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IMMINGHAM EASTERN RO-RO TERMINAL

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Chapter 11: Coastal Protection, Flood Defence and Drainage
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Immingham Eastern Ro-Ro Terminal

Environmental Statement: Volume 1
Chapter 11: Coastal Protection, Flood Defence and Drainage

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11.1 Introduction

11.1.1 This chapter provides an environmental impact assessment (EIA) of the potential significant effects of the proposed Immingham Eastern Ro-Ro Terminal (IERRT) on coastal protection, flood defence and drainage receptors. The principal elements of the IERRT project are shown on Figure 1.2 (marine) and Figure 1.3 (landside) in Volume 2 of this Environmental Statement (ES) (Application Document Reference number 8.3). This chapter has been prepared by AECOM Ltd.

11.1.2 The following receptors have been considered as part of the assessment:

- People;
- Property (buildings and services);
- Infrastructure (such as roads, footpaths and railways);
- Flood defence assets;
- Drainage and sewer systems; and
- Waterbodies (such as Main Rivers, Ordinary Watercourses, ponds etc.).

11.1.3 Figures supporting the description of the existing environment (baseline) are provided in Volume 2 of this ES (Application Document Reference number 8.3). Figure 1.1 shows the location of the IERRT project. Figure 11.1 shows the location of surface water features, study area and flood zones in proximity to the site.

11.1.4 Due to the interdisciplinary nature of effects, this chapter cross references other ES chapters including Physical Processes (Chapter 7) with reference to predicted changes in tidal water levels, wave heights and erosion rates within the Humber Estuary and Ground Conditions (Chapter 12) including land quality with regards to underlying geology, hydrogeology and ground water levels. This chapter is also supported by Appendix 11.1 Flood Risk Assessment (FRA) (AECOM, 2021) in Volume 3 of ES (Application Document Reference number 8.4) in which flood risk impacts from tidal, fluvial, pluvial, groundwater and artificial sources, as well as surface water drainage impacts that could arise as a result of the IERRT project are considered.

11.1.5 A Drainage Strategy is provided in Annex B of the FRA (Appendix 11.1 to this ES) outlining how surface water runoff will be managed on-site post development. The strategy includes details on surface water attenuation, consideration of climate change and proposed discharge rates to the Habrough Marsh Drain (agreed with the North East Lindsey Internal Drainage Board (IDB)).

11.1.6 This chapter describes the impacts and subsequent effects that may arise in the context of coastal protection, flood defence and drainage as a result of the construction and subsequent operation of the IERRT project and outlines proposed design and other measures to mitigate these potential effects.

11.1.7 The IERRT project comprises land side and marine side areas. For the purpose of this chapter, the term 'site' refers to the landside area of the IERRT project only, unless specified differently in the text.

11.1.8 As well as the FRA and Drainage Strategy, this chapter references the requirement for the development of, and adherence to, a Construction Environmental Management Plan (CEMP) (Application Document Reference number 9.2) which will be implemented to mitigate any potential effects during construction.

11.2 Definition of the study area

11.2.1 The study area for this assessment is the area over which potential direct and indirect effects of the IERRT project are predicted to occur during the construction and operational periods. The direct effects on coastal protection, flood defence and drainage receptors are those occurring within the footprint of the IERRT project boundary. Indirect effects are those that may arise due to changes in the hydrodynamic (wave) environment or surface water as a result of the IERRT project. Indirect effects may occur outside the IERRT project site boundary.

11.2.2 The study area for the coastal protection, flood defence and drainage topic is considered to be the IERRT project and adjacent Immingham coastline denoted by the adjacent flood cells in the Humber Estuary Strategy (Environment Agency, 2008). The study area also extends upstream into Habrough Marsh Drain to the limit of tidal influence, including any new surface water discharges into this waterbody. The study area is shown on Figure 11.1 to this ES.

11.3 Assessment methodology

Data and information sources

11.3.1 Current baseline conditions have been determined by a desk-based review of available information.

11.3.2 The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the IERRT project include:

- Google Maps website;
- 'Catchment Data Explorer' website (Environment Agency, 2022);
- British Geological Survey (BGS) GeoRecords Plus online interactive map (BGS, 2022);

- Multi-Agency Geographic Information for the Countryside (MAGIC) website (Natural England, 2020);
- Flamborough Head to Gibraltar Point Shoreline Management Plan (East Riding of Yorkshire Council *et al.,* 2011);
- Humber Flood Risk Management Strategy (FRMS) (Environment Agency, 2008);
- Immingham Section 19 Flood Investigation Report (Balfour Beatty, 2012);
- Environment Agency Product 4, 5 and 8 data consultation responses (November 2021 and November 2022); and
- Environment Agency Flood Maps for Planning (available online) (Environment Agency, accessed April 2022).

Determining significance of effects

11.3.3 For the impact assessment process and to ensure consistency in the terminology used throughout this ES, a standard assessment methodology has been applied. This methodology has been developed from a range of sources, including the Design Manual for Roads and Bridges (DMRB) Lifecyle Appraisal (LA) 113 (Highways England, 2020a) and the Department of Transport (Transport Analysis Guidance) TAG Unit A3, Environmental Impact Appraisal (Department for Transport, 2019).

11.3.4 There is no standard guidance in place for the assessment of the likely significant effects on the water environment from developments of this type. Based on professional judgement, therefore, a qualitative assessment of the likely significant effects on surface water quality and water resources has been undertaken using the guidance and criteria set out in the DMRB LA 113 (Highways England, 2020a) which provides a robust and well tested method.

11.3.5 Approaches to mitigating potential impacts during construction and operational phases have been described with reference to good practice guidance and design.

11.3.6 Following the DMRB LA 113 (Highways England, 2020a) guidance, the criteria that have been used to determine the importance of receptors is presented in Table 11.1 below.

11.3.7 In accordance with the stages of the DMRB LA 113 (Highways England, 2020a) methodology, there are three stages to the assessment of effects, which are as follows:

- A level of sensitivity or importance (low to very high) is assigned to the receptor based on a combination of attributes (such as the size of the watercourses, Water Framework Directive (WFD) designation, water supply and other uses, biodiversity and recreation etc.) and on receptors to flood risk based on the vulnerability of the receptor to flooding;
- The magnitude of potential and residual impact (or change) (classed as negligible, minor, moderate or major and adverse/ beneficial) is

determined based on the criteria listed in Table 11.2 to this chapter and the assessor's professional judgement. Primary or tertiary mitigation measures are taken into account in the initial assessment, but any secondary mitigation is not considered until the assessment of residual effects; and

- A comparison of the sensitivity/ importance of the resource and magnitude of the impact (for both potential and residual impacts) results in an assessment of the overall significance of the effect on the receptor using the matrix presented in Table 11.3 to this chapter. The significance of each identified effect (both potential and residual) is classed as very large, large, moderate, slight or neutral and either beneficial or adverse significance.

11.3.8 Where significant adverse effects are predicted, appropriate mitigation has been considered and adopted where possible. The residual effects of the IERRT project with identified mitigation in place have then been assessed and presented in Table 11.9 to this chapter.

Table 11.1. Sensitivity (value) of coastal protection, flood risk and drainage receptors (adapted from DMRB LA 113 Table 3.70)

Sensitivity	General Criteria	Attributes
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.	▪ Human receptors – general public / visitors. ▪ Floodplain or defence protecting more than 100 residential properties from flooding. ▪ Flood Zone 3b. ▪ Essential Infrastructure or highly vulnerable development. ▪ Offsite regional sewerage networks.
High	Receptor of national or regional importance with a low ability to absorb change without fundamentally altering its present character.	▪ Human receptors – construction workers and site operatives with knowledge of site conditions. ▪ Floodplain or defence protecting between 10 and 100 residential properties or industrial premises from flooding; ▪ Flood Zone 3a; ▪ More vulnerable development; ▪ Low lying land and local pumped drainage network.

Sensitivity	General Criteria	Attributes
Medium	Receptor of regional or local importance, with medium ability to absorb, adapt to or recover from change. The receptor is of regional or local importance and has medium capacity to absorb change, adapt to or recover from change without significantly altering its present character.	▪ Floodplain or defence protecting 10 or fewer industrial properties from flooding; ▪ Flood Zone 2; ▪ Less vulnerable development; ▪ Surface water drainage network including drainage ditches.
Low	The receptor is of local importance and tolerant of change without detriment to its character (i.e. has some ability to absorb, adapt to or recover from change).	▪ Floodplain with limited constraints and low probability of flooding of residential and industrial properties; ▪ Flood Zone 1; ▪ Water compatible development; ▪ Local drainage network (existing private site drainage or soakaway).
Negligible	Receptor is resistant to change and is of little or no environmental value.	Not applicable.
Note – Essential Infrastructure, Highly Vulnerable, More Vulnerable, Less Vulnerable development and water compatible development are defined in the Planning Policy Guidance on Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities (DLUHC), 2022)		

11.3.9 The impact assessment for the coastal protection, flood risk and drainage topic is informed by the FRA, which is presented in Appendix 11.1 to this ES.

11.3.10 The impact assessment is based on existing flood risk information, such as the Product 4 and Product 8 datasets provided by the Environment Agency.in November 2021 Confirmation that this data is currently the most up to date publicly available information for flood risk was received from the Environment Agency in November 2022, therefore no new or additional modelling is required to inform the assessment.

11.3.11 Evidence of previous flood events in the study area have been considered, as provided by Associated British Ports (ABP), statutory consultees and described in the Immingham Section 19 Flood Investigation Report (Balfour Beatty, 2012).

11.3.12 The effect of climate change has been assessed by considering the national government guidance for sea level rise and changes to precipitation levels. The latest guidance, published by the Environment Agency, entitled Flood Risk Assessments: climate change allowances, detailing climate change allowances for flood risk assessments and planning (Environment Agency, 2022) is provided on the GOV.UK website. The guidance includes changes

to peak river flows, peak rainfall intensity levels and sea level rise allowances for different points in time over the next century.

11.3.13 Published in November 2018 (Met Office, 2018), the UK Climate Projections 2018 (UKCP18) is the official source of information on how the climate of the UK may change over the rest of this century. The UKCP18 projections replace the UKCP09 projections.

11.3.14 In coastal locations, where developments are sensitive to flood risk and/ or have a lifetime of at least 100 years, it is recommended that both the current allowance in 'Flood risk assessments: climate change allowances' (Environment Agency, 2022) and the 95th percentile of UKCP18 'Representative Concentration Pathway (RCP) 8.5' scenario (high emissions scenario) standard are used to assess the impact of climate change over the lifetime of a proposed development. Both data sets have been used to inform this assessment.

11.3.15 A desk-based review of available data has been undertaken to ascertain the likely surface water and drainage issues within the study area relevant to the IERRT project. This review was informed by a site-specific topographic survey, historic maps of the site / surrounding area showing the existing drainage infrastructure, where available, and information provided by ABP.

Determining the magnitude of change (impacts)

11.3.16 The magnitude of potential change upon coastal protection, flood risk and drainage receptors take account of the scale of the predicted change to baseline conditions and where there are potential pathways between an impact source/ hazard and identified receptors. This takes into account the spatial scale of the impact, as well as its duration and reversibility (e.g., the impact magnitude may be moderated if the impacts are temporary rather than permanent; or are reversible rather than irreversible).

