdown in the environment.
Polycyclic Aromatic Hydrocarbons	Hydrocarbon-organic compounds containing only carbon and hydrogen, often produced by incomplete combustion of organic matter (e.g. in engines and incinerators)
Potential Contaminant of Concern	A contaminant which may or may not be causing risk or adverse effects to human health or the environment.
Preliminary Environmental Information Report	A consultation document, aimed at the local community. Includes information on EIA methodology, environmental baseline, impacts and mitigation.
Preliminary Risk Assessment	Identifies potentially unacceptable risks to human health of the environment posed by the proposed scheme and the immediate surroundings.
Public Right of Way	A path that anyone has legal right to use on foot, and sometimes other modes of transport.
Pulverised fuel Ash	A by-product of pulverised fuel fired power stations.
Radon	Radon is a chemical element which is radioactive, colourless, odourless and tasteless.
Ramsar	The convention on wetlands, the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
Refuse Derived Fuel	The fuel produced from various types of waste, such as paper, plastics and wood from the municipal or commercial waste stream.



Renewable Obligation	Places an obligation on UK electricity suppliers to source an increasing proportion of electricity they supply from renewable sources.
Schedule 1 bird species	Protected birds which require a licence to carry out works with the potential to disturb them.
Scour	The removal of granular bed material in the vicinity of coastal structures (erosion)
Sites of Special Scientific Interest	Areas of land and water that are protected by law to conserve their wildlife or geology.
Slag	Solid by-product of the gasification process.
Solid Recovered Fuel	Fuel Produced by shredding and dehydrating solid waste, typically consisting of combustible components of municipal solid waste.
Sound Level Meters	Used for acoustic measurements.
Source Protection Zones	Source Protection Zones show the level of risk of contamination from activities, which have the potential to cause groundwater pollution and affect the water quality.
Special Area of Conservation	These areas are strictly protected sites under the EC Habitat's Directive and have been designated because of a possible threat to the special habitats or species which they contain.
Special Protection Areas	Strictly protected areas under the EC Bird's Directive, which are classified for rare and vulnerable birds and for regularly occurring migratory species.
Stratum (plural strata)	Layer of sedimentary rock or soil with internally consistent characteristics that distinguish it from other layers.
Statutory Instruments	Statutory Instruments are a form of legislation which allow the provisions of an Act of Parliament to be subsequently brought into force or altered without Parliament having to pass a new Act.
Substation	Equipment for reducing the voltage in electrical power transmission.
Superficial Deposits	The youngest geological deposits, formed during the most recent period of geological time which extends back about 2.6 million years from the present
Sustainable Drainage Systems	Drainage solutions that provide an alternative to the direct channelling of the surface water through networks of pipes and sewers to nearby watercourses.
Syngas	A mixture of gases, mainly comprised of hydrogen and carbon monoxide



Tidal Flat Deposits/ Alluvial deposits	Commonly silt and clay with sand and gravel layers; possible peat layers; from the tidal zone.
United Kingdom Hydrographic Office	Provide hydrographic and geospatial data for the Royal Navy and merchant shipping.
Volatile and Semi-Volatile Organic Compounds	Organic chemicals that have a high vapour pressure at ordinary room temperature, this results in a low boiling point which causes a large number of molecules to evaporate from the liquid or solid form of the compounds and enter the surrounding air.
Waste Framework Directive	Legislative framework for the collection, transport, recovery and disposal of waste.
Waste Hierarchy	The waste hierarchy ranks waste management options according to what is best for the environment.
Water Framework Directive	A European Union (EU) directive which commits EU member states to achieve good qualitative and quantitative status of all water bodies.
Wetland Bird Survey	Monitors non-breeding waterbirds in the UK.
World Health Organisation	Directs international health within the United Nations' system and to lead partners in global health responses.
Zone of Influence	The area over which features may be subject to significant effects as a result of the proposed project and associated activities.
Zone of Theoretical Visibility	The potential (or theoretical) visibility of an object in the landscape.

Glossary of Acronyms and Abbreviations

Abbreviation	Meaning
ACC	Air Cooled Condenser
ACT	Alternative Conversion Technology
ALC	Agricultural Land Classification
AQMAs	Air Quality Management Areas
AUP	Alternative Use Projects Ltd
BAP	Biodiversity Action Plan
BAT	Best Available Techniques
BBC	Boston Borough Council

BCT	Bat Conservation Trust
BGS	British Geological Survey
BTO	British Trust for Ornithology
CCS	Carbon Capture and Storage
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CfD	Contract for Difference
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CO2	Carbon Dioxide
CRTN	Calculation of Road Traffic Noise
cSAC	Candidate Special Areas of Conservation
CTMP	Construction Traffic Management Plan
CV	Calorific Value
DCO	Development Consent Order
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EA	Environment Agency
EfW	Energy from Waste
EIA	Environmental Impact Assessment
ELV	Emission Limit Values
EPC	Energy Performance Certificate
EPC Contractor	Engineering, Procurement, and Construction contractor
ES	Environmental Statement
FBSG	Fluidised Bed Staged Gasification
FEAD	European Federation of Waste Management and Environmental Services
FRA	Flood Risk Assessment
GEART	Guidelines for the Environmental Assessment of Road Traffic
GEP	Good Ecological Potential
GES	Good Ecological Status
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HIS	Habitat Suitability Index Assessment
IAQM	Institute of Air Quality Management

IED	Industrial Emissions Directive
IDB	Internal Drainage Board
ILE	Institute of Lighting Engineers
ILP	Institute of Lighting Professionals
LBRC	Lincolnshire Biological Records Centre
LCA	Landscape Character Area
LCCC	Low Carbon Contracts Company
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LPA	Local Planning Authority
LVIA	Landscape and Visual Impact Assessment
LWA	Lightweight Aggregate Plant
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
MHWS	Mean High Water Spring
MMO	Marine Management Organisation
NBN	National Biodiversity Network
NE	Natural England
NNR	National Nature Reserve
NPS	National Policy Statement
NRHE	National Record of the Historic Environment
NSIP	Nationally Significant Infrastructure Project
OS	Ordnance Survey
O&M	Operation and Maintenance
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated biphenyls
PCOC	Potential Contaminant of Concern
PCSM	Preliminary Conceptual Site Model
PEIR	Preliminary Environmental Information Report
PFA	Pulverised fuel ash
PFAS	Per- and poly-fluorinated alkyl substances
PM10	Fine Particulate Matter
PoB	Port of Boston



PPG	Planning Practice Guidance
PRA	Preliminary Risk Assessment
PRoW	Public Right of Way
pSPA	potential Special Protection Area
RDF	Refuse Derived Fuel
RO	Renewable Obligation
SAC	Special Areas of Conservation
SIs	Statutory Instruments
SLM	Sound Level Meter
SPA	Special Protection Areas
SPZ	Source Protection Zones
SRF	Solid Recovered Fuel
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SVOCs	Semi-Volatile Organic Compounds
UKHO	United Kingdom Hydrographic Office
VOCs	Volatile Organic Compounds
WHO	World Health Organisation
WID	Waste Incineration Directive
WFD	Water Framework Directive
WeBS	Wetland Bird Survey
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility



A1 Appendix – Baseline Noise Assessment

Note / Memo

HaskoningDHV UK Ltd.
Industry & Buildings

To: Alternative Use Projects Limited
From: Mark Smith
Date: 21 September 2017
Copy:
Our reference: I&BPB6934N001D0.1
Classification: Project related

Subject: Boston Gasification- Baseline Noise Survey

1 Introduction

In order to characterise the existing noise climate within the vicinity of the Boston Gasification scheme study area a baseline noise survey was undertaken at receptor locations in the vicinity of the site between 24th and 30th August 2017.

2 Survey Practice

Baseline survey measurements were conducted in accordance with current guidance, including BS4142:2014¹ Method for Rating and Assessing Industrial and Commercial Sound, and BS 7445:2003²³ Description and measurement of environmental noise.

Sound level meters (SLM) were fully calibrated, traceable to UKAS standards and satisfied the requirements of BS EN 61672-1:2013⁴ for a 'Class 1' Sound Level Meter (SLM).

For all measurement locations during the noise survey SLMs were set to record the following:

- L_{Aeq} – the equivalent continuous sound pressure level over the measurement period. This parameter was standardised as pertinent for land use within BS 7445;
- L_{Amax} – the maximum sound pressure level occurring within the defined measurement period;
- L_{A90} – the sound pressure level exceeded for 90% of the measurement period and is indicative of the background noise level;
- L_{A10} - the sound pressure level exceeded for 10% of the measurement period. The L_{A10} index is used within the Calculation of Road Traffic Noise (CRTN) as an appropriate descriptor of traffic noise.

¹ British Standards Institute (2014) BS 4142:2014 Methods for rating and assessing industrial and commercial sound. BSI, London.

² British Standards Institute (2003) BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures. BSI, London.

³ British Standards Institute (2003) BS 7445-2:2003 Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use. BSI, London.

⁴ British Standards Institution (2013). BS EN 61672-1:2013 Electroacoustics. Sound level meters. Specifications. BSI, London

A description of these terms is detailed within **Appendix A**.

The equivalent continuous sound pressure level (L_{Aeq}) is the conventional descriptor of environmental noise and is defined below:

$$L_{eq,T} = 10 \times \log \left[\frac{1}{T} \int \frac{\rho^2(t) \partial t}{\rho_0^2} \right] dB$$

Noise measurements are normally taken with an A-weighting (denoted by a subscript 'A') to approximate the frequency response of the human ear. An Appendix will provide further descriptions of these terms.

The noise measurements were conducted with the SLMs mounted on tripods at a height of between 1.2m and 1.5m above ground level and 3.5m away from any reflecting surface other than the ground, i.e. in free-field conditions. The instruments were calibrated before and after the survey using a portable calibrator. No significant deviation in the calibration level was observed.

The surveys were conducted during periods of weather favourable for noise measurements, i.e. no rainfall and wind speeds below 5m/s.

3 Measured Baseline Noise Data

Baseline noise measurements have been conducted at the nearest identified sensitive receptors and adjacent corresponding site boundary locations. These can be found in **Appendix B Figure 1** and **Table 3.1**, below.

Table 3.1 Baseline Noise Monitoring Locations

Usage	Street	Receptor ID	Boundary ID
Residential	Ivy House Slippery Gowt Lane	STR1	B1
Residential	Anacary Marsh Lane	STR2	B2
Residential	Beeston Farm Nursery Road	STR3	B3
Residential	Lodge/ Bank View Powell Street	STR4	n/a
Residential	No. 21 River Way	STR5	n/a

Long term monitoring was undertaken at receptor measurement positions STR1 – STR3 for 5 days between Friday 25th and Wednesday 30th of August.

At measurement positions STR3 and STR4 long term monitoring was conducted between 24th and 25th as no suitably secure location could be found to leave equipment for the full five day duration.

4 Data Analysis

Statistical analysis methods have been applied to the resulting data sets in order to assess the background noise levels (L_{A90}) which will form the basis for the operational assessment.

Analytics, including mode, average, average – 1 standard deviation and average + 1 standard deviation, have been applied to the data sets and the most consistent value chosen to represent a typical background noise level at residential receptors within the vicinity of the measurement position.

5 Measured Data Summary

5.1 Residential Receptors – L_{A90} Analysis

Table 5.1 Baseline Noise Data Analysis (STR1) to 5.6 contain a summary of the long term monitoring data at residential receptors and the derivation of the assessment values of L_{A90} . Data has been corroborated by Plate 0-1 to Plate 0-9 in **Appendix C**.

Table 5.1 Baseline Noise Data Analysis (STR1)

Period	L_{A90} Analysis (dB)					
	Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation	75 th Percentile	90 th Percentile
Day	≥36 <37	36.4	32.1	40.7	39.7	42.3
Night	≥31 <32	33.6	30.3	36.8	36.1	38.0

Table 5.2 Baseline Noise Data Analysis (STR2)

Period	L_{A90} Analysis (dB)					
	Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation	75 th Percentile	90 th Percentile
Day	≥38 <39	38.1	34.9	41.3	40.5	42.2
Night	≥38 <39	36.3	33.5	39.2	38.8	40.2

Table 5.3 Baseline data Analysis (STR3)

Period	L_{A90} Analysis (dB)					
	Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation	75 th Percentile	90 th Percentile

Day	≥39 <40	40.2	36.4	43.9	43.1	45.2
Night	≥42 <43	41.0	38.3	43.7	42.8	44.5

Table 5.4 Baseline Data Analysis (STR4)

Period	L _{A90} Analysis (dB)					
	Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation	75 th Percentile	90 th Percentile
Day	≥44 <45	44.8	43.2	46.5	45.5	47.2
Night	≥45 <46	45.9	44.6	47.3	46.6	47.7

Table 5.5 Baseline Data Analysis (STR5)

Period	L _{A90} Analysis (dB)					
	Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation	75 th Percentile	90 th Percentile
Day	≥47 <48	46.0	44.0	48.0	47.2	48.5
Night	≥46 <47	47.4	45.9	48.8	48.5	49.7

5.2 Boundary Measurements

Boundary measurements were conducted on an attended basis between the 24th and 25th August consisting of three L_{Aeq,15min} measurements at each location during the daytime, evening and night time periods. Table 5.6 details a summary of the baseline data obtained at the boundary measurement locations.

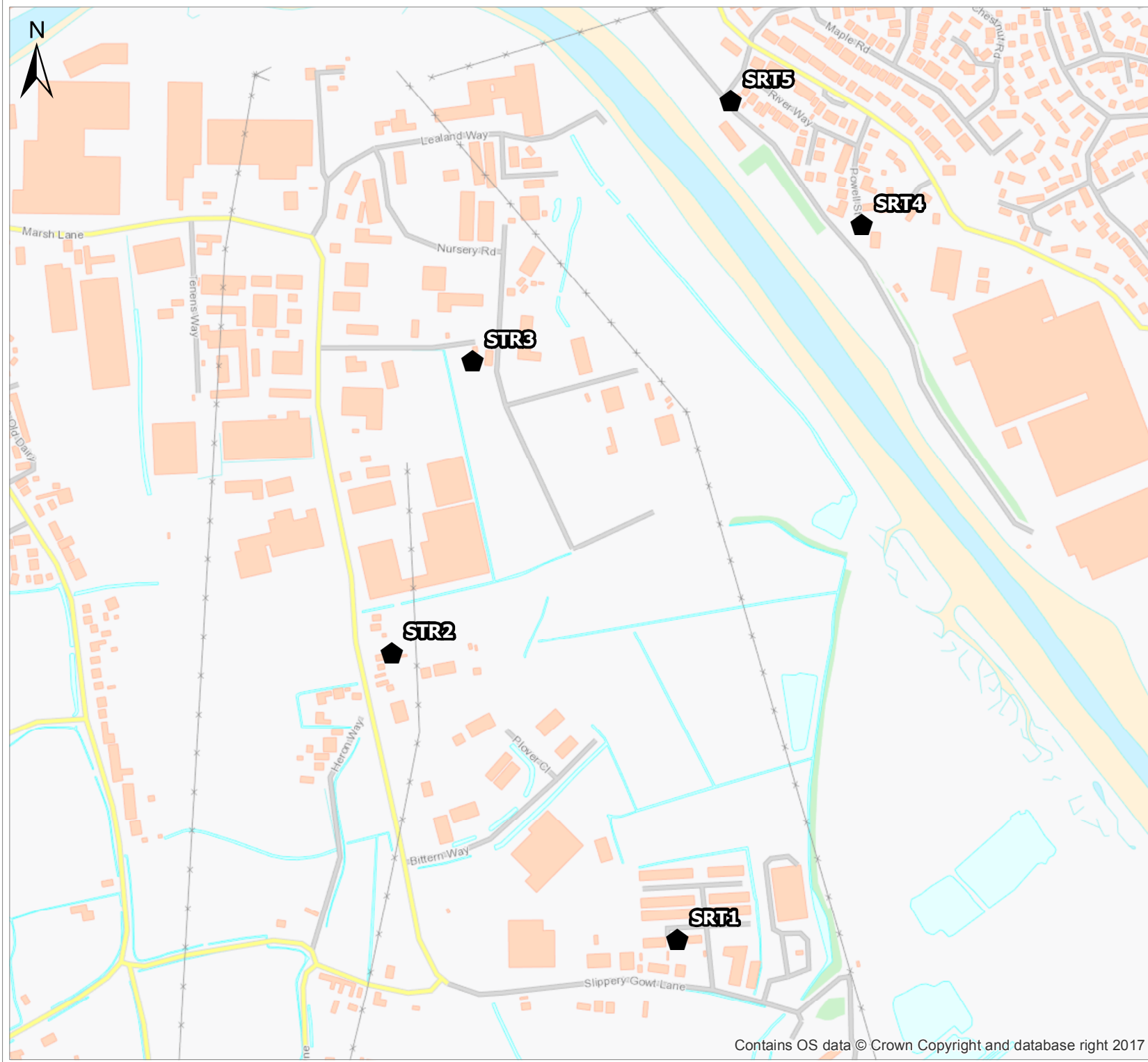
Table 5.6 Baseline Noise Data (Boundary Locations)

ID	Time Period	Date	Start Time	End Time	L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}
B1	Day	25/08/2017	11:49:09	12:04:19	44.8	61.6	45.8	42.7
	Evening	24/08/2017	20:12:06	20:27:06	40.8	51.5	41.5	39.7
	Night	24/08/2017	23:07:14	23:23:34	45.1	51.8	45.9	44.1
B2	Day	25/08/2017	11:24:50	11:39:50	47.4	55.6	48.4	45.9
	Evening	24/08/2017	20:47:01	21:02:21	37.7	51.8	38.4	36.2
	Night	24/08/2017	23:34:00	23:50:10	40.3	45.4	41.0	39.4
B3	Day	25/08/2017	11:02:21	11:18:01	44.4	60.4	44.7	42.2
	Evening	24/08/2017	21:17:29	21:34:09	48.0	51.7	48.4	47.6
	Night	24/08/2017	23:56:42	00:12:52	48.6	52.6	49.1	47.9

APPENDIX A

Term	Description
Decibel (dB)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μ Pa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.
dB(A)	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
$L_{Aeq,T}$	The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.
$L_{A10,T}$	The A weighted noise level exceeded for 10% of the specified measurement period (T). L_{A10} is the index generally adopted to assess traffic noise.
$L_{A90,T}$	The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014 it is used to define the 'background' noise level.
L_{Amax}	The maximum A-weighted sound pressure level recorded during a measurement.
L_{Amin}	The minimum A-weighted sound pressure level recorded during a measurement.
R_w	The weighted sound reduction index, R_w , is a single figure description of sound reduction index which is defined in BS EN ISO 717-1: 1997. The R_w is calculated from measurements in an acoustic laboratory to BS EN ISO 140-3:1997 and ratings to BS EN ISO 717-1:1997. Sound insulation ratings derived from site (which are invariably lower than the laboratory figures) are referred to as the R'_w ratings (apparent weighted sound reduction index) and measured to BS EN ISO 140-4:1998

APPENDIX B



Legend

- Noise Monitoring Location

Title
Baseline Noise Monitoring Location Plan

Project
PB6974 - Boston Gasification

Client
Alternative Use Projects Limited

Date
19/09/2017

Scale
1:7169

Figure
Figure 1

Drawn by
MS

Checked by
AB



APPENDIX C

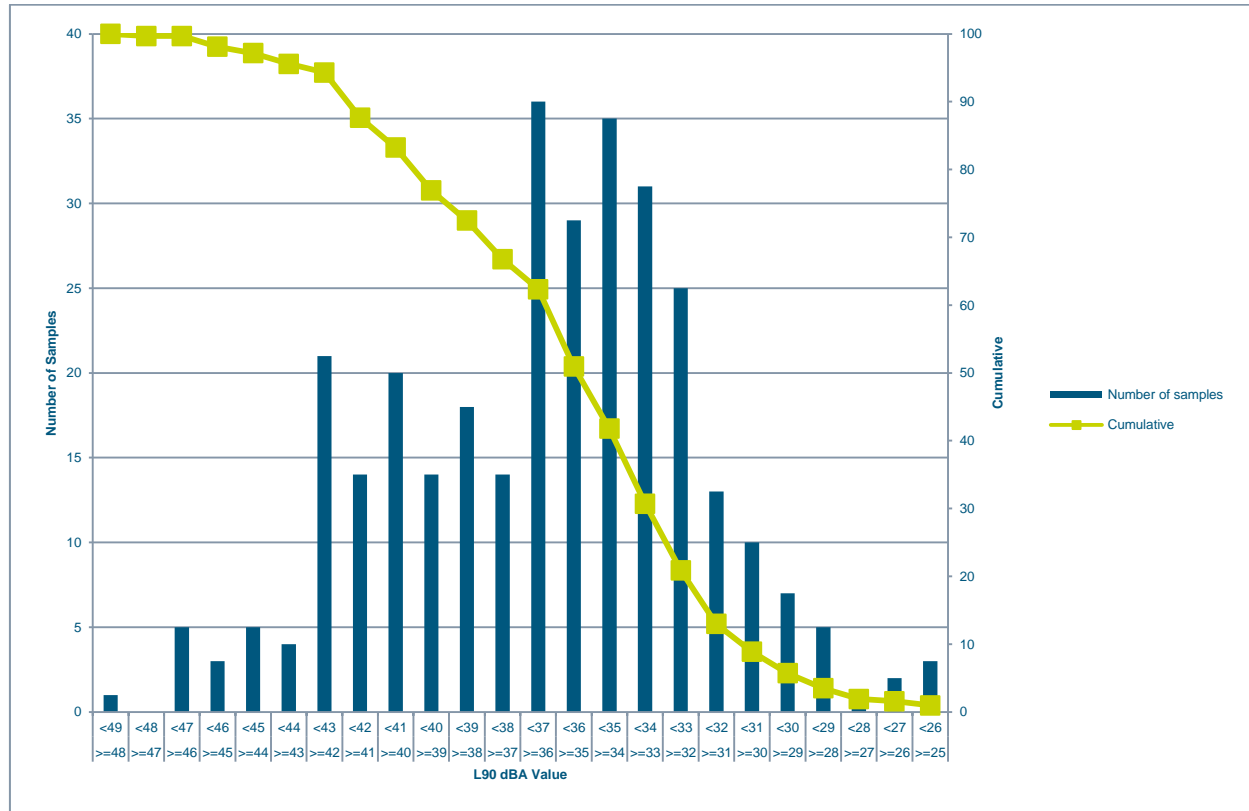


Plate 0-1 STR1 – Daytime L_{A90} Analysis

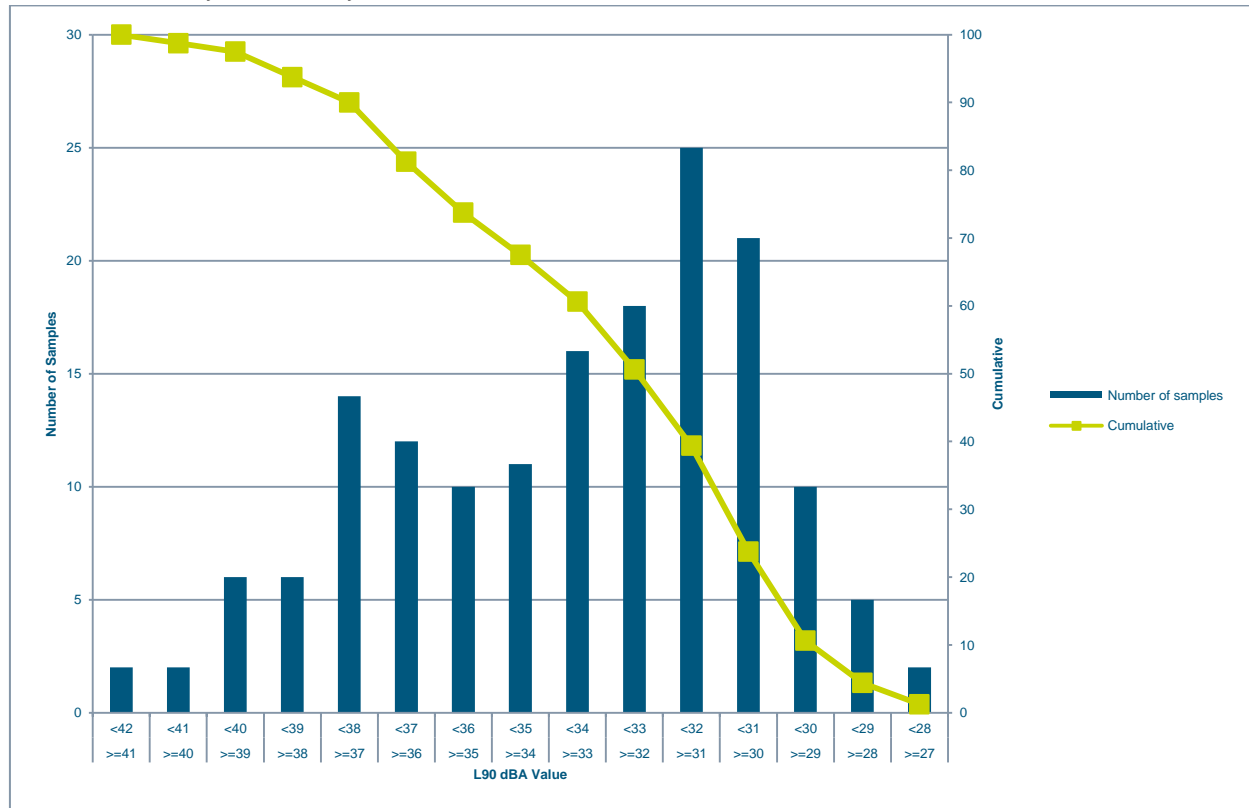


Plate 0-2 STR1 – Night Time L_{A90} Analysis

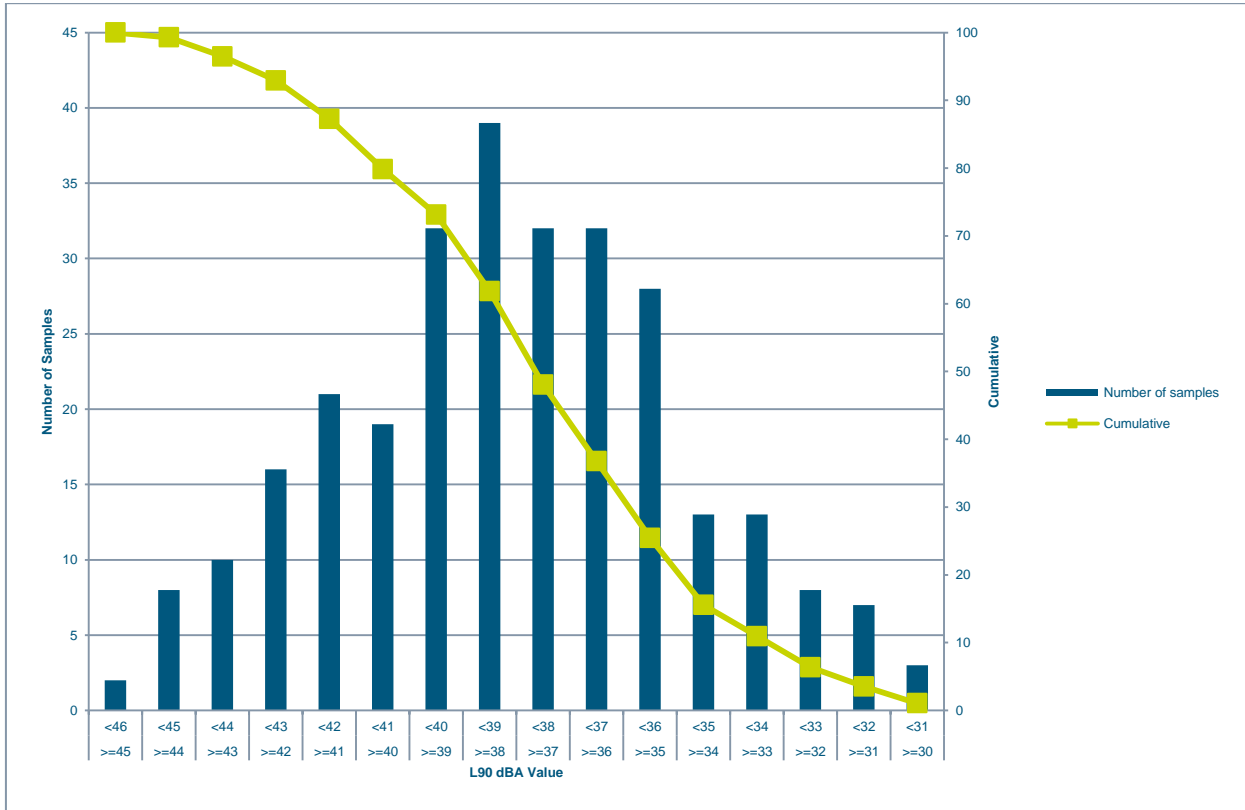


Plate 0-3 STR2 – Daytime L_{A90} Analysis

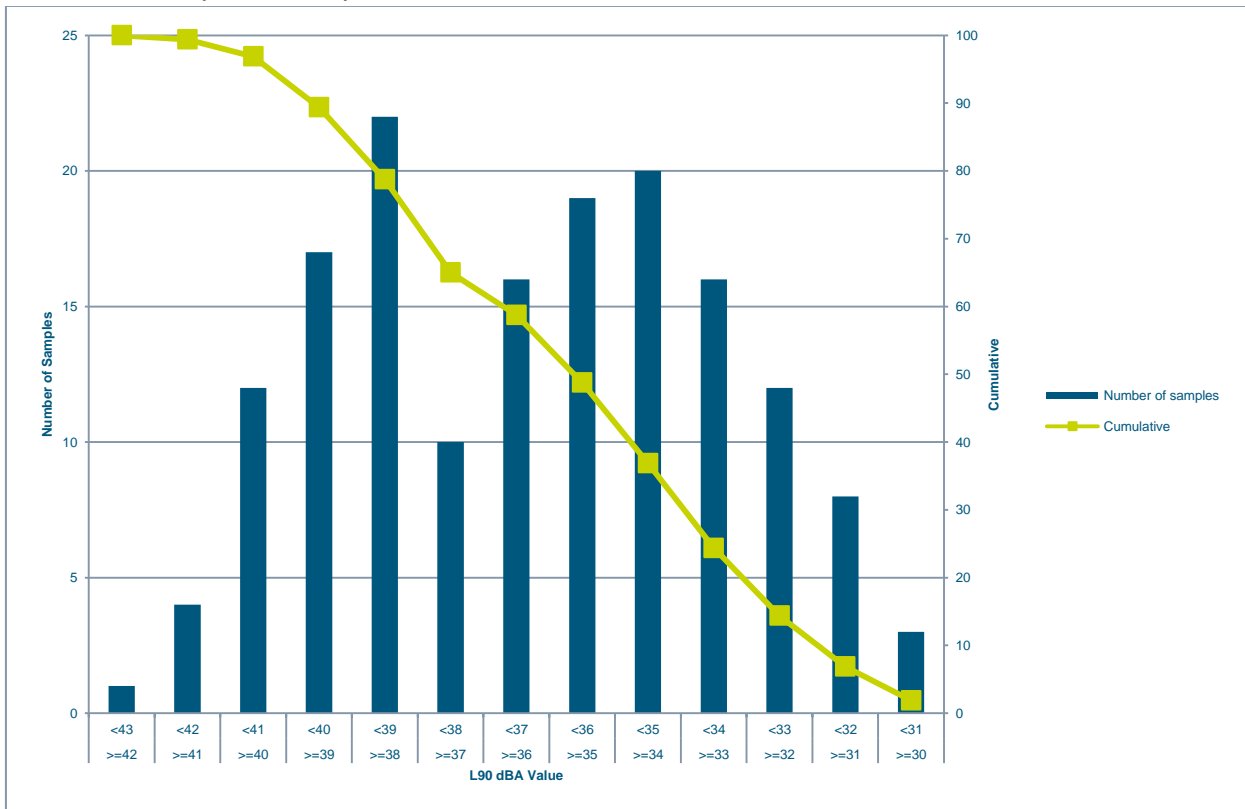


Plate 0-4 STR2 – Night Time L_{A90} Analysis

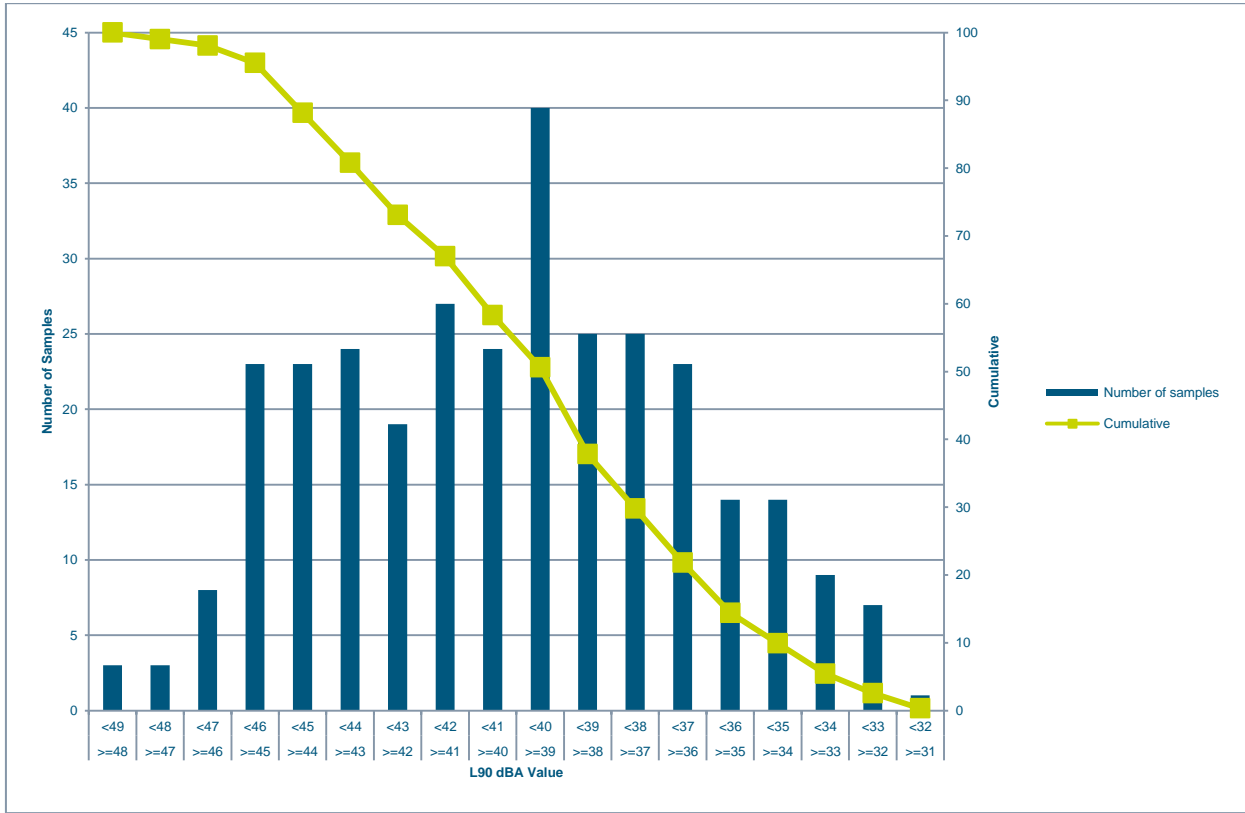


Plate 0-5 STR3 – Daytime L_{A90} Analysis

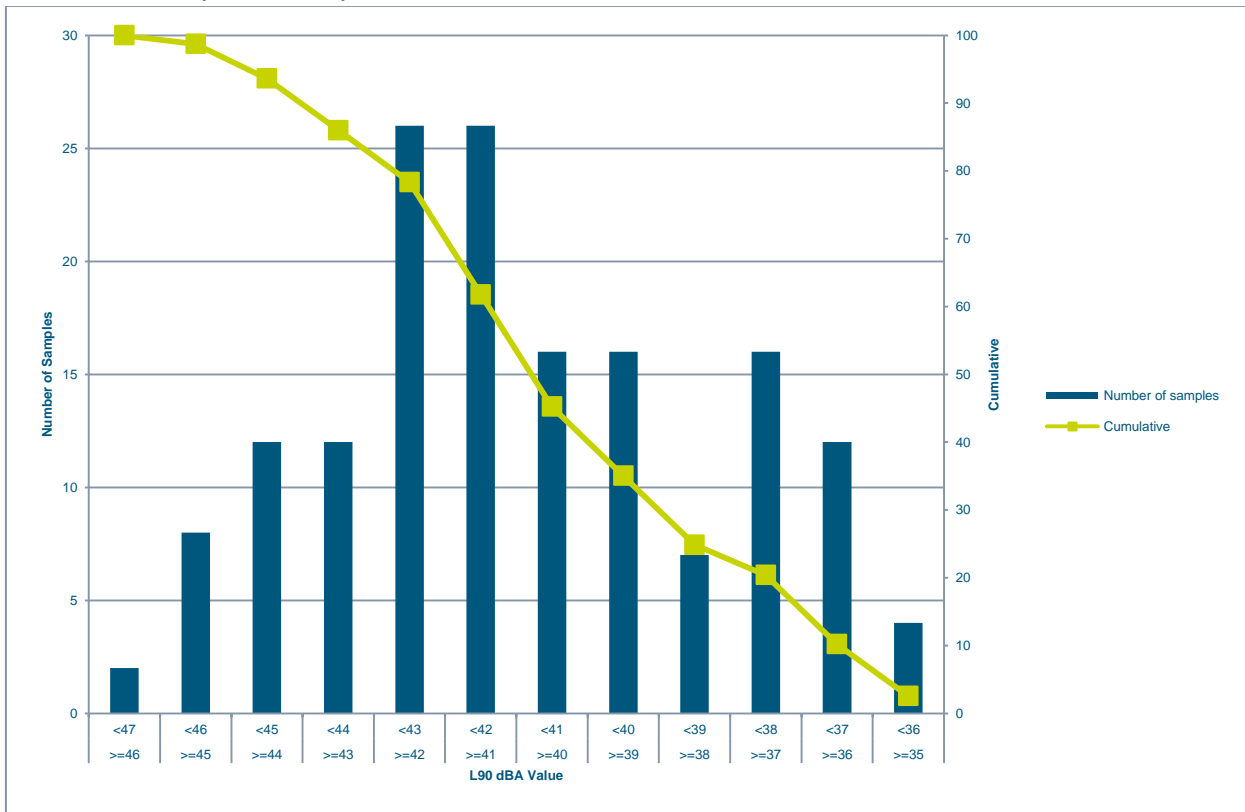


Plate 0-6 STR3 – Night Time L_{A90} Analysis

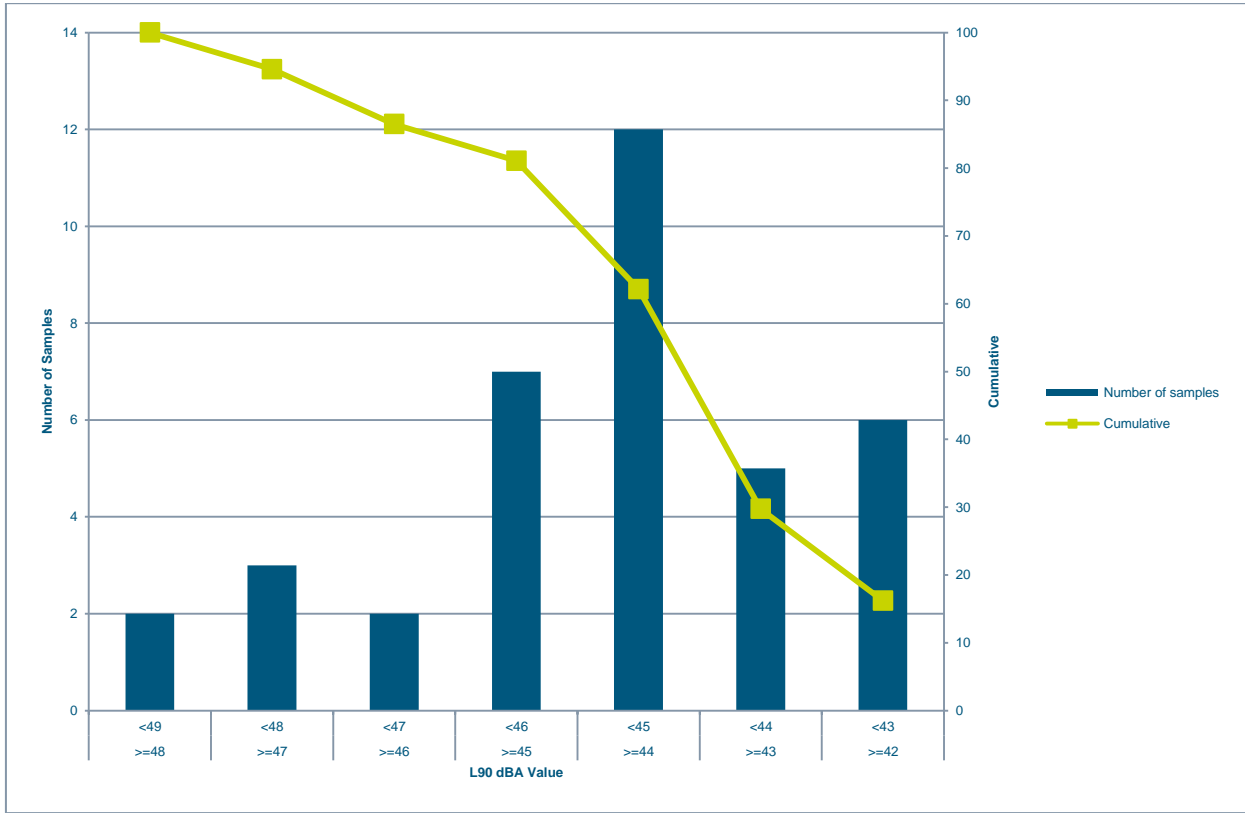


Plate 0-7 STR4 – Daytime L_{A90} Analysis

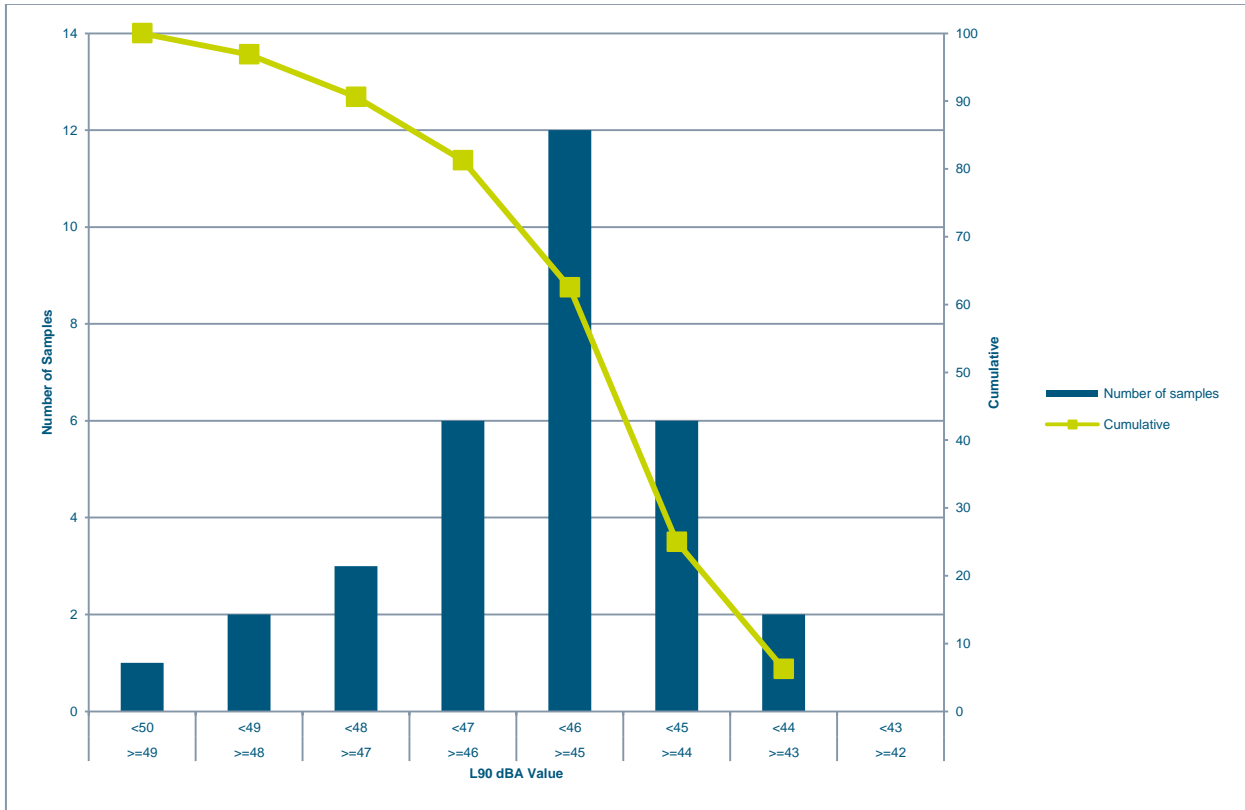


Plate 0-8 STR4 – Night Time L_{A90} Analysis

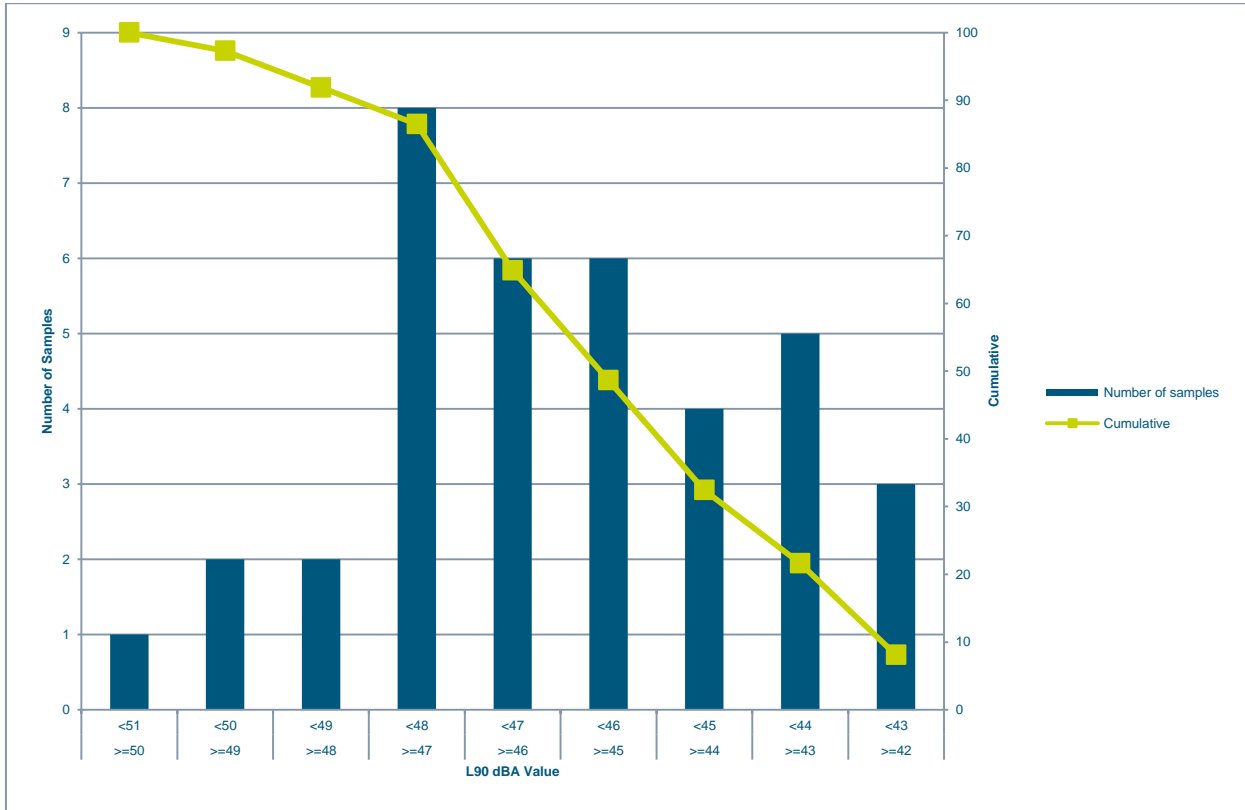


Plate 0-9 STR5 – Daytime L_{A90} Analysis

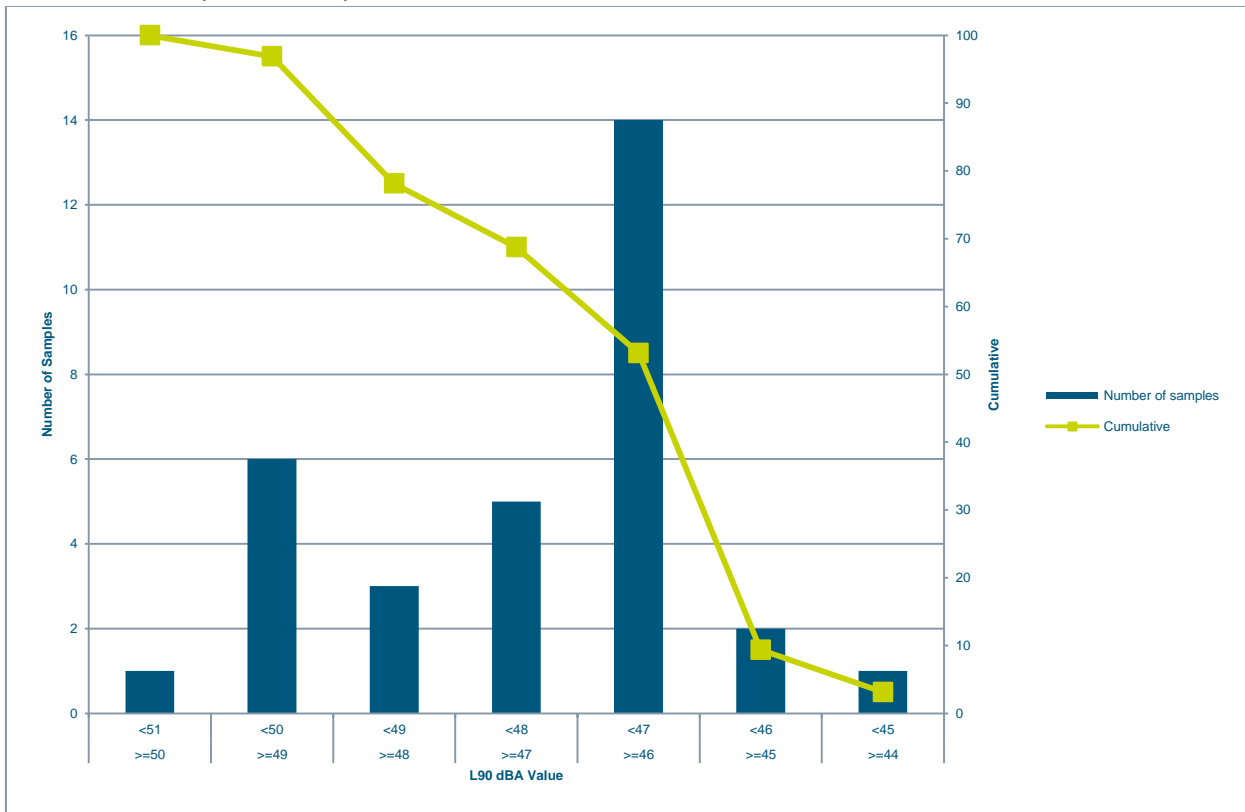


Plate 0-10 STR5 – Night Time L_{A90} Analysis



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A2 Appendix - Phase 1 Preliminary Risk Assessment

REPORT

Boston Gasification

Land Quality Phase 1 Preliminary Risk Assessment

Client: Alternative Use Projects Ltd

Reference: I&BPB6934-RH001R002D0.1

Revision: 0.1/Draft

Date: 27 October 2017

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Date: 27 October 2017
Project name: Boston Gasification Project
Project number: PB6934
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Date / initials: 29/08/17 DBP

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Date / initials: GB 27/10/2017

Classification



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Executive Summary

Royal HaskoningDHV has been commissioned by Alternative Use Boston Projects Ltd (AUP) to carry out a Phase 1 Land Quality Preliminary Risk Assessment (PRA) to support a DCO application for the Boston Gasification Project.

The key objectives of the desk study were to identify potential sources of contamination within or around the site that may represent an unacceptable risk to construction workers, site users and/or the environment. This will determine whether further investigation or assessment is needed to understand and mitigate the identified risks. A preliminary conceptual site model (CSM) has been therefore been developed to describe potential pollutant linkages and is summarised below.

Identified potential sources of contamination include the historic landfill site, recycling centre and other historic activities including a plastic factory. Identified potential sources of contamination associated with the off-site sources include former brick works. Potential contaminants of concern (PCOC) associated with these land uses could represent an unacceptable risk to sensitive receptors.

Potential contaminants of concern include:

- Metals and metal compounds;
- Petroleum hydrocarbons;
- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile and semi-volatile organic compounds (VOCs / SVOCs)
- Phenols
- Polychlorinated biphenyls (PCBs)
- Pulverised fuel ash (PFA)
- Inorganic contaminants (e.g. ammonia, arsenic, cyanides, sulphides, phosphates); and
- Asbestos

Potentially viable pathways are:

- direct exposure of site workers to on-site contaminated soils or groundwater (through dermal contact, ingestion or inhalation) during construction;
- exposure of future site users to on-site contaminated soils in landscaped areas of the proposed development (through dermal contact, ingestion or inhalation);
- gas generation and transport;
- leaching of any on-site contamination causing deterioration of shallow groundwater quality; and
- groundwater migration.

Further investigation and assessment is considered necessary to clarify the potentially unacceptable risks to human health and controlled waters. To clarify the risks associated with the potential pollutant linkages identified above, it is recommended that an intrusive ground investigation is undertaken at the site. This should include soil and soil leachate groundwater and gas.

1 Introduction

Royal HaskoningDHV has been commissioned by Alternative Use Boston Projects Ltd (AUP) to carry out a Phase 1 Land Quality Preliminary Risk Assessment (PRA) to support a DCO application for the Boston Gasification Project.

This report has been prepared by RHDHV for the sole benefit of AUP.

1.1 Proposed Development

- AUP is proposing the development of a gasification facility, which will include a 96MWe Power Station (80MWe exportable) using solid waste as a fuel source; and associated development. At this scale, the proposed development would constitute a Nationally Significant Infrastructure Project (NSIP). Therefore, AUP are pursuing a Development Consent Order (DCO) for the gasification facility and associated development which includes a lightweight aggregate manufacturing plant, a new wharf, and a waste checking and storage facility to support in the operational phase of the gasification process.

1.2 Key Objectives

The objectives of the PRA are to:

- identify (as far as reasonably possible) any potential sources of contamination within or around the site that may represent an unacceptable risk to construction workers, site users and/or the environment; and,
- conclude whether further investigation or assessment is needed to understand and mitigate the identified risks.

1.3 Methodology

The PRA has been completed in general accordance with the recommended approach in Contaminated Land Report 11, (*DEFRA and Environment Agency, 2004. Model Procedures for the Management of Contaminated Land, R & D Publication CLR11*).

The PRA is a desk-based study and forms the initial step in the assessment of potentially contaminated land. It proceeds, if required, intrusive investigation, risk assessment, options appraisal, remedial design, implementation planning and completion reporting.

The main purpose of the PRA is to identify whether there are potentially unacceptable risks to human health or the environment posed by the site and the immediate surroundings, which warrant further investigation.

The following desk-based information sources have been reviewed:

- Envirocheck Report comprising historical maps, environmental sensitivity data and permitting records for a search area of 1km around the site boundary (Order No.: 136439979_1_1)
- British Geological Survey (BGS) Onshore GeoIndex web portal
- Google Earth

A site walkover survey was also undertaken on the 16 August 2017 to verify current conditions at the site.

1.4 Report Format

The remainder of this report comprises the following principal sections:

- Section 2 – Site Setting and Land Use.
- Section 3 – Environmental Setting.
- Section 4 – Preliminary Conceptual Site Model and Qualitative Risk Assessment.
- Section 5 – Conclusions.
- Section 6 – References.

2 Site Setting and Land Use

2.1 Site Location and Description

The study site ('the site') is located in Boston, Lincolnshire to the west of the Haven and east of Nursery Road. The site is generally flat, low level land between 2 to 5 mAOD, except for the raised flood embankments on the banks of the Haven and small embankment (shown as old Roman embankment). The site was used as arable land in the past (evidence of ploughing still visible on the ground) but is currently not cultivated with crops. The site currently comprises mostly semi-improved grassland. The surrounding area is dominated by an industrial estate including car parks and storage buildings. The site can be accessed from Nursery Road to the north and Bittern Way to the south (further details regarding site access are provided in **Section 2.2**).

The site location is shown in **Appendix 2**.

2.2 Site Walkover Survey

A site inspection survey was carried out by Royal HaskoningDHV on 16 August 2017; the key findings are summarised below. The site is sub-divided into areas according to the proposed components of the DCO application. The land immediately surrounding the site is occupied by various industrial estate related operations including mixed use warehouses, as well as a recycling centre and depot. The site is undeveloped and appears to be semi-improved grassland. The boundary is generally not secure.

Boston 2 and 3 – Gasification and LWA facility

The site is not fenced off and can be accessed from Bittern Way to the south and Nursery Road to the north. There is an internal track which crosses the site and connects Bittern Way and Nursery Road. The site topography is flat. Both areas appear to comprise semi-improved grassland.

There are no buildings or other structures on site. There are open drainage channels crossing the site. The drains are densely vegetated (mostly by common reed). A new culvert is currently being installed along an existing track within Boston 2 by the local Council. An overhead electricity transmission line runs above the eastern boundary of the Boston 2 site.

No evidence of contamination (including fly tipping) or invasive species was noted on site.

Boston 4 – new wharf area

The perimeter of the area is fenced with landside access via a gate on Nursery Road; or on the riverside via a gate on Lealand Way. The site is generally flat with a high embankment with steep slopes to the eastern edge, which runs along the Haven. A barbed wire fence runs along the embankment's toe. There is a track which runs along the dry side of the embankment and connects to the track coming from the Nursery Road.

A wide deep drain runs parallel to the embankment on its western side. The water levels were very low at the time of the survey. A partially collapsed culvert outfall was noted on-site. It is anticipated that there is culvert which runs along the access track from Nursery Road and joins with the channel along the embankment. Several manholes were noted along the track.

A public footpath runs along the top of the embankment. A sign marking the position of an underground water main was noted during the survey on the waters-edge of the embankment.

No evidence of fly tipping or other contamination were noted on this area; and no invasive species were noted on site. However, the site is adjacent to an active recycling centre and a fenced of area where old agricultural plant and different types of wastes (timber, concrete slabs and soil) are stored.

Boston 5 – proposed waste reception area

The site is separated from the proposed Boston 4 area by a dense hedge and can be accessed by track from Boston 4 only. The area is surrounded by an embankment from the west, south and east. The site comprises mostly bare ground with ruderal vegetation along the site edges.

The site is currently used for storing sands and gravels and some construction type waste (mostly reinforced concrete). A metal container was noted on site. No invasive species were noted on site.

Site photographs are provided in the site inspection record (**Appendix 3**).

2.3 Historical Land Use

Potentially contaminative historical land use information is summarised for the site in **Table 2.1** and for the surrounding area (within 1km), in **Table 2.2**. The information was determined from historical Ordnance Survey maps contained within the Envirocheck Report (Ref. 1) presented in **Appendix 4**.

Table 2.1: Historical Land Use: On-site.

Map Dates	On-site Features
1888	Throughout this period the site remains undeveloped, possibly forming part of an agricultural holding associated with Battery Farm. A drainage channel appears to pass through the site. There are saltings shown on the map along the river bank and in Boston 5 area. An embankment marked as Roman Bank runs through the site.
1906	No significant change
1938	No significant change
1951	No significant change
1956	No significant change
1967 - 1984	No significant change
1967 - 1984	No significant change
1973-1974	No significant change
1985	No significant change
2000	Electricity overhead cable running along the site boundary

Table 2.2: Historical Land Use: Off-site

Map Dates	Off-site Features	Distance	Direction
1888	Pump	250m	South-west
	Boston docks and dock railway	500m	North-west
	Iron works	250m	North
	Boston Union Works	500m	North
1906	Riffle Range	250m	South-east
	Iron works shown as disused	250m	North
	Saw Mill	500m	North
1938	Wood Mills	500m	North-east
	Hydraulic Engine House	750m	North-west
	Timber slip	500m	East
1950 - 1951	No significant change		
1956	No significant change		
1967 - 1984	Warehouses (no further detail presented)	100m	West
1968 - 1971	Plastic factory	200m	West
	Concrete works and box factory	500m	West
1973-1974	Poultry houses	250m	West

Map Dates	Off-site Features	Distance	Direction
	Timber Yard	250m	West
	Timber Yard	250m	East
	Works and Depot	500m	East
	Hydraulic Engine House and timber slip no longer shown on the map replaced by a large timber yard	750m	North-west
	Wood Mill no longer shown on the map	500m	North-east
1985	Factory (no further detail presented)	0m	West
	Depot	100m	West
	Warehouses, works (no further detail presented), abattoir and factories	250- 1000m	West
	Works (no further detail presented)	250m	North
1993	Tanks	150m	West
2000	Riverside industrial estate	50-1000m	West
	Factory (no further detail presented)	500m	East
	Substation	500m	North
	Depot	250m	South
	Abattoir	50m	West
	Timber yard no longer shown on the map	750m	North-west

2.4 Regulatory Information

Regulatory information relating to potentially contaminative activities near the site has been summarised in **Table 2.3**. Further details are provided in the Envirocheck Report (Ref. 1) enclosed in **Appendix 4**.

Table 2.3: Regulatory Information.

Environmental Records	On-site	0-250m	Description
Discharge Consents	0	9	<p>No discharge consents on site. Nine licensed discharge consents are recorded within 250m including: sewage discharges (final/treated effluent, storm overflow/storm tank), storm sewage overflow, trade discharges, discharge of other matter- and freshwater stream/river discharges.</p> <p>Between 250m and 1km licensed discharge consents are recorded at 22 separate locations including: sewage discharges (final/treated effluent, storm overflow/storm tank), storm sewage overflow, trade discharges, discharges of other matter, miscellaneous discharges and freshwater stream/river discharges.</p>
Pollution Incidents to controlled waters	0	7	<p>One significant incident and six minor incidents within 250m of the site, involving vegetable washings, oils – diesel, crude sewage and chemicals – solvents, all into surface waters (drains or directly into the Haven).</p> <p>Four significant incidents and 23 minor incidents were recorded between 250m and 1km of the site. The incidents involved oils, organic wastes and crude sewage, all into surface water (drains or directly into the Haven or its tributaries).</p>
Substantiated Pollution Incidents	0	1	<p>One significant incident to land and water 65m to the north. Pollutants included contaminated water: firefighting run-off. This incident is likely to be up hydraulic gradient of the site.</p> <p>Four significant incidents occurred between 250m and 1km of the site, involving asbestos waste, gas and fuel oils and vegetable washings.</p>
Registered landfill, historic landfill or other waste disposal sites	0	5	<p>Two historic landfills located immediately adjacent to the Boston 5 area. Both registered as Boston Landfill Site operated by Lincwaste Limited. The landfill sites overlap. Deposited waste included:</p> <ul style="list-style-type: none"> - Site 1 inert industrial, commercial, household and special waste, and liquid sludge. - Site 2 special waste. <p>One historic landfill site within 250m of the site (located to the east). Deposited waste included: commercial and household waste, and liquid sludge.</p> <p>Two historic landfill site:</p> <ul style="list-style-type: none"> - At 343m of the site. Deposited waste included inert waste. - At 852m west of the site. Deposited waste included inert waste. <p>These sites are likely to be up hydraulic gradient of the site.</p> <p>Two registered landfill sites within 250m of the site (located to the east). Authorised Waste include:</p> <ul style="list-style-type: none"> - animal processing wastes, bentonite drilling mud, bonded asbestos, empty used containers, fibrous asbestos, food processing wastes/starch, industrial effluent treatment sludge, interceptor pit wastes. - Category A inert waste - solid, or granular material which either does not decompose or decomposes only very slowly and is virtually insoluble in water. - Category B semi inert waste - solid, or granular or broken materials which either may decompose slowly, or are only slightly soluble in water.

Environmental Records	On-site	0-250m	Description
			<ul style="list-style-type: none"> - Category C putrescible waste - materials which may decompose and may consist in part of soluble matter which could cause pollution if allowed to enter ground or surface water systems. <p>Two registered landfill sites between 250m and 1km of the site:</p> <ul style="list-style-type: none"> - At 387m to the east. Authorised Waste include Category A inert waste. - At 933m to the west. Authorised Waste include Category A inert waste.
Licensed waste management facilities (transfer, treatment and disposal sites)	0	3	<p>Three Licensed Waste Management Facilities within 250m of the site:</p> <ul style="list-style-type: none"> - at 68m to the north of the site (Vehicle Depollution Facility). - at 96m to the north-west of the site. Authorised waste include Household, Commercial and Industrial (HCI) waste and asbestos. - at 234m (household, commercial and industrial transfer stations). <p>Nine Licensed Waste Management Facilities between 250m and 1km located to the west, south and southeast of the site, including HCI waste transfer stations, metal recycling site, physical treatment facility and co-disposal landfills sites.</p>
Integrated Pollution Prevention and Control authorisations	0	2	<p>Two within 250m associated with:</p> <ul style="list-style-type: none"> - incineration of non-hazardous waste (likely to be downgradient of Boston 2 and 3). - waste landfilling (likely to be located up gradient of Boston 2 and 3). <p>Within 1km there are six authorisations located to the south and south east of the site, all associated with waste landfilling.</p>
Local Authority Pollution Prevention and Control authorisations	0	7	<p>Within 250m there are 7 authorisations including:</p> <ul style="list-style-type: none"> - blending, packing, loading and use of bulk cement at 166m southwest (in operation). - processes for the manufacture of particleboard and fibreboard at 229m northeast, 232m northeast and 235m northeast, Three different operators but located under the same address (two authorisations revoked, one in operation) - manufacture of timber and wood-based products at 232m northeast and 235m northeast, two different operators under the same address (one authorisation in operation) - combustion of fuel manufactured from/or comprised of solid waste in appliances between 0.4-3MW thermal input at 235m NE (authorisation in operation) <p>There are 12 authorisations between 250m and 1km north, northeast and northwest of the site, including authorisations for blending, packing, loading and use of bulk cement, wood combustion processes, treatment and processing of animal or vegetable matter, paper coating and textile, and fabric coating of finishing processes.</p>
Hazardous substances consents and handling notifications	0	0	<p>Two consents for explosive site at 810m northwest and 745m southwest for ammonium nitrate and ammonium nitrate compounds (where nitrogen content is more than 28% by weight) or aqueous ammonium nitrate solutions (where concentration of ammonium nitrate is more than 90% by weight).</p>
Prosecutions relating to Authorised Processes	0	1	<p>One associated with failure to comply with packaging waste regulations at 149m west.</p> <p>Three between 250m and 1km northwest of the site, associated with knowingly keeping transferring and disposing of controlled waste on land not in accordance with a waste management licence and failure to comply with packaging waste regulations.</p>

Environmental Records	On-site	0-250m	Description
Prosecutions Incidents to Controlled Waters	0	0	None present within 1km.
Licensed radioactive substances	0	0	None present within 1km.
Fuel sites	0	0	One closed petrol station is present at 943m east.
Contemporary Trade Directory records (active and former)	0	75	<p>Within 250m of the site there are 75 entries including (mostly located north and north west of the site):</p> <ul style="list-style-type: none"> - Bus & Coach Operators & Stations - Meat – Wholesale - Electric Motor Sales & Service - Domestic Appliances - Servicing, Repairs & Parts - Distribution Services - Abrasive Products - Manufacturers & Distributors - Printing Equipment Manufacturers - Pallets, Crates & Packing Cases - Garage Services - Printers - Wood Recycling - Scrap Metal Merchants - Waste Disposal Services <p>- Car Dealers</p> <p>Between 250m and 500m there are 23 records. Between 500m and 1km there are 44 records.</p> <p>See Appendix 4 for further details.</p>

3 Environmental Setting

3.1 Geological Conditions

Information on geological conditions at the site has been collated from the British Geological Survey (BGS) datasets including 1:50,000 scale geological mapping, historical borehole records and Envirocheck data provided in **Appendix 4**. The anticipated geological sequence is outlined in **Table 3.1** below.

Table 3.1: *Geology.*

Stratum	Unit	Description
Superficial Deposits	Tidal Flat Deposits	Normally a consolidated soft silty clay, with layers of sand, gravel and peat.
Bedrock	Amphill Clay Formation	Mudstone, mainly smooth or slightly silty, pale to medium grey with argillaceous limestone (cementstone) nodules; some rhythmic alternations of dark grey mudstone in the lower part; topmost beds are typically pale grey marls with cementstone.

A ground investigation was undertaken at the Boston 1 site in 2012 to the east of the Boston 2 site. (Geotechnical Engineers & Report, 2012). At each of the borehole locations, the underlying natural strata was represented by a sequence of Tidal Flat or Alluvial deposits (clay, silt and sand) underlain by Glacial Till. The Glacial Till comprised firm to stiff, greenish brown, mottled lightly grey, silty, slightly sandy clay containing chalk and flint. This rested on a band of wet medium dense greenish brown and yellowish silty sand with coarse gravels. The band was underlain by boulder clay. Occasionally, lenses of sand were encountered and also hard stony layers (**Table 3.2**).

Table 3.2: *Boston 1 Ground Investigation borehole logs (Geotechnical Engineers & Report, 2012).*

Borehole	Depth [m bgl]	Description
BH 1	0-0.35	Topsoil / disturb ground
	0.35-5.6-	Tidal Flat Deposits / Alluvium
	5.6-14.95	Glacial Till / Boulder Clay
BH2	0-0.3	Topsoil
	0.3-5.8	Tidal Flat Deposits / Alluvium
	5.8-15	Glacial Till / Boulder Clay
BH 3	0-0.23	Topsoil
	0.23-7	Tidal Flat Deposits / Alluvium
	7-14.95	Glacial Till / Boulder Clay
BH 4	0-0.3	Topsoil
	0.3-6	Tidal Flat Deposits / Alluvium
	6-14.95	Glacial Till / Boulder Clay

3.1.1 Mining and Mineral Extraction

The site is in an area that is considered not to be affected by coal mining activity.

There are no BGS recorded mineral sites within 1km of the site.

3.1.2 Radon Gas

The presence of radon gas is assessed in the UK according to the number of homes likely to be above the Action Level (200 Bq m⁻³). Under building regulations the requirement for protection measures (described in BRE, 2015) in the construction of new buildings, conversions or extensions is dependent on Radon Potential¹.

BGS data indicate that the site is located within a lower probability radon area (less than 1% of homes above the Action Level) therefore no protective measures are required.

3.2 Groundwater

3.2.1 Hydrogeology

The superficial and bedrock deposits underneath the site have been classified as Unproductive Strata (by the Environment Agency (Tidal Flat Deposits, Ampthill Clay Formation)).

Unproductive Strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Environment Agency groundwater vulnerability maps indicate the site is located within an area of low groundwater vulnerability. This indicates that surface soils may provide the some protection to groundwater from pollution and are likely to be characterised by low leaching soils and/or the presence of low permeability drift deposits.

Perched groundwater was encountered at Boston 1 within the alluvial deposits at depths around 3.5m bgl (Geotechnical Engineers & Report, 2012). Groundwater was also encountered at the base of alluvial sequence and within the upper weathered layers of the glacial deposits at the depths around 7m bgl. It is anticipated that the groundwater flow is likely to be from the west to the east (towards the Haven). The groundwater and surface watercourses on site is likely in hydraulic continuity.

BGS flood risk information indicates that the site is not located within an area with potential for groundwater flooding.

3.2.2 Groundwater Abstractions

There are no licensed groundwater abstractions on site or within 1km of the site.

Note that the data search has not included identification of unlicensed water supplies abstracting less than 20 m³ of water per day.

3.2.3 Groundwater Source Protection Zones

Groundwater Source Protection Zones (SPZs) are defined around abstraction boreholes used for potable water supply, to delineate the area where release of a contaminant into the aquifer could impact on the abstraction². The site does not lie within a published SPZ and none are present within 1km.

¹ Public Health England, 2016 <http://www.ukradon.org/>

² The Inner Zone (Zone 1) is the most sensitive and certain potentially hazardous activities are restricted in this area. Outside this are the Outer Zone (Zone 2) and the Total Catchment (Zone 3), which indicates the recharge area that contributes to that water

3.3 Surface Water

3.3.1 Hydrology and Drainage

There are drainage channels located along the site boundaries and crossing the site. Most of the drains are culverted. The Haven is located to the east of the site and is a tidal river. The watercourse flows in a south easterly direction into the Wash approximately 7km to the southeast. The Haven is part of the River Witham transitional water body (GB530503000100). The water body was classified by the Environment Agency as being of 'bad' overall potential in 2015.

3.3.2 Surface Water Abstractions

There are no on-site licensed surface water abstractions. There are seven licensed surface water abstractions within 1.0 km of the site:

- Four at 313m to the south-west (water may be abstracted from a river or stream reach, or a single point used for amenity purposes).
- One at 323m to the east (water may be abstracted from a stream).
- One at 507m to the south-west (water may be abstracted from a stream).
- One at 655m to the north-west (water may be abstracted from the river and used for general washing/process washing).

Note that the data search has not included identification of unlicensed water supplies abstracting less than 20 m³ of water per day.

3.4 Sensitive Land Use

Havenside Local Nature Reserve is located 99m north-east of the site.

supply. The Environment Agency has published SPZs for public water supplies and other significant sources. For potable abstractions without published SPZs there is a default Inner Zone of 50 m radius and, (for sources providing more than 2,000m³) an Outer Zone of 250 m radius.

4 Preliminary Conceptual Site Model and Qualitative Risk Assessment

Current guidance recommends that a preliminary Conceptual Site Model (PCSM) is formulated based on the information available and updated as more data is acquired. The PCSM is limited to the identification and assessment of potential sources, potential receptors, and the anticipated pathways to those receptors identified from documentary research.

For contamination within soil or water to pose a risk, a viable pollutant linkage must be established. A pollutant linkage consists of three parts:

- A source of contamination in or on the land;
- A pathway by which the contaminant can cause harm (or which presents a significant possibility of such harm being caused); and
- A receptor which is sensitive to impact from the contamination.

Where all three of these are present, a pollutant linkage exists.

4.1 Potential Sources

Potential on-site sources of contamination are identified in **Table 4.1**.

Table 4.1 Potential On-site Sources of Ground Contamination

Potential Source	Potential Associated Contaminants
Sand and gravels as well as construction wastes are being stored in the Boston 5 area.	Unknown potential contaminants of concern (PCOC) might be associated with the waste materials stored at the site.
Embankments	Unknown infill material might have been used to construct the embankments. PCOCs might contaminants such as asbestos, metals, their compounds, oils, and fuels and many others.

Several current and historical activities undertaken within 1km of the site may have released contaminants into the ground, which have subsequently migrated to the site in groundwater. These are identified in **Table 4.2**.

Table 4.2 Potential Off-site Sources of Ground Contamination

Potential Source	Potential Associated Contaminants
Boston Recycling Centre	One significant substantiated pollution incident occurred at the site in 2010. The pollutants include contaminated water (firefighting run-off). PCOC associated with this site could include heavy metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile and semi-volatile organic compounds (VOCs and SVOCs), phenols, cyanides, ammonium, chlorides and sulphates, as well as Per- and poly-fluorinated alkyl substances (PFAS) associated firefighting foams.
Landfill sites and transfer stations	Landfill sites have potential to be associated with various contaminants including asbestos, heavy metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile and semi-volatile organic compounds (VOCs and SVOCs), phenols, cyanides, ammonium, chlorides and sulphates.
Former Timber yard sites	Timber yard activities may be associated with contaminants such heavy metals, inorganic elements and compounds like chlorates and sulphates and PAHs.
Former Slaughterhouse	The activities at sites might be associated with very wide range of contaminants including solvents (kerosene are the usual solvents (isopropanol, ethyl acetate, xylene, toluene and

	chlorinated solvents), acids, particularly hydrochloric or sulphuric, and alkalis as well as hydrocarbons and heavy metals.
Former Concrete works	The activities at sites might be associated with very wide range of contaminants including inorganic compounds, pulverised fuel ash (PFA), bitumen, kerosene and other organic compounds.
Former Plastic Factory	The activities at sites might be associated with very wide range of contaminants including metals, metalloids and their compounds, inorganic ions (phosphates and borates), organic solvents and compounds.
Industrial Estate and Industrial Premises including Boston Union Works and Hydraulic engine house	The Trade Directory entries and authorisation records indicate the presence of a range of activities including: <ul style="list-style-type: none"> - Engineering- potentially associated with contaminants such as fuel and lubricating oils, degreasing solvents and metals. - Bus depot - Depot may be associated with very wide range of contaminants including hydrocarbons and other organic compounds. - Garages - PCOC associated with these industries include hydrocarbons, VOCs (MTBE chlorinated hydrocarbons), SVOCs, heavy metals (zinc, copper and lead) and PAHs into the ground. - Tanks – PCOC include hydrocarbons. - Paper and Printing services - potentially associated with contaminants such as oils, solvents, metals and other inorganic compounds.
Boston docks and rail	Ship construction, maintenance and repair activities may have been source of contaminants such as heavy metals, hydrocarbons, phenols and pesticides. The railway activities may be potentially associated with contaminants such as asbestos, metals, metalloids and their compounds, acids, inorganic and organic chemicals.
Electricity substation	An electricity substation is shown on the maps south of the proposed works which may be associated with contaminants including Polychlorinated Biphenyls (PCBs).
Iron works	The PCOCs include heavy metals (arsenic, chromium, lead and tin), volatile hydrocarbons, PAHs, ammonia, cyanide and sulphates.

Potential contaminants of concern include:

- Metals and metal compounds;
- Petroleum hydrocarbons;
- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile and semi-volatile organic compounds (VOCs / SVOCs)
- Phenols
- Polychlorinated biphenyls (PCBs)
- pulverised fuel ash (PFA)
- Inorganic contaminants (e.g. ammonia, arsenic, cyanides, sulphides, phosphates); and
- Asbestos

4.2 Preliminary Conceptual Site Model and Qualitative Risk Assessment

The PCSM and Qualitative Risk Assessment are presented below in **Table 4.3**.

Table 4.3 Preliminary Conceptual Site Model and Qualitative Risk Assessment.

Source	Pathway	Receptor	Qualitative Assessment
Potential on-site sources of soil and groundwater contamination	Dermal contact, ingestion, inhalation	Construction workers Site users (staff and visitors / maintenance workers)	<p>The documentary research indicates that the site is undeveloped, however PCOC may be present at the site as result of the storage of construction wastes and material used to construct embankments. Such PCOC could represent an unacceptable risk to construction workers/ maintenance workers. Any construction/ maintenance undertaken on the site could result in the potential exposure of site operatives if contaminated soil is present. However, it is likely that short term risks associated with construction/ maintenance could be managed using personal protective equipment and appropriate working practices. Furthermore, it should be assumed that, asbestos might be encountered within the embankment infill material.</p> <p>The site end use will be commercial and it is anticipated that most of the site will be covered by hardstanding. However, there is a potentially unacceptable risk to future users of the site, who could be exposed to PCOC in landscaped areas or as result of the migration of volatile contaminants (if present) into buildings.</p> <p>Based on the information currently available we consider that feasible pollutant linkages may be present at the site and further targeted assessment is required to establish the presence and extent of PCOC. The results of any assessment would be used to update the qualitative assessment, feed into contractor's risk assessment for construction works, help to inform the potential for reusing excavated material and potential off-site disposal routes and provide information on baseline conditions for any site condition report which will be required as part of the permitting process.</p>
	Leaching and groundwater transport	Surface waters Groundwater resources	<p>The site is located adjacent to the Haven and drainage ditches and culverts are present in the site and along site boundaries. The documentary research indicates that the site is undeveloped, however PCOC may be present at the site as result of the storage of construction wastes and material used to construct embankments. Precipitation over time may have exacerbated the leaching of PCOC potentially resulting in impacts to surface water and groundwater. However, impacts to surface waters or groundwater are unlikely to be significant based on the following rationale:</p> <ul style="list-style-type: none"> • the embankments are likely to have been in place for many years and any ongoing leaching of PCOC is likely to be minimal • the on-site storage of construction wastes appears to be of small scale • the soil deposits are likely to be of low permeability thereby minimising the potential for horizontal and vertical migration • should contaminants impact the surface water the dilution potential is likely to be sufficient to minimise detrimental impacts on water quality • The Environment Agency data suggests that the site is underlain by unproductive strata • There are no groundwater abstractions for potable supply within 1km of the site • The site is not located within a groundwater source protection zone <p>It would be prudent to undertake some targeted ground investigation and sampling to confirm this qualitative assessment. The results of any assessment would be used to update the qualitative assessment, feed into contractor's risk assessment for construction works, help to inform the potential for reusing excavated material and potential off-site disposal routes and provide information on baseline conditions for any site condition report which will be required as part of the permitting process.</p>

Source	Pathway	Receptor	Qualitative Assessment
	Physical transport by surface runoff or due to erosion	Surface waters	During construction, there is a risk that runoff from exposed made ground or spoil heaps during construction could transport contaminated sediments or dissolved contaminants to surface waters via the on-site or highway drainage system, resulting in potentially unacceptable risks to controlled waters. However, it is likely that short term risks associated with construction would be managed using appropriate working practices in line with current best practice.
Potential off-site sources of groundwater contamination	Groundwater migration	Surface waters Groundwater resources Groundwater on-site	<p>Several current and historical potentially contaminative land uses have been identified on land surrounding the site. It is anticipated that the local groundwater flow is likely to be from the west to the east and that there is the potential for contaminated groundwater to migrate from adjacent sites located to the west and northwest of the proposed works including recycling centre and activities associated with the Riverside Industrial Estate. Migration in groundwater of potential contaminants from these sites could have impacted the quality of groundwater beneath the site, and could represent an unacceptable risk to construction/ maintenance workers and future site users.</p> <p>The superficial and bedrock deposits underneath the site have been classified as Unproductive Strata (by the Environment Agency (Tidal Flat Deposits, Ampthill Clay Formation) and groundwater vulnerability maps indicate the site is located within an area of low groundwater vulnerability. However, a ground investigation undertaken on the adjacent site encountered perched groundwater within the alluvial deposits. Groundwater was also encountered at the base of alluvial sequence and within the upper weathered layers of the glacial deposits. At this stage it is not known whether the perched groundwater encountered represent a continuous water body or localised discontinuous water bodies.</p> <p>It is likely that potential risks to construction/ maintenance workers can be managed via the use of personal protective equipment and appropriate working practices. Site users are unlikely to come into contact with surface/ groundwater, however volatile contaminants may represent a risk if present and are able to migrate and accumulate in confined spaces.</p> <p>It would be prudent to undertake some targeted ground investigation and sampling to confirm this qualitative assessment. The results of any assessment would be used to update the qualitative assessment, feed into contractors risk assessment for construction works, and provide information on baseline conditions for any site condition report which will be required as part of the permitting process.</p>
Ground gases and vapours	Gas generation and transport	Construction workers, Future site users	<p>There are two historic landfill sites immediately adjacent to the site. Landfill gas generated during decomposition of waste deposits have the potential to migrate via permeable deposits and accumulate in confined space and may represent a risk to human health. Whilst such risks can be mitigated against during construction and operation, given the close proximity of the sites it would be prudent to undertake some on site monitoring to establish if this potential pollutant linkage is active.</p> <p>It would, therefore be prudent to undertake some targeted ground investigation and monitoring to confirm this qualitative assessment. The results of any assessment would be used to update the qualitative assessment, feed into contractors risk assessment for construction works, and provide information on baseline conditions for any site condition report which will be required as part of the permitting process.</p>

4.3 Uncertainties in the Conceptual Site Model

Uncertainties in the conceptual model are associated with defining the source term and the respective pathways as summarised below:

- The presence, magnitude and extent of the PCOC needs to be established to determine risks to human health, controlled waters and property;
- The mobility of contaminants needs to be established to determine risks to controlled waters; and
- Characterisation of geological and hydrogeological regime at the site needs to be established to determine the potential for contaminant migration, including ground gas.

5 Conclusions/ Recommendations

The key objectives of the desk study were to identify potential sources of contamination within or around the site that may represent an unacceptable risk to construction/ maintenance workers, site users and/ or the environment and conclude whether the site is suitable for the proposed end use. A preliminary conceptual site model (PCSM) has, therefore been developed based on documentary research to aid in the identification of any potential pollutant linkages associated with the proposed redevelopment that may represent unacceptable risks.

The PRA has identified several plausible pollutant linkages that could represent an unacceptable risk to sensitive receptors. However, several uncertainties in the understanding of the PCSM have also been identified which warrant further assessment. Key receptors are likely to be construction/ maintenance workers, site operatives and controlled waters.

We consider it would therefore be prudent to undertake a targeted preliminary intrusive ground investigation and subsequent data assessment in line with current guidance to develop an initial understanding of the ground and groundwater conditions at the site and inform the potential risk to human health and controlled waters.

The intrusive investigation should comprise *inter alia* the drilling of boreholes across the site to facilitate the recovery of soil samples. Boreholes should be installed with combined groundwater and gas monitoring wells to facilitate the collection of groundwater samples and the monitoring of ground gases. Soil samples should be recovered from the key source areas and any other Made Ground/ reworked material encountered during the ground investigation. Soil and groundwater samples should be analysed for a range of potential contaminants of concern based on the documentary research presented in this PRA report. It would also be cost effective to combine the scope of the ground investigation with any geotechnical investigation that may be required to inform the proposed development.

On completion of the investigation and receipt of laboratory results, a generic quantitative risk assessment should be undertaken utilising the findings of the intrusive works and laboratory analysis, and the PCSM updated. The assessment should be undertaken in line with current guidance.

It would also be prudent, where possible, to engage with the Regulators at an early stage (pre-site investigation) to agree the scope of works and gain agreement to the proposed approach.

6 References

- 1 Landmark Information Group, 2017. Envirocheck Report, Order No.: 131403390_1_1.
- 2 British Geological Survey's (BGS) online geology viewer. Available at URL: <http://www.bgs.ac.uk/GeoIndex/wms.htm>. [Accessed 21/08/17]
- 3 British Standards Institute, 2011. Investigation of potentially contaminated sites - code of practice.
- 4 CL:AIRE, 2011. Definition of Waste: Development Industry Code of Practice v2.
- 5 Environment Agency Flood Risk Mapping Available at URL: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/> [Accessed 21/08/17]
- 6 Environment Agency Aquifer Classification, Source Protection zone and Groundwater Vulnerability Map. Available at URL: http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683&y=355134&scale=1&layerGroups=default&ep=map&extonly=off&lang=_e&topic=groundwater. [Accessed 21/08/17]
- 7 Building Research Establishment (BRE), 2015. BR 211 Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects).

Appendix 1

Limitations

Limitations

The direct assessments and judgements given in this report are limited by both the finite data on which they are based and the proposed works to which they are addressed. The acquisition of data is constrained by both physical and economic factors and, by definition, is subject to limitations. Conditions at the site will change over time due to natural variations and may be affected by human activities.

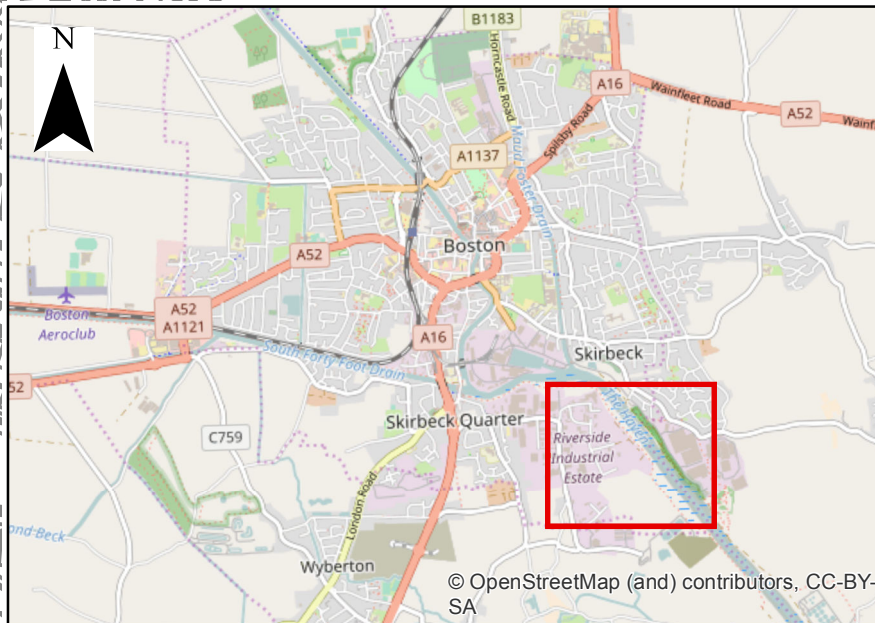
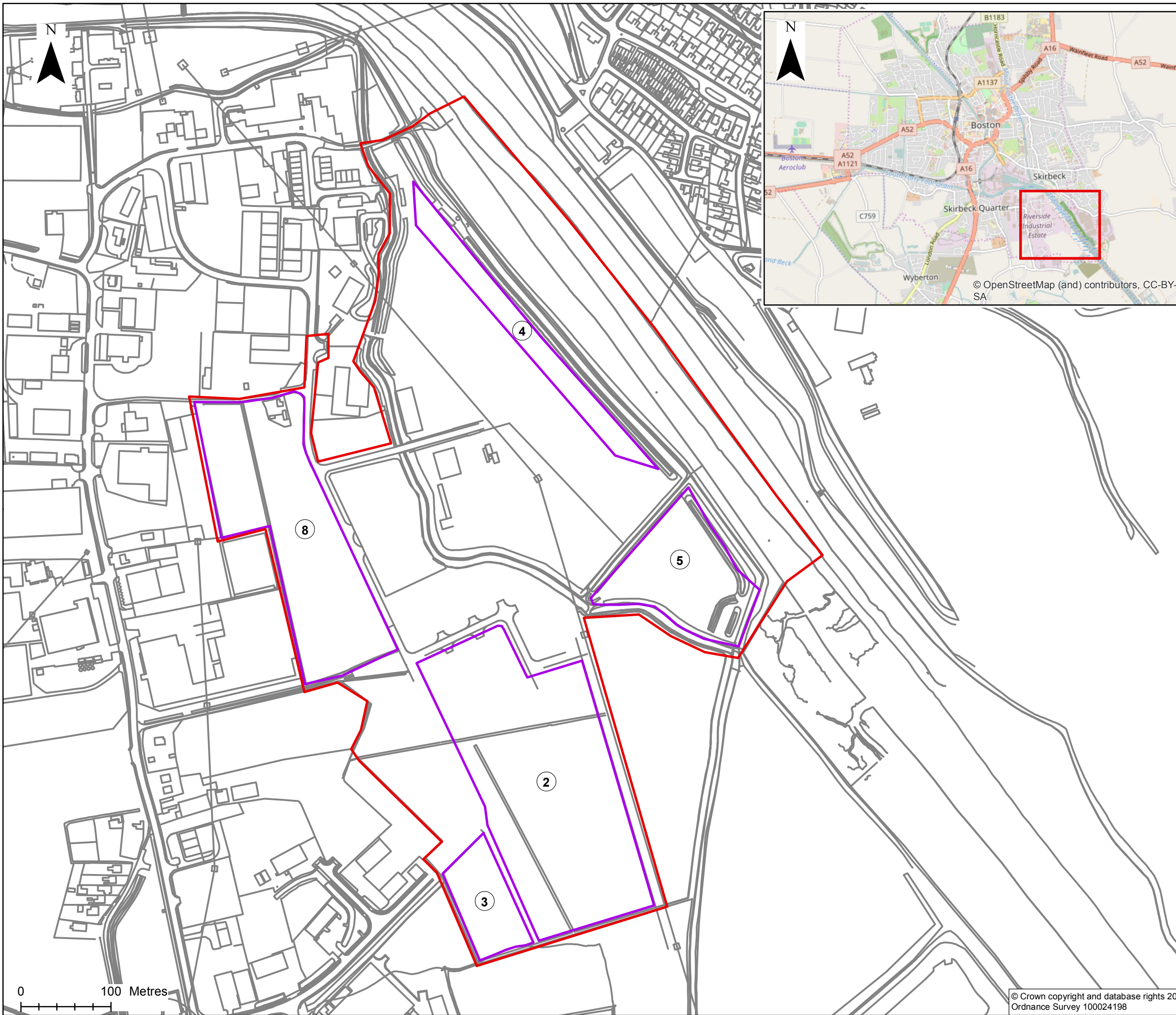
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The findings and opinions are relevant to the dates of the information reviewed and should not be relied upon to represent conditions at later dates. The opinions included herein are based on the information obtained from the assessments undertaken in the study area and from the experience of the reviewers.

This Phase I Land Quality Assessment has utilised a variety of publicly available data sources such as the Environment Agency, Landmark Group, historical maps and the British Geological Survey. Therefore, the study is limited by the age and limitations inherent in the data described.

Appendix 2

Site Location Plan



Legend

- Survey Boundary
- Site Area Reference

P1	Aug'17	For review	MP	JD	GB
REV	DATE	DESCRIPTION	BY	CHK	APP

REVISIONS

CLIENT

ALTERNATIVE USE PRODUCTS LTD

PROJECT

BOSTON GASSIFICATION PLANT

TITLE

FIGURE 1 APPENDIX A



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DRAWN	MCP	CHECKED	JD	APPROVED	GB
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DATE	Aug'17	SCALE @A3	1:4,000	REF	PB6934
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DRAWING NUMBER	FIGURE 1	STATUS	S0	REVISION	P1
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Appendix 3

Site Photos

Plate 1: Boston 2 and 3 comprises mostly grassland.



Plate 2: A culvert is currently being installed along the track in Boston 2



Plate 3: A partially collapsed culver outfall in Boston 4



Plate 4: A sign marking location of a pipe line



Plate 5: The embankment along the river Haven.



Plate 6 Sand and gavels stored in Boston 5.



Appendix 4

Envirocheck Report



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A3 Appendix – Extended Phase 1 Habitat Survey

ECOLOGY REPORT

Boston Gasification Ecology Report

Client: Alternative Use Projects Ltd.

Reference: I&BPB6934RH001_R003D0.1

Revision: 0.1/Draft_revB

Date: 27 October 2017

DRAFT

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Document title: Boston Gasification Ecology Report

Document short title: Ecology Report
Reference: I&BPB6934RH001_R003D0.1
Revision: 0.1/Draft
Date: 27 October 2017
Project name: Boston Gasification
Project number: PB6934
Author(s): Jack Douglas

Drafted by: Jack Douglas

Checked by: Claire Smith

Date / initials: 29/08/2017 CS

Approved by: Gary Bower

Date / initials: GB 27/10/2017

Classification

Project related



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Appendices

Appendix A	Drawings
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1 Introduction

This report has been produced on behalf of Alternative Use Boston Projects Ltd (AUP) to establish an ecological baseline at a site in Boston, Lincolnshire (herein referred to as the survey area), in order to facilitate an effective approach to scoping. The proposed development within the survey area comprises a gasification facility, which will include a 96MWe Power Station (80MWe exportable) using solid waste as a fuel source; and associated development. At this scale, the proposed development would constitute a Nationally Significant Infrastructure Project (NSIP). Therefore, AUP are pursuing a Development Consent Order (DCO) for the gasification facility and associated development which includes a lightweight aggregate manufacturing plant, a new wharf, and a waste checking and storage facility to support in the operational phase of the gasification process..

The survey area is denoted by the solid red line on **Figure 1, Appendix A**, with individual proposed development element locations (as detailed above) illustrated on this figure. The central National Grid Reference (NGR) for the survey area is TF 33950 42241.

1.1 Purpose of this report

This report details the findings of an ecological appraisal (which comprises an Extended Phase 1 Habitat Survey and desk study) of the survey area. The findings will be used to identify any ecological constraints to the proposed development and in turn identify any recommendations and/or enhancements that are to be considered within the design proposals during the pre-application stage of the DCO.

1.2 Scope of this of report

This report comprises the results of an Extended Phase 1 Habitat Survey which was undertaken on the 16th August 2017. This survey comprises three components, which collectively has enabled an ecological appraisal of the survey area to be made:

- a desktop review that summarises information on existing protected species records and nature conservation designations within the survey area and up to 2km from its boundaries;
- a record of the key habitats noted during the Extended Phase 1 Habitat Survey; and
- an initial understanding of the presence/likely presence/absence of legally protected species or species of conservation concern, as well as invasive non-native species, within the survey area.

This report has been prepared in line with the guidelines set out in the Chartered Institute of Ecology and Environmental Management's (CIEEM) Guidelines on Ecological Report Writing (December, 2015).

2 Legislation

Table 2.1 provides a summary of the key ecological legislation in relation to individual species that have been identified as being relevant to the survey area from the Extended Phase 1 Habitat Survey.

Table 2-1 Summary of protected species legislation relevant to the survey area

Species	Legislation	Level of Protection	Relevant Mitigation/Actions
Reptiles	Sections 9(1) and 9(5) of Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) All common reptile species, including grass snake, are listed under Section 41 of the NERC Act 2006.	It is an offence to intentionally killing and injury. It is an offence to sell, offer for sale, possess for transporting for the purpose of sale or publishing advertisements to buy or sell a protected species.	No licence is required.
Birds	Wildlife and Countryside Act 1981 (as amended) S.1	It is an offence to intentionally kill, injure or take any wild bird; intentionally take, damage or destroy the nest of any wild bird while that nest is in use or being built; intentionally take or destroy the nest or eggs of any wild bird. [Special penalties are liable for these offences involving birds on Schedule 1] It is an offence to intentionally or recklessly disturb a Schedule 1 species while it is building a nest or is in, on or near a nest containing eggs or young; intentionally or recklessly disturb dependent young of such a species.	No licences are available to disturb any birds in regard to development. Licences are available in certain circumstances to damage or destroy nests, but these only apply to the list of licensable activities in the Act and do not cover development. General licences are available in respect of 'pest species' but only for certain very specific purposes e.g. public health, public safety, air safety.
Bats	Conservation of Habitats and Species Regulations 2010 (as amended) Reg. 41	It is an offence to deliberately capture, injure or kill a bat; to deliberately disturb bats; or damage or destroy a breeding site or resting place used by a bat. [The protection of bat roosts is considered to apply regardless of whether bats are present.]	A Natural England (NE) licence in respect of development is required in England. European Protected Species: Mitigation Licensing- How to get a licence (NE 2010) Bat Mitigation Guidelines (English Nature 2004) Bat Workers Manual (JNCC 2004)
	Wildlife and Countryside Act 1981 (as amended) S.9	It is an offence to intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection or disturb a bat in such a place.	Licence from NE is required for surveys (scientific purposes) that would involve disturbance of bats or entering a known or suspected roost site.
Badgers	Protection of Badgers Act 1992	Wilfully kill, injure or take a badger; or intentionally or recklessly damage, destroy or obstruct access to a badger sett or disturb a badger in its sett. [It is not illegal to carry out disturbance activities in the vicinity of setts that are not occupied.]	Where required, licences for development activities involving disturbance or sett interference or closure are issued by Natural England (NE). Licences are normally not granted from December to June inclusive because cubs may be present within setts.
Otters	Conservation of Habitats and Species Regulations 2010 (as amended)	Intentionally or deliberately capture, injure or kill; deliberately damage or disturb the breeding or resting site, or	Where offences under the Conservation of Habitats and Species Regulations 2010 cannot

Species	Legislation	Level of Protection	Relevant Mitigation/Actions
		any structure used for shelter or protection.	be avoided Licences from Natural England can be obtained to legitimise works.
	Wildlife and Countryside Act 1981 (as amended)	Intentionally or recklessly kill, injure or take, obstruct access to any structure or place used for shelter or protection, or disturb in such a place.	
Water voles	Wildlife and Countryside Act 1981 (as amended)	Intentionally or recklessly kill, injure or take, obstruct access to any structure or place used for shelter or protection, or disturb in such a place.	A licence is required if disturbance of water voles or their burrows is likely (e.g. detailed and prolonged examination of a known water vole burrow which would cause disturbance to any water voles present or interference with burrow entrances by digging or blocking) and to trap them for marking or study.

3 Methodology

3.1 Study area

A 2km buffer around the survey area is considered an appropriate 'study area' for the gathering of information during the desk study. For the Extended Phase 1 Habitat Survey walkover, the survey area's footprint plus a 50m buffer from its boundary is considered appropriate (with the exception of a 250m zone for the purposes of great crested newts *Triturus cristatus*).

The desk based study area was determined through a review of the proposed development in order to identify the spatial scale at which ecological features could be affected. This study area is sufficient to include the zone of influence, defined as the area encompassing all predicted negative ecological effects from the proposed development; both those which will occur as a result of land-take and habitat loss, and those which may occur indirectly through disturbance such as noise or via other pathways such as the fluvial environment.

3.2 Desk study

The Multi-Agency Geographic Information for the Countryside (MAGIC) website (www.magic.gov.uk) was reviewed in August 2017 for information on statutory sites and notable habitats (e.g. ancient woodlands) of nature conservation value within 2km of the survey area centred on TL 1025 7916.

A search for water bodies within 250m of the survey area boundary was made using 1:25 000 Ordnance Survey (OS) maps in August 2017 to inform the potential for great crested newts to be present. A search area of 250m was chosen having taken into account the habitats around the survey area and because although great crested newts can use suitable terrestrial habitat up to 500m from a breeding pond (Great Crested Newt Mitigation Guidelines, English Nature, 2001), research suggests that newts are likely to travel no more than 250m from ponds where suitable habitats for foraging and hibernation exist (Cresswell and Whitworth, 2004).

The water body information derived from the OS maps was then used to identify the potential presence of (and potential for impacts on) great crested newts and other aquatic and semi-aquatic protected species including otter *Lutra lutra*, water vole *Arvicola amphibius* and white clawed crayfish *Austropotamobius pallipes*.

Google Earth aerial photos were reviewed in August 2017 to assist in identifying any other notable habitats within the survey area and its surrounding areas.

The UK Biodiversity Action Plan (UK BAP) and Lincolnshire BAP (Local BAP) were reviewed in August 2017 to identify habitats and species of conservation concern that may be present within the survey area.

A biological data request from the Lincolnshire Biological Records Centre (LBRC) was undertaken in August 2017.

3.3 Field survey methodologies

3.3.1 Extended Phase 1 Habitat Survey

A survey of the survey area and its immediate surrounds was undertaken on 16th August 2017.

This survey followed the 'Extended Phase 1 Habitat Survey' methodology as set out in *Guidelines for Baseline Ecological Assessment* (Institute of Environmental Assessment, 1995) and the Handbook for Phase 1 Habitat Survey (Joint Nature Conservation Committee (JNCC), 2010). This method of survey provides information on the habitats in the survey area and assesses the potential for legally protected species to occur on or adjacent to it.

Preliminary investigations were undertaken in respect of the presence of the following legally protected species within the survey area:

- Great crested newts. Searching for suitable habitats for breeding populations within the survey area and up to 250m from its boundary. Also searching for suitable terrestrial habitat within the survey area;
- Badger *Meles meles*. Searching for signs of activity including setts, tracks, snuffle holes and latrines within the survey area and up to 30m from its boundary;
- Water voles, otters and white clawed crayfish. Searching for suitable habitat for in water bodies within or immediately adjacent to the survey area;
- Bats. Preliminary daytime inspection of potential bat roosting sites, particularly within trees/buildings within the survey area from the ground level and using binoculars;
- Reptiles. Searching for suitable habitats within the survey area;
- Birds (nesting/breeding). Searching for signs of nests and identifying any suitable nesting habitats within the survey area;
- Invertebrates. Assessing the suitability of habitats to provide appropriate habitat for rare and notable aquatic and terrestrial invertebrate species.
- Other protected species (e.g. dormice *Muscardinus avellanarius*). Searching for suitable habitat within the survey area; and
- Invasive species. Assessing their presence within, and up to 10m from, the survey area boundary. The list of invasive plant species included on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) is extensive and these plants are found in a range of different habitats. The 2017 survey assessed, in particular, the presence of Japanese knotweed *Fallopia japonica*, giant knotweed *Fallopia sachalinensis*, hybrid knotweed, giant hogweed *Heracleum mantegazzianum*, Himalayan balsam *Impatiens glandulifera*, rhododendron *Rhododendron ponticum* and cotoneaster.

3.3.2 Preliminary daytime inspection for bats

A daytime inspection of all features (e.g. all trees and buildings where present) within the survey area was undertaken on the 16th August 2017, and at the same time as the Extended Phase 1 Habitat survey.

During this survey, all suitable buildings, structures or trees within the survey area were externally surveyed from the ground level and using binoculars for their potential to support roosting bats. Each tree/building throughout the survey area was categorised using a four point scale (negligible, low, medium and high) broadly based on the Bat Conservation Trust (BCT) guidelines (3rd Edition, 2016) for their potential to support roosting bats:

- **Negligible potential** – no features present which could offer bats the opportunity to roost;
- **Low potential** – only minor crevices or cracks present which are considered to offer poor roosting spaces for bats;
- **Medium potential** – features present such as small cavities and gaps leading to small enclosed spaces, which offer some form of protection for either individual bats or small numbers of bats; or
- **High potential** – significant holes, cracks or crevices in roof or building structures, which are considered very suitable to be used by bats for roosting and could support large or important roosts such as maternity roosts.

3.3.3 Constraints to survey

Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour. There may be invasive plant species present within the survey area which were not recorded, but it is considered that this survey is sufficient to identify any significant constraints posed by invasive species due to it being undertaken within the optimal time of year (August). The ecological survey has not therefore produced a complete list of plants and animals and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

Only land immediately surrounding the survey area and up to 50m from its boundary was surveyed at the time of the 2017 survey. Water bodies identified as within a 250m zone of the survey area, and their immediate surroundings, were also surveyed where access permitted. Land outside of these areas was not accessed.

The Extended Phase 1 Habitat walkover survey was undertaken within its optimum surveying window. Therefore, the results of the 2017 ecological survey has allowed an evaluation of the likely use of the survey area by legally protected species and the requirement for mitigation for these species to be made.

4 Baseline Environment

4.1 Designated sites

4.1.1 Statutory designated sites

The survey area is not located within a statutory or proposed statutory site of importance for nature conservation. Havenside Local Nature Reserve (LNR) is located approximately 140m north-east of the survey area at its closest point on the northern bank of the Haven (tidal River Witham).

The Havenside LNR is 33.1ha in area, defined as a main habitat of coarse or rank grassland habitats, with additional habitats of new native plantation, scrub, semi-improved neutral grassland, improved grassland, ditch, pond, coastal grazing marsh, marsh, and reedbed. The LNR comprises a long man-made sea bank dating from the 19th Century. The component areas are:

- A raised bank of plantation and meadow at the western end;
- Triangular area of rough grassland and newly planted trees;
- Grazed grassland with drainage ditches and ponds;
- Older sea bank with dense scrub; and
- An amenity area centred on the Pilgrim Fathers memorial with amenity grassland, two small ponds and wet grassland.

The mosaic of woodland, grassland and wetland is very valuable in the local context and of significant value to local bird, mammal and invertebrate populations. The linear nature of the site provides a good wildlife corridor through Boston.

Given the separation of the survey area from this LNR by the Haven, it is assessed that the proposed development will not directly impact upon this designated site. However, the proposed development has the potential to indirectly impact upon the species listed for this site's importance (i.e. oystercatcher *Haematopus ostralegus*, barn owl *Tyto alba*, bats, and common seal *Phoca vitulina*) (BBC, 2015) via noise and visual disturbance.

No further surveys are recommended in relation to the LNR, but mitigation measures will need to be considered during the construction and operational phases of the proposed development to minimise impacts upon birds, bats and common seal.

4.1.2 Non-statutory designated sites

The survey area is not located within a non-statutory or proposed non-statutory site of importance for nature conservation. Within 2km of the survey area, there are three Local Wildlife Sites (LWS). These are Havenside (LWS (located approximately 140m north-east of the survey area at its closest point on the northern bank of the Haven), South Forty Foot Drain LWS (located approximately 1.4km north-west of the survey area), and Slippy Gowt Sea Bank LWS (located approximately 500m east of the survey area).

The South Forty Foot Drain LWS is listed as comprising “a man-made watercourse and bankside communities. The bankside vegetation comprises rough neutral grassland, scrub and trees. The site is a good corridor linking the centre of Boston with the wider countryside.”

The Slippy Gowt Sea Bank LWS is listed as comprising “a rough grassland bank, landside only, adjacent to the Haven and associated tracts of saltmarsh. The site mainly comprises a rough grassland bank between the bank top and footpath and the drain which occurs between the waste site and the bank. The area supports Boston horsetail which occurs (or has occurred in the past) all the way along the

landward bank, including the area that was stripped in 2006-07. This is the only site for this species in Greater Lincolnshire.”

No further surveys and/or mitigation are recommended in relation to the non-statutory designated sites due to the geographical separation of the survey area from these sites removing potential mechanisms of impact because of the proposed development upon the habitats for which they are designated LWS, and as such impacts upon these sites are not considered further in this assessment.

4.2 Flora and habitats

4.2.1 Habitats

The 2017 Extended Phase 1 Habitat Survey recorded the following habitats within the survey area:

- Semi-improved neutral grassland with scattered scrub (comprising species such as bramble *Rubus fruticosus*, teasel *Dipsacus spp.*, and nettle *Urtica dioica*);
- Area of tall ruderals (comprising predominantly nettle);
- Areas of scattered and dense scrub;
- Species poor intact hedgerow;
- Species rich hedgerow with trees;
- Areas of amenity grassland;
- Areas of bare ground (hard standing and areas of rubble);
- Areas of bare ground (with scattered scrub);
- Semi-natural broadleaved woodland;
- Dry ditches (drainage channels);
- Marginal vegetation; and
- Running water (brackish).

The location of these habitats is shown on **Figure 2, Appendix A**.

There is no ancient woodland within the survey area.

The north-eastern extent of the proposed developments adjoins Coastal Saltmarsh and Mudflat Priority Habitat. The proposed development will involve a localised loss of these habitats to accommodate the proposed wharfage facilities on the Haven for feedstock delivery. This loss of Priority Habitat would account for a very small proportion of the overall saltmarsh and mudflat habitat locally. Impacts upon these habitats and associated mitigation measures will need to be considered further during the construction and operation phases of the proposed development in order to identify opportunities that result in no net loss of these Priority Habitats.

4.2.2 Invasive species

There are several recent records of invasive species, including Japanese knotweed (recorded November 2009, approximately 1.2km from the survey area) and giant hogweed (recorded August 2013, approximately 0.65km from the survey area), within 2km of the survey area, although none within the survey area.

No invasive plant species were recorded within the survey area during the 2017 Extended Phase 1 Habitat Survey. Consequently no further surveys and/or mitigation measures are required and as such are not considered further in this report.

4.3 Legally protected and notable species

4.3.1 Badgers

There are five recent records of badger within 2km of the survey area, the most recent being February 2016, although none within the survey area. The closest record is approximately 900m west of the survey area at its closest point, recorded in October 2007.

There is suitable habitat for badger in the survey area, including woodland, scrub and hedgerows. However, no evidence of badger was recorded within the survey area during the survey. Furthermore, as the survey area comprises largely open grassland area, and is subject to regular human disturbance, it is considered unlikely that badgers use the survey area for residence. Therefore, no further surveys are required; but general ecological awareness, as detailed in **Section 5.6**, is recommended in order to minimise any potential impacts upon the local badger population within the wider area.

4.3.2 Water voles

There are a total of 27 recent records of water vole within 2km of the survey area, the most recent being May 2014, although none within the survey area. The closest record is approximately 800m west of the survey area at its closest point, recorded in October 2007.

The ecological chapter of the Boston Barrier Tidal Project Environmental Statement (ES) (Environment Agency, 2016) notes disused burrows, likely to be water vole, along the South Forty Foot Drain (over 2km north-west of the survey area) have been previously recorded, with the potential for water voles to also be present in brackish ditches and saltmarsh pools in the area.

There are a series of ditches within the survey area, although all dry at the time of the survey (during water vole breeding season) and therefore assessed as sub-optimal for water vole (**TN4, Figure 2, Appendix A**). As such, no further surveys are required but general ecological awareness, as detailed in **Section 5.6**, is recommended in order to minimise any potential impacts upon water voles if present in the wider area.

4.3.3 Otters

There are no recent records of otter, within 2km of the survey area, although there are records of otter on the River Witham north of Boston over 2km from the survey area.

The ecological chapter of the Boston Barrier Tidal Project ES (Environment Agency, 2016) notes that there are no suitable features for otter holt building on the River Witham (north of the survey area) due to a lack of bankside features that would provide suitable cover, and high levels of human disturbance.

The tidal River Witham does not provide suitable holt building habitat for otters within the survey area due to a lack of bankside features that would provide suitable cover (**TN6, Figure 2, Appendix A**). Furthermore, the ditch network within the survey area was assessed as sub-optimal for otters because they are dry. However, otters may use the tidal River Witham for commuting in the wider area. As such, general ecological awareness is detailed in **Section 5.6** in order to minimise potential impacts to otters if in the wider area.

4.3.4 Great crested newts and white clawed crayfish

There are no recent records for great crested newts or white clawed crayfish within 2km of the survey area.

Several ephemeral ponds, fed by the tidal River Witham, are present along the footpath adjoining the Haven at the north-east extent of the survey area (**TN7, Figure 2, Appendix A**). A Habitat Suitability

Index Assessment (HSI) confirmed these water bodies to be of 'poor' suitability for great crested newt. Although this habitat suitability score is not a replacement for more detailed surveys, it is considered that great crested newts are unlikely to be present within the survey area due to the poor quality of this habitat, and lack of suitable surrounding terrestrial habitat (with the River Witham creating a barrier to movement, and the surrounding terrestrial habitat lacking suitable shelter and being prone to flood events).

The River Witham waterbody was assessed as sub optimal white clawed crayfish due to the absence of suitable habitats for burrowing and refugia, whilst the ditch network within the survey area does not provide habitat (i.e. flowing water) suitable for white clawed crayfish.

Therefore and given the nature of the survey area and its immediate surrounds, in combination with the absence of suitable aquatic and terrestrial habitat within the survey area, it is unlikely that great crested newts and white clawed crayfish are present within the survey area. Therefore, no further surveys and/or mitigation measures are required and consequently these species are not considered further in this report.

4.3.5 Bats

There are a total of 44 records of bat species within 2km of the survey area, including records of Daubenton's bat *Myotis daubentonii*, Noctule bat *Nyctalus noctula*, Brown Long-eared bat *Plecotus auritus*, and Common Pipistrelle *Pipistrellus pipistrellus*, although none are within the survey area itself. The closest record is approximately 400m north-east of the survey area at its closest point.

There are no buildings within the survey area. There are a number of trees within the survey area which were assessed from the ground using binoculars for their suitability to support roosting bats. The hedgerows and areas of woodland are assessed as providing suitable foraging and/or commuting habitat for bat species (**TN2 and TN5, Figure 2, Appendix A**).

No evidence of bat roost potential was noted within the trees in the survey area.

It is understood that existing vegetation (i.e. trees and hedgerows) will be retained as part of the proposed development, therefore resulting in no removal of suitable foraging/commuting habitat for bat species. As such, no further surveys are required but mitigation measures will need to be considered during the construction and operational phases of the proposed development to minimise impacts to local bat populations.

4.3.6 Reptiles

There are no recent records of reptile within 2km of the survey area.

During the 2017 Extended Phase 1 Habitat Survey, the survey area was assessed as having potential to support common reptile species should they be present in the wider area. In particular the areas of tall ruderals, hedgerow habitats and scattered scrub adjacent to semi-improved grassland and bare ground (with scattered debris and rubble piles) were noted to provide suitable basking, refugia and foraging habitat (**TN3, TN5 and TN8, Figure 2, Appendix A**). It is understood at the time of writing this report that some of these areas of vegetation, bare ground and debris/rubble piles will require removal to facilitate the proposed development. As such, mitigation measures will need to be considered during the construction and operational phases of the proposed development to minimise impacts to local reptile populations.

4.3.7 Dormice

There are no recent records of dormice within 2km of the survey area.

No evidence of dormice or suitable habitat was recorded during the 2017 Extended Phase 1 Habitat Survey. It is therefore, considered unlikely that this species is present within the survey area and

consequently no further surveys and/or mitigation measures are required and as such this species is not considered further in this report.

4.3.8 Birds

There are several records Schedule 1 bird species within 2km of the survey area, including records of Goshawk *Accipiter gentilis*, Kingfisher *Alcedo atthis*, Garganey *Anas querquedula*, Ruff *Calidris pugnax*, Little Ringed Plover *Charadrius dubius*, Marsh Harrier *Circus aeruginosus*, Montagu's Harrier *Circus pygargus*, Peregrine *Falco peregrinus*, Hobby *Falco Subbuteo*, Black-tailed Godwit *Limosa limosa*, Red Kite *Milvus milvus*, Black Redstart *Phoenicurus ochruros*, Avocet *Recurvirostra avosetta*, Firecrest *Regulus ignicapilla*, and Barn Owl *Tyto alba*.

Bird species recorded within the survey area during the 2017 Extended Phase 1 Habitat Survey included blackbird *Turdus merula*, common gull *Larus canus*, magpie *Pica pica*, sparrow *Passer domesticus* and woodpigeon *Columba palumbus*. Mediterranean Gull *Larus melanocephalus*,

The trees, woodland, hedgerows, areas of scattered scrub and tall ruderals within the survey area are assessed as being suitable to support common nesting bird species. A relic common birds nest was recorded within the area of woodland at the eastern extent of the survey area (**TN1, Figure 2, Appendix A**), although no evidence of active nests was noted at the time of the survey. Therefore no further surveys are required but mitigation measures will need to be considered during the construction and operational phases of the proposed development to minimise impacts to local bird populations.

4.3.9 Aquatic and terrestrial invertebrates

The grassland, scrub, trees and woodland on site may support common species of terrestrial invertebrates. The tidal River Witham and mudflats may also provide suitable habitat for common species of aquatic invertebrates.

No further surveys are required for invertebrate species but mitigation measures are recommended during the construction and operational phases of the proposed development to minimise impacts to invertebrate populations.

4.3.10 Summary

Based on the findings of the 2017 ecological surveys, the receptors detailed in **Table 4.1** will be considered further in **Section 4**.

Table 4-1 Summary of ecological receptors which are scoped in/out as requiring further consideration

Receptor	Scoped in for further assessment (Yes/No)	Reasoning
Statutory designated nature conservation site	Yes	The survey area is not located within a designated site, although Havenside LNR is approximately 140m north-east of the survey area at its closest point on the northern bank of the Haven (tidal River Witham). Given the separation of the survey area from the LNR by the Haven, it is assessed that the proposed development will not directly impact upon this designated site. However, the proposed development has the potential to indirectly impact upon the species listed for this site's importance (i.e. oystercatcher, barn owl, bats, and common seal) (BBC, 2015) via noise and visual disturbance. Mitigation measures will need to be considered during the construction phase of the proposed development to minimise potential impacts to these species.
Non-statutory designated nature conservation sites	No	The survey area is not located within a non-statutory or proposed non-statutory site of importance for nature conservation. No further surveys and/or mitigation are recommended in relation to the non-statutory designated sites due to the geographical separation of the survey area from these sites removing potential mechanisms of impact as a result of the proposed development, and as such impacts upon these sites are not considered further in this assessment.
Habitats	No	The proposed development will result in areas of habitat being lost. Some areas of existing vegetation (e.g. woodland and hedgerows) will be retained and incorporated within the proposed development. The north-eastern extent of the proposed developments adjoins Coastal Saltmarsh and Mudflat Priority Habitat. The proposed development will involve a localised loss of these habitats to accommodate the proposed wharfage facilities on the Haven for feedstock delivery. This loss of Priority Habitat would account for a very small proportion of the overall saltmarsh and mudflat habitat locally. Impacts upon these habitats and associated mitigation measures will need to be considered further during the construction and operation phases of the proposed development in order to identify opportunities that result in no net loss of these Priority Habitats.
Invasive species	No	No invasive species recorded during surveys undertaken to date.
Badgers	No	Badgers have not been recorded within the survey area. General ecological awareness is detailed in Section 5.6 in order to minimise potential impacts to local badger populations.
Water voles	No	Water voles have previously been recorded north of the survey area, with the potential for water voles to also be present in brackish ditches and saltmarsh pools in the area highlighted in the Boston Barrier Tidal Project Environmental Statement (ES) (Environment Agency, 2016). The ditches recorded within the survey area were all dry at the time of the survey, and assessed as sub-optimal for water vole. As such, no further surveys are required. General ecological awareness is detailed in Section 5.6 in order to minimise potential impacts to water vole if present in the wider area
Otters	No	Otters may utilise the tidal River Witham for commuting in the wider area. General ecological awareness is detailed in Section 5.6 in order to minimise potential impacts to otter if present in the wider area
GCN and white clawed crayfish	No	Given the nature of the survey area and its immediate surrounds, in combination with the absence of suitable aquatic and terrestrial habitat within the survey area, it is unlikely that great crested newts and white clawed crayfish are present within the

Project related

Receptor	Scoped in for further assessment (Yes/No)	Reasoning
		survey area. Therefore, no further surveys and/or mitigation measures are required and consequently these species are not considered further in this report.
Bats	Yes	The hedgerows and woodland habitats within the survey area provide suitable foraging and commuting habitat for bats. It is understood that existing vegetation (i.e. trees and hedgerows) will be retained as part of the proposed development. Mitigation measures will need to be considered during the construction and operational phases of the proposed development to minimise impacts to local bat populations.
Reptiles	Yes	There are suitable habitats within the survey area for which reptiles could use. Therefore mitigation measures will need to be considered during the construction and operational phases of the proposed development to minimise impacts to local reptile populations.
Dormice	No	There is no suitable habitat for dormice within the survey area.
Birds	Yes	The development could result in direct and in-direct impacts to birds as a result of disturbance and habitat loss. Therefore mitigation measures will need to be considered during the construction and operational phases of the proposed development to minimise impacts to local bird populations.
Aquatic and terrestrial invertebrates	Yes	The grassland, scrub, trees and woodland on site may support common species of terrestrial invertebrates. The tidal River Witham and mudflats may also provide suitable habitat for common species of aquatic invertebrates. No further surveys are required for invertebrate species but mitigation measures are recommended during the construction and operational phases of the proposed development to minimise impacts to invertebrate populations.

5 Recommendations

5.1 Statutory designated sites

The proposed development has the potential to indirectly impact upon the species listed for the Havenside LNR, located approximately 140m north-east of the survey area at its closest point on the northern bank of the Haven (tidal River Witham), including oystercatcher, barn owl, bats, and common seal via noise and visual disturbance.

Liaison with Boston Borough Council's Biodiversity Officer should be undertaken prior to works to assess the impact upon the integrity of the LNR. Particular reference would need to be made to the LNR's ability to provide habitat for overwintering birds.

A toolbox talk with respect to common seal will be provided to the construction workers prior to construction, explaining what this species look like, that works should cease if one is identified and the contractors' legal obligations with respect to this species.

The proposed mitigation with regards to bat species is detailed in **Section 5.5**.

5.2 Habitats

The proposed development will involve a localised loss of Coastal Saltmarsh and Mudflat Priority Habitat habitats to accommodate the proposed wharfage facilities on the Haven for feedstock delivery. This loss of Priority Habitat would account for a very small proportion of the overall saltmarsh and mudflat habitat locally. Impacts upon these habitats and associated mitigation measures will need to be considered further once detailed designs of the proposed wharf are known.

Early liaison with the Boston Borough Council's Biodiversity Officer and County Ecologist should be undertaken in order to establish appropriate design and mitigation measures with regards to these habitats. Consultation with the Marine Management Organisation (MMO) may also be required depending on the design of the proposed wharf.

The detailed design of the proposed wharf should be sympathetic with regards to habitat loss, where enhancement measures, habitat compensation and creation may all require consideration to result in an overall no net loss in Priority Habitat.

5.3 Bats

No evidence of roosting bats was noted during the 2017 survey; however, the hedgerows and woodland areas within the survey area was assessed as providing potentially suitable foraging and commuting habitat for bat species. Bat species are typically considered to be of high value; however it is understood that the existing vegetation (i.e. trees and hedgerows) will be retained as part of the proposed development and where possible incorporated within the design. Should this not be the case then further ecological advice should be sought as further surveys (i.e. dusk/dawn emergence/re-entry surveys) may be required.

Noise and visual disturbance may result from any night working which may occur as part of the construction of the development. Lights and activity could also interrupt foraging and commuting activity.

Mitigation to manage this impact should include the use of low pressure sodium lighting which will be located away from areas that could be used by bat species (i.e. hedgerow and woodland habitats) where possible. All lights should also be pointed away from these features.

Consideration should be given to any new lighting required for the proposed development to be designed (where safe and practical to do so) in such a way as to maintain (if not decrease) ambient night time light levels. This could be achieved by following accepted good practice guidance (Institute of Ecological and Environmental Management (IEEM), 2006; BCT and Institute of Lighting Engineers (ILE), 2007), including:

- Low pressure sodium lights are a preferred option to high pressure sodium or mercury lamps, and lights would be directed low with minimal light spillage;
- Artificial lighting would not directly illuminate any potential bat commuting areas. Similarly, any newly planted linear features around the site boundary would not be directly lit; and
- Lighting design would be based on general guidance set out in Guidance Notes for the Reduction of Obtrusive Light GN01:2011 (Institute of Lighting Professionals (ILP), 2011).

Enhancement measures for bats should also be incorporated into the development designs if possible, for example the inclusion of bat bricks or bat boxes. In addition, opportunities to incorporate additional planting should be incorporated within the design, with species of plants that attract insects (e.g. oxeye daisy and yarrow) being planted to encourage bats to forage within and around the survey area.

5.4 Reptiles

There is potential for reptiles to be present within the working areas with regards to the proposed development. A reptile sensitive clearance methodology (under ecological supervision) will therefore be implemented prior to any construction works within the footprint of the proposed development. This will ensure that any reptiles are safeguarded from the construction process.

The reptile sensitive methodology involves habitat manipulation followed by a destructive search. Habitat manipulation will be carried out a maximum of one week prior to works commencing on site. Any potential sheltering features will be inspected (visually and by hand) before entire removal by an ecologist. Any reptiles present can then be rescued and moved to an identified and suitable location (which has been identified prior to works commencing). Any vegetation removal works should start from the furthest extent so that any reptiles, should they be present, can move into an area that will not be accessed or disturbed by the works. All arisings should be removed from the works area immediately and either taken off-site, or placed in a predetermined location well away from the works area (and any access). A method statement for these actions will be prepared by an ecologist in advance of any works starting on site. This work will be undertaken within the reptile activity season (March – October inclusive).

5.5 Birds

The survey area contains suitable nesting bird habitat, such as areas of scattered and dense scrub, trees and hedgerows. The birds species recorded within the survey area are common species and are therefore considered to be of low value.

All birds, their nests and eggs are protected by the Wildlife and Countryside Act 1981 (as amended) and it is an offence to intentionally take, damage or destroy the nest of any wild bird whilst it is in use or being built. Should there be a requirement for vegetation to be removed during the nesting bird season (March to August inclusive), a check of any vegetation to be removed would be required. An ecologist will need to check the area for nesting birds a maximum of 48 hours prior to the commencement of the works. Active nests and their associated vegetation/location must remain until young birds have left the nest and during this period an alternative approach to the works must be undertaken. Enhancement measures for these species (e.g. owl and other bird species boxes) should be considered within the designs where possible in order to provide suitable habitat for species and ecological benefits.

5.6 General ecological awareness

No evidence of badgers (e.g. setts, faeces, etc.), water voles, or otters was noted during the 2017 survey, although there is potential for these species to utilise the wider area for commuting and foraging.

As such, it is recommended that a toolbox talk with respect to these species is provided to the construction workers prior to construction. This will need to include:

- Legislation and legal obligations regarding these species;
- Field signs to look out for; and
- Who to contact in the event of discovering the presence of these species.

With regards to badgers, all excavations shall be covered when not working on site so as to avoid potential harm to badgers. Exit routes within each excavation shall be provided in order to allow a route of escape.

With regards to otter, all vehicles should be checked each morning before ignition and movement prior to works to ensure no otters are laying up under the vehicles overnight. Any excavations dug should include an exit ramp overnight to ensure that should any otter fall into them can escape.

If a badger sett or evidence of otter or water vole is discovered during the works, works should cease and a suitably qualified ecologist consulted immediately.

5.7 Aquatic and terrestrial invertebrates

The proposed development should consider the potential to integrate suitable habitat for invertebrate species in its design. This could include measures such as a varied planting regime comprising scrub fringes such as hawthorn, field maple, blackthorn and ivy, which provide sheltered elevated temperatures for invertebrates, foraging areas for predatory wasps, and nectar and pollen for flower-dependant invertebrates.

6 Conclusion

An Extended Phase 1 Habitat Survey was undertaken on the 16th August 2017 by a Royal HaskoningDHV ecologist of the site in Boston. An ecological desk study was also undertaken.

The survey area is not located within a statutory, proposed statutory, or non-statutory designated nature conservation sites. Havenside LNR is located approximately 140m north-east of the survey area at its closest point on the northern bank of the Haven (tidal River Witham).

Liaison with Boston Borough Council's Biodiversity Officer should be undertaken prior to works to assess the impact upon the integrity of the LNR. Particular reference would need to be made to the LNR's ability to provide habitat for overwintering birds. A toolbox talk with respect to common seal will also be provided to the construction workers prior to construction, explaining what this species look like, that works should cease if one is identified and the contractors' legal obligations with respect to this species.

The main habitats within the survey area are:

- Semi-improved grassland with scattered scrub;
- Area of tall ruderals;
- Areas of scattered and dense scrub.
- Species poor intact hedgerow;
- Species rich hedgerow with trees;
- Areas of amenity grassland;

- Areas of bare ground (hard standing and areas of rubble);
- Areas of bare ground (with scattered scrub);
- Semi-natural broadleaved woodland;
- Dry ditches (drainage channels);
- Marginal vegetation; and
- Running water (brackish).

There is no ancient woodland within the survey area.

The proposed development will involve a localised loss of Coastal Saltmarsh and Mudflat Priority Habitat habitats to accommodate the proposed wharfage facilities on the Haven for feedstock delivery. Early liaison with the Boston Borough Council's Biodiversity Officer and County Ecologist should be undertaken in order to establish appropriate design and mitigation measures with regards to these habitats. Consultation with the Marine Management Organisation (MMO) may also be required depending on the design of the proposed wharf. The detailed design of the proposed wharf should be sympathetic with regards to habitat loss, where enhancement measures, habitat compensation and creation may all require consideration to result in an overall no net loss in Priority Habitat.

No evidence of roosting bats was noted during the 2017 survey; however habitats such as hedgerows and woodland were assessed to provide suitable commuting and foraging habitat for bat species. As such there remains the potential to disturb bats if present in the area. Bat species are typically considered to be of high value; however it is understood that the existing vegetation (i.e. trees and hedgerows) will be retained as part of the proposed development and where possible incorporated within the design. Should this not be the case then further ecological advice should be sought as further surveys (i.e. activity surveys) may be required.

Mitigation to manage the potential noise, visual and lighting disturbance as a result of the construction works should include the use of low pressure sodium lighting which will be located away from areas that could be used by bat species (i.e. the hedgerow and woodland habitats) where possible, and no night time working should be undertaken. A toolbox talk will also be delivered to all construction workers with regards to the potential presence of bats and what to do if they are encountered. Should a bat be encountered during the works, works will cease in that area and the advice from an ecologist sought prior to commencing.

Consideration will be given to any new operational lighting required for the proposed development to be designed (where safe and practical to do so) in such a way as to maintain (if not decrease) ambient night time light levels. Enhancement measures for bats, for example including the inclusion of bat bricks or bat boxes into the development's design, should also be considered. In addition, opportunities to incorporate additional planting will be incorporated within the design and as part of the overall proposals, with species of plants that attract insects (e.g. oxeye daisy and yarrow) being planted to encourage bats to forage within and around the survey area.

It is understood at the time of writing this report that the areas of existing vegetation will be retained and incorporated within the proposed design. However, and should any vegetation removal works associated with the proposed developments be required, these will be undertaken outside of the nesting bird season (March to August inclusive), although where this is not possible, a check by a suitably qualified ecologist prior to removal is recommended.

There is potential for reptiles to be present within the working areas with regards to the proposed development. Therefore a reptile sensitive clearance methodology (under ecological supervision) will be implemented prior to any construction works within the footprint of the proposed development to ensure that any reptiles are safeguarded from the construction process.

Due to the potential for badgers, otters and water vole to be present within the wider area, a toolbox talk with respect to these species will be provided to the construction workers prior to construction, explaining identification measures for these species, what to do if one is identified and contractors' legal obligations with respect to these species. All vehicles should be checked each morning before ignition and movement prior to works to ensure no otters are laying up under the vehicles overnight, and any excavations dug should include an exit ramp overnight to ensure that should any otter fall into them they can escape. All excavations will be covered when not working on site to avoid potential harm to badgers. Exit routes within each excavation will be provided in order to allow a route of escape.

The proposed development should also consider the potential to integrate suitable habitat for invertebrate species in its design. This could include measures such as a varied planting regime comprising scrub fringes such as hawthorn, field maple, blackthorn and ivy, which provide sheltered elevated temperatures for invertebrates, foraging areas for predatory wasps, and nectar and pollen for flower-dependant invertebrates.

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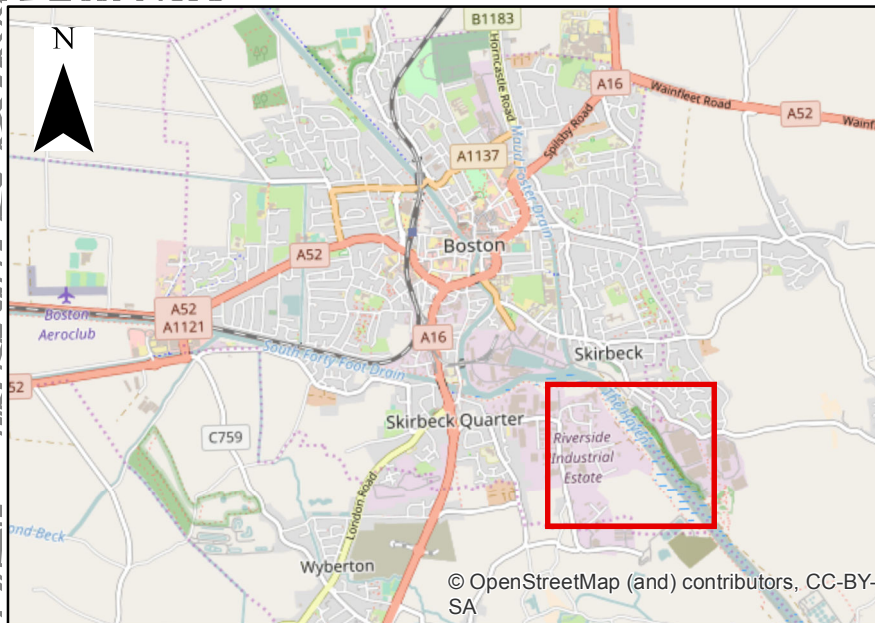
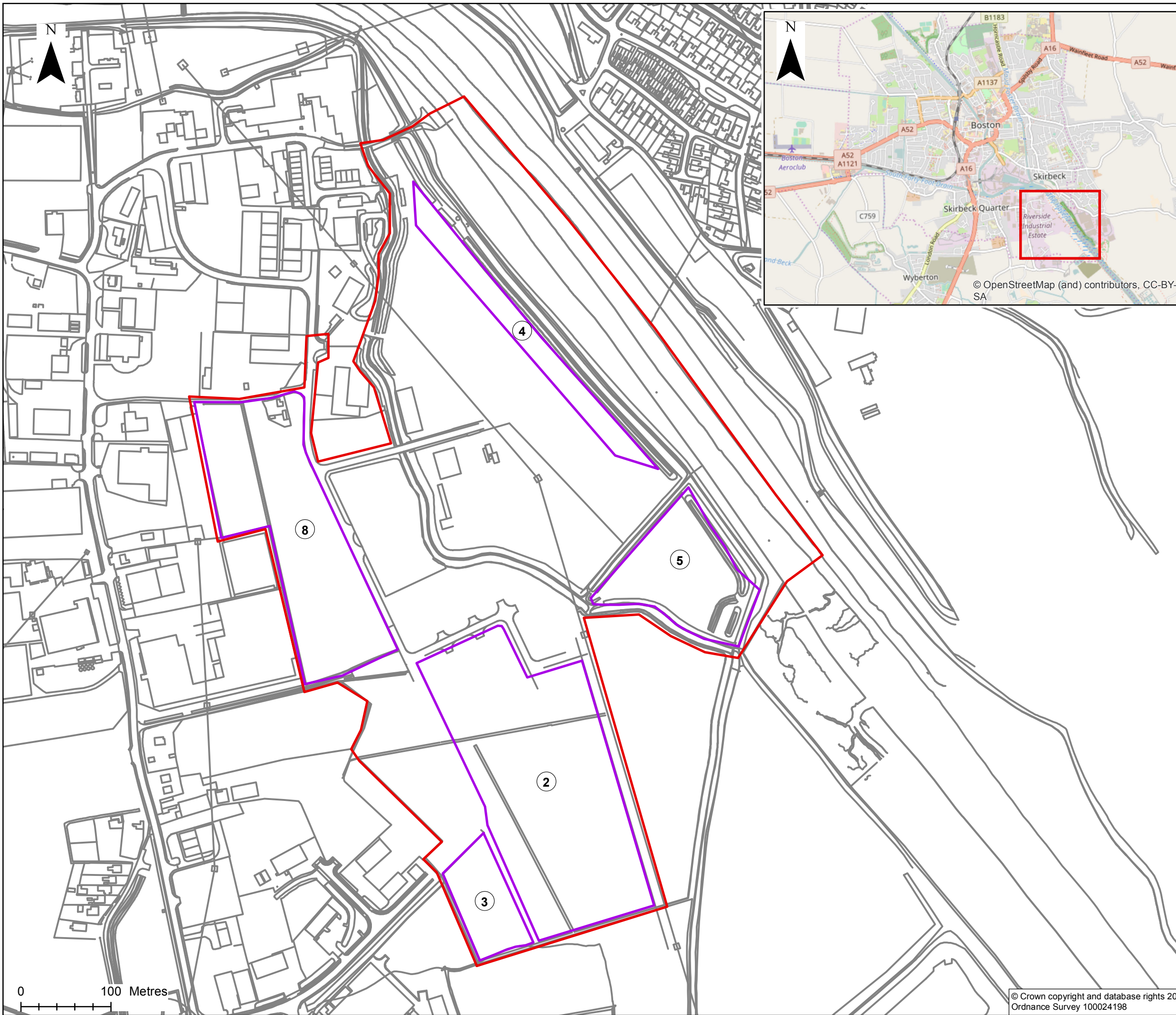
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Appendix A Drawings

Please note that **Figure 2, Appendix A** is to be read in conjunction with the Target Notes (TN) presented in **Appendix B**.

PLACEHOLDER – FIGURE 1



Legend

- Survey Boundary
- Site Area Reference

P1	Aug'17	For review	MP	JD	GB
REV	DATE	DESCRIPTION	BY	CHK	APP

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CLIENT
ALTERNATIVE USE PRODUCTS LTD

PROJECT
BOSTON GASSIFICATION PLANT

TITLE
FIGURE 1 APPENDIX A

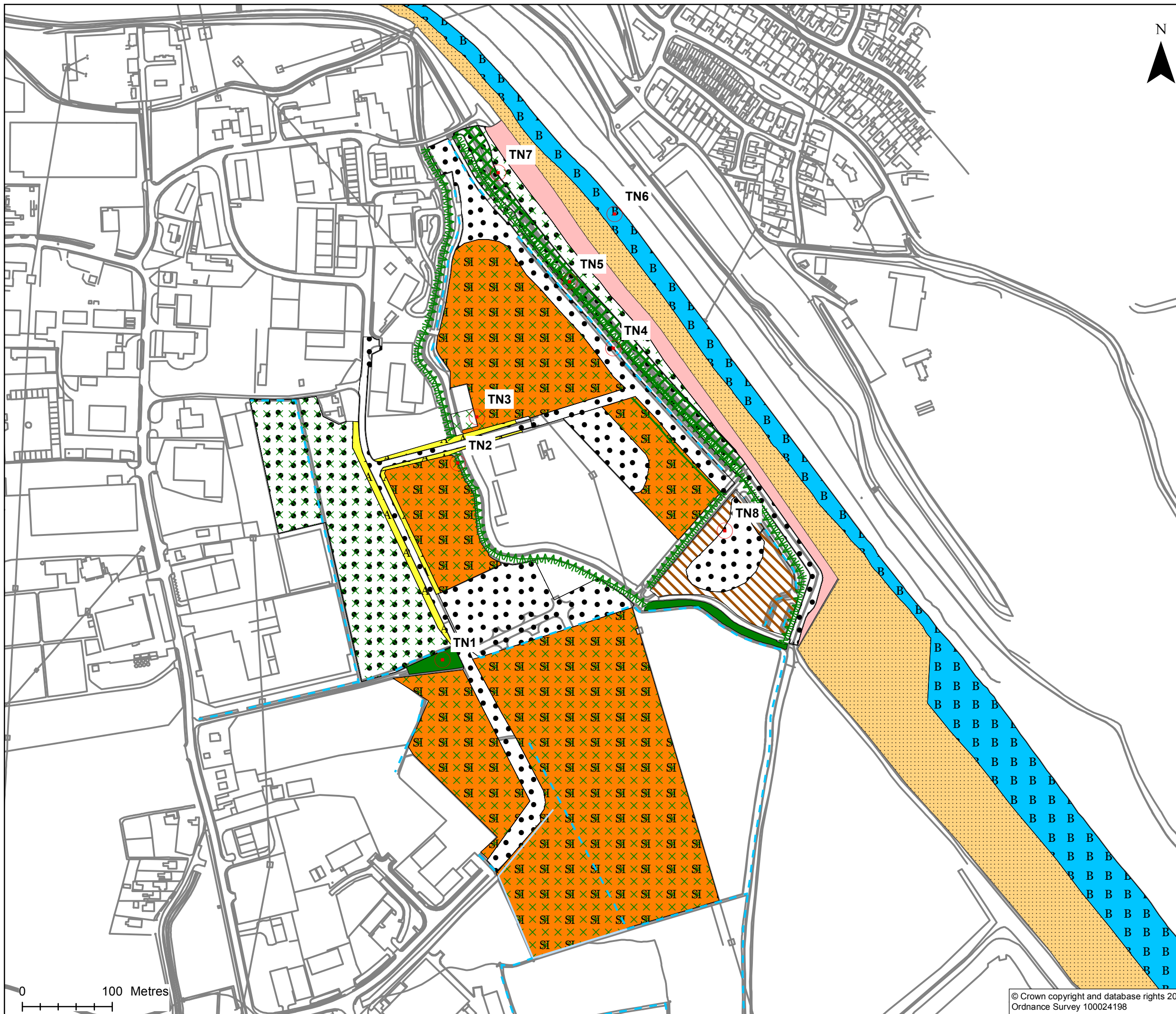

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DRAWING NUMBER	FIGURE 1	STATUS	S0	REVISION	P1
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PLACEHOLDER – FIGURE 2



- Legend**
- Extended Phase 1 Habitats**
- Broadleaved woodland - semi-natural
 - Scrub - dense/continuous
 - Scrub - scattered
 - Neutral grassland - semi-improved
 - Tall herb and fern - ruderal
 - Running water - brackish
 - Intertidal - mud/sand
 - Saltmarsh - dense/continuous
 - Cultivated/disturbed land - amenity grassland
 - Hedge with trees - native species-rich
 - Bare ground
 - Marginal and inundation - marginal vegetation
 - Intact hedge - species-poor
 - Hedge with trees - native species-rich
 - Dry ditch
 - Target Notes (TN)

P1	Aug'17	For review	MP	JD	GB
REV	DATE	DESCRIPTION	BY	CHK	APP

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FIGURE 2 APPENDIX A

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DRAWING NUMBER	FIGURE 2	STATUS	S0	REVISION	P1
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Appendix B Target Notes

Please note that the Target Notes (TN) presented in the table below are to be read in conjunction with **Figure 2, Appendix A**.

Target Note (TN)	Description	Photo
1	Woodland area suitable for nesting birds. Relic bird nest present (red arrow).	
2	Dense hedge (native species rich) with trees	
3	Scrub habitat with adjacent semi-improved grassland, hedgerow, bare ground and debris/rubble piles. Suitable foraging, refugia and basking habitat for reptile species.	

Target Note (TN)	Description	Photo
4	Dry drain adjoining defunct hedge with trees. Assessed as being sub-optimal for water vole.	
5	Dense scrub habitat on top of embankment.	
6	The Haven (tidal River Witham). No suitable habitat for otter holt creation.	

Target Note (TN)	Description	Photo
7	Ephemeral pond fed by the tidal River Witham. HSI score = 0.3 (poor) - not suitable for GCN.	
8	Tall ruderal habitat adjoining hedgerow, semi-improved grassland, bare ground and debris/rubble piles. Suitable foraging, refugia and basking habitat for reptile species.	



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With its headquarters in Amersfoort, The Netherlands, Royal HaskoningDHV is an independent, international project management, engineering and consultancy service provider. Ranking globally in the top 10 of independently owned, nonlisted companies and top 40 overall, the Company's 6,500 staff provide services across the world from more than 100 offices in over 35 countries.

Our connections

Innovation is a collaborative process, which is why Royal HaskoningDHV works in association with clients, project partners, universities, government agencies, NGOs and many other organisations to develop and introduce new ways of living and working to enhance society together, now and in the future.

Memberships

Royal HaskoningDHV is a member of the recognised engineering and environmental bodies in those countries where it has a permanent office base.

All Royal HaskoningDHV consultants, architects and engineers are members of their individual branch organisations in their various countries.