

REPORT

Boston Alternative Energy Facility – Environmental Statement

Chapter 11 Contaminated Land, Land Use and
Hydrogeology

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Executive Summary

This chapter focused on the potential environmental effects associated with the interaction of the Boston Alternative Energy Facility (the Facility) with potential contaminated land and the subsequent effects to sensitive receptors, as well the direct effects on land use including the degradation and loss of soil resources. An assessment of the potential effects during the construction, operation, and decommissioning phases of the Facility was carried out, and sensitive receptors (land use, human health and controlled waters) were considered in relation to potential effects arising from the Facility. This assessment identified mitigation measures required to eliminate or reduce predicted effects.

It should be noted that due to its location and influence by water within The Haven the Habitat Mitigation Area is more appropriately considered within both **Chapter 15 Marine Water and Sediment Quality** and **Chapter 16 Estuarine Processes**.

The chapter also sets out the required embedded mitigation measures for the Facility to minimise potential effects. The effects identified for the Facility relate to the off-site historical landfill as a potential source of contamination which could migrate onto the Principal Application Site, which are not considered to be significant.

A ground investigation for geotechnical and geoenvironmental purposes will be required to inform foundation design of the proposed Facility. Investigation into potential contaminated land sources and nature of the soils present at the Principal Application Site will be undertaken as part of this investigation to gather sufficient data to undertake a generic quantitative risk assessment. A ground investigation scope inclusive of a sampling strategy document will be prepared prior to the investigation being carried out to define the extent of the ground investigation. This investigation is secured by way of a Requirement in the DCO. Following this, if required, appropriate mitigation measures, will be determined prior to construction of the Facility.

The following impacts were identified for the construction phase of the Facility:

- Impact on human health, including construction workers and general public during any excavations and construction related activities;
- Impact on groundwater quality from construction related activities;
- Impact on groundwater quantity from construction related activities;
- Impact on surface water quality from general earthworks and construction related activities;
- Impacts to soil quality; and



- Loss of Best Most Versatile (BMV) agricultural land

The following impacts were identified for the operational phase of the Facility:

- Impact to human health and groundwaters during operational and maintenance activities as a result of residual contaminants; and
- Impact to human health and groundwater during operation as a result of new sources of contamination being introduced.

Impacts for the decommissioning phase of the Facility were considered to be similar to the impacts considered during the construction phase.

11 Contaminated Land, Land Use and Hydrogeology

11.1 Introduction

11.1.1 This chapter provides a description of the anticipated physical environment baseline conditions in contaminated land, land uses and hydrogeology. This chapter then considers how alteration to the baseline environment from the Boston Alternative Energy Facility (the Facility) will impact sensitive receptors (land use, human health and controlled waters).

11.1.2 Baseline conditions were identified for the defined study area as shown in **Figure 11.1**, which is defined as the Principal Application Site plus a 1 km buffer. For agricultural land only the baseline environment for the Principal Application Site has been developed. The impact assessment set out within this chapter has been prepared in relation to the Principal Application Site i.e. excluding the Habitat Mitigation Area (as shown in **Figure 1.1**). Due to its location and influence by water within The Haven the Habitat Mitigation Area is more appropriately considered within both **Chapter 15 Marine Water and Sediment Quality** and **Chapter 16 Estuarine Processes**. The works at this area are described in **Chapter 5 Project Description** and shown on **Figure 17.9**.

11.1.3 This chapter details the assessment of potential effects likely to occur during the construction, operation and decommissioning phases of the Facility. The impact assessment was developed based on how the Facility will interact with the identified receptors (land use, human health and controlled waters) and contaminated land to create potential effects. Additionally, effects to agricultural land and soil quality were also considered as part of this assessment. Where appropriate, cross references were used to highlight the interrelationship between the identified receptors and impacts. In particular, this was carried out where impacts or receptors were considered in more detail within other chapters. The direct effects to surface water and drainage are considered in **Chapter 13 Surface Water, Flood Risk and Drainage Strategy**, and the effects from contaminated sediments is considered in **Chapter 15 Marine Water and Sediment Quality**.

11.2 Legislation, Policy and Guidance

Legislation

11.2.1 The following sections provide detail on key UK legislation, policy and guidance which are relevant to this chapter.

National Planning Policy

National Policy Statements

11.2.2 National Policy Statements (NPSs) form a principal part of the decision-making process for Nationally Significant Infrastructure Projects (NSIPs). The policy statements of relevance to the Facility are:

- The overarching NPS for Energy (**EN-1**) (Department of Energy and Climate Change (DECC) 2011a), and
- The NPS for Renewable Energy Infrastructure (**EN-3**) (DECC, 2011b).

11.2.3 Sections of the NPSs relevant to this chapter are summarised in **Table 11-1**. As can be seen from the table, there are no relevant contaminated land provisions in EN-3.

Table 11-1 National Policy Statement Requirements

National Policy Statement Requirements	NPS Reference	ES Chapter Reference
Overarching NPS for Energy (EN-1)		
<i>“The ES should identify existing and proposed land uses near the project, any effects of replacing an existing development or use of the site with the proposed project or preventing a development or use on a neighbouring site from continuing. Applicants should also assess any effects of precluding a new development or use proposed in the development plan.”</i>	EN-1 Section 5.10.5	A review of historical map information was undertaken during the scoping stage of the project and presented in the Preliminary Risk Assessment (PRA), considering contaminated land, and was included as an appendix to the scoping report. For ease of reference, the PRA is provided as Appendix 11.1 .
<i>“During any pre-application discussions with the Applicant the LPA [Local Planning Authority] should identify any concerns it has about the impacts of the application on land use, having regard to the development plan and relevant applications and including, where relevant, whether it agrees with any independent assessment that the land is surplus to requirements.”</i>	EN-1 Section 5.10.7	The local planning considerations of relevance to the Principal Application Site are outlined in Section 11.2 and Table 11-3 . The PRA (Appendix 11.1) considered the previous land uses for the Principal Application Site and has been used to development the baseline conditions for the Principal Application Site in Section 11.6 and the potential impacts from the Facility to agricultural

National Policy Statement Requirements	NPS Reference	ES Chapter Reference
		land use and agricultural land classification are considered in Section 11.7 .
<i>“Applicants should seek to minimise impacts on the best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification) and preferably use land in areas of poorer quality (grades 3b, 4 and 5) except where this would be inconsistent with other sustainability considerations. Applicants should also identify any effects and seek to minimise impacts on soil quality taking into account any mitigation measures proposed. For developments on previously developed land, Applicants should ensure that they have considered the risk posed by land contamination.”</i>	EN-1 Section 5.10.8	The baseline conditions for soil quality and agricultural land classification (ALC) are presented in Section 11.6 and the potential impacts from the Facility considered in Section 11.7 . Land contamination is considered in the PRA (Appendix 11.1). The current baseline for land contamination (land quality) is addressed in Section 11.6 and the potential impacts from the Facility considered in Section 11.7 .
Ensure that Applicants “do not site their scheme on the best and most versatile agricultural land without justification. It should give little weight to the loss of poorer quality agricultural land (in grades 3b, 4 and 5).”	EN-1 Section 5.10.15	The baseline conditions for soil quality and ALC are presented in Section 11.6 and the potential impacts from the Facility and the justification for the Facility’s location is addressed in Section 11.7 .

National Planning Policy Framework (NPPF)

11.2.4 The NPPF (Ministry of Housing, Communities and Local Government (MHCLG), 2019) does not contain specific policies relating to NSIPs. However, some policy requirements detailed in the NPPF may be of relevance. The policies relating to this chapter are detailed in **Table 11-2**.

Table 11-2 National Planning Policy Framework Requirements

National Policy Statement Requirements	Reference	Chapter Reference
<i>“The planning system should contribute to and enhance the natural and local environment by: [...] e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by,</i>	NPPF: Section 15, Paragraph 170	Land contamination is considered in the PRA (Appendix 11.1). The current baseline for land contamination (land quality) is addressed in Section 11.6 and the

National Policy Statement Requirements	Reference	Chapter Reference
<p><i>unacceptable levels of soil, air, water or noise pollution or land instability.</i></p> <p><i>f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.”</i></p>		<p>potential impacts from the Facility considered in Section 11.7.</p>
<p><i>“Planning policies and decisions should also ensure that:</i></p> <p><i>a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);</i></p> <p><i>b) after remediation, as a minimum land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990;</i></p> <p><i>c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.”</i></p>	<p>NPPF: Section 15, Paragraph 178</p>	<p>Land contamination will be investigated further during required ground investigation for geotechnical purposes to provide qualitative information further to that presented within the PRA (Appendix 11.1). The conclusion of the qualitative assessment would inform the sampling strategy further investigation and/or remediation.</p> <p>Intrusive ground investigations are secured as a requirement of the DCO.</p>
<p><i>“Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.”</i></p>	<p>NPPF: Section 15, Paragraph 179</p>	<p>Future intrusive geotechnical and land contamination investigations will follow the PRA (Appendix 11.1) to ensure the developer and/or landowner maintain commitment to the responsibility for securing a safe development.</p>
<p><i>“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.”</i></p>	<p>NPPF: Section 15, Paragraph 180</p>	<p>The likely effects of potential land contamination are considered in the PRA (Appendix 11.1). The current baseline for land contamination (land quality) is addressed in Section 11.6 and the potential impacts, including cumulative impacts from the Facility are considered in Section 11.7.</p>
<p><i>“The focus of planning policies and decisions should be on whether the proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control</i></p>	<p>NPPF: Section 15, Paragraph 183</p>	<p>By following the procedure set out in land contamination risk management guidance, (such as Environment</p>

National Policy Statement Requirements	Reference	Chapter Reference
<i>regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”</i>		Agency (EA) Land Contamination Risk Management guidance (EA, 2020)) the proposed development ensure acceptable use of land and issues relating to planning can be discharged without the requirement to revisit through permitting regimes.

Local Planning Policy

11.2.5 The Overarching NPS for Energy (**EN-1**) states at paragraph 4.1.5 that the Planning Inspectorate may consider Development Plan Documents or other documents in the Local Development Framework to be relevant to its decision making. Paragraph 4.1.5 goes on to state that:

“In the event of a conflict between these or any other documents and an NPS, the NPS prevails for the purposes of IPC decision making given the national significance of the infrastructure.”

11.2.6 The Application Site is located within the jurisdiction of Lincolnshire County Council (LCC) and Boston Borough Council (BCC) local planning authority. BBC in partnership with South Holland District and Lincolnshire County Council have developed a local plan for South East Lincolnshire. The South-East Lincolnshire Local Plan (2011-2036) was adopted on Friday 8 March 2019 (South-East Lincolnshire Joint Strategic Planning Committee (SELJSPC), 2019). Policies of relevance to this chapter are detailed in **Table 11-3**.

11.2.7 This chapter also considered the Lincolnshire Minerals and Waste Local Plan (LCC, 2016). Policies of relevance to this chapter are detailed in **Table 11-3**.

Table 11-3 Local Planning Policies

Local Planning Policy Requirements	Reference	ES Chapter Reference
South-East Lincolnshire Local Plan (2011-2036) (SELJSPC, 2019)		
<i>“Development proposals will demonstrate how the following issues, where they are relevant to the proposal, will be secured: [...] 13. the use of locally sourced building materials, minimising the use of water and minimising land take, to protect best and most versatile soils”</i>	Section 3.4 Design of New Development Policy 3: Design of New Development	The baseline conditions for soils quality and ALC are presented is addressed in Section 11.6 and the potential impacts from the Facility considered in Section 11.7 .

Local Planning Policy Requirements	Reference	ES Chapter Reference
<p><i>“Development proposals will not be permitted where, taking account of any proposed mitigation measures, they would lead to unacceptable adverse impacts upon:</i></p> <ol style="list-style-type: none"> <i>1. health and safety of the public;</i> <i>2. the amenities of the area; or</i> <i>3. the natural, historic and built environment;</i> <p><i>by way of:</i></p> <p><i>[...]</i></p> <ol style="list-style-type: none"> <i>7. land quality and condition; or</i> <i>8. surface and groundwater quality</i> <p><i>[...]</i></p> <p><i>Development proposals on contaminated land, or where there is reason to suspect contamination, must include an assessment of the extent of contamination and any possible risks. Proposals will not be considered favourably unless the land is, or can be made, suitable for the proposed use.”</i></p>	<p>Section 7.4 Pollution</p> <p>Policy 30: Pollution</p>	<p>Land contamination is considered in the PRA (Appendix 11.1). The current baseline for land use, land contamination (land quality), hydrology and hydrogeological conditions are addressed in Section 11.6 and the potential impacts from the Facility considered in Section 11.7.</p>
<p>Lincolnshire Minerals and Waste Local Plan: Core Strategy and Development Management Policies (LCC, 2016)</p>		
<p><i>“Proposals for minerals and waste development should protect and, wherever possible, enhance soils.”</i></p> <p><i>“Proposals for minerals and waste development should take into account their impact on soil resources, agricultural land quality and farming, and other established rural land uses. This assessment should be informed by a soil and land quality survey and a soil handling and replacement strategy, where appropriate.</i></p> <p><i>Soil is a finite resource which takes many years to develop but which can be quickly lost or degraded. Good soil management and conservation are therefore critical to sustainable land management practices in minerals and waste development. The NPPF states that soils should be protected and enhanced.</i></p> <p><i>Where soil is not required for restoration purposes on the site, other options for the sustainable use of the soil include using it for restoring other nearby sites (subject to planning permission for the areas involved) or storing the soil "permanently" on site in appropriately designed bunds – potentially allowing its use at a later date if the need arises.”</i></p>	<p>Policy DM11: Soils</p> <p>Agricultural land and Soils, Paragraphs 7.67 to 7.69</p>	<p>The Application Site is predominantly located within the Riverside Industrial Estate (WA22-BO). This area has been allocated for industrial use and consideration for waste developments (Lincolnshire Minerals and Waste Local Plan Site Allocations document, adopted in December 2017 (LCC, 2017).</p> <p>This allocation was reviewed by relevant stakeholders and allocated in 2016.</p> <p>This issue is further discussed in Chapter 4 Site Selection and Alternatives of this ES.</p> <p>The baseline conditions for soils quality and ALC are presented in Section 11.6 and the potential impacts from the Facility are considered in Section 11.7.</p>

Local Planning Policy Requirements	Reference	ES Chapter Reference
<p><i>“Proposals for minerals and waste development that include significant areas of best and most versatile agricultural land will only be permitted where it can be demonstrated that:</i></p> <ul style="list-style-type: none"> • <i>no reasonable alternative exists; and</i> • <i>for mineral sites, the site will be restored to an after-use that safeguards the long-term potential of the best and most versatile agricultural land.”</i> 	<p>Policy DM12: Best and Most Versatile Agricultural Land</p>	<p>The Application Site is predominantly located within the Riverside Industrial Estate (WA22-BO). This area has been allocated for industrial use and consideration for waste developments.</p> <p>This allocation was reviewed by relevant stakeholders and allocated in 2016.</p> <p>This issue is further discussed in Chapter 4 Site Selection and Alternatives of this ES.</p> <p>The baseline conditions for soils classified as BMV are presented in Section 11.6 and the potential impacts from the Facility considered in Section 11.7.</p>
<p><i>“The proposed after-use should be designed in a way that is not detrimental to the local economy and conserves and where possible enhances the landscape character and the natural and historic environment of the area in which the site is located.</i></p> <p><i>After-uses should enhance and secure a net gain in biodiversity and geological conservation interests, conserve soil resources, safeguard the potential of the best and most versatile agricultural land, and decrease the risk of adverse climate change effects. Such after-uses could include agriculture, nature conservation, leisure, recreation/sport, and woodland.</i></p> <p><i>Where appropriate, the proposed restoration should provide improvements for public access to the countryside including access links to surrounding green infrastructure. Restoration proposals should be designed to ensure that they do not give rise to new or increased hazards to aviation.”</i></p>	<p>Policy R2: After-use</p>	<p>The Application Site is predominantly located within the Riverside Industrial Estate (WA22-BO). This area has been allocated for industrial use and consideration for waste developments.</p> <p>This allocation was reviewed by relevant stakeholders and allocated in 2016.</p> <p>The baseline conditions for soils classified as BMV are presented in Section 11.6 and the potential impacts from the Facility considered in Section 11.7.</p> <p>Opportunities for biodiversity are identified in Chapter 9 Landscape and Visual Impact Assessment and Chapter 13 Terrestrial Ecology of this ES.</p>
<p><i>“Planning permission will be granted for minerals and waste development provided that it does not</i></p>	<p>Policy DM3: Quality of</p>	<p>The Application Site is predominantly located within</p>

Local Planning Policy Requirements	Reference	ES Chapter Reference
<p><i>generate unacceptable adverse impacts arising from:</i> [...] <ul style="list-style-type: none"> <i>the migration of contamination,</i> [...] <i>to occupants of nearby dwellings and other sensitive receptors.</i></p> <p><i>And in respect of waste development is well designed and contributes positively to the character and quality of the area in which it is to be located.</i></p> <p><i>Where unacceptable impacts are identified, which cannot be addressed through appropriate mitigation measures, planning permission will be refused.”</i></p>	<p>Life and Amenity</p>	<p>the Riverside Industrial Estate (WA22-BO). This area has been allocated for industrial use and consideration for waste developments.</p> <p>Land contamination, hydrology and hydrogeological conditions of the Principal Application Site are considered in the PRA (Appendix 11.1). The current baseline for land use, land contamination (land quality), hydrology and hydrogeological conditions are addressed in Section 11.6 and the potential impacts from the Facility considered in Section 11.7.</p>
<p><i>“Proposals for new waste facilities, including extensions to existing waste facilities, in and around the main urban areas set out in Policy W3 will be permitted provided that they would be located on:</i></p> <ul style="list-style-type: none"> <i>previously developed and/or contaminated land; or</i> <i>existing or planned industrial/employment land and buildings; or</i> <i>land already in waste management use; or</i> <i>sites allocated in the Site Locations Document; or</i> <i>in the case of biological treatment, the land identified in Policy W5.</i> <p><i>Proposals for the recycling of construction and demolition waste and/or the production of recycled aggregates in and around the main urban areas set out in Policy W3 will also be permitted at existing Active Mining Sites.</i></p> <p><i>In the case of large extensions to existing waste facilities, where the proposals do not accord with the main urban areas set out in Policy W3, proposals will be permitted where they can demonstrate they have met the above criteria. Small scale facilities that are not in and around the main urban areas will be considered under Policy W7.</i></p>	<p>Policy W4: Locational Criteria for New Waste Facilities in and around main urban areas</p>	<p>The Application Site is predominantly located within the Riverside Industrial Estate (WA22-BO). This area has been allocated for industrial use and consideration for waste developments. This issue is further discussed in Chapter 4 Site Selection and Alternatives of this ES.</p> <p>Land contamination, hydrology and hydrogeological conditions of the Principal Application Site are considered in the PRA (Appendix 11.1). The current baseline for land use, land contamination (land quality), hydrology and hydrogeological conditions are addressed in Section 11.6 and the potential impacts from the Facility considered in Section 11.7.</p>

Local Planning Policy Requirements	Reference	ES Chapter Reference
<i>Proposals must accord with all relevant Development Management Policies set out in the Plan.</i>		

Guidance

11.2.8 The following UK guidance is considered the most relevant to this chapter and has been considered when identifying the baseline and assessing the potential impacts from the Facility:

- Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance (Defra, 2012);
- EA Land Contamination Risk Management guidance (EA, 2020) (this is an update to the former Environment Agency Model Procedures for the Management of Land Contamination, Contaminated Land Report 11 (CLR11));
- British Standard BS10175 Code of Practice for the Investigation of Potentially Contaminated Sites;
- British Standard BS5930 Code of Practice for Site Investigations;
- British Standard BS8485 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings;
- Environment Agency Technical Report P5-065/TR (Technical Aspects of Site Investigations) (EA, 2000);
- CIRIA publication C532: Control of water pollution from construction sites, Guidance for consultants and contractors (CIRIA, 2001);
- CIRIA publication C741: Environmental good practice on site guide (4th Edition) (CIRIA, 2015);
- CIRIA publication C762: Environmental good practices working on site pocketbook (4th Ed.) (CIRIA 2016);
- CIRIA publication C665: Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2007);
- Construction Code of Practice for the Sustainable Use of Soil on Construction Sites (Defra, 2009);
- Biosecurity Guidance to Prevent the Spread of Animal Diseases (Defra, 2008);
- Managing Invasive Non-native Plants (EA, 2010);

- Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land (Ministry of Agriculture, Fisheries and Food (MAFF), 1988);
- Good Practice Guide for Handling Soils (MAFF, 2000);
- Preventing the Spread of Plant and Animal Diseases – a Practical Guide (MADD, 1991); and
- Guide to assessing development proposals on agricultural land (Natural England, 2018).

11.3 Consultation

11.3.1 Consultation is a key part of the Development Consent Order (DCO) application process. To date, consultation on contaminated land, land use and hydrogeology has been undertaken through a Scoping Opinion (The Planning Inspectorate, 2018) from the Planning Inspectorate on the Facility's Scoping Report (Royal HaskoningDHV, 2018), during Public Information Days in September 2018, February 2019 and July 2019, online consultation during August 2020 and through Section 42 Consultation Responses on the Facility's Preliminary Environmental Information Report (PEIR). Full details on the consultation process and consultation undertaken as part of this application is presented within **Chapter 7 Consultation** and the Consultation Report (document reference 5.1) which is submitted with this DCO application.

11.3.2 Consultation undertaken throughout the pre-application phase informed the approach and the information provided in this chapter. A summary of the consultation of particular relevance to contaminated land, land use and hydrogeology is detailed in **Table 11-4**.

Table 11-4 Consultation and Responses

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
The Planning Inspectorate, July 2018	Soil classification and management The Applicant should be aware that loss of Agricultural Land Classification (ALC) Grade 1 (excellent) land may require specific mitigation to protect what is a recognised valuable resource. The ES should include information about the specific measures necessary for soil management and handling. The Applicant should make effort to seek agreement with relevant consultation bodies regarding the soil management measures required. The ES should state the likely dimensions and locations	The impacts to agricultural land and soils are assessed as shown in Section 11.7 . The likely dimensions and location of any potential spoil will be developed further as the design of the Facility progresses and was not included at this stage. The specific mitigation measures are discussed in Table 11-13 .

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
	applicable to the spoil heaps required during the construction phase. The ES should also describe any mitigation measures required to prevent spoil heaps leaching contaminants to the surrounding area.	
	<p>Baseline - Borehole locations</p> <p>The Scoping Report indicates the intent to inform the assessment in the ES using information derived from the (Lincs Laboratory, 2011) borehole data. The study area used in the ES and on which the assessment is based must be adequate to encompass the full extent of likely significant effects. The locations of the boreholes outlined in Table 6.5 of the Scoping Report and used to inform the baseline assessment should be clearly stated within the ES. The ES should also include a figure to depict the location of boreholes.</p>	<p>The study area used to assess potential impacts is shown in Figure 11.1. The locations of borehole information used to inform the impact assessment are shown in Figure 11.6. The boreholes used to inform the baseline are listed in Table 11-12.</p>
	<p>Baseline - Groundwater</p> <p>The Inspectorate notes that groundwater levels stated within the Scoping Report are derived from existing information from the (Lincs Laboratory, 2011) report. The ES should explain the extent to which this data is relevant to the receiving environment for the Proposed Development. The Scoping Report states that the British Geological Society (BGS) flood risk information indicates that the site is not located within an area with potential ground water flooding. To aid the reader the ES should include the BGS groundwater flood risk map. The ES should include a ground water risk assessment to assess the potential effects that accidental spills of pollutants may have on the groundwater. Furthermore, if de-watering is required during the construction phase of the Proposed Development, the environmental effects of de-watering should be assessed and presented within the ES.</p>	<p>The flood risk information has been incorporated into a figure to aid the reader (Figure 11.7). The environmental effects of dewatering and accidental spillages have been assessed in Section 11.7. Impacts to groundwater quality and quantity have been assessed as set out in Section 11.7.</p>
	<p>Scope - Unlicensed water suppliers</p> <p>The Scoping Report proposes to exclude consideration of unlicensed water supplies abstracting less than 20m³ from the assessment. No justification in support of this approach has been provided. The assessment in the ES should take these activities into account where significant effects are likely to</p>	<p>Private water supply records were obtained from Boston Borough Council and the baseline hydrogeological conditions were evaluated, considering all likely abstractions, as described in Section 11.6. Determination of baseline hydrogeological sensitivity, considering all likely abstractions is presented in Section 11.7.</p>

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
	occur.	
	<p>Methodology – Further investigation</p> <p>If further investigations and/or surveys will be undertaken to determine the potential for contaminated land and groundwater to cause significant effects as outlined within Table 6.9 of the Scoping Report, the ES should include a full description, location, methods used, and the results of the investigations. The ES must assess the effects of potential contaminants having regard to the likely impact pathways to sensitive receptors as well as impacts to the Proposed Development during construction.</p>	<p>Further investigations into contaminated land have not been proposed at this stage. Further geotechnical and geo-environmental testing will be completed as part of the detailed design stage of the Facility, post DCO submission. The assessment of impacts of contaminated land is outlined in Section 11.7 and this has accounted for effects of potential contaminants having regard to the likely impact pathways to sensitive receptors as well as impacts to the Facility during construction.</p> <p>A PRA, considering contaminated land, was included as an appendix to the scoping report. Since the submission of the scoping report, the Facility design has evolved. Therefore, there are minor changes to the proposed footprint for the Principal Application Site from that reported in the original PRA. However, the conclusions drawn in the PRA about existing baseline conditions at the Principal Application Site remain valid because the changes to the design have not been sufficiently significant to fundamentally change the source-receptors-pathway potential linkages identified in the PRA report. For ease of reference, the PRA is provided as Appendix 11.1.</p>
	<p>Potential effects – Receptors and study area</p> <p>A full description of the methodology used to determine the sensitivity of receptors and the significance of effect should be included within the ES. The Inspectorate notes that interrelated impacts between aspects have not been addressed within this aspect of the Scoping Report. The ES should assess the interrelated impacts from this aspect that may result in significant effects when considered with other applicable aspects, for example ecology and landscape effects. The ES should explain the study area applied to the assessment which should be applicable to the extent of the anticipated impacts and the likely significant</p>	<p>A full description of the methodology used to determine the sensitivity of receptors is outlined in Table 11-7. Interrelated impacts are cross referenced within the assessment and throughout this chapter and addressed specifically within Section 11.11. The rationale for the study area is addressed in Section 11.5</p>

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
	effects.	
	<p>Mitigation – Monitoring</p> <p>Table 6.9 of the Scoping Report indicates that the build-up and migration of ground gas and vapours will be monitored during construction to prevent potential significant effects. A full description of the monitoring measures and how they will be implemented should be included within the ES, with reference to a CEMP as appropriate.</p>	<p>Consideration of the ground gas and vapour risk and associated outline mitigation measures are detailed in Table 11-12, which would be incorporated into a Code of Construction Practice (CoCP) to be finalised prior to construction.</p>
	<p>Mitigation</p> <p>The ES should include a full description of the proposed mitigation measures (including embedded mitigation and any ‘appropriate working practices’ as referred to in the Scoping Report) as well as an assessment of the efficacy of the mitigation measures, and how these measures will be secured in the DCO or by other suitable agreement.</p>	<p>Embedded mitigation is included in Table 11-13. Details of further mitigation requirements are provided within the impact assessment sections, where appropriate.</p>
	<p>Potential effects – Piling</p> <p>This aspect chapter of the Scoping Report does not state if piling is required, however it is noted in other aspect chapters of the Scoping Report. If piling is required during the construction phase, the location of piling, and a full assessment of the impacts that may result in potentially significant environmental effects be included within the ES.</p>	<p>The impacts from any potential piling are assessed in Section 11.7</p>
	<p>Potential effects – Wharf construction and operation</p> <p>The Inspectorate advises that an assessment of the potential land contamination and hydrogeological effects that may arise from the construction of the wharf including the disturbance of sediment within the River Witham should be included within the ES. The ES should include a full assessment of the potentially significant environmental effects that may arise from the construction and operation of the wharf and fully describe any required mitigation measures and their efficacy.</p>	<p>Impacts from hydrogeological risk are assessed in this chapter. Impacts from sediment disturbance are assessed within Chapter 15 Marine Water and Sediment Quality and Chapter 16 Estuarine Processes.</p>
<p>Public Health England, July 2018</p>	<p>Land Quality</p> <p>We would expect the promoter to provide details of any hazardous contamination present on site (including ground gas) as part of the site condition report. Emissions to and from the</p>	<p>Impacts associated with land quality are considered as described in in Section 11.7 Future environmental management, waste, and soil management plans will be informed by further chemical testing to be carried out</p>

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
	<p>ground should be considered in terms of the previous history of the site and the potential of the site, once operational, to give rise to issues. Public health impacts associated with ground contamination and/or the migration of material off-site should be assessed and the potential impact on nearby receptors and control and mitigation measures should be outlined. Relevant areas outlined in the Government's Good Practice Guide for EIA include:</p> <ul style="list-style-type: none"> • effects associated with ground contamination that may already exist • effects associated with the potential for polluting substances that are used (during construction / operation) to cause new ground contamination issues on a site, for example introducing / changing the source of contamination • Impacts associated with re-use of soils and waste soils, for example, re-use of site-sourced materials on-site or offsite, disposal of site-sourced materials offsite, importation of materials to the site, etc. 	<p>at the detailed design stage of the project, post consent.</p> <p>Waste management, including the potential for use of excavated material on site is described in Chapter 23 Waste.</p>
<p>Marine Management Organisation (MMO), July 2018</p>	<p>The MMO welcomes the intention to assess the potential for contamination but would expect that disturbance of the river bed sediment (both during construction and operation) is considered within the ES.</p>	<p>The impacts associated with river sediments are considered within Chapter 15 Marine Water and Sediment Quality. This is informed by Chapter 16 Estuarine Processes.</p>
<p>Environment Agency, July 2018</p>	<p>A preliminary risk assessment (PRA) has been completed, which has revealed the site to be historically farmland and on unproductive strata (Non-Aquifer). Consequently, we consider this to be a low risk site in respect to groundwater. Furthermore, investigations are proposed in the EIA with the aim to refine the environmental setting of the site, but these will be predominately for geotechnical and human health risks. I can therefore confirm that we are satisfied with the finding of the PRA and the EIA scope of works in this respect.</p>	<p>Noted. The PRA assessment was included as appendix to the scoping report and is included as Appendix 11.1 to this ES chapter.</p>
<p>Section 42 Consultation Response – LCC, 1st August 2019</p>	<p>The Council are content that this chapter addressed all relevant points with adequate detail.</p>	<p>Noted.</p>
<p>Section 42 Consultation</p>	<p>We have reviewed Chapter 11, along with the associated Land Quality Phase 1 Preliminary</p>	<p>Noted.</p>

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
Response – Environment Agency, 6 th August 2019	<p>Risk Assessment (ref: PB6934-RHD-01-ZZ-RP-N-2011_A11.1, dated 27 October 2017) included in Appendix 11.1.</p> <p>Based on the available information, the site has been previously used for arable/agricultural use and is located in an area of low sensitivity for groundwater. As such, we consider the site to pose a negligible risk to controlled waters and the PEIR is satisfactory in respect of this.</p>	
Section 42 Consultation Response – Lincolnshire Wildlife Trust, 6 th August 2019	<p>Drainage</p> <p>Chapter 11 Contaminated Land Use and Hydrology and Chapter 13 relating to Surface water, Flood Risk and Drainage should also consider impacts and opportunities for biodiversity.</p>	<p>Noted. Impacts to surface water quality are assessed within Chapter 13 Surface Water and Flood Risk. Impacts to ecological receptors from contamination were addressed within the PRA and are considered as part of the impact assessment. The impacts to ecological receptors are considered in the context of impacts to biodiversity.</p>

11.4 Assessment Methodology

11.4.1 The overall approach of assessment considers how the Facility will interact with the identified receptors (land use, human health and controlled waters) and contaminated land to create potential impacts. The approach to this assessment is outlined below. Additionally, the impacts to land use by the consideration of agricultural land classification and soils is considered in this chapter and the approach to this assessment is set out below.

11.4.2 The assessment of potentially contaminated land follows a phased risk-based approach, which considers potential sources, pathways and receptors to identify potential pollutant linkages that may result in unacceptable risks to receptors from ground contamination. For a risk to exist, all three elements (defined below) must be present:

- **Source:** A potentially polluting activity or existing ground contamination. A contaminant is a substance which is in or on the land and which has the potential to cause significant harm.
- **Pathway:** A route or means by which a receptor could be exposed to contamination.
- **Receptor:** Something which could be adversely affected by contamination.

- 11.4.3 The PRA for the Facility was carried out by Royal HaskoningDHV to support the scoping stage of the project and is presented in **Appendix 11.1**. Outlined within the PRA is a preliminary Conceptual Site Model (CSM) for the Facility. The CSM is used as the baseline for this chapter's assessment, the CSM describes feasible pollutant linkages associated with the construction and operational phases of the Facility.
- 11.4.4 Development activities or features that materially affect the baseline CSM may increase or decrease the level of risk, compared with the baseline. The assessment considers what impact the Facility would have on the baseline level of risk. Creation of a new pollutant linkage or increase in the likelihood that an existing linkage would occur (e.g. by exposing contaminated ground during construction), would increase risk, resulting in an adverse effect. Reducing the risk to a receptor (e.g. by remediating any ground contamination at a site) would result in a beneficial effect.

Receptor Sensitivity

- 11.4.5 The sensitivity of receptors will be assessed according to the criteria set out in **Table 11-5**. This is based on the capacity of receptors for adaptability, tolerance, recoverability and the acceptability of risks.

Table 11-5 Sensitivity Criteria for Receptors

Sensitivity	Definition
High	Has very limited or no capacity to accommodate physical or chemical changes. Increased risk of exposure / pollution would be unacceptable.
Medium	Has limited capacity to accommodate physical or chemical changes or influences. Increased risk of exposure/ pollution may be acceptable.
Low	Has moderate capacity to accommodate physical or chemical changes. Increased risk of exposure / pollution likely to be acceptable.
Negligible	Is generally tolerant of physical or chemical changes. Insensitive to increased risk of exposure / pollution.

Value

- 11.4.6 The sensitivity assessment for each receptor considers how 'acceptable' changes to the availability, quality or condition of a particular resource as a whole would be. This approach is dependent on the value of that resource, which is assessed based on its strategic or geographic importance (**Table 11-6**). The degree of

change that is considered to be acceptable is dependent on the value of a receptor, which is discussed further below.

Table 11-6 Value Criteria for Receptors

Value	Definition
High	Is an international or nationally important resource.
Medium	Is a regionally important resource
Low	Is a locally important resource
Negligible	Is of no significant value

11.4.7 The definition of the different sensitivity levels for the receptors are presented in **Table 11-7**.

Table 11-7 Receptor Sensitivity Criteria

Sensitivity Criteria	Definition Examples
High Has very limited or no capacity to accommodate physical or chemical changes; or, Is an international or nationally important resource.	Human Health Construction Workers Site Operatives General Public
	Controlled Waters Groundwater Source Protection Zone 1 / 2 (including unpublished abstraction wells); Unlicensed groundwater abstractions; Surface water or groundwater supporting internationally designated or nationally important conservation site (e.g. Special Areas of Conservation, Special Protection Area, Ramsar site / Site of Special Scientific Interest) or fishery
	Agricultural Land Quality ALC Grade 1 or 2 land; Farming practices with specific requirements Land with notifiable weeds (risk of spread) Land with notifiable scheduled diseases (risk of spread), or soil vulnerable to structural damage and erosion or unrecoverable or not adaptable to changes
Medium Has limited capacity to accommodate physical or chemical changes or influences. Is a regionally important resource.	Controlled Waters Principal Aquifer (resource potential) Groundwater Source Protection Zone Total Catchment Licenced groundwater / surface water abstractions Surface water or groundwater supporting regionally important wildlife sites (Local Nature Reserve, Site of Nature Conservation Interest) or commercial aquaculture
	Agricultural Land Quality ALC Grade 3; or Seasonally susceptible to structural damage or erosion

Sensitivity Criteria	Definition Examples
Low Has moderate capacity to accommodate physical or chemical changes. Is a locally important resource.	Controlled Waters Secondary B Aquifers / Undifferentiated Aquifer Surface waters with Water Framework Directive (WFD) Status / Potential objective 'Moderate' / 'Poor' Surface water or groundwater supporting locally important wildlife or amenity site
	Agricultural Land Quality ALC Grade 4
Negligible Is generally tolerant of physical or chemical changes. Is of no significant resource value.	Controlled Waters Unproductive strata Surface waters with WFD status "Bad"
	Agricultural Land Quality Urban ALC

Magnitude

11.4.8 Potential effects may be adverse, beneficial or neutral. The magnitude of impact was assessed qualitatively, according to the criteria set out in **Table 11-8**. The following definitions apply to time periods used in the magnitude assessment:

- Long-term: >5 years;
- Medium-term: 1 to 5 years; and
- Short-term: <1 year.

11.4.9 For human health, magnitude reflects the likely increase or decrease in exposure risk for a receptor. For controlled waters, magnitude represents the likely effect that an activity would have on resource usability or value, at the receptor. Magnitude is therefore affected by the distance and connectivity between an impact source and the receptor. For Agricultural land and Soils the magnitude of effect relates to the size and amount of agricultural land which will be taken out of use from the proposed development, as outlined in **Table 11-8**.

Table 11-8 Magnitude of Impact Criteria

Criteria	Examples – Proposed development are “likely” to result in:
High	Human Health Permanent or major change to existing risk of exposure (Adverse / Beneficial). Unacceptable risks to one or more receptors over the long-term or permanently (Adverse). Prosecution e.g. under health and safety legislation (Adverse). Remediation and complete source removal (Beneficial).

Criteria	Examples – Proposed development are “likely” to result in:
Permanent or large-scale change affecting usability, risk or, value over a wide area, or certain to affect regulatory compliance	<p>Construction workers at risk due to lack of appropriate personal protective equipment (Adverse).</p> <p>Controlled Waters Permanent, long-term or wide scale effects on water quality or availability (Adverse / Beneficial). Permanent loss or long-term derogation of a water supply source resulting in prosecution (Adverse). Change in WFD water body status / potential or its ability to achieve WFD status objectives in the future (Adverse / Beneficial). Permanent habitat creation or complete loss (Adverse / Beneficial). Measurable habitat change that is sustainable / recoverable over the long-term (Adverse / Beneficial).</p> <p>Soil and Agricultural Land Quality The proposed development would lead to the loss of 50 ha or more of agricultural land. The proposed development would lead to the loss of more than one of soils primary functions and a reduction in the primary functions of soils off-site.</p>
Moderate Permanent or long-term reversible change affecting usability, value, or risk, over the medium-term or local area; possibly affecting regulatory compliance	<p>Human Health Medium-term or moderate change to existing risk of exposure (Adverse / Beneficial). Unacceptable risks to one or more receptors over the medium-term (Adverse). Serious concerns or opposition from statutory consultees (Adverse).</p> <p>Controlled Waters Medium-term or local scale effects on water quality or availability (Adverse / Beneficial). Medium-term derogation of a water supply source, possibly resulting in prosecution (Adverse). Observable habitat change that is sustainable / recoverable over the medium-term (Adverse / Beneficial). Temporary change in status / potential of a WFD waterbody or its ability to meet objectives (Adverse / Beneficial).</p> <p>Soil and Agricultural Land Quality The proposed development would lead to the loss of 20 – 50 ha of agricultural land. A reduction in the primary function of soils on site would occur.</p>
Low	<p>Human Health Short-term temporary or minor change to existing risk of exposure (Adverse / Beneficial). Unacceptable risks to one or more receptors over the short-term (Adverse).</p> <p>Controlled Waters Short-term or very localised effects on water quality or availability. (Adverse / Beneficial).</p>

Criteria	Examples – Proposed development are “likely” to result in:
Temporary change affecting usability, risk or value over the short-term or within the site boundary; measurable permanent change with minimal effect usability, risk or value; no effect on regulatory compliance	<p>Short-term derogation of a water supply source (Adverse).</p> <p>Measurable permanent effects on a water supply source that do not impact on its operation (Adverse).</p> <p>Observable habitat change that is sustainable / recoverable over the short-term (Adverse / Beneficial).</p> <p>No change in status / potential of a WFD waterbody or its ability to meet objectives (Neutral).</p>
	<p>Soil and Agricultural Land Quality</p> <p>The proposed development would lead to the loss of 5 – 20 ha of agricultural land. Soil displacement will still allow the primary functions of soil to occur onsite.</p>
Negligible Minor permanent or temporary change, indiscernible over the medium- to long-term short-term, with no effect on usability, risk or value	<p>Human Health</p> <p>Negligible change to existing risk of exposure.</p> <p>Activity is unlikely to result in unacceptable risks to receptors (Neutral).</p>
	<p>Controlled Waters</p> <p>Very minor or intermittent impact on local water quality or availability (Adverse / Beneficial).</p> <p>Usability of a water supply source will be unaffected (Neutral).</p> <p>Very slight local changes that have no observable impact on dependent receptors (Neutral).</p> <p>No change in status / potential of a WFD waterbody or its ability to meet objectives (Neutral).</p>
	<p>Soil and Agricultural Land Quality</p> <p>The proposed development would lead to the loss of 5 ha or less of agricultural land. Soil would retain all pre-existing functions.</p>

Evaluation of Significance

11.4.10 The impact significance assessment combined receptor sensitivity (**Table 11-7**) with effect magnitude (**Table 11-8**). Assessment of impact significance is qualitative and reliant on professional experience, interpretation and judgement. The matrix should therefore be viewed as a framework to aid understanding of how a judgement has been reached, rather than as a prescriptive, formulaic tool.

11.4.11 Effects that result in major or moderate effects are considered to be ‘significant’ in EIA terms. The impact significance matrix used in this assessment is shown in **Table 11-9**.

Table 11-9 Significance of Impact

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

Cumulative Impact Assessment

11.4.12 Cumulative impacts are assessed through consideration of the extent of influence of changes or effects upon contaminated land, land use and hydrogeology and associated sensitive receptors arising from the Facility cumulatively.

11.4.13 The main potential for cumulative impacts is expected to be associated with the remediation of any contaminated land during the construction process.

Transboundary Impact Assessment

11.4.14 There are no transboundary impacts regarding contaminated land, land use and hydrogeology because the Facility is not sited in proximity to any international boundaries. Therefore, transboundary impacts on contaminated land, land use and hydrogeology were scoped out of this assessment and were not considered further.

11.5 Scope

Study Area

11.5.1 The study area for contaminated land and hydrogeology comprises the Principal Application Site and an environmental data search area extending 1 km from the boundary of the Principal Application Site, as shown in **Figure 11.1**. It is unlikely that receptors associated with contaminated land and hydrogeology, which are outside this area could be affected by the Facility due to distance from the Principal Application Site.

11.5.2 Contaminated land sources were assessed only where reasonable migration pathways beyond the Principal Application Site were identified. This was carried out across a maximum limit of 1 km from the Principal Application Site, which is considered the maximum reasonable limit for any pathways to the Principal Application Site to exist.

11.5.3 For agricultural land classification and soils, the study area encompasses all of the land being considered within the Principal Application Site. The rationale for this is that agricultural land quality is impacted by the direct deterioration and loss of the resource itself. This predominately occurs by direct actions on soil quality via construction related activities.

Data Sources

11.5.4 The assessment was undertaken with reference to several information sources, as detailed in **Table 11-10**.

Table 11-10 Key Information Sources

Data	Reference / Data Source
South-East Lincolnshire Local Plan	http://www.southeastlincslocalplan.org/
Private Water Supplies	Boston Borough Council
Groundwater Source Protection Zones	www.environment.data.gov.uk/catchment-planning
Historical Maps	Landmark Envirocheck Report
Regulatory information (Contemporary trade directories, waste licences, discharge consents etc..)	Landmark Envirocheck Report
Historical Landfills	www.environment.data.gov.uk
Pollution incidents	https://data.gov.uk/dataset/f/environmental-pollution-incidents
Solid Geology	British Geological Survey Onshore Geindex: http://www.bgs.ac.uk/GeoIndex/ British Geological Survey map Sheet 128 Solid and Drift Edition
Superficial Geology	British Geological Survey Onshore Geindex: http://www.bgs.ac.uk/GeoIndex/ British Geological Survey map Sheet 128 Solid and Drift Edition
ALC and agri-environment schemes	Natural England. Site specific request for data.
Soil Survey of England and Wales	National Soil Resources Institute. Site specific request for data.
Animal Burials	Animal and Plant Health Agency. Site specific request for data.
Soil-Borne Diseases	Animal and Plant Health Agency. Site specific request for data.

Assumptions and Limitations

- 11.5.5 The direct assessments and judgements given in this chapter are limited by both the finite data on which they are based and the proposed works to which they are addressed. The assessment utilises a variety of publicly available data sources; therefore, the study is limited by the age and limitations inherent in the data.
- 11.5.6 Conditions at the Principal Application Site will change over time due to natural variations and may be affected by human activities. In particular, groundwater, surface water and soil gas conditions should be anticipated to change with diurnal, seasonal and meteorological variations. Soil and water chemistry may change due to the actions of, for example, groundwater flows and microbiological activity. The likely variations in the data with time can be assessed following extended periods of measurement and statistical analyses. Unless specifically discussed in the text, such extended measurement and analysis was not carried out and the data collected were taken to be representative.
- 11.5.7 The opinions included herein are based on the information obtained from the published information, investigations undertaken at the adjacent site and professional experience. Two ground investigation reports for sites adjacent to the Principal Application Site have been used to support this assessment, these are discussed in the PRA (**Appendix 11.1**) produced during the scoping stage of the Facility. The location of boreholes and trial pits undertaken during these investigations are detailed in **Figure 11.6**. The relevance and finding of these reports are set out below.

11.6 Existing Environment

- 11.6.1 This section sets out the environmental baseline and, where appropriate, defines the existing sensitivity of the receptors (specifically land use, controlled waters and human health, insofar as it relates to exposure to land contamination) in the study area. Land quality is not considered to be a receptor but is discussed in the context of the potential for contamination to be present in the soils and groundwater.
- 11.6.2 The PRA (**Appendix 11.1**) completed as part of the Scoping Report for the Facility forms the basis of the baseline environmental information that was utilised to assess the environmental impacts associated with the Facility.
- 11.6.3 Baseline environmental information with regard to agricultural land use classification was also utilised to assess land use impacts associated with the Facility.

Site Setting

11.6.4 The Principal Application 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 (operated by Mick George Ltd at the time of writing), a household waste recycling centre, several warehouses, several footpaths along the boundary of the Principal Application Site and overhead powerlines crossing the Principal Application Site. A further description of the Principal Application Site is provided in **Chapter 5 Project Description**.

Land Use

11.6.5 The land use within the Principal Application Site is predominately agricultural land with areas of non-agricultural land use where soils have been stripped during the development of the adjacent environs.

Sensitive Land Uses

11.6.6 The Havenside Local Nature Reserve is located directly east of the Principal Application Site on the opposite bank of The Haven. No other sensitive land uses were identified within the study area.

Geology

11.6.7 The geology beneath the Principal Application 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 11-11**). Maps of the Principal Application Site's bedrock geology and superficial geology are provided in **Figure 11.4** and **Figure 11.5** respectively.

Table 11-11 Summary of Geological Conditions

Stratum	Unit	Description
Superficial Deposits	Tidal Flat Deposits	Normally a consolidated soft silty clay, with layers of sand, gravel and peat.
Solid Geology	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.

Table 11-12 Summary of Solid Geology from BGS Map Sheet 128

Geological Unit	Description
Ampthill Clay	Mudstone described as grey, shelly, partly calcareous mudstone and silty mudstone, approximately 80 m thick.

Geological Unit	Description
West Walton Formation	Mudstone described as grey, shelly, silty, partly calcareous mudstone with minor nodular limestones, approximately 21 m to 42 m thick.
Oxford Clay Formation	Grey, shelly mudstone, in lower part becoming calcareous, bituminous and fissile, with thin nodular limestones, approximately 48 m to 69 m thick.

11.6.8 Several ground investigations have been undertaken close to the Principal Application Site. A ground investigation was undertaken adjacent to the southern boundary of the Principal Application Site (see **Appendix 11.2** (Lincs Laboratory, 2011)). The geology was summarised as up to 9.45 m (but mostly 5.8 m to 6.7 m thick) of silt and clay (with occasional silty fine sand layers) on top of glacial diamicton or sand and gravel.

11.6.9 T.L.P Ground Investigations (2012) recovered nine boreholes approximately 500 m to the south of the Principal Application Site (see **Appendix 11.3**). They found 4.75 to 4.8 m of silty clay, underlain by 0 to 0.6 m of peat, underlain by 0.85 to 1.7 m of medium sand, all resting on diamicton. The base of the diamicton was not reached. The boreholes were not surveyed to a datum so only thicknesses are available.

11.6.10 The ground investigation undertaken in 2011, was undertaken at a site for a proposed Boston Waste Transfer Station located to the south of the Principal Application Site (Lincs Laboratory, 2011). It was undertaken on behalf of Lincolnshire County Council. The borehole and trial pit locations carried out as part of this investigation are shown on **Figure 11.6**. 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 or hard stony layers (**Table 11-13**).

Table 11-13 Borehole Records from Previous Stages of Investigation

Borehole / Trial Pit	Depth (m)	Description
BH1	0 – 0.50	Topsoil / MADE GROUND
BH1	0.50 – 5.70	Tidal Flat deposits / Alluvium
BH1	5.70 -	Glacial Till / Boulder Clay

Borehole / Trial Pit	Depth (m)	Description
BH2	0 – 0.50	Topsoil
BH2	0.50 – 5.90	Tidal Flat deposits / Alluvium
BH2	5.90 -	Glacial Till / Boulder Clay
BH3	0 – 0.30	Topsoil
BH3	0.30 – 6.20	Tidal Flat deposits / Alluvium
BH3	6.20 -	Glacial Till / Boulder Clay
BH4	0 – 0.30	Topsoil
BH4	0.30 – 7.9	Tidal Flat deposits / Alluvium
BH4	7.90	Glacial Till / Boulder Clay
BH5	0 – 0.50	Topsoil
BH5	0.50 – 5.90	Tidal Flat deposits / Alluvium
BH5	5.90 -	Glacial Till / Boulder Clay
BH6	0 – 0.50	Topsoil
BH6	0.50 – 13.45	Tidal Flat deposits / Alluvium

Hydrogeology

11.6.11 The Environment Agency classified the Tidal Flat Deposits and Ampthill Clay Formation that underlies the Principal Application Site as unproductive strata. Unproductive strata are defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

11.6.12 The Environment Agency groundwater vulnerability maps indicate that site is located within an area of low groundwater vulnerability. This indicates that surface soils may provide some protection to groundwater from pollution and the area likely to be characterised by low leaching soils.

11.6.13 BGS flood risk information shows that the site is not located within an area with the potential for groundwater flooding, as shown in **Figure 11.7**.

11.6.14 Perched groundwater was encountered during the ground investigation to the south of the site within the alluvial deposits at approximately 3.5 m bgl (Lincs Laboratory, 2011). The location of these boreholes in relation to the Principal Application Site is shown in **Figure 11.6**.

11.6.15 The Principal Application Site is not located within any groundwater source protection zones (SPZ) and no SPZs occur within 1 km of the Principal Application Site.

11.6.16 Records held by the Environment Agency and Boston Borough Council indicate that there are no groundwater abstractions (of any volume) present below the Principal Application Site or located with 1 km.

Hydrology

11.6.17 The hydrology associated with the Facility is outlined in detail within **Chapter 13 Surface Water, Flood Risk and Drainage Strategy**. The eastern extent of the Principal Application Site directly adjoins the Haven, which is tidal. The Haven flows past Principal Application Site and drains into The Wash, approximately 7 km downstream. The downstream reaches of the river, where it meets the sea, include a wide range of intertidal features including intertidal mudflats, saltmarshes and sand and shingle banks and beaches.

11.6.18 In addition to being adjacent to The Haven, there is an extensive network of drainage systems within the vicinity of the Principal Application Site (Black Sluice IDB, 2017; Environment Agency, 2016; Groundsure, 2014). There are watercourses located within the Principal Application Site.

11.6.19 Data from the Environment Agency's Catchment Data Explorer (2016) indicate that water quality in the surface drainage network is below the required standards. Surface waters are affected by pressures from sewage discharges, agricultural and rural land management and industrial discharges. These pressures combine to give rise to alterations in chemical composition and high temperatures. Water quality is sufficiently poor to adversely impact upon fish populations. WFD requirements are detailed in **Appendix 13.1 of Chapter 13 Surface Water, Flood Risk and Drainage Strategy**.

Land Quality

11.6.20 The Principal Application Site is located directly adjacent to one authorised landfill and two historical landfill operations. Additionally, the newly developed Biomass UK No. 3 Ltd facility and Boston's household waste recycling centre are located adjacent to the Principal Application Site. The existing flood defences along the river or infilled historical channels have the potential to contain fill material of

unknown composition.

11.6.21 The preliminary CSM for the Principal Application Site was developed for the PRA. The findings of the PRA indicated that the following potential contaminants of concern were associated with the historical land uses associated with the Principal Application Site and its surrounding land use (1 km from the Principal Application Site):

- Metals, semi-metal, non-metals and sulphates;
- Petroleum hydrocarbons;
- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile and semi-volatile organic compounds (VOCs / SVOCs);
- Polychlorinated biphenyls (PCBs);
- Ground gases; and
- Asbestos.

11.6.22 Specifically, the potential onsite sources were identified as stockpiles of sand, gravel and waste materials associated with development adjacent to the site, and unknown fill material associated with onsite flood defences and embankments.

Soil and Agricultural Land Quality

11.6.23 The Soilsmap map indicates that the soils within the study area are generally classified as loamy and clayey soils, associated with coastal flat deposition and an area with naturally high groundwater. The soil parent material group is medium to heavy and heaviest soils as shown in **Figure 11.2**.

11.6.24 Agricultural land in England and Wales is classified according to the quality and versatility of the soil in a nationally recognised grading system (the Agricultural Land Classifications (ALCs)). The grading system was produced by the former Ministry of Agriculture, Fisheries and Food (MAFF, now Defra). Grade 1 represents best quality agricultural land, through to Grade 5 which represents agricultural land of the poorest quality. The ALC system classifies land into five grades, with Grade 3 subdivided into subgrades 3a and 3b. BMV agricultural land is defined as Grades 1, 2 and 3a.

11.6.25 The classification of soils within the Principal Application Site is ALC Grade 1 (Excellent) (ALC, 2011), and are described as loamy and clayey soils, developed from coastal flat deposits in an area with naturally high groundwater. According to the Soilsmap map, the soils are of moderate natural fertility (National Soil Resources Institute, 2017).

- 11.6.26 No detailed assessment of the Principal Application Site's ALC classification was carried out; however, a detailed assessment of the adjacent land, carried out in 1991 (Natural England, 2016), showed that the ALC of soils encountered was lower than ALC Grade 1 for the majority of the area surveyed.
- 11.6.27 The provisional and strategic ALC mapping indicates that there is the potential for BMV land to be present. However, it is the detailed-ALC field survey data which is used to provide a robust assessment of the likely anticipated conditions of agricultural soils, which has not been undertaken on the site.
- 11.6.28 The provisional ALC mapping (1:250,000 scale ALC mapping) indicates the Principal Application Site as being predominantly Grade 1 Agricultural Land, as shown in **Figure 11.3**. **Figure 11.3** also identifies where detailed post 1988 mapping has been undertaken, in relation to the Principal Application Site. This figure lists ALC classification of soils of the Principal Application Site according to Grade 1, 2 or 3a.

Human Health

- 11.6.29 The baseline human health receptors likely to interact with the Facility during the construction stage of the Facility are construction workers and the general public. The general public is considered to be represented by commercial workers from adjacent industrial units, people visiting the household waste recycling centre, and local residents located within the study area.
- 11.6.30 For the operational stage of the Facility the human health receptors would be maintenance workers visiting the Facility, the staff required to operate the Facility and the general public as identified above. Further details on human health receptors are outlined within **Chapter 22 Health**. All human health receptors were considered to be of high sensitivity for the purpose of this assessment.

11.7 Potential Impacts

- 11.7.1 A summary of the identified potential impacts on sensitive receptors from the interaction of the Facility with contaminated land, land use and hydrogeology can be divided into impacts associated with the following aspects:
- Impacts associated with the terrestrial elements of the Facility, including associated infrastructure; and
 - Impacts associated with the proposed wharf.
- 11.7.2 The Principal Application Site's terrestrial operational footprint is approximately 15.7 ha and will require construction of 15 – 20 m foundation piles across strata

and associated earthworks required for the plant across the Facility.

11.7.3 The wharf construction is envisaged to comprise a suspended deck of piles on a sloping revetment. This would have a likely landside footprint of 400 m by 30 m and require approximately 300 piles. The depth of piles required would likely be across multiple strata below the site and into depth of 15 - 20 m bgl, to within the (firm to stiff) solid geology below the Principal Application Site.

11.7.4 The elements of construction most likely to be associated with impacts contaminated land, land use and hydrogeology are:

- General earthworks;
- Footprint of the Facility;
- Footprint of temporary works;
- Pilling across strata; and
- Removal or disturbance of embankments.

Embedded Mitigation

11.7.5 As part of the project design, several embedded mitigation measures have been proposed to reduce potential impacts on sensitive receptors for contaminated land, land use and hydrogeology. The embedded mitigation for the project has been set out in accordance with current industry best practice and associated guidance and are outlined in detail within **Table 11-14**.

11.7.6 The assessment of impacts associated with contaminated land, land use and hydrogeology was developed assuming the adherence and adoption of the outlined embedded mitigation measures.

Table 11-14 Embedded Mitigation Measures

Parameter	Mitigation Embedded into the Project Design
Construction	
Code of Construction Practice (CoCP)	<p>Environmental best practice would include the (now-revoked) Environment Agency best practice guidelines (e.g. Pollution Prevention Guidance (PPG) PPG1, PPG5, PPG6 and PPG22) and current best practice guidelines. The methods adopted will also follow the Environment Agency's approach to groundwater protection (Environment Agency, 2018).</p> <p>Adherence to a Pollution Prevention and Incident Response Plan which will be drafted in advance of any construction works,</p> <p>A outline CoCP (OCoCP) document will be submitted with the DCO (document reference 7.1) The final CoCP will be based on the OCoCP and will be a dynamic document in preparation as the detail of design progresses prior to construction and will provide a protocol under which the environmental risk mitigation and other specific</p>

Parameter	Mitigation Embedded into the Project Design
	<p>remedial measures will be defined and executed.</p> <p>The outcomes of the geotechnical and geo-environmental ground investigations will be taken into account in the preparation of the CoCP.</p>
<p>Construction Design Management Regulations (CDM-2015)</p>	<p>All works/operations to be carried out by appropriately trained personnel.</p> <p>Appropriate personal protective equipment (PPE) and working practices to be adopted by construction workers, including subcontractors, and health and safety measures would be implemented to mitigate any short term risk during construction.</p> <p>CDM site specific risk assessments will be identified and implemented prior to construction.</p>
<p>Environment Agency groundwater protection pollution prevention guidance and hydrogeological risk assessment</p>	<p>The Environment Agency's approach to groundwater protection (Environment Agency, 2018) and current best practice guidance for the groundwater protection pollution prevention guidance will be considered.</p> <p>A hydrogeological risk assessment will be produced pre-construction to ensure protection of ground and surface waters where construction activity including piling and is in hydraulic continuity with sensitive receptors. This will include method statements and detailed hydrogeological risk assessment of the effects of piling activities.</p>
<p>General environmental best practice</p>	<ul style="list-style-type: none"> • Oils and fuel will only be stored within designated areas above ground in impervious storage bunds with a minimum of 110% capacity to contain any leaks or spillages; • Oil and fuel storage areas will be regularly inspected; • Refuelling activities will only take place within designated areas where impermeable surfaces and drip trays are utilised; • Spill kits will be made available for use on site at key locations; • All staff to have site inductions covering the appropriate use of chemical and fuels on site; • A pollution prevention plan and incident response plan will be incorporated into the CoCP. This is to be agreed with the Environment Agency and will follow industry best practice; • Storage of hazardous materials will be done with due care using adequate store locations in accordance with Health and Safety Executive guidelines; and • A protocol for dealing with potentially contaminated materials will be utilised during the construction works.
<p>CL:AIRE The Definition of Waste: Development Industry Code of Practice</p>	<p>Construction activities within the Principal Application Site will involve the excavation of soils and is likely to involve the movement of soil around the site for stockpiling, potential re-use or removal for recovery or disposal off-site. These activities could result in the relocation and disturbance of potentially contaminated soils. The potential for cross contamination as a result of soil movements would be mitigated following the principles of the CL:AIRE Code of Practice incorporating the development of a Materials Management Plan. Excavated soils would be chemically tested and screened against regulatory-approved assessment criteria to demonstrate the soils are suitable for use prior to re-placement on-site.</p>

Parameter	Mitigation Embedded into the Project Design
Asbestos Management Plan	<p>Risks to construction workers can generally be managed through construction best practice. However, it may be necessary to adopt additional measures when working in the areas potentially impacted by asbestos.</p> <p>Subject to further ground investigation and assessment, if asbestos is identified within the Principal Application Site at levels that could pose an unacceptable risk to human health, an asbestos management strategy would be developed in liaison with an appropriately qualified and experienced asbestos contractor to ensure the risks associated with asbestos are appropriately mitigated.</p> <p>Mitigation measures may require the works to be undertaken by specialist operatives, the provision of decontamination units, atomisers to prevent dust generation and monitoring during the works.</p> <p>The strategy would be agreed with the relevant regulators prior to commencing works on the Principal Application Site.</p>
Soil quality and management	<ul style="list-style-type: none"> • Soils handling, storage and reinstatement would be carried out by a competent contractor under Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites; • Topsoil stripping will be carried out within all construction areas and will be stored adjacent to where it is extracted, where practical; • Textural classification of soils will be undertaken in accordance with BS3882 and grading in accordance with BS1377; • Excavated subsoil will be stored separately from the topsoil, with sufficient separation to ensure segregation; • Soils will be handled according to their characteristics; • Where necessary, tree roots would be removed by screening; • For most after-uses, subsoils may be treated as a single resource for stockpiling; • During wet periods, mechanised soil handling would be limited in areas where soils are highly vulnerable to compaction; • Movements of heavy plant and vehicles would be restricted to specific routes and trafficking of construction vehicles in areas of the site which are not subject to construction phase earthworks would be avoided; and • In circumstances where construction has resulted in soil compaction, further remediation may be provided, through an agreed remediation strategy.
Operation	
	Operation of the Facility would be covered by environmental permit requirements and adherence to health and safety legislation.

Parameter	Mitigation Embedded into the Project Design
	The construction of the building and associated infrastructure will incorporate any necessary ground gas/vapour membranes should the risk assessment identify this requirement.
Decommissioning	
The same best practice methods and guidance documents would be adhered to as described for the construction stages of the Facility.	

Worst Case

11.7.7 The Worst-Case Scenario (WCS) developed for interaction with contaminated land, land use and hydrogeology is outlined in **Table 11-15** below. Only those design parameters with the potential to influence the level of impact to relevant receptors were identified. Therefore, if the design parameter is not described below in **Table 11-15**, it was not considered to have a material bearing on the outcome of this assessment.

11.7.8 Preparation of the site will require general earthworks which could lead to topsoil loss, soil compaction, soil erosion and runoff. The likely associated impacts are considered to be localised and short term in duration. There is the potential for the disturbance and remobilisation of existing contaminant sources to occur.

Table 11-15 Worst-Case Scenario Conditions Considered for this Chapter

Impact	Parameter
Construction / Decommissioning	
Impacts to Human Health	<p>Potential on-site sources of soil and groundwater contamination from storage of construction wastes and material used to construct embankments. This 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.</p> <p>Landfill gas generated during decomposition of waste deposits and groundwater contaminated with volatile contaminants have the potential to migrate via permeable deposits onto the Principal Application Site and accumulate in confined space and may represent a risk to human health. However, the use of appropriate PPE/RPE and working methods can negate the risk to construction workers.</p> <p>Migration of potential contaminants into groundwater beneath the site could affect construction and maintenance workers, as well as adjacent sites.</p> <p>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,</p>
Impacts to Groundwater	
Impacts to Surface Water Quality	
Impacts to Soils and Agricultural Land (including Best Most Versatile agricultural soils)	

Impact	Parameter
	<p>resulting in potentially unacceptable risks to controlled waters (The Haven).</p> <p>There will be a permanent loss of agricultural land during both the construction and operational phase.</p>
Operation	
Impacts to Human Health	<p>Potential on-site sources of soil and groundwater contamination could provide an unacceptable risk to future users of the site in landscaped areas, or due to migration of volatile contaminants (if present).</p> <p>There is a risk of potential inhalation of vapours from groundwater contaminated with volatile contaminants via migration of off-site groundwater onto the Principal Application Site, which could be a risk if a migration pathway is present.</p> <p>Landfill gas generated during decomposition of waste deposits have the potential to migrate via permeable deposits onto the Principal Application Site and accumulate in confined space and may represent a risk to human health.</p>
Decommissioning	
The WCS impacts for the decommissioning of the Facility and associated infrastructure align with the impact considerations for the construction stage of the Facility.	

Potential Impacts during Construction

Impact 1: Impact to Human Health, Including Construction Workers and General Public During Any Excavations and Construction Related Activities

- 11.7.9 The impacts to human health from the construction stages of the Facility were considered in the context of existing identified contaminated sources and how the Facility is likely to interact with these, based on significant pollution linkages.
- 11.7.10 A PRA was undertaken for the Facility as part of the scoping stage (**Appendix 11.1**). The Principal Application Site is not anticipated to contain significant sources of contamination. However, several localised sources of contamination were identified.
- 11.7.11 Storage of construction wastes, and material used to construct embankments may give rise to soil and groundwater contamination, which could represent a risk to construction workers. The potential pathways would be through dermal contact, ingestion or inhalation through any contaminated soil or groundwaters present.
- 11.7.12 The potential contamination of most concern, as identified in the PRA, is a potential for asbestos risks, in particular unknown fill materials used for the

construction of embankments on the Principal Application Site. However, given the embankments have been in place for centuries the extent of potential contaminations of concern (PCOC) being incorporated into them is likely to be minimal. Further assessment of the risk to human health from these sources should be carried out post-consent, as part of the geotechnical investigations prior to the development of the wharf. The Sampling Strategy that will be written to guide these investigation works will inform the necessary requirements for PPE used to inform this assessment. The Sampling Strategy and future ground investigation is secured as a requirement of the DCO.

11.7.13 In the event of exposing soils and stockpiling construction waste (including excavated materials), dust could be generated during dry and windy conditions. Under these conditions, construction workers and the general public, such as users of neighbouring sites and surrounding residents, could temporarily be exposed to contamination via the inhalation of potentially contaminated dust.

11.7.14 Additionally, the risk associated with soil contamination sources to human health could be altered by a change in the migration pathways by construction activities. A specific risk of concern is ground gases and vapour risks due to the location of two historical landfills within 1 km of the Principal Application Site. Historical landfills were identified 343 m and 852 m east and south-east of the boundary of the Principal Application Site respectively. Both sites were authorised to receive Category A inert waste and as such are anticipated to be a low gas generation source.

11.7.15 Active waste management licences within 250 m of the site boundary were also identified, with sites within 100 m carrying out vehicle depollution and receiving household, commercial and industrial wastes, and a household waste transfer facility. These are not anticipated to be sources of ground gas, vapours and groundwater contamination.

11.7.16 However, adjacent to the Principal Application Site boundary, historical landfilling of wastes has occurred. The ground gas risk for the Facility is unknown and no ground gas or vapour information is available. Consideration of the potential risk from ground gas and vapours, including the potential risk of ground gas and vapour accumulation in confined spaces could represent a risk to human health through asphyxiation and explosion. In addition to the risk posed from existing sources of contamination, there are potential risks from the accidental spillages, leakages and inadvertent release of contamination during construction activity, which is managed via appropriate embedded mitigation measures previously mentioned.

11.7.17 Construction workers are considered the most sensitive receptor, due to their longer and more direct exposure routes, resulting from the activities they would be engaged in, in comparison to the general public. Potential impacts to construction workers can, however, be managed directly via appropriate controls and construction management practices. Embedded mitigation, as described in **Table 11-14**, will control the majority of impacts associated with ground contamination.

Magnitude of impact

11.7.18 The impacts were predicted to be of local spatial extent (localised to the work areas), of short-term duration, of intermittent occurrence and high reversibility (occurring only during the works). Exposure to contamination will vary depending on the exposure scenario, e.g. duration of exposure and proximity to contamination. Embedded mitigation will control most impacts associated with ground contamination. Where potentially significant risks have been identified, (such as ground gases and vapours) further assessment and remediation will be undertaken prior to development. The magnitude of effect was therefore assessed as **low** for construction workers and **low** for the public.

Sensitivity of receptor

11.7.19 The sensitivity of human health is considered to be **high**.

Significance of effect

11.7.20 Given the magnitude of the impact and sensitivity of the receptors, effects were therefore predicted to be of **moderate adverse** significance for construction workers and general public prior to mitigation.

Mitigation measures

11.7.21 Further intrusive geotechnical and geoenvironmental investigation works (referred to a 'Phase 2 investigation') will be carried out in accordance with a sampling plan to inform the necessary requirements for any additional mitigation measures. Should a significant ground gas and vapour risk be identified following a Phase 2 investigation works the risks posed during the constructions phase can be managed via the use of appropriate working methods, and appropriate PPE. The provision of a sampling plan and ground investigation is secured in a requirement to the DCO

Residual effects

11.7.22 92. Following the implementation of appropriate mitigation measures, the magnitude of effect will be reduced to negligible and the potential effect would be

minor adverse (not significant).

Impact 2: Impact on Groundwater Quality from Construction-Related Activities

11.7.23 The Principal Application Site is underlain by superficial deposits and bedrock geology that is classified as unproductive strata. No groundwater abstractions were identified as supported by or associated with the groundwater environment present beneath the Principal Application Site.

11.7.24 Construction activities will likely involve the direct disturbance of superficial deposits and soils during construction. Piled foundations will also be utilised for the proposed wharf and site plant.

Magnitude of impact

11.7.25 Removal of superficial deposits could alter the surface hydrology, disrupt infiltration rates and alter surface runoff interactions with the subsurface. This could alter pathways and allow the mobilisation of sources of contamination within superficial deposits and allow the migration of contaminants into strata containing the underlying superficial aquifer. Piling could also result in the creation of preferential pathways. The magnitude of the impacts on groundwater were therefore considered to be moderate. However, taking into account the proposed embedded mitigation (**Table 11-14**) and with agreement on appropriate groundwater protection measures for the Facility the magnitude of effect would be considered **low**.

Sensitivity of receptors

11.7.26 The superficial and bedrock deposits below the site are classified as unproductive strata. There are no licenced or private water groundwater abstraction or groundwater source protection zones within 1 km of the Principal Application Site. The sensitivity of the aquifer alone would be considered low. However, given the proximity (adjacent) and anticipated groundwater flow being towards The Haven which supports a local nature reserve (Havenside), the sensitivity of the receptor was therefore considered to be **medium**.

Significance of effect

11.7.27 Given low magnitude of effect and receptor sensitivity of medium the anticipated effect of the Facility is considered to be of **minor adverse** significance.

Mitigation measures

11.7.28 No additional measures to those embedded into the design of the construction activities are required as the effect is expected to have **no significant impact**

during the construction works.

Residual effects

11.7.29 92. The residual effect would remain as **minor adverse** (not significant).

Impact 3: Impact on Groundwater Quantity from Construction Related Activities

11.7.30 Construction activities will involve the direct disturbance of superficial deposits and soils during construction. The specific impact of concern is the requirement for dewatering and alteration in the groundwater flow from the Principal Application Site. This may occur as a result of direct dewatering or surcharging requirements for the Facility or as the indirect alteration of the site's groundwater flow dynamic by the creation of preferential pathways or creation of below ground structures. The site is underlain by superficial deposits and bedrock geology that is classified as unproductive strata. No groundwater abstractions were identified as supported by or associated with the groundwater environment present beneath the Principal Application Site.

11.7.31 Dewatering and surcharging requirements for the construction of the Facility have not been defined at this stage. However, dewatering and / or surcharging could be required for the installation of foundations and piling for the proposed wharf and the Energy from Waste and lightweight aggregates plant of the Facility and associated infrastructure. Dewatering or surcharging would impact the quantity of groundwater flow from within the site to the surrounding environs.

11.7.32 Removal of superficial deposits could alter the surface hydrology, disrupt infiltration rates and alter surface runoff interactions with the subsurface. This could alter pathways and quantity of groundwater flow within superficial deposits. However, given the anticipated ground conditions, with superficial deposits and bedrock geology consisting of low permeability strata, the geology is unlikely to hold significant flows.

Magnitude of impact

11.7.33 The magnitude of the impacts on groundwater quantity are considered to be long to medium term, with localised effects on water quality or availability. Therefore, the magnitude of effects is considered to be moderate. Considering the embedded mitigation (**Table 11-14**) and requirement for a hydrogeological risk assessment the magnitude would be reduced to **low**.

Sensitivity of receptors

11.7.34 The superficial and bedrock deposits below the Principal Application Site are

classified as unproductive strata. There are no licenced or private water groundwater abstraction or groundwater source protection zones within 1 km of the Principal Application Site. The sensitivity of the aquifer alone would be considered low. However, given the proximity (adjacent) and anticipated groundwater flow being towards The Haven which supports a Local Nature Reserve (Havenside), the sensitivity of the receptor was therefore considered to be **medium**.

Significance of effect

11.7.35 The sensitivity of receptors is considered to be **medium** and the magnitude of effect taking into account embedded mitigation is **low** therefore, the anticipated significance of the effect to groundwater quantity is considered to be of **minor adverse** significance.

Mitigation measures

11.7.36 No additional measures to those embedded into the design of the construction activities are required as the effect is expected to have no significant impact during the construction works.

Residual effects

11.7.37 92. The residual effect would remain as minor adverse (not significant).

Impact 4: Impact on Surface Water Quality from General Earthworks and Construction Related Activities

11.7.38 Construction activities will involve the direct disturbance of superficial deposits and soils during construction. This could alter the surface water regime during construction. In addition, where soils or superficial deposits excavated during the works are retained on site in bunds, run off could occur.

11.7.39 The potential impacts to surface water quality relate to:

- Run off from stockpiles of superficial deposits and soils;
- Accidental spillages or leakages;
- Mobilisation of existing contamination; and
- Alteration of the groundwater regime and mobilisation of groundwater contaminants and subsequent discharged to surface waters.

Magnitude of impact

11.7.40 Taking into account the nature of the anticipated construction (as outlined above)

and the embedded mitigation (**Table 11-14**), the effect to surface water quality is considered to be short-term. With a short-term impact on water quality and potential for short-term derogation, it is anticipated that the magnitude of construction impacts would be **low**.

Sensitivity of receptors

11.7.41 Surface water receptors are located adjacent to the Principal Application Site with works taking place within the flood bank and mudflats adjacent to main channel of The Haven. Additional surface water receptors include three land drains located within and surrounding the Principal Application Site. Surface waters including drains present on the Principal Application Site are considered to be a **medium** sensitivity receptor, as The Haven supports the Havenside Local Nature Reserve site directly opposite the Facility.

Significance of effect

11.7.42 It is anticipated that after adopting the outlined embedded mitigation measures, specifically the adherence to the environment agency pollution prevention guidance, the magnitude of effect will be **low** and therefore given the sensitivity of the receptor is **medium** the effect would be considered to be of **minor adverse** significance.

Mitigation measures

11.7.43 No additional measures to those embedded into the design of the construction activities are required as the effect is expected to have **no significant impact** during the construction works.

Residual effects

11.7.44 92. The residual effect would remain as minor adverse (not significant).

Impact 5: Impacts to Soil Quality

11.7.45 The following activities proposed during the construction phase were identified as having a detrimental impact on existing soil resources:

- Intrusive pre-construction technical surveys and investigations;
- Removal of vegetation;
- Topsoil stripping, earthworks and landscaping within the construction footprint; and

- Construction and operation of temporary haul roads to minimise traffic on soils.

11.7.46 There is the potential for soils to be compacted and soil structure to deteriorate during the works. The result would be reduced biological activity, porosity and permeability and increased strength. It can also lead to reduced water infiltration capacity and increased risk of erosion (European Commission, 2008). The effect of all of these impacts is usually reduced fertility and crop yields, should the site be returned to agricultural use in the future.

Magnitude of impact

11.7.47 The embedded mitigation outlined above will be incorporated into a Soil Management Plan (SMP) for the site. This would be completed pre-construction once an earthworks contractor has been appointed and detailed earthworks phasing information is available. The contractor would be required to comply with the SMP. Following the incorporation of the mitigation measures outlined above in detail, the magnitude of effects are considered to be **negligible**

Sensitivity of receptors

11.7.48 The current known baseline for the site classifies the soils as heavy loamy soils. The sensitivity of heavy loamy and clay soils, which are vulnerable to degradation is considered to be **high**.

Significance of effect

11.7.49 With a **negligible** magnitude of effect and given the sensitivity of soil quality is **high**, the significance of the effect is considered to be of **minor adverse** significance.

Mitigation measures

11.7.50 No additional measures to those embedded into the design of the construction activities are required as the effect is expected to have **no significant impact** during the construction works.

Residual effects

11.7.51 92. The residual effect would remain as **minor adverse** (not significant).

Impact 6: Loss of Best Most Versatile (BMV) Agricultural Land

Magnitude of impact

11.7.52 Development at the Principal Application Site will lead to a loss of agricultural land.

This area is allocated for industrial use in the Lincolnshire Minerals and Waste Local Plan Site Allocations document (LCC, 2017). The magnitude of the impacts on agricultural land and loss of BMV land would be considered to be **high due** to a permanent loss of BMV land. However, taking into consideration the allocation of the Facility for industrial use within the local plan, a regulatory assessment and approval for this loss of BMV and agricultural soils has already been made for the area affected. Additionally, it is anticipated that after adopting the outlined embedded mitigation measures and requirement for a soil survey and development of SMP pre-construction the magnitude impacts to agricultural soils and BMV land from the Facility is considered to be **negligible**.

Sensitivity of receptors

11.7.53 The current known baseline data classifies the soils present on the majority of the site as ALC Grade 1, therefore the sensitivity of this receptor is considered to be **high**. However, where detailed post-1988 surveys have taken place, within and adjacent to the Principal Application Site, the ALC classification has been shown to be of a lower grade.

11.7.54 For some areas of the Principal Application Site detailed agricultural land classification surveys have been undertaken. During this survey, soils were classified as Grade 2 and Grade 3a (Natural England (2016)). This is considered BMV agricultural land. Detailed post 1988 surveying is more accurate than strategic agricultural mapping, therefore should further detailed soil classification work be carried out, the classification of the site would likely be reduced given some areas of the site no longer contain soil. However, where soils remain, they are still likely to be considered BMV agricultural soils.

Significance of effect

11.7.55 Given the magnitude of the impact is considered to be **negligible** and sensitivity of BMV and agricultural land within the Principal Application Site is **high**, the significance of the effect was therefore predicted to be of **minor adverse** significance for loss of BMV agricultural land. This is not considered to be significant in EIA terms.

Mitigation measures

11.7.56 No additional measures to those embedded into the design of the construction activities are required as the effect is expected to have **no significant impact** during the construction works.

Residual effects

11.7.57 The residual effect would remain as minor adverse (not significant).

Potential Impacts during Operation

11.7.58 On completion of construction works, it is anticipated that most of the Principal Application Site will be hard standing. This significantly reduces the potential impacts from contaminated land to human health and controlled waters. However, during operational activities within any peripheral landscaped areas or disturbance of the ground, future pathways for contamination exposure could occur. Potential operational phase impacts may occur from ground gas, ground vapours and gas encountered from maintenance related activities.

11.7.59 The impacts during the operation of the Facility will be mitigated by the requirement to adhere to the Facility's environmental permit, site operational procedures, working practices and appropriate PPE required under UK Health and Safety legislation.

11.7.60 No impacts to soils in terms of ALC or Soil Quality are anticipated to arise during the operational phase of the Facility, because all proposed operational activities will occur on hard standing or dedicated roadways. Furthermore, some areas of the Principal Application Site are only allocated for laydown purposes during construction and are not required in for operation of the Facility. These will be returned to the same state prior to construction starting. Impacts to soils during the operation phases have therefore not been considered further.

11.7.61 Impacts to surface waters from operational activities are considered in **Chapter 15 Marine Water and Sediment Quality** and the drainage requirements for the Facility are considered in **Chapter 13 Surface Water, Flood Risk and Drainage Strategy**.

Impact 1: Impact to Human Health and Groundwaters During Operational and Maintenance Activities as a Result of Residual Contaminants

11.7.62 Prior to construction of the Facility, further geotechnical and geoenvironmental investigation work is proposed and specific measures for dealing with identified and unidentified sources of contamination will have been established. Where appropriate and necessary, unacceptable pollutant linkages will be addressed. This will be completed considering a conceptual model with the operational stages of the Facility considered. Potential impacts could still occur where maintenance activities are required.

Magnitude of impact

11.7.63 The magnitude of effect from exposure to contamination will vary depending on the exposure scenario e.g. duration of exposure and proximity to contamination. Best practice will control most impacts associated with ground contamination and operational risks from gasses and/or vapours. Considering the embedded mitigation (**Table 11-14**) the magnitude of effects was considered to be **negligible** for maintenance and operational staff and the general public.

Sensitivity of receptors

11.7.64 The sensitivity of human health receptors is considered to be **high**. Maintenance and operational staff were considered to experience the greatest magnitude of effect due to longer and more direct exposure routes resulting from the activities they would be engaged in, in comparison to the general public. Potential impacts to maintenance and operational staff can, however, be managed via appropriate building construction design. Embedded mitigation, as described in **Table 11-14**, will control most impacts associated with ground contamination.

11.7.65 The sensitivity of controlled waters is considered to be **medium**, for the reasons previously outlined.

Significance of effect

11.7.66 Given the magnitude of the impact is considered to be **negligible** and the sensitivity of the receptors is considered **medium to high**, the predicted effect is considered to be of **negligible to minor adverse** significance. This is not considered to be significant in EIA terms.

Mitigation measures

11.7.67 No additional measures to those embedded into the design of the Facility are required as the effect is expected to have no significant effect during the maintenance and operational works.

Residual effects

11.7.68 92. The residual effect would remain as **negligible to minor adverse** (not significant).

Impact 2: Impact to Human Health and Groundwater during Operation as a Result of New Sources of Contamination being Introduced

Magnitude of impact

11.7.69 The Facility will be operated in accordance with the conditions of an environmental permit, which will require it to be operated by fully trained staff, and in line with company standard operating procedures. Risk to human health and controlled waters could occur during the operation of the Facility from new sources of contamination which could be introduced as a result of maintenance activities. However, it is anticipated that same PPE requirements and embedded mitigation measures considered during the construction stage of the Facility will be utilised. Therefore, the magnitude of impacts is considered to be **negligible**.

Sensitivity of receptors

11.7.70 The sensitivity of human health receptors is considered to be **high**. Maintenance and operational staff were considered to experience the greatest magnitude of effect due to more direct exposure routes resulting from the activities they would be engaged in, in comparison to the general public. Potential impacts to maintenance and operational staff can, however, be managed via appropriate building construction design. Embedded mitigation, as described in **Table 11-14**, will control most impacts associated with ground contamination.

11.7.71 The sensitivity of controlled waters is considered to be **medium**, for the reasons previously outlined. Impacts to hydrogeology as a sensitive receptor are considered to be highly localised and restricted to the Principal Application Site. Accidental spillages may occur, leading to the introduction of new sources of contamination during the operation of the Facility. These were considered in detail within **Chapter 13 Surface Water, Flood Risk and Drainage Strategy**.

Significance of effect

11.7.72 Given the magnitude of the impact is considered to be **negligible** and the sensitivity of the receptors is considered **medium to high**, with the incorporation of environmental permitting requirements and embedded mitigation measures, effects to human health and groundwaters from operational and maintenance activities are considered to be of **negligible to minor adverse** significance. This is not considered to be “significant” in EIA terms.

Mitigation measures

11.7.73 No additional measures to those embedded into the design of the Facility are required as the effect is expected to have no significant effect during the

maintenance and operational works.

Residual effects

11.7.74 The residual effect would remain as **negligible to minor adverse** (not significant).

Potential Impacts during Decommissioning

11.7.75 The impacts during the decommissioning phase of the project are considered to be similar to the impacts considered during the construction phase, with the exception of the loss of agricultural land. It is not anticipated that the operation of the Facility would significantly change the baseline conditions at the site, and therefore the same control and management processes would be applicable to decommissioning as for construction.

11.7.76 The loss of agricultural land during the decommission phase of the Facility is not anticipated to have a similar impact during the decommissioning phase of the project. The site has been allocated for industrial use and as such is unlikely to be considered for agricultural use in the future. Therefore, no alteration to the status of agricultural soils are anticipated to occur during the decommissioning phase.

11.8 Cumulative Impact Assessment with Other Developments

11.8.1 The assessment of cumulative impacts has been undertaken firstly by assessing all impacts from identified in **Table 11-15** for potential to act cumulatively with other projects. This summary assessment is outlined in **Table 11-16**.

Table 11-16 Potential Cumulative Impacts

Impact	Potential for cumulative impact	Rationale
Construction		
Impact 1 – Impact on Human Health, Including Construction Workers and General Public during construction	No	Impacts to human health are likely to be highly localised. The requirement for environmental management controls (e.g. dust suppression) likely to limit the impacts within the Principal Application Site boundaries.
Impact 2 – Impact on Groundwater Quality from Construction-Related Activities	No	The mechanism to create pathways from other developments to affect the unproductive strata is not considered to be present.
Impact 3 – Impact on Groundwater Quantity from Construction-Related Activities	No	The mechanism to create pathways from other developments to affect the unproductive strata is not considered to be present.
Impact 4 – Impact on Surface Water Quality from General Earthworks and Construction Related Activities	No	Appropriate construction management and earthworks activities are localised to within the Principal Application Site boundaries and unlikely to be exacerbated by other projects.
Impact 5 – Impacts on soil quality	No	Impacts soil quality are localised, only considered within the Principal Application Site boundaries and not likely to be exacerbated by other projects on this basis.
Impact 6 – Impacts on Loss of Best Most Versatile (BMV) agricultural Land	No	Impacts to loss of BMV agricultural land are localised, only considered within the Principal Application Site boundaries and not likely to be exacerbated by other projects on this basis.
Operation		
Impact 1 - Impact to Human Health and Groundwaters During Operational and Maintenance Activities as a Result of Residual Contaminants	No	Robust investigation and vapour and ground gas risk assessment will be undertaken, and any building design include membrane requirements should risk assessment inform the need.
Impact 2 - Impact to Human Health and Groundwater during Operation as a Result of New Sources of Contamination being Introduced	No	Risk to human health and controlled waters could occur during the operation of the Facility from new sources of contamination which could be introduced as a result of maintenance activities. This will be localised to within the Principal Application Site boundaries and is unlikely to be exacerbated by other projects.
Decommissioning		
No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rule and legislation change over time. A decommissioning plan will be provided prior to decommissioning of the Facility.		

Table 11-17 Summary of Projects considered for the CIA in relation to Contaminated Land, Land Use and Hydrogeology

Project	Status	Development Period	Distance from the Application Site	Project Definition	Project Status	Data	Included in CIA	Rationale
Boston Barrier Flood Defence	Transport and Works Act Order consented	2017 ongoing – (completed August 2021)	Boston Barrier at closest point to the Application Site is 500 m.	Environmental Statement	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Battery Energy Storage Plant (Marsh Lane) B/17/0467	Application approved	2017 ongoing -	Beeston Farm less than 10 m from the Application Site	Detailed application	Incomplete / low		No	The development includes construction in the northern area of the site, which is approximately 280 m away from site at the closest point. As such, it is considered to be sufficient distance from the site to not result in impacts of a direct or indirect nature.
The Quadrant Mixed-use development of 502 dwellings and commercial/leisure uses B/14/0165	Application approved Construction started	2014 ongoing -	Quadrant 1 1.2 km from the Application Site	Details within Environmental Statement	Quadrant 1 – Complete/ high Quadrant 2 - Incomplete/ low		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.

Project Related

Project	Status	Development Period	Distance from the Application Site	Project Definition	Project Status	Data	Included in CIA	Rationale
Land to the west of Stephenson Close Residential Development of up to 85 dwellings B/17/0515	Application not yet determined	2017 ongoing	From the most eastern part of the Scheme to the Application Site is 550 m.	Outline only	Incomplete/ low		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Triton Offshore Farm Knoll Wind	DCO consented	2008 ongoing	Onshore cable corridor and Construction compound at Langrick 9.7 km from the Application Site	Environmental Statement	Complete/ high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Viking Link Interconnector B/17/0340	Application approved	2014 - 2023	Bicker Fen substation 14.4 km from the Application Site	Environmental Statement	Incomplete / low		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Sutterton Garage and adjacent land, Station Road, Sutterton, Boston, Lincolnshire PE20 2JH B/15/0084	Application approved	2015 ongoing	10.3 km south (following A16 and B1397) of the Application Site	Outline only	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Land west of Boston Road, Kirton, Boston,	Application approved	2015 ongoing	4 km south west of the Application Site	Approval reserved of matters	Complete / high		No	Considered to be sufficient distance from site to not result

Project Related



Project	Status	Development Period	Distance from the Application Site	Project Definition	Project Status	Data	Included in CIA	Rationale
Lincolnshire, PE20 1ES B/15/0266								in impacts of a direct or indirect nature.
Land adjacent to London Road/Drainside South, Kirton, Boston, Lincolnshire, PE20 1JH	Application approved	2015 ongoing	– 6 km south west of the Application Site	Outline only	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Land south of Endeavour Way, PE20 0JA Erection of 14,655sq.m Class B2 (general industrial) floor space B/15/0506	Application Approved	2015 ongoing	– 10 km south west of the Application Site	Detailed application	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Land off Station Road, PE20 3NX Erection of 63 no. residential dwellings with associated infrastructure B/16/0052	Application approved	2016 ongoing	– 8 km west of the Application Site	Detailed application	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.

Project Related



Project	Status	Development Period	Distance from the Application Site	Project Definition	Project Status	Data	Included in CIA	Rationale
The Junction Community Hall, PE20 1QJ Construction of community building B/16/0062	Application approved	2016 ongoing	– 4 km south west of the Application Site	Detailed application	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Yew Lodge, PE20 2EE Demolition of outbuildings and the construction of 14 no. dwellings B/16/0313	Application approved	2016 ongoing	– 8 km south west of the Application Site	Outline application with some matters reserved for later approval	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Land at Station Road, PE20 2JH Erection of 21 dwellings, new vehicular access, private access road and associated works B/16/0409	Application approved	2016 ongoing	– 8 km south west of the Application Site	Detailed application	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Land west of Boston Road, Kirton B/17/0171	Application approved	2017 ongoing	- 3 km south west of the Application Site	Detailed application	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.

Project Related



Project	Status	Development Period	Distance from the Application Site	Project Definition	Project Status	Data	Included in CIA	Rationale
Woods Nurseries Site, Swineshead, Boston Proposed residential development of 41 market and affordable dwellings B/17/0244	Application approved	2017 ongoing	– 9 km west of the Application Site	Outline application	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Land to the rear of Westminster Terrace, Swineshead, Boston Construction of 18 dwellings B/17/0396	Application approved	2017 ongoing	– 8 km west of the Application Site	Detailed application	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Land adjacent to Avalon Road, PE20 1QR Construction of 4 no. detached buildings comprising 16 no. industrial units B/18/0057	Application approved	2018 ongoing	– 6 km south west of the Application Site	Detailed application	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.

Project Related



Project	Status	Development Period	Distance from the Application Site	Project Definition	Project Status	Data	Included in CIA	Rationale
Land to the north and west of Coles Lane, PE20 3NS Change in site boundary of planning permission B/17/0404 B/18/0382	Application approved	2018 ongoing	– 8 km west of the Application Site	Detailed application	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
Plots C and D, The Quadrant, Land adjacent to A16, Wyberton, Boston For approval of reserved matters (appearance, layout and scale) for the construction of hotel, public restaurant and drive-thru B/18/0413	Application approved	2018 ongoing	– 1 km south west of the Application Site	Application for approval of reserved matters	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.
The Quadrant, PE21 7HT Application for approval of reserved matters from application	Application approved	2018 ongoing	– 1 km south west of the Application Site	Application for approval of reserved matters	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.

Project Related



Project	Status	Development Period	Distance from the Application Site	Project Definition	Project Status	Data	Included in CIA	Rationale
B/14/0165 (roads 6, 7 and 8) B/19/0027								
Wash Station Kirton Demolition of dwelling and erection of 30 dwellings. B/15/0503	Road/Road. Application approved at appeal	2015 ongoing	– 4 km south west of the Application Site	Application for demolition, outline application for erection of dwellings and matters reserved for later consideration	Complete / high		No	Considered to be sufficient distance from site to not result in impacts of a direct or indirect nature.

11.9 Inter-Relationships with Other Topics

11.9.1 This chapter has inter-relationships with **Chapter 8 Cultural Heritage**, **Chapter 13 Surface Water, Flood Risk and Drainage Strategy**, **Chapter 14 Air Quality**, **Chapter 15 Marine Water and Sediment Quality**, **Chapter 22 Health** and **Chapter 23 Waste**, as detailed in **Table 11-18**.

Table 11-18 Chapter Topic Inter-Relationships

Topic and description	Related Chapter	Where addressed in this Chapter
Impacts on water quality associated with surface water discharges	Chapter 15 Marine Water and Sediment Quality	Section 11.7
Cultural heritage: Impacts on peat deposits	Chapter 8 Cultural Heritage	Sections 11.6 and 11.7
Impacts to Human Health	Chapter 22 Health	Section 11.7
Waste	Chapter 23 Waste	Embedded mitigation, Section 11.7

11.10 Interactions

11.10.1 The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts because of that interaction. The worst-case impacts assessed within the chapter take these interactions into account and for the impact assessments are considered conservative and robust. For clarity, the areas of interaction between impacts are presented in **Table 11-19**, along with an indication as to whether the interaction may give rise to synergistic impacts.

Table 11-19 Interaction Between Impacts

Potential interaction between impacts						
Construction						
	Impact 1 – Impact on Human Health, During Any Excavations and Construction Related Activities	Impact 2 – Impact on Groundwater Quality from construction related activities	Impact 3 – Impact on Groundwater Quantity from construction related activities	Impact 4 – Impact on Surface Water Quality from construction related activities	Impact 5 – Impacts on soil quality	Impact 6 – Loss of Best Most Versatile (BMV) Agricultural Land
Impact 1 – Impact on Human Health, During Any Excavations and Construction Related Activities	-	Yes	Yes	Yes	No	No
Impact 2 – Impact on Groundwater Quality from construction related activities	Yes	-	Yes	Yes	No	No

Potential interaction between impacts						
Impact 3 – Impact on Groundwater Quantity from construction related activities	Yes	Yes	-	Yes	No	No
Impact 4 – Impact on Surface Water Quality from construction related activities	Yes	Yes	Yes	-	No	No
Impact 5 – Impacts on soil quality	No	No	No	No	-	Yes
Impact 6 – Loss of Best Most Versatile (BMV) Agricultural Land	No	No	No	No	Yes	-
Operation						
	Impact 1 - Impact to Human Health and Groundwaters During Operational and Maintenance Activities as a Result of Residual Contaminants			Impact 2 - Impact to Human Health and Groundwater during Operation as a Result of New Sources of Contamination being Introduced		
Impact 1 - Impact to Human Health and Groundwaters During Operational and Maintenance Activities as a Result of Residual Contaminants	-			Yes		

Potential interaction between impacts		
Impact 2 - Impact to Human Health and Groundwater during Operation as a Result of New Sources of Contamination being Introduced	Yes	-
Decommissioning	It is anticipated that the decommissioning impacts will be similar in nature to those of construction.	



11.11 Summary

11.11.1 A summary of the impacts relating to contaminated land, land use and hydrogeology are detailed in **Table 11-20** below.

Table 11-20 Impact Summary

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Effect
Construction						
Impact 1 – Impact on Human Health, Including Construction Workers and General Public During Any Excavations and Construction Related Activities	Human Health	High	Low	Moderate	Further investigation to assess ground gas and vapour risk.	Minor Adverse
Impact 2 – Impact on Groundwater Quality from construction related activities	Groundwater	Medium	Low	Minor	None required	Minor Adverse
Impact 3 – Impact on Groundwater Quantity from Construction Related Activities	Groundwater	Medium	Low	Minor	None required	Minor Adverse
Impact 4 – Impact on Surface Water Quality from General Earthworks and Construction Related Activities	Surface waters	Medium	Low	Minor	None required	Minor Adverse
Impact 5 – Impacts to Soil Quality	Soil quality	High	Negligible	Minor	None required	Minor Adverse
Impact 6 – Loss of Best Most Versatile (BMV) Agricultural Land	Land use	High	Negligible	Minor	None required	Minor Adverse

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Effect
Operation						
Impact 1 - Impact to Human Health and Groundwaters During Operational and Maintenance Activities as a Result of Residual Contaminants	Human Health Groundwater Surface waters	Medium - High	Negligible	Negligible to Minor	None required	Negligible to Minor Adverse
Impact 2 - Impact to Human Health and Groundwater during Operation as a Result of New Sources of Contamination being Introduced	Human Health Groundwater Surface waters	Medium - High	Negligible	Negligible to Minor	None required	Negligible to Minor Adverse

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