11.3.17 The magnitude of change on a receptor ranges from major adverse to major beneficial. The criteria for determining the magnitude of change on a receptor are given in Table 11.2 below.

Table 11.2. Magnitude of change for coastal protection, flood risk and drainage (adapted from DMRB LA 113 Table 3.71)

Level of Magnitude	Definition of Magnitude and Examples
Major Adverse	Results in a loss of attribute and/ or quality and integrity of the attribute. For example: ▪ Change in flood risk to receptor from low or medium to high; ▪ Increase in peak flood level (>100 mm); ▪ Permanent adverse effect on local drainage system and subsequent capacity implications.
Moderate Adverse	Results in impact on integrity of attribute, or loss of part of attribute. For example:

Level of Magnitude	Definition of Magnitude and Examples
	▪ Change in flood risk to receptor from low to medium; ▪ Increase in flood peak level (>50 mm); ▪ Severe temporary adverse effect on local drainage system and subsequent capacity issues.
Minor Adverse	Results in some measurable change in attribute's quality or vulnerability. For example: ▪ Change in flood risk to receptor from no risk to low risk; ▪ Increase in peak flood level (>10 mm); ▪ Minor effect on local drainage system and subsequent capacity issues.
Negligible/ no change	Results in impact on attribute, but of insufficient magnitude to affect the use or integrity. For example: ▪ No change in flood risk leading to a negligible change in the attribute's integrity; ▪ Negligible change to peak flood level ≤ ±10 mm; ▪ Minute unidentifiable change on local drainage system.
Minor Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring. For example: ▪ Change in flood risk to receptor from low risk to no risk; ▪ Creation of flood storage and decrease in peak flood level (> 10 mm); ▪ Minor reduction in surface water run-off and subsequently the impact on the local drainage system.
Moderate Beneficial	Results in moderate improvement of attribute quality. For example: ▪ Change in flood risk to receptor from medium to low; ▪ Creation of flood storage and decrease in peak flood level (>50 mm); ▪ Moderate reduction in surface water run-off and subsequently the impact on the local drainage system.
Major Beneficial	Results in a gain of attribute and/ or quality and integrity of the attribute. For example: ▪ Change in flood risk to receptor from high to medium or low; ▪ Creation of flood storage and decrease in peak flood level (>100 mm); ▪ Major reduction in surface water run-off and subsequently the impact on the local drainage system.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Note: All references to peak flood level in Table 11.2 are for a 0.5% annual probability tidal event or 1% annual probability fluvial event, including climate change. Where access or egress routes are affected, the magnitude of the impact is defined by the change in the Flood Hazard Rating as defined by Defra and the Environment Agency (Flood Risk Assessment Guidance for New Development Phase 2) FD2320 (Environment Agency, 2005).

Determining the significance of effects

11.3.18 The sensitivity of the receptor (Table 11.1 of this chapter) and the magnitude of change (Table 11.2 of this chapter) are determined independently from each other and are then used in combination to determine the overall significance of effects (Table 11.3 of this chapter). The level of effect has been based on professional judgement and Table 11.4 has been used as a tool which has assisted with this process.

Table 11.3. Significance (Effect) Matrix

Receptor Value	Magnitude of Impact (degree of change)				
	No Change	Negligible	Minor	Moderate	Major
Very High	Neutral	Slight	Moderate or large	Large or very large	Very large
High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Source: DMRB Table 3.8.1 LA 104

Table 11.4. Significance Categories (Effects) and Typical Descriptions

Significance Category	Typical Description
Very large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Source: DMRB Table 3.7 LA 104 (Highways England, 2020b).

11.3.19 Whilst Table 11.3 to this chapter provides ranges, the significance of effect is confirmed as a single level and not a range, informed by professional judgement. For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse'. A statement is also made as to whether the level of effect is 'significant' or 'not significant', again based on professional judgement. Effects of moderate or greater are considered 'significant' in EIA terms.

11.3.20 The methodology described above has been used to assess the significance of effect for the following stages of the IERRT project:

- Construction; and
- Operation.

11.3.21 Cumulative and in-combination effects are considered in Chapter 20 of this ES (Cumulative and In-combination Effects).

Significance criteria and mitigation

11.3.22 Effects that are found to be significant in the process, (i.e. moderate, large or very large effects) may require mitigation measures to reduce residual effects, as far as possible, to environmentally acceptable levels. Within the assessment procedure the use of mitigation measures will alter the risk of exposure and, hence, will require significance to be re-assessed and thus the residual effect (i.e. with mitigation) identified.

11.3.23 Mitigation measures considered throughout the EIA process can take three forms, as detailed in the Institute of Environmental Management and Assessment (IEMA) Guide to Delivering Quality Development (IEMA, 2016):

- Primary (inherent) – modifications to the location or design of the development made during the pre-application phase that are an inherent (or embedded) part of the project. These are captured and taken into account in the initial impact assessment;
- Secondary (foreseeable) – actions that will require further action in order to achieve the anticipated outcome (identified as necessary through the assessment process). Within the impact assessment process, the use of secondary mitigation measures will alter the risk of exposure and, hence, will require significance to be re-assessed and thus the residual impact (i.e. with mitigation) identified; and
- Tertiary (inexorable) – actions that would occur with or without input from an environmental impact assessment process, including actions that will be undertaken to meet other existing legislative requirements, or actions considered to be standard practices to manage commonly occurring environmental effects. These are captured and taken into account in the initial impact assessment.

11.3.24 In addition, the DMRB document LA 104 ‘Environmental Assessment and Monitoring’ (Rev 1 Aug 2020) (Highways England, 2020b) states that Environmental assessment and design shall incorporate mitigation measures using a hierarchical system, as follows:

- Avoidance and prevention: design and mitigation measures to prevent the effect (e.g. alternative design options or avoidance of environmentally sensitive sites);
- Reduction: where avoidance is not possible, then mitigation is used to lessen the magnitude or significance of effects; and

- Remediation: where it is not possible to avoid or reduce a significant adverse effect, these are measures to offset the effect.

11.3.25 In certain instances, a decision may need to be taken despite residual uncertainty about the effects. In such cases, adaptive management, linked to a bespoke monitoring programme, is a well-established and recommended way of ensuring that any negative impacts or effects are addressed in the course of the construction of the development and during the subsequent operational phase.

Confidence assessment

11.3.26 Following the significance assessment, a confidence assessment has been undertaken which recognises the degree of interpretation and expert judgement applied. This is presented in the summary table contained within the conclusions section of each impact assessment section. Confidence is assessed on a scale incorporating three values: low, medium, and high.

11.4 Consultation

11.4.1 Consultation as to whether there are likely to be any coastal protection, flood defence and drainage effects as a result of the construction and operation of the IERRT project has been undertaken with the Environment Agency, North East Lincolnshire Council as the Lead Flood Authority, North East Lindsey Internal Drainage Board (c/o Witham Internal Drainage Board) and Anglian Water.

11.4.2 The outcomes of the formal ES scoping process, as well as any feedback received in response to the statutory consultation and publication of the Preliminary Environmental Information Report (PEIR) and supplementary statutory consultation and the publication of the Supplementary Consultation Report, have also informed the assessment.

11.4.3 The outcomes of the consultation that has been undertaken along with how it has influenced the coastal protection, flood defence and drainage assessment, are presented in Table 11.5

Table 11.5. Summary of consultation

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
Planning Inspectorate (PINS)	Scoping Opinion, October 2021 Table ID 4.6.2	It is noted that the FRA will be provided as an appendix to the coastal defence, flood risk and drainage assessment in the ES. The FRA should as a minimum, address the requirements listed in paragraph 5.2.5 of the Policy Statement for Ports.	The requirements listed in Paragraph 5.2.5 of the Planning Policy Statement for Ports are addressed throughout the FRA in Appendix 11.1 to this ES.
Environment Agency	Scoping Opinion, October 2021 Appendix 2 Environment Agency response	Any potential impacts on flood risk infrastructure should be linked to the FRA outcomes. Any resulting mitigation / monitoring of the impacts should be linked to the detailed approvals that would normally be considered in the Flood Risk Activities of an Environmental Permit.	No impacts on flood risk infrastructure are expected as a consequence of the IERRT project. ABP own, and are responsible for, the flood risk defences along the Port of Immingham frontage and sufficient space will be provided for defence improvement works, in line with the 'hold the line' policy approach, where the jetty approach road is proposed to pass over the defences. No Flood Risk Activity permit is required for works relating to the IERRT project. However, a protective provision for the benefit of the Environment Agency has been included in the Development Consent Order (DCO) which requires that the works not to come into physical contact with the existing flood defence and be set at a sufficient height above the flood defence to facilitate access for maintenance inspections.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		Invitation to discuss the details of the proposed works to determine whether an Environmental Permit for Flood Risk Activities is required and if so, whether this can be incorporated into the DCO or Marine Licence.	Works over and in proximity to the ABP owned flood defences will not require an Environmental Permit for Flood Risk Activities as the flood defences are owned by ABP and the Humber Estuary is not classed as a Main River. A requirement for the works not to come into physical contact with the existing flood defence and be set at a sufficient height above the flood defence to facilitate access for maintenance inspections is included in the DCO.
		Any new terminal buildings for “less vulnerable” uses should raise Finished Floor Levels (FFLs) as high as practicable and, if these will be below the predicted flood depth (referring to the relevant 2115 0.5% Annual Exceedance Probability (AEP) tidal breach map), suitable flood resistance / resilience measures identified.	Section 7 of the FRA in Appendix 11.1 to this ES addresses mitigation, including FFLs, flood resilience for critical infrastructure and safe refuge. In addition, suitable flood resistance/ resilience measures are identified.
		Single storey buildings should be built with FFLs above the predicted flood depth (referring to the relevant 2115 0.5% AEP tidal breach map). If this is not practicable, an area of safe refuge will need to be provided, or an appropriate flood warning and evacuation plan (to be assessed by the Local Planning Authority (LPA)) will	Section 7 of the FRA in Appendix 11.1 to this ES addresses mitigation, including FFLs, levels for critical infrastructure and safe refuge. Safe refuge will be provided on the upper level of the main terminal building above the 0.1% AEP breach flood water level with climate change allowance of 6.25 m

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		need to demonstrate how this risk will be managed.	Above Ordnance Datum (AOD) (agreed with Environment Agency in June 2022).
Anglian Water	Scoping Opinion, October 2021 Appendix 2 Anglian Water response	All surface water during construction and operation of the project should be managed via Sustainable Drainage Systems (SuDS) and not via the public sewer network.	Surface water runoff, after attenuation, will drain to the Humber Estuary, Immingham Dock and via existing outfalls to Habrough Marsh Drain. There is no requirement to discharge to the public sewer network. Further details are provided in the Drainage Strategy (provided as Annex B of the FRA in Appendix 11.1 to this ES)
		Anglian Water should be consulted, and data sought on historic sewer flooding, if on site design and offsite impacts from the project, and cumulatively with other development, potentially cause increased risk to the existing sewer network.	There are no proposed surface or foul water connections to the surrounding Anglian Water surface water drainage network and therefore no potential onsite or off-site impacts from the IERRT project Foul drainage will be treated on site via a package treatment plant with no connection to the Anglian Water foul water system required. No off-site or cumulative impacts will be incurred as a result of the IERRT project. A Drainage Strategy is provided as Annex B of the FRA in Appendix 11.1 to this ES.
North East Lindsey Internal Drainage Board (c/o Witham Internal Drainage Board (IDB))	Data Consultation Response, October 2021	There is a network of Board maintained watercourses near the site. Habrough Marsh Drain is a gravity system with a flapped outfall into the Humber within the port site. There is a link to the	Noted. The risk of flooding from Ordinary Watercourses is presented in Section 4.4 (baseline flood risk) and Section 6.2 (post-development flood risk) of the FRA in Appendix 11.1 to this ES.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		Immingham pumped drainage system which allows flow into the Drain only when there is spare capacity available. High levels within this system have a potential flood risk for the area, particularly if rainfall events combine with high water levels in the Humber.	
		The proposals show new infrastructure in the Humber near to the gravity outfall of Habrough Marsh Drain. The FRA should address this and put in place measures to mitigate siltation that could impede the existing discharge.	Siltation (and longer-term morphological) impacts on the existing infrastructure (including the Habrough Marsh Drain) have been considered (for both construction and operation phases) within Section 7.8 of the Physical Processes chapter (Chapter 7) of the ES. Mapping of the Habrough Marsh Drain intertidal creek has been undertaken by ABP based on aerial photography overlaid with the proposed route of the jetty approach road. This mapping has been used to ensure the location of the piles required for the approach jetty will be spaced sufficiently wide apart that there is no impact on the creek channel. Provisions have been put in place with the North East Lindsey IDB in the DCO to safeguard the creek across the intertidal area so the existing discharge is not impeded.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
			Comments have been addressed in the FRA in Appendix 11.1 to this ES, which has informed this chapter of the ES.
		The prior written consent of the Board is required for any proposed temporary or permanent works in, under, over or within 7 m of the top of bank of a Board maintained watercourse (A revised Byelaw distance of 9 m is expected in the near future). This width is required to be kept clear of all obstructions.	Noted. The IDB Bye-law requirement is outlined in Section 3.3.7 of the FRA in Appendix 11.1 to this ES. The DCO provides a mechanism for the approval/ consent required for works to or adjacent to Habrough Marsh Drain to be obtained from the IDB.
		Surface water discharge into the Boards drainage system from any re-development should be reduced to 70% of the existing discharge rate.	Noted. A Drainage Strategy is provided as Annex B of the FRA (Appendix 11.1 to this ES) outlining how surface water runoff will be managed on-site post development.
North East Lincolnshire Council	Data Consultation Response. October 2021	ABP do not report incidents of flooding on their land, primarily because the drainage infrastructure serving the dock estate is nearly all under ABP ownership. The only information held by the Council Drainage Team is: ▪ There was extensive flooding of the dock estate during the tidal surge on 5 December 2013; ▪ The only watercourses on ABP land not owned by ABP are the North East Lindsey IDB drains. All information on flood risk from these is held by the IDB; and	Noted. The response has been used to inform relevant sections of the FRA in Appendix 11.1 to this ES. Data consultation has been undertaken with the North East Lindsey IDB and information obtained used to inform this assessment and the FRA (Appendix 11.1 to this ES).

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		▪ Any hydraulic models of the watercourses will be held by the IDB.	
Environment Agency	Consultation response. November 2021	The following data for the proposed development site and surrounding area has been provided: ▪ Flood Map for Planning showing Flood Zone Extents and location of flood defences; ▪ Historic flood event outlines map showing historical flood extents for events in 1953 and 2013; ▪ Fluvial flood risk information, this site is not considered to be at risk of flooding from main rivers. The site may be at risk from local ordinary watercourses for which other risk management authorities, such as the Lead Local Flood Authority (i.e. top tier council) or Internal Drainage Board (where they exist) have responsibility; ▪ Tidal flood risk and tidal water level data; and ▪ Tidal Hazard Mapping for breach and overtopping events for the years 2006 and 2115.	Receipt of information is confirmed. The information provided by the Environment Agency has been used to inform this ES chapter and the FRA and is presented in Annex A to the FRA in Appendix 11.1 to this ES. Consultation has been undertaken with other statutory consultees to obtain flood risk information, including the North East Lindsey IDB and North East Lincolnshire Council (Lead Local Flood Authority).
North East Lindsey Internal Drainage Board (c/o Witham	Statutory Consultation	The Preliminary Environmental Information Chapter 11: Coastal Protection, Flood Defence and	Noted. Data provided by the IDB has been used to inform this ES chapter and the FRA (Appendix 11.1 to this ES).

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
Internal Drainage Board (PI13)	response on PEIR (14 February 2022)	Drainage included in the submission contains the appropriate information relating to North East Lindsey IDB following a previous consultation on the project in October 2021. The Board will comment further when details are produced and submitted.	Further consultation/ meetings have been undertaken with the IDB and feedback used to inform this assessment and the FRA. Further details regarding the meeting is presented within this Table.
Member of the Public (PI14)	Statutory Consultation response on PEIR (14 February 2022)	Concerns regarding the proposed IERRT development and drainage, specifically ensuring that the site is fully drained in the correct manner and that this will not impact surrounding properties outside the planned site; e.g. along Queens Road and individual property flooding.	Noted. The area of concern raised by the member of the public is located outside the IERRT project site boundary and is not related to the DCO application. Surface water flooding and off-site impacts are addressed in Sections 6.3 and Section 8 of the FRA respectively in Appendix 11.1 to this ES. A Drainage Strategy is provided as Annex **B** of the FRA (Appendix 11.1 to this ES) outlining how surface water runoff will be managed on-site post development with no off-site impacts.
Environment Agency (PI34)	Statutory Consultation response on PEIR (23 February 2022)	We are pleased to see the Preliminary Flood Risk Assessment (FRA) (Appendix 11.1) confirms that the integrity of any existing flood defence on site, whether maintained by the Environment Agency or other parties, would be persevered at all times during the construction of the new jetty and	Noted.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		over the duration of the operational lifetime of the development.	
		We are also pleased that the flood defences and any future works to the defences will not be impacted as a result of the development. Sufficient clearance between the flood defences and the jetty approach road will be provided to allow the flood defences to be raised in the future to adapt to climate change and to enable machinery to access the flood defences.	Noted.
		It is important that the approach roadway from the shore to the jetty and/or the transfer facility, will pass over, but will not touch, the flood defences and that access to and along the flood defence will not be affected. We would request including this as a Requirement in the Development Consent Order.	This request is noted. Section 7.5 of the FRA in Appendix 11.1 of this ES confirms that the approach roadway/ transfer facility will pass over, but will not touch, the flood defences and that access to and along the flood defence will not be affected. In addition, a requirement for the works not to come into physical contact with the existing flood defence and be set at a sufficient height above the flood defence to facilitate access for maintenance inspections is included within the DCO for the benefit of the Environment Agency.
		The FRA states that improvement works to the flood defences by ABP will be completed within the lifetime of the	It is anticipated that the improvements to the flood defences will be undertaken after the proposed approach road and jetty are

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		proposed development. Please can you confirm whether these improvements will take place before or after the proposed approach roadway and jetty are put in place.	in place. This is clarified in Section 6.1 of the FRA (Appendix 11.1 to this ES).
		The FRA should explain more clearly that the Environment Agency inspects flood defence assets within the port, however ABP is responsible for the maintenance of these assets. The PEIR Chapter 11 document suggests that the Environment Agency has an ongoing maintenance programme on site, which is not the case. The assets are inspected annually; the FRA suggests (in Section 8.2) this occurs twice a year, which is incorrect.	Section 4.2.2 of the FRA in Appendix 11.1 to this ES has been amended to add clarity regarding the roles of the Environment Agency and ABP including their individual responsibilities for the inspection and maintenance of the flood defences under their jurisdiction. Where required, this chapter of the ES clarifies that the role of the Environment Agency with regards to the inspection and maintenance of the flood defences. Section 8.2 of the FRA (Appendix 11.1 to this ES) has been amended to read "*In addition, the tidal flood defences are inspected annually by the Environment Agency with maintenance to the defences undertaken by the Environment Agency and ABP (for defences under their respective ownership) when required to ensure that they remain fit for purpose*".
		The only exception to this is Habrough Marsh Drain outfall, which is maintained by the Environment	Text has been included in both this ES chapter (paragraph 11.6.21) and the FRA (Appendix 11.1 to this ES) to reflect the

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		Agency. The Environment Agency requires space around Habrough Marsh Drain outfall; we can only access this site through the port from the west. We require space for access and a crane to be set up with a works area around the crane for removal of the pointing doors/recondition works. The current designs suggest that there will be buildings to the north east of the outfall, which may obstruct the access and space we require.	Environment Agency's responsibility for maintaining the Habrough Marsh outfall pointing doors. Additional text has been added to Section 7.5 of the FRA in Appendix 11.1 to this ES confirming that access will be maintained to allow the Environment Agency to undertake works to the Habrough Marsh Drain outfall.
		Chapter 7 of the PEIR explains the potential for increased wave heights on and off site due to the development and possible change in erosion patterns. We would like to see more detail around how this affects the foreshore and the standard of protection of the flood defences on and off site and any mitigation for this that will be proposed.	The physical processes assessment in ES chapter 7 Section 7.8 to this ES has included consideration of potential impacts on local and regional features, including estuary banks, flood defences and channels. Zone of Influence (ZoI) for each of the different physical process elements is provided on the respective map plots for hydrodynamics, sediment transport and plume dispersion. The FRA (Appendix 11.1 to this ES) has been updated to address this, where required.
		The FRA states "*To ensure that they remain dry, it is advised that critical plant/equipment (as defined by ABP), should be raised and secured above*	Noted. Section 7 of the FRA in Appendix 11.1 to this ES addresses mitigation, including resilience and raised levels, where practicable for critical infrastructure.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		the expected 0.5% AEP climate change breach scenario flood water level where it is practicable to do so". However, the Environment Agency recommends that critical plant/ equipment should be raised above the 0.1% climate change (2115) scenario breach depth.	
		The FRA also states that safe refuge areas should have a freeboard of 0.5 m above the flood level corresponding to the 0.5% AEP breach flood event with climate change allowance. The Environment Agency recommends that all areas of safe refuge should be above the 0.1% climate change flood level. However, the responsibility for agreeing flood warning and evacuation plans rests with the local planning authority and therefore we recommend that you seek advice on the appropriate level for safe refuge from North East Lincolnshire Council.	Noted. Section 7 of the FRA in Appendix 11.1 to this ES addresses mitigation, including levels for safe refuge sited above the 0.1% AEP climate change (2115) scenario breach depth of 6.25 m AOD (agreed with the Environment Agency in June 2022).
North Lincolnshire Council (PI38)	Statutory Consultation response on PEIR (23 February 2022)	The Flood Risk and Surface Water Project Officer has raised concerns regarding impacts on pluvial flood risk and SuDS given the scale and location of the development. However, Officers would welcome the submission of a full Flood Risk Assessment including	Section 2.2 of the FRA in Appendix 11.1 to this ES identifies water resources including surface water e.g., rivers, lakes/ ponds, riparian land drainage systems, coastal or underground waters on or around the site.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		surface water/drainage assessment etc with any forthcoming application. This is in order to determine whether there are any water resources including surface water e.g. rivers, lakes/ponds, riparian land drainage systems, coastal or underground waters on or around the location which could be affected by the project.	A Drainage Strategy is provided in Annex B of the FRA (Appendix 11.1 of this ES) outlining how surface water runoff will be managed on-site post development.
Anglian Water (PI43)	Statutory Consultation response on PEIR (23 February 2022)	With regards to the Drainage Strategy Anglian Water requests drafts of the application documents on these matters for agreement prior to application submission.	The Drainage Strategy has been submitted in draft to Anglian Water and forms part of the suite of documents with the DCO application. The Drainage Strategy is provided in Annex B of the FRA (Appendix 11.1 of this ES).
		Anglian Water welcomes clarification that all surface water will not at any time discharge via the public sewer network and will discharge (after suitable treatment) into watercourses or the sea.	Surface water run-off, after attenuation, will be discharged in existing drainage structures to the Habrough Marsh Drain, and an existing piped outfall into the Humber Estuary. There will be no surface water discharge to the Anglian Water surface water system. Foul drainage will be treated on site via a package treatment plant with no connection to the Anglian Water foul water system required.
		The PEIR advises that there is no Anglian Water recycling infrastructure within the IERRT project site boundary. The PEIR correctly advises that there	Noted.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		is a sewer which runs to the east of the site.	
		The PEIR advises that the wastewater is managed on site including using sewage treatment plants. The subsequent assessment of the port's private wastewater infrastructure indicates that this will need enhancement including to cater for climate change.	Noted. Enhancements will be undertaken if and when required. There will be no requirement for waste water services from Anglian Water as the port estate is not connected to mains sewerage.
		Table 11.7 confirms that the existing port does not have any discharges to Anglian Water sewer systems. Subsequent paragraphs include no reference to connections to Anglian Water wastewater infrastructure and consequently the impacts which will need to be covered in the ES are construction and operational traffic impacts on the Rising Main to the east and south of the Site and the Immingham Sea Outfall it connects to.	Neither the site or the wider Port of Immingham are connected to the Anglian Water foul sewer system and the Anglian Water rising foul main, located to the east and south of the site, is not located within the red line boundary for the IERRT project and therefore no potential onsite or off-site impacts from the IERRT project.
North East Lincolnshire Council (PI45)	Statutory Consultation response on PEIR (23 February 2022)	There are no specific drainage issues with the proposed development, they will be able to directly discharge water into the estuary so there are no surface water flood risk requirements.	Surface water run-off , after attenuation, will be discharged in existing drainage structures to the Habrough Marsh Drain, and an existing piped outfall into the Humber Estuary. A Drainage Strategy is provided Annex B of the FRA (Appendix 11.1 to this ES).

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		The drainage board should be consulted as it is within their district, and they have their Habrough Marsh Drain outfalling at the side of the docks. The proposed development should not interfere with the outfall.	Consultation with North East Lindsey IDB has been undertaken and the IERRT project will not interfere with the outfall of Habrough Marsh Drain. The DCO will provide a mechanism for approval/ consent of the IDB to be obtained for works to or adjacent to Habrough Marsh Drain and its outfall.
Q77	Statutory Consultation – 19 Jan – 23 Feb 2022	Concern was raised regarding the impact of the proposed development on the Immingham Outflow Discharge.	Neither the site nor the wider Port of Immingham are connected to the Anglian Water foul sewer system and the Anglian Water rising foul main, located to the east and south of the site, is not located within the red line boundary for the IERRT project. The impact of the IERRT project on the Immingham Outflow discharge is assessed in Chapter 7 (Physical Processes) to this ES.
North East Lindsey Internal Drainage Board (c/o Witham Internal Drainage Board) (PI44)	Meetings on 24 February and 11 May 2022	The Habrough Marsh Drain outfall has cut a creek-like formation across the intertidal and reassurance is required that new structures will not cause accretion/restrictions to flow at the outfall.	Siltation (and longer-term morphological) impacts on the existing infrastructure (including the Habrough Marsh Drain) have been considered (for both construction and operation phases) within Section 7.8 of the Physical Processes chapter (Chapter 7) of the ES. Mapping of the Habrough Marsh Drain intertidal creek has been undertaken by ABP based on aerial photography overlaid

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
			with the proposed route of the jetty approach road. This mapping has been used to ensure the location of the piles required for the approach jetty are spaced sufficiently wide apart that there is no impact on the creek channel. Provisions will be included in the DCO for the North East Lindsey IDB to safeguard the creek across the intertidal area, so the existing discharge is not impeded. Comments have been addressed in the FRA (Appendix 11.1 to this ES), which has informed this ES chapter.
		Access to Habrough Marsh Drain outfall is required for dredging equipment so the channel can be cleared out.	Access to Habrough Marsh Drain, via East Riverside, will remain as the current scenario to allow North East Lindsey IDB access for channel maintenance works.
		If surface water is to be discharged to Habrough Marsh Drain, then flow rates will need to be considered and attenuation may be required. The capacity in Habrough Marsh Drain is limited particularly during a pluvial event that coincides with high water levels in the estuary in which case the outfall doors will be closed and water unable to discharge to the estuary until	Surface water will drain via the two existing outfalls to Habrough Marsh Drain with surface water attenuated on-site. A Drainage Strategy is provided Annex B of the FRA (Appendix 11.1 to this ES).

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		the flood ebb tide has allowed the doors to open again.	
North East Lincolnshire Council (NELC)	Meeting 1 June 2022	NELC noted any proposals by ABP to upgrade flood defences would follow implementation of the IERRT scheme Noted that as Lead Local Flood Authority 'sea flood' risk does not fall under NELC's jurisdiction as 'sea flooding' is the Environment Agency's responsibility.	Noted.
		Although Habrough Marsh Drain is under operational control of the North East Lindsey IDB, NELC, as Lead Local Flood Authority require oversight to surface water drainage in to the Habrough Marsh Drain. It is possible NELC may want some Protective Provisions to cover off approval of plans insofar as these pertain to drainage. There are no concerns about surface water drainage going to the estuary or enclosed dock basin.	Noted. Protective provisions will be included in the DCO for NELC (as Lead Local Flood Authority) specifically for the IERRT project with the necessary mechanism for providing approval of plans relating to drainage, and oversight in respect of the surface water drainage.
		NELC are interested in the flow attenuation methods to be used and ensuring run-off is as clean as possible noting the Environment Agency's Water Framework Directive objectives for the estuary. For residential developments NELC would prefer SUDS, swales or even reed filtration	A Drainage Strategy is provided at Annex B of the FRA (Appendix 11.1 to this ES. The IERRT project does not comprise residential development.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		beds and even though these may not be applicable to the IERRT require some thought put to this over and above the standard interceptor approach.	
Environment Agency	Meeting, 20 May 2022	The Environment Agency are happy with the approach taken and responses to previous consultation comments provided as part of the Scoping and PEIR Consultation process. Safe refuge needs to be provided at a level above the 0.1% AEP breach flood water level with climate change allowance which is confirmed as 6.25 m AOD.	Safe refuge will be provided on the upper level of the IERRT terminal building above the agreed 0.1% AEP breach flood water level with climate change allowance of 6.25 m AOD This is outlined in Section 7 of the FRA (Appendix 11.1 to this ES).
North East Lindsey Internal Drainage Board (c/o Witham Internal Drainage Board) (PI 12)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The Board provided comments originally in October 2021 which remain valid. Through engagement of ABP locally the Board is also aware of the proposed changes that potentially can affect the local drainage. The Board will continue to work with ABP and consultants on the surface water Drainage Strategy as set out in the Preliminary Flood Risk Assessment.	Noted.
North East Lindsey Internal Drainage Board (c/o Witham	Supplementary Statutory	The Board is still concerned of the effects of the new infrastructure in the Humber over and near to the gravity	Siltation (and longer-term morphological) impacts on the existing infrastructure (including the Habrough Marsh Drain)

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
Internal Drainage Board (PI 12)	Consultation – 28 Oct – 27 Nov 2022	outfall of Habrough Marsh Drain, there is concern that this will result in siltation which will impede the discharge. The Flood Risk Assessment and Drainage Strategy should address this and put in place measures to mitigate it.	have been considered (for both construction and operation phases) within Section 7.8 of the Physical Processes chapter (Chapter 7) of the ES. Mapping of the Habrough Marsh Drain intertidal creek has been undertaken by ABP based on aerial photography overlaid with the proposed route of the jetty approach road. This mapping has been used to ensure the location of the piles required or the approach jetty will be spaced sufficiently wide apart that there is no impact on the creek channel. Provisions have been put in place with the North East Lindsey IDB in the DCO to safeguard the creek across the intertidal area so the existing discharge is not impeded. In addition, access to Habrough Marsh Drain, via East Riverside, will remain as the current scenario to allow North East Lindsey IDB access for channel maintenance works.
Environment Agency (PI 11)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	This consultation has alerted us to the potential for additional impacts on siltation to the Harborough Marsh Drain outfall and that these impacts were not specifically assessed as a	Impacts on the existing infrastructure (including the Habrough Marsh Drain) have been considered (for both construction and operation phases) within

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		separate impact pathway in the original Preliminary Environmental Impact Report (Table 1, Page 42). It is our view that these potential impacts should be assessed for both the construction phase and the future operation of the terminal. If the assessment concludes that the development will (or may) have a detrimental impact on the operation of the existing outfall then details of appropriate monitoring and mitigation measures, and the mechanism for securing these, should be included in the Environmental Statement.	Section 7.8 of the Physical Processes chapter (Chapter 7) of the ES. Provisions have been put in place with the North East Lindsey IDB in the DCO to safeguard the creek across the intertidal area so the existing discharge from the outfall is not impeded.
North East Lindsey Internal Drainage Board (c/o Witham Internal Drainage Board)	Email, 5 Dec 2022	The IDB reviewed a draft version of the Drainage Strategy. In general, the Drainage Strategy was considered acceptable. A few minor changes were suggested (e.g., referencing of sub-catchments, clarification of IDB responsibilities, and wording on Habrough Marsh Drain capacity).	The final version of the Drainage Strategy incorporates the comments received from the IDB. This is provided at Annex B of the FRA (Appendix 11.1 of this ES).
North East Lincolnshire Council (NELC)	Emails, 14 – 15 Dec 2022	Response provided following review of draft Protective Provisions for the benefit of NELC as the lead local flood authority. NELC confirmed that they consider the draft Protective Provisions satisfactory in terms of the protection given to the area's drainage. This was	Noted. Protective Provisions to be included in DCO.

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		also confirmed with the planning officer.	

11.5 Implications of policy legislation and guidance

11.5.1 This section of the chapter sets out key aspects and implications of applicable legislation, regulation, policy and guidance that are relevant to the assessment of likely impacts on coastal protection, flood defence and drainage receptors. It builds upon the overarching chapter covering the Legislation, Policy and Consenting Framework (Chapter 5).

Legislation

11.5.2 The United Kingdom (UK) left the European Union (EU) on the 31 January 2020. The legislation discussed below has been retained by the UK and remains applicable to the assessments in this ES Chapter.

The Flood Directive (Directive 2007/60/EC)

11.5.3 The Flood Directive (Directive 2007/60/EC) aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage, and economic activity. The Directive requires Member States to identify the river basins and associated coastal areas at risk of flooding. For such zones, flood risk maps must be produced and flood risk management plans (FRMPs) established focused on prevention, protection, and preparedness. The Directive applies to inland waters as well as all coastal waters. The Flood Directive was transposed into domestic law by the Flood Risk Regulations 2009, which are discussed below.

The Environmental Permitting Regulations 2016

11.5.4 The Environmental Permitting (England and Wales) (Amendment) (No. 2) Regulations 2016 came into force on 6 April 2016. They amend the Environmental Permitting (England and Wales) Regulations 2010 in order to extend the requirement for an environmental permit to flood risk activities in addition to polluting activities included under the previous regulations. The permitting requirements for flood risk activities replace the previous 'flood defence consent scheme', allowing the Environment Agency to concentrate on higher risk activities.

Flood and Water Management Act 2010

11.5.5 The Flood and Water Management Act 2010 (FWMA) aims to improve both flood risk management and the way we manage our water resources by creating clearer roles and responsibilities. This includes a lead role for local authorities in managing local flood risk (from surface water, ground water and ordinary watercourses), and a strategic overview role of all flood risk for the Environment Agency. The FWMA provides opportunities for a comprehensive, risk-based approach on land use planning and flood risk management by local authorities and other key partners.

Flood Risk Regulations 2009

11.5.6 The Flood Risk Regulations 2009 transposed the Floods Directive (Directive 2007/60/EC) on the assessment and management of flood risk into domestic law in England and Wales and implemented its provisions. The Regulations designate Lead Local Flood Authorities (LLFA) and impose duties on the Environment Agency and LLFAs to prepare a number of documents including:

- Preliminary Flood Risk Assessments;
- Flood hazard and flood risk maps; and
- Flood Risk Management Plans.

Water Resources Act 1991

11.5.7 The Water Resources Act 1991 gives the Environment Agency powers and duties to prevent or remedy the pollution of controlled waters. Previously under the Act and now under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) it is a criminal offence for a person to cause or knowingly permit pollution of controlled waters. Sections within the Act refer to water resources management, pollution of water resources, flood defences, fishery controls, financial provisions, land and works powers and information provisions.

Land Drainage Act 1991

11.5.8 The Land Drainage Act 1991 requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. If a riparian owner fails to carry out his responsibilities under the Land Drainage Act 1991, or if anyone else causes a watercourse to become blocked or obstructed, the County and District Councils have powers of enforcement by serving a notice under the Act.

11.5.9 The 1994 Land Drainage Act amends the Land Drainage Act of 1991 in relation to the functions of internal drainage boards and local authorities.

National policy

National Policy Statement for Ports (NPSfP)

11.5.10 The National Policy Statement for Ports (NPSfP) (Department for Transport, 2012) is the framework for decisions on proposals for new port development that are Nationally Significant Infrastructure Projects (NSIPs). The aims of the NPSfP on development and flood risk are to ensure that flood risk from all sources of flooding is taken into account at all stages in the planning process, to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, including "*water compatible*" development, the policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall. Port

development is defined as being water compatible development and, therefore, acceptable in high flood risk areas (Paragraph 5.2.3).

11.5.11 The NPSfP states that "*all applications for port development of 1 hectare or greater in Flood Zone 1 and all proposals for projects located in Flood Zones 2 and 3 should be accompanied by a flood risk assessment (FRA). This should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account*" (Paragraph 5.2.4).

11.5.12 The NPSfP notes that the latest set of UK Climate Projections should be used in assessments to ensure the appropriate adaptation measures have been identified – stating that "*Applicants should apply, as a minimum, the emissions scenario that the independent Committee on Climate Change suggests the world is currently most closely following – and the 10%, 50% and 90% estimate ranges. These results should be considered alongside relevant research which is based on the climate change projections such as Environment Agency Flood Maps*" (Paragraph 4.13.7).

11.5.13 Paragraph 5.2.18 of the NPSfP states "*The Government's view is that there is no 'public good' need, on national resilience grounds, to require a higher specification than will secure commercial resilience of the individual facility, notwithstanding that some types of severe weather may effect ports in a region or along a particular stretch of coastline, for example from a storm surge. The NPSfP provides more generally for resilience and diversity of ports provision. Applicants will be in the best position to make a commercial judgement on the required appropriate adaptation measures to reduce the risk from long term climate change as it affects their own facilities*".

UK Marine Policy Statement (MPS)

11.5.14 The Marine Policy Statement (MPS) (HM Government, 2011) is the framework for preparing marine plans and taking decisions affecting the marine environment. The MPS also sets out the general environmental, social and economic considerations that need to be taken into account in marine planning and provides guidance on the pressures and impacts that decision makers need to consider when planning for and permitting development in the UK marine areas.

11.5.15 Section 2.6.8 of the MPS is relevant to the coastal protection, flood risk and drainage assessment. In particular, paragraph 2.6.8.4 states, amongst other things, that - "*Marine plan authorities should be satisfied that activities and developments will themselves be resilient to risks of coastal change and flooding and will not have an unacceptable impact on coastal change*...". In addition, paragraph 2.6.8.6 notes that the impacts of climate change throughout the operational life of a development should be taken into account in assessments, and that any geomorphological changes that an activity or development has on coastal processes, including sediment movement, should be minimised and mitigated.

East Inshore and East Offshore Marine Plans

11.5.16 The first Marine Plans include the East Inshore and East Offshore Marine Plans (Defra, 2014), which are collectively referred to as 'the East Marine Plans'. These were formally adopted on 2 April 2014. The East Inshore Marine Plan area covers 6,000 km² of sea, from mean high water springs (MHWS) out to the 12 nautical mile limit from Flamborough Head in the north to Felixstowe in the south. The East Offshore Marine Plan covers 49,000 km² of area from the 12 nautical mile limit to the border with The Netherlands, Belgium and France.

11.5.17 Section 3.5 states "*The East marine plan areas have a role to play in realising national ambitions with regard to climate change... Adaptation involves modifying infrastructure to better deal with climate change conditions and helping people to determine how to adjust their behaviour/decisions to enable them to adapt to the challenges of a changing climate*" (paragraph 230).

11.5.18 Policy CC1 states that:

"*Proposals should take account of:*

- *How they may be impacted upon by, and respond to, climate change over their lifetime and*
- *How they may impact upon any climate change adaptation measures elsewhere during their lifetime. Where detrimental impacts on climate change adaptation measures are identified, evidence should be provided as to how the proposal will reduce such impacts*."

11.5.19 Policy CC1 is consistent with and adds marine planning context to other policy in seeking that new development should be planned to avoid increased vulnerability to the range of impacts arising from climate change. The combination of a low-lying topography, isostatic change, a rise in sea levels and the possibility of an increase in tidal surges in the North Sea are particularly significant for the East Coast.

National Planning Policy Framework (NPPF)

11.5.20 Whilst not the primary planning policy document for a harbour NSIP development, the National Planning Policy Framework (NPPF) (Ministry for Housing, Communities and Local Government (MHCLG), 2021) sets out the Government's planning policies for England. Although primarily for proposals under the Town and Country Planning Act 1990, NPPF policies of relevance to flooding, including the Flood Risk and Coastal Change Planning Policy Guidance (PPG) (DLUHC, 2022) last revised in August 2022, which states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

11.5.21 The NPPF states that when determining planning applications, LPA's should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific FRA. Development should only be allowed in areas at risk of flooding where, in light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
- The development is appropriately flood resistant and resilient;
- It incorporates SuDS, unless there is clear evidence that this would be inappropriate;
- Any residual risk can be safely managed; and
- Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

11.5.22 Major developments should incorporate SuDS unless there is clear evidence that this would be inappropriate. The systems used should:

- Take account of advice from the LLFA;
- Have appropriate proposed minimum operational standards;
- Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
- Where possible, provide multifunctional benefits.

The National Flood and Coastal Erosion Risk Management Strategy for England

11.5.23 The Environment Agency's National Flood and Coastal Erosion Risk Management Strategy for England (Environment Agency, 2020) provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England.

11.5.24 This Strategy sets out practical measures to be implemented by risk management authorities, partners and communities, which will contribute to longer term delivery objectives and the Environment Agency's vision: A nation ready for, and resilient to, flooding and coastal change – today, tomorrow and to the year 2100. The Strategy has three core ambitions concerning future risk and investment needs:

- "*Climate resilient places: working with partners to bolster resilience to flooding and coastal change across the nation, both now and in the face of climate change;*
- *Today's growth and infrastructure resilient in tomorrow's climate: Making the right investment and planning decisions to secure sustainable growth and environmental improvements, as well as resilient infrastructure; and*
- *A nation ready to respond and adapt to flooding and coastal change: Ensuring local people understand their risk to flooding and coastal change and know their responsibilities and how to take action*".

11.5.25 The Strategy describes what needs to be done by all risk management authorities involved in flood and coastal erosion risk management for the benefit of people and places. This includes the Environment Agency, lead local flood authorities, district councils, internal drainage boards, highways authorities and water and sewerage companies, who must exercise their flood and coastal erosion risk management activities, including plans and strategies, consistently with the Strategy. Through its 'strategic overview' role the Environment Agency exercises its strategic leadership for all sources of flooding and coastal change. This Strategy seeks to better manage the risks and consequences of flooding from rivers, the sea, groundwater, reservoirs, ordinary watercourses, surface water and sewers and coastal erosion.

Local policy

North East Lincolnshire Local Plan 2013 – 2032

11.5.26 The IERRT project is located within the administrative area of North East Lincolnshire Council. The existing North East Lincolnshire Local Plan (North East Lincolnshire Council, 2018) was adopted in 2018 and covers the period 2013 to 2032 and includes the following policies that are of relevance to coastal protection, flood risk and drainage:

- Policy 33 – Flood Risk in the North East Lincolnshire Local Development Plan (North East Lincolnshire Council, 2015) states that proposals should have "*regard to the requirements of the flood risk sequential test and, if necessary, the exception test. The regeneration benefits of development in areas of high flood risk should also be considered in light of the Council's Guidance Note on the application of the Sequential and Exception Tests in North East Lincolnshire, and the Environment Agency's Standing Advice.*

  In order to minimise flood risk impacts and mitigate against the likely effects of climate change, development proposals should demonstrate that:

  - *A. where appropriate, a site-specific flood risk assessment has been undertaken, which takes account of the best available information related to all potential forms of flooding;*
  - *B. there is no unacceptable increased risk of flooding to the development site or to existing properties;*
  - *C. the development will be safe during its lifetime;*
  - *D. SuDS have been incorporated into the development unless their use has been deemed inappropriate;*
  - *E. opportunities to provide natural flood management and mitigation through green infrastructure have been assessed and justified, based upon sound evidence, and, where appropriate, incorporated, particularly in combination with delivery of other aspects of green infrastructure in an integrated approach across the site;*

- *F. arrangements for the adoption, maintenance and management of any mitigation measures have been established and the necessary agreements are in place*".

North East Lincolnshire Council Local Flood Risk Management Strategy (LFRMS)

11.5.27 As LLFA, North East Lincolnshire Council has a responsibility to develop a LFRMS (in this case the adopted North East Lincolnshire Council, 2015) which sets out a clear plan for future flood risk management in the region, ensuring people, businesses communities and other risk management authorities have an active role in how flood risk is managed.

11.5.28 The LFRMS sets out how the Council intends to manage local flood risks, as well as contribute to management from non-local sources, and to engage and inform residents on their own responsibilities and enable them to contribute to the management of flood risk.

Shoreline Management Plan 3: Flamborough Head to Gibraltar Point

11.5.29 Shoreline Management Plan (SMP) 3: Flamborough Head to Gibraltar Point (Scott Wilson, 2010) covers the study area. The SMP is a large-scale assessment of the risks associated with coastal processes which seeks to reduce these risks to people and the developed, historic, and natural environments. An SMP determines the natural forces which are shaping the shoreline to assess how it is likely to change over the next 100 years, taking account of the condition of existing defences. The SMP develops policies outlining how the shoreline should be managed in the future, balancing the scale of the risks with the social, environmental, and financial costs involved, and avoiding adverse impacts on adjacent coastal areas.

11.5.30 The Port of Immingham and adjacent areas are located within SMP Policy Unit L – East Immingham to Humberston Fitties (western section). The preferred management option for this SMP policy unit area is to Hold the Line (HTL) for short (by 2025), mid (by 2055) and long term (by 2105) which is to be achieved through maintaining or upgrading the level of protection provided by the existing defences. The baseline for the impact assessment assumes that the coastal defences on site will be maintained and upgraded as necessary in order to implement the HTL policy over the next 100 years.

Humber Flood Risk Management Strategy

11.5.31 The Humber Flood Risk Management Strategy (FRMS) (Environment Agency, 2008) sets out the Environment Agency's vision for managing the risk of flooding from the Humber Estuary to respond to climate change and sea level rise. The Strategy sets out the Environment Agency's general approach to managing the estuary's flood defences.

11.5.32 The IERRT project is situated within Flood Area 24 in the Humber FRMS. In line with the SMP, the preferred management option is to HTL for the short (by 2025), mid (by 2055) and long term (by 2105) which is to be achieved

through maintaining or upgrading the level of protection provided by the existing defences. It is ABP's intention that the coastal defences (owned by ABP) on site at the Port of Immingham will be maintained and upgraded in order to implement this policy.

Grimsby and Ancholme Catchment Flood Management Plan (CFMP)

11.5.33 In 2009, a Grimsby and Ancholme Catchment Flood Management Plan (CFMP) was produced by the Environment Agency for the Grimsby and Ancholme catchment (Environment Agency, 2009), addressing the scale and extent of flooding both now and in the future, and setting policies for managing flood risk. In the area considered in relation to the IERRT project (Sub-area 4 Immingham, Grimsby, and Buck Beck) the CFMP addresses the risk posed by the tidal risk from the Humber Estuary, tide locking of local watercourses and the pumping of drainage channels. The vision and preferred management policy for the sub-area is Policy option 4: Areas of low, moderate, or high flood risk where the Environment Agency are already managing the flood risk effectively but where further actions may be taken to keep pace with climate change.

North East Lindsey Drainage Board Byelaws

11.5.34 IDBs operate in the low-lying fen and valley areas, maintaining pumping stations and drainage channels to ensure that people are safe, and the risk of flooding is greatly reduced. Part of the Witham Internal Drainage Board group (a group of four independent statutory land drainage, water levels and flood risk management authorities working collectively under a partnership agreement), the North East Lindsey Drainage Board (the 'Board') extends to an area of 11,250 hectares which is formed predominantly of the coastal strip extending from the Humber bridge southwards to Grimsby. (the 'Board') extends to an area of 11,250 hectares which is formed predominantly of the coastal strip extending from the Humber bridge southwards to Grimsby.

11.5.35 The North East Lindsey Drainage Board Byelaws and Land Drainage Act 1991 allow the Board to take action to ensure that free flow of water is unrestricted.

11.5.36 Watercourses maintained by the Board are cleaned out annually and it is important that access is preserved for machinery to enable this work to be undertaken. The Board's Byelaws prevent the erection of any building, structure (whether temporary or permanent) or planting of trees/ shrubs etc. within nine metres either side of a Board maintained watercourse irrespective of any planning permission. The Board's consent will normally be required to undertake works such as:

- Works in, over, under or within nine metres of a Board maintained watercourse;
- Installation of a culvert, weir, or other like obstruction within any watercourse; and
- Any works that increase the flow of surface water or treated foul effluent to any watercourse within the Board's district.

11.5.37 Provisions will be included in the DCO for North East Lindsey IDB including a mechanism for obtaining approvals/consents from the Board for works that would normally require consent.

Guidance

North and North East Lincolnshire Strategic Flood Risk Assessment (SFRA)

11.5.38 North and North East Lincolnshire Council 2022 SFRA (North Lincolnshire Council and North East Lincolnshire Council, 2022) provides an update on the original report which was published in 2011 (North Lincolnshire Council and North East Lincolnshire Council, 2011).

11.5.39 The purpose of this update is to ensure the SFRA provides a comprehensive and robust evidence base to inform the review of the North East Lincolnshire Local Plan.

11.5.40 Since 2011 new flood risk evidence has become available and National Planning Policy and legislation published. The revised SFRA will be used by North East Lincolnshire Council in decision making and to inform decisions on the location of future development.

11.5.41 The SFRA was completed in consultation with the Environment Agency and IDB to provide information on the probability of flooding. The report also takes into account the impacts of climate change.

11.5.42 The SFRA locates the site within the Eastern Coastal Area where the main source of flooding is a combination of large waves and high water levels in the Humber Estuary. A more detailed assessment has been undertaken as part of the Level 2 SFRA for Flood Compartment 1T3 – Immingham and North Killingholme which indicates the Immingham area is liable to flooding should a breach of the flood defences occur.

Anglian Water's Policy for Surface Water Drainage

11.5.43 The Policy for Surface Water Drainage document (Anglian Water, 2021) provides guidance on Anglian Water's position regarding the management of surface water arising from new and redeveloped areas. The document provides a series of design criteria for types of development. The developer must demonstrate that the site does not increase flood risk both within the development and elsewhere, and that the surface water hierarchy has been considered.

11.5.44 In order of preference, the disposal hierarchy should be in the following order;

- Discharge by infiltration into the ground;
- Discharge to an open surface water body;
- Discharge to a surface water sewer;
- Discharge to a combined sewer;
- Discharge to a foul sewer.

11.5.45 Surface water design criteria for connections to the existing network are provided, although these are not considered relevant to the IERRT project which will discharge surface water directly into a watercourse/ the sea.

Non-Statutory Technical Standards for Sustainable Drainage Systems

11.5.46 The Non-statutory Technical Standards for SuDS (Defra, 2015) was published by Defra in March 2015 and is the current guidance for the design, maintenance, and operation of SuDS. The standards set out the following:

- "*Peak runoff rates should be as close as is reasonably practicable to the greenfield rate, but should never exceed the pre-development runoff rate;*
- *The drainage system should be designed so that flooding does not occur on any part of a development site for a 1 in 30-year (3.33% AEP) rainfall event, and that no flooding of a building (including basement) would occur during a 1 in 100 year (1.0% AEP) rainfall event; and*
- *Pumping should only be used when it is not reasonably practicable to discharge by gravity*".

11.5.47 Further industry good practice guidance on the planning for and design of SuDS is provided by C753 - The SuDS Manual (Construction Industry Research and Information Association (CIRIA) 2015).

11.6 Description of the existing environment

11.6.1 Baseline conditions established for this assessment are based on the collation and review of a wide range of data and information from published material and consultations with statutory bodies and other stakeholders.

11.6.2 The relevant baseline physical characteristics of the study area and the water features present are described in this section and with reference to Figure 11.1 to this ES.

Topography

11.6.3 Review of OS mapping indicates that the landside area of the IERRT project is generally flat with ground elevation generally between 4.6 and 5.5 m AOD. Levels tend to be higher in the north and west of the site falling away to the south and east.

Land use

Site description

11.6.4 The land side IERRT project area is located within the eastern and south-eastern area of the Port of Immingham and are predominantly brownfield in nature comprising the operational port facilities or recently vacant land. Figure 1.1 to this ES shows the location of the IERRT project.

11.6.5 The marine elements are located within the Humber Estuary where the proposed terminal jetty and piers will be positioned.

11.6.6 The landside area is currently comprised largely of a mixture of material and vehicle storage areas and warehouses.

11.6.7 Within the southern area of the site there are railway sidings with land use comprised largely of a mixture of storage areas, stockpiles and trailer yards, with some currently vacant land to the southeast with some vegetation throughout.

11.6.8 Further details of the site and its surrounding area can be found in Chapter 2 of this ES.

Surrounding land use

11.6.9 The Port of Immingham lies immediately adjacent to the Humber Estuary's main deep-water shipping channel. The Port comprises a number of discrete operational areas, with bulk commodities such as liquid fuels, solid fuels and ores, as well as roll-on/roll-off (ro-ro) freight, being handled from in-river jetties. These include the Eastern and Western Jetties, the Immingham Oil Terminal (IOT), the Immingham Gas Terminal, Immingham Outer Harbour (IOH) and the Humber International Terminal (HIT).

11.6.10 Table 11.6 summarises the key features and current land use of the area surrounding the site.

Table 11.6. Summary of Surrounding Land Use

Direction	Summary
North	The majority of the Port of Immingham lies directly to the west and north-west of the IERRT project site. There are a number of industrial and operational land uses located within this area including electrical sub stations, freight shipping companies, biofuels company, heating oil supplier and several warehouses and tanks. The proposed marine works are located within the Humber Estuary. To the north-east/ east of the proposed marine works lies an existing jetty with associated bulk liquid pipelines and mooring equipment. Beyond this the Humber Estuary continues for approximately 2.5 km.
East	Habrough Marsh Drain is located along the south-eastern IERRT project site boundary and beyond this is the land side tank farm that forms part of the Associated Petroleum Terminals (Immingham) Ltd. (APT) facility. Further east of the site, the land use comprises industrial use, agricultural fields and the Humber Estuary.
South	Railway sidings are located along the south-western border of the IERRT project site boundary, running from north-west to south-east. Beyond the railway sidings lies Habrough Marsh Drain and several industries located further to the south of the site. These include shipping companies, waste management companies, manufacturing

Direction	Summary
	plants, power plants and electrical sub stations. The area south of this is predominantly dominated by agricultural fields. The nearest residential properties are on Queens Road, approximately 200 m south of the site. The A180 road lies approximately 2.3 km south.
West	Railway lines are located to the south/ south-west of the IERRT project site beyond which lies the Habrough Marsh Drain and various industrial and commercial sites. The town of Immingham is located approximately 500 m west/ south-west of the site. The land beyond the town predominantly consists of agricultural fields.

Water bodies

11.6.11 Figure 11.1 to this ES shows the location and names of various watercourses present within the study area. These include:

- The Humber Estuary (a tidal waterbody);
- Stallingborough North Beck (fluvial waterbody);
- Habrough Marsh Drain; and
- Numerous small drains beyond the Port Estate.

11.6.12 The Humber Estuary, a deep water, intertidal estuary is located directly adjacent to the north-east of the site with the marine side area of the IERRT located within the estuary.

11.6.13 The Humber Estuary begins at Trent Falls near Faxfleet in East Yorkshire, the site of the confluence of the two tidal rivers the River Trent and the River Ouse, and flows in an easterly direction towards its outer limits between Humberston in Lincolnshire and Spurn Head in East Yorkshire and then out into the North Sea. The Humber Estuary drains a catchment area of approximately 24,472 km^2, around 20% of the total land surface of England.

11.6.14 The Stallingborough North Beck is located approximately 0.9 km to the south-east of the IERRT project and is designated as an Environment Agency ‘Main River’. The Beck is an embanked upland river which receives pumped surface water runoff from south, central, and east Immingham as well as land drainage run off from West Lindsey. The Beck discharges by gravity, via a sluice gate, into the Humber Estuary.

11.6.15 The Habrough Marsh Drain is designated as an ‘Ordinary Watercourse’ and falls under the jurisdiction of the North East Lindsey IDB. The Drain skirts the south-western and south-eastern perimeters of the IERRT project site, flowing from west to east along the southern IERRT project site boundary and discharges partly to the Humber Estuary and partly to the Stallingborough North Beck through the Immingham Pumping Station.

11.6.16 In addition, there are numerous drains and small watercourses beyond the port estate that form part of the North East Lindsey IDB land drainage system for the low-lying coastal area.

Coastal protection

11.6.17 There are tidal flood defences in place along the entire south bank of the Humber Estuary.

11.6.18 ABP is responsible for the sea walls along the entire length of the operational Port of Immingham. These consist of concrete sheet piled walls and concrete/stone slab revetment walls topped with rock filled gabion baskets. Information from the Environment Agency show the flood defences, along the Port of Immingham frontage up to Habrough Marsh Drain, have a crest elevation of 5.05 m AOD and a wall height of 0.84 m resulting in a total defence elevation of 5.89 m AOD.

11.6.19 Topographic survey of the flood defences, undertaken for ABP in 2018, indicates a varying crest height along the Immingham Dock frontage with levels between 5.52 m AOD and 6.15 m AOD. The crest level of the defences shown on the topographic survey for the section of defences in the location of the proposed jetty are approximately 5.80 m AOD – 6.0 m AOD with a low spot of 5.52 m AOD.

11.6.20 Lock gates are used to control water levels within the enclosed dock part of the Port of Immingham. Both lock structures are protected by an external flood gate. Following a tidal storm surge in December 2013 the standard of protection afforded by the external lock gate to the docks was improved via the installation of new outer lock gates with reverse head restraint capability and a crest height of 6.5 m AOD.

11.6.21 To the east of Habrough Marsh Drain, the existing Environment Agency flood defences consist of an earth embankment topped by a concrete wave return wall comprising a smooth concrete or asphalt seaward face.

11.6.22 The Habrough Marsh Drain outfall (which consists of hanging gates), is inspected regularly and maintained by the Environment Agency. The North East Lindsey IDB also undertake maintenance work on the Habrough Marsh Drain channel (removal of vegetation and dredging of the channel). The outfall and channel are accessed through the port, via East Riverside, and sufficient space is currently provided for access. A crane pad currently provides space for a crane to be used with a works area around the crane for removal of the hanging doors/ recondition works, when maintenance is required. The Environment Agency replaced the hanging doors on the Habrough Marsh Drain outfall in April 2022.

11.6.23 Whilst ABP is responsible for the flood defences along the frontage of the Port, the flood defences along the wider Humber Estuary south bank frontage are maintained by the Environment Agency. However, the Environment Agency are responsible for inspecting the condition of all of the flood defences and have confirmed that the condition of the flood defences adjacent to the site are classed as ‘fair’ (Condition Grade 3). The Environment Agency inspects these defences annually to ensure that any potential defects are identified early.

11.6.24 In relation to the flood defences located along the front of the IERRT project site (Compartment IT3 Immingham and North Killingholme), the North East Lincolnshire Council SFRA states:

> *"… ignoring freeboard, these defences will protect the area behind against events with a 0.2% annual probability of occurring or better. The standard will remain above the 0.5% annual probability requirement set out in PPS25 for the next 50 years, taking the effect of sea level rise into account".*

11.6.25 In 2008 the Environment Agency published the Humber FRMS (Environment Agency, 2008). The strategy outlines the flood risk management plan for the Humber Estuary for the next 25 years and beyond. It looks at different ways of managing flood risk; raising defences where appropriate, but also introducing sites for managed realignment (MR) and flood storage which will help maintain valuable habitats.

11.6.26 The Humber FRMS (Environment Agency, 2008) divides the Humber Estuary in to 27 flood risk areas. The majority of port infrastructure, including the IERRT project site, is located within Flood Area 24 – Immingham to River Freshney, which contains major industrial and commercial facilities, including wharves, storage areas, petro-chemical and power plant. The area also contains important road and rail links and high voltage powerlines, while most undeveloped land is used for agriculture. Along with the industrial development, the defences protect over 11,500 properties (at risk in Area 24). The proposed management approach policy for this frontage is for continued protection and improvement of the defences that protect existing development.

11.6.27 The Environment Agency on 8 November 2021 confirmed that there are currently no ongoing capital projects to reduce or sustain the current flood risk to the site.

Flood risk

11.6.28 The NPSfP requires the effects of all forms of flood risk to and from the IERRT project to be considered. A FRA has been prepared and is provided in Appendix 11.1 to this ES. The following provides a summary of the baseline flood risk pertinent to the site.

Historical flooding

11.6.29 The Port of Immingham has a history of flooding from tidal surges, notably in 1953 and in 2013.

11.6.30 The 2013 surge event inundated parts of the port on 5 December with a maximum flood water level of approximately 5.22 m AOD, equivalent to a 1 in 750-year (0.133% AEP) event.

11.6.31 The flooding resulted primarily from inundation of the quayside as water levels rose above the lock/ dock cope levels and filled the enclosed dock basin via the lockpit. In addition, tidal water also overtopped a small section of gabion baskets along the frontage on the western part of the port, approximately 3 km away from the IERRT project site (this area has now been repaired), with further slight ingress (backflow) through the drainage system where flap valves failed to close properly. Maximum flood depths of up to 0.5 – 1 m were identified at locations across the port centred around the enclosed dock basin which was the primary source of flooding due to the older, lower outer lock gates allowing water to enter the lockpit and enclosed dock. These outer gates have now been replaced with gates that have a higher crest height and are capable of being held in position against a reverse head of water (reverse head restraint system). Subsequent surveys undertaken by ABP post the 2013 flood event indicate that the IERRT project site did not flood.

Flood map for planning

11.6.32 The Environment Agency Flood Map for Planning (FMfP) available online (see Figure 11.1 to this ES), shows the site is located in Flood Zone 3a. The Environment Agency FMfP does not differentiate between Flood Zone 3a and Flood Zone 3b, however the presence of flood defences along the Port of Immingham and estuary frontage negates the presence of Flood Zone 3b.

11.6.33 The definition of flood zones, according to the PPG (DLUHC, 2022), are summarised in Table 11.7 below.

Table 11.7. Environment Agency Flood Zone Definitions

Flood Zone	Definition	Risk of flooding
Flood Zone 1	Land that has a low probability of flooding (less than 1 in 1,000 annual probability of river or sea flooding (<0.1%))	Low
Flood Zone 2	Land that has a medium probability of flooding (between 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1-1%), or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1-0.5%)	Medium
Flood Zone 3a	Land that has a high probability of flooding (1 in 100 year or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%)	High
Flood Zone 3b (Functional Floodplain)	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:	Very High

Flood Zone	Definition	Risk of flooding
	• land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).	

Tidal sources

11.6.34 The main risk of flooding for the IERRT project will typically be associated with a storm surge event. Storm surges result from low pressure weather systems, high winds and tidal conditions which change the sea level. Storm surges can lead to extensive flooding over a wide area and can be dangerous to people in coastal areas.

11.6.35 As defined in Table 11.7 to this chapter, the site lies within tidal Flood Zone 3a. Although not indicated on the Environment Agency FMfP, the IERRT project is protected from flooding associated with tidal sources up to and including a 0.5% AEP flood event due to the presence of tidal flood defences along the south bank of the Estuary (see Coastal Protection subsection above). However, areas behind the defences are still considered to be at residual risk of flooding through overtopping or failure of the defences although the likelihood of either occurring is low.

Extreme water levels

11.6.36 Current extreme predictions determined by the Environment Agency for the Port of Immingham are considered to be the most up-to-date and appropriate for this assessment (Environment Agency, 2018). These are provided in Table 11.8 for a baseline year of 2017.

Table 11.8. Extreme Water Levels for the Humber Estuary Meters Above ordnance Datum (mAOD)

Return Period (Years)	Annual Exceedance Probability (AEP) (%)	Extreme Water Level (mAOD)
1	100	4.15
2	50	4.25
5	20	4.40
10	10	4.51
20	5	4.62
25	4	4.66
50	2	4.77
75	1.3	4.85
100	1	4.90

Return Period (Years)	Annual Exceedance Probability (AEP) (%)	Extreme Water Level (mAOD)
150	0.67	4.97
200	0.5	5.03
250	0.4	5.06
300	0.33	5.10
500	0.2	5.20
1,000	0.1	5.34
10,000	0.01	5.85

Source: Environment Agency, 2018

11.6.37 Based on the information in Table 11.8 the extreme still water level for the Port of Immingham is 5.03 m AOD for a 0.5% AEP event and 5.34 m AOD for a 0.1% AEP event.

11.6.38 The maximum water level currently recorded at Immingham occurred on 5 December 2013 at 19:00 hours with a level of 5.216 m AOD (equivalent to a 0.133% (1 in 750 year) AEP event) compared to the tide level prediction of 3.689 m AOD, therefore, the meteorological surge effect for this event was 1.527 m.

11.6.39 The IERRT project site is protected from flooding associated with tidal sources up to and including a 0.5% AEP flood event due to the presence of tidal flood defences along the south bank of the estuary (see Coastal Protection subsection above).

11.6.40 Areas located behind the defences are, however, still considered to be at residual risk of tidal flooding through overtopping or failure of the defences, although the likelihood of either occurring is low.

Breach of defences

11.6.41 The Environment Agency has provided breach location and associated breach flood extent maps from the Northern Area Tidal Breach Mapping Study (presented in Annex A to the FRA at Appendix 11.1 of this ES). The Northern Area Tidal Breach Hazard Mapping project involved a modelled representation of tidal breaches along the east coast and the south bank of the Humber Estuary, with breaches in the hard defences set at 20 m wide with the defences assumed to breach down to the ground level behind the defence. The defences were raised within the model to create reservoir cells, ensuring that the most precautionary volumes of water were driven through the breach opening.

11.6.42 The breach modelling is based on the Still Water Tidal Levels from the Northern Area Tidal Model Analysis 2006 including a 100% (1 in 1) AEP wave height allowance (current year 2006 and 2115) on top of the 0.5% AEP and 0.1% AEP flood events. For further information on Breach Hazard Maps and flood hazard classification definitions refer to the FRA provided in Appendix 11.1 to this ES.

11.6.43 The Breach Hazard Mapping shows the following:

- For a current day (2006) 0.5% and 0.1% AEP breach events the majority of the site area is not located within the breach flood extent;
- The east/north east of the site, directly adjacent to the Humber Estuary is located in a hazard area classified as 'Danger to Most' with a maximum water velocity of 0-0.3 m/s for both the 0.5% and 0.1% AEP flood events. Maximum water depth increases from 0.25-0.5 m (0.5% AEP flood event) to a depth of 1-1.6 m (0.1% AEP flood event).

11.6.44 Although a breach of the flood defences would represent a significant to extreme hazard, given the Environment Agency undertake condition inspections and maintenance is undertaken when required by the Environment Agency and ABP for the flood defences under their jurisdiction, the likelihood of a breach is low.

Overtopping of defences

11.6.45 The Environment Agency has provided flood extent maps from the Northern Area Tidal Overtopping Hazard Mapping Study for the 0.5% AEP (1 in 200) and the 0.1% AEP (1 in 1,000) overtopping scenarios (presented in Annex A of Appendix 11.1 FRA, ES Volume 3). The modelling is based on the Still Water Tidal Levels from the Northern Area Tidal Model Analysis 2006 including a 100% AEP (1 in 1) wave height allowance (current year 2006 and 2115). For further information on Overtopping Hazard Maps and flood hazard classification definitions refer to the FRA provided in Appendix 11.1 to this ES.

11.6.46 The flood hazard maps indicate that for the 2006 0.5% AEP breach event:

- The majority of the site area is located outside of a hazard area; and
- The east/ north-east of the site, directly adjacent to the Humber Estuary is located in a hazard area classified as 'Danger to Most' with a maximum water depth of 1-1.6 m and a maximum water velocity of 0-0.3 m/s.

11.6.47 Although overtopping of the flood defences would represent a significant hazard, given that both the 0.5% AEP and 0.1% AEP extreme tidal water levels (Table 11.8) are below the crest height of the tidal flood defences, the likelihood of overtopping is low.

Fluvial sources

11.6.48 The FMfP (shown in Figure 11.1 to this ES) illustrates that the IERRT project is located predominantly within Flood Zone 3 (high risk) defined as land having a >1%/ 0.5% AEP (greater than a 1 in 100/ 1 in 200 chance in any year) of river or sea flooding. However, this map does not differentiate between the tidal and fluvial sources of risk and the tidal defences are not taken into account.

11.6.49 Mapping in Section 2.4 of the North East Lincolnshire Preliminary Flood Risk Assessment (PFRA) gives some indication of fluvial flood zones and suggests that the site is located in Flood Zone 1.

11.6.50 The SFRA notes that hydraulic modelling of the Stallingborough North Beck was undertaken in 2009. The results indicate that the water level having a 1.0% annual probability of occurring varies from 3.37 m AOD at the outfall to 4.40 m AOD at the upstream end of the model located at the B1210 road bridge crossing approximately 3 km upstream (Paragraph H.49, SFRA).

11.6.51 Further data provided by the Environment Agency on fluvial flooding is provided in Annex A of the FRA at Appendix 11.1 to this ES.

11.6.52 Based on the available information it has been determined that the IERRT project is at a low risk of flooding from fluvial sources.

Groundwater sources

11.6.53 Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in low-lying areas underlain by permeable rocks (aquifers).

11.6.54 The North East Lincolnshire Council PFRA states *"Generally the risk of flooding from groundwater is in the coastal areas from Immingham to Humberston, i.e. the lower lying parts of the Borough. This is caused by artesian spring flows from confined chalk where high groundwater pressures force an upward flow path through the confining clay*" (Page 26).

11.6.55 Groundwater levels tend to get re-charged during the winter and high groundwater levels can cause flooding as the water table rises. This rise in water table levels can be very slow, dependent on rainfall patterns. There is no reference to groundwater flooding events in the North East Lincolnshire SFRA for the Eastern Coastal Area where the IERRT project is located.

11.6.56 There are no historical flood records for groundwater flooding within the IERRT project site boundary or the wider Port of Immingham area.

11.6.57 The IERRT Phase 1 Geoenvironmental and Geotechnical Desk Study (Appendix 12.1 to this ES) includes historical boreholes records in proximity to the site, however although these logs show the geology encountered, groundwater strikes were not recorded.

11.6.58 During the GD Pickles Ltd 2020 Ground Investigation (see the Ground Conditions including Land Quality chapter (Chapter 12) of this ES and Appendix 12.2 to this ES), two groundwater bodies were observed and are considered to be perched groundwater within the Made Ground and at the boundary of the Made Ground and Tidal Flat Deposits. Observed groundwater was recorded at 3.6 m bgl. The report noted that sub artesian pressures build up underneath Tidal Flat Deposits and Boulder Clay.

11.6.59 Given the above information and the limited groundwater information and potential for groundwater flooding in the surrounding area, the assessment of the risk of flooding from groundwater sources is assessed as a medium risk.

Surface water (pluvial) sources

11.6.60 Surface water flooding is caused by overland flow that results from rainfall that fails to drain into the ground through infiltration, instead travelling over the ground surface. This can be exacerbated where the permeability of the ground is low due to the type of soil (such as clayey soils) and geology or land use including urban developments with impermeable surfaces.

11.6.61 The Environment Agency 'Risk of Flooding from Surface Water' mapping indicates areas at risk from surface water flooding when rainwater does not drain away through the normal drainage systems or soak into the ground, but instead lies on or flows over the ground. The mapping indicates that the IERRT project site is generally not at risk from surface water flooding, classifying the majority of the land to be at very low risk of flooding from surface water.

11.6.62 There are small, isolated areas of the IERRT project site shown to be at low, medium and high risk of surface water flooding predominantly to the southern corner of the IERRT project site and to the west in the area most recently used as a storage area/ car park for newly imported vehicles. However, it is considered that these areas shown to be at risk are reflective of areas of low topography where water sits and pools during higher return period storm events.

11.6.63 The risk of flooding from surface water is considered to be low.

Existing drainage infrastructure and sewer sources

11.6.64 Drainage infrastructure present within the IERRT project site and the area in proximity to the IERRT project site boundary is outlined in the Drainage section below.

11.6.65 When tidal levels are high, discharge from drainage infrastructure can become tide locked which can cause surcharging of the system and flooding. This can be further exacerbated if higher sea levels inundate the discharge outlets of the drains along the Immingham frontage, thus delaying or preventing the drainage of floodwater.

11.6.66 Given the limited presence of drainage infrastructure within the IERRT project site and the localised nature of drainage infrastructure within the wider Port of Immingham, the risk of flooding from drainage infrastructure and sewers is considered to be low.

11.6.67 Further data is provided in the FRA at Appendix 11.1 (to this ES) and the Drainage Strategy at Annex B of the FRA at Appendix 11.1 to this ES.

Artificial Sources

11.6.68 The Environment Agency Reservoir Flood Risk maps (Environment Agency, date accessed: 2021) indicate that the IERRT project site is not considered at risk from reservoir flooding.

11.6.69 There are no canals, lakes, or other artificial water sources in proximity to the IERRT project site.

11.6.70 The risk of flooding to the IERRT project site from all artificial waterbodies is therefore considered to be low.

Drainage

11.6.71 Anglian Water asset mapping shows there is no surface water drainage infrastructure for which Anglian Water have responsibility located within the IERRT project site. Drainage of surface water within both the site and the wider Port of Immingham is privately owned and does not discharge to the wider Anglian Water surface water drainage network beyond the Port of Immingham.

11.6.72 Foul and surface water management infrastructure at the Port of Immingham is comprehensive and comprises the following:

- Numerous drainage outfalls (flap gate culverts) provide drainage to the Humber Estuary directly, via Immingham Lock or through adjacent drainage channels;
- Pumping pits across the port estate allow drainage water in low elevated areas to be pumped from drainage points into the Humber Estuary (either directly or indirectly via Immingham Dock);
- Drain interceptors across the port estate prevent contaminants from entering the drainage systems;
- Sewage treatment plants provide treatment of effluent on-site before being discharged to the Humber Estuary; and
- An extensive network of drainage pipes, channels, and manholes.

11.6.73 A surface water drainage system, owned by ABP, is present within the site. Surface water from the north and south-eastern areas of the site drain via two existing outfalls to Habrough Marsh Drain.

11.6.74 Surface water from the southern and western areas of the site drain towards the north-east. Drainage infrastructure within the western area of the site discharges to an existing pumping station which also receives process water from the Port of Immingham to the west of the site and this is then pumped out into the Humber Estuary, along with treated foul effluent via a 600 mm pumped main.

11.6.75 Surface water from the southern site area is discharged via an outfall to the internal Immingham Dock.

11.6.76 An Anglian Water rising foul sewer main runs beneath Kings Road flowing south-east then north-east beneath Queens Road and continues flowing north-east, discharging to the Humber Estuary via the Immingham Sea Outfall located at Ordnance Survey National Grid Reference (OS NGR) TA2141715599, downstream of the Port of Immingham. Neither the rising foul main or the sea outfall are located within the IERRT project site boundary, and both will remain in-situ post development of the IERRT project.

11.6.77 Further information is provided in the Drainage Strategy at Annex B of the FRA at Appendix 11.1 to this ES.

11.7 Future baseline environment

11.7.1 In the future baseline scenarios, the existing coastal defence and drainage structures within the port estate would be maintained and improved, as appropriate and hydrodynamic and sedimentary processes will continue to be influenced by natural and human-induced variability, ongoing cyclic patterns, and trends (e.g. ongoing maintenance dredging and disposal).

11.7.2 The future baseline will also be influenced by climate change. It is anticipated that the impact of climate change will include: :

- Changes in storminess/ storm surges, wave heights, and sea levels, posing an increased risk of coastal damage and tidal flooding;
- Changes in rainfall intensity increasing peak river flows, posing an increased risk of fluvial flooding and property damage; and
- Changes in rainfall intensity increasing surface water runoff (overland flow), posing an increased risk of pluvial and drainage/ sewer flooding.

11.7.3 An increase in both tidal and fluvial water levels will occur as a consequence of climate change (climate change is assessed over a 100-year period). It is estimated that tidal water levels will increase by 0.96 m (based on the higher central climate change allowance) and fluvial peak flows in Habrough Marsh Drain, local drains and Stallingbrough North Beck will increase by 4% - 12% by 2115.

11.7.4 An increase in rainfall intensity by 25% will occur over the operation of the IERRT project (assessed to be 75 years – see Annex B Drainage Strategy of the FRA).

11.8 Consideration of likely impacts and effects

11.8.1 This section identifies the potential likely effects on coastal protection, flood risk and drainage receptors as a result of the construction and subsequent operation of the IERRT project which have been identified.

11.8.2 The Physical Processes assessment (Chapter 7 of this ES) has informed the outcomes of the coastal defence, flood risk and drainage assessment.

11.8.3 Cumulative impacts on coastal defence, flood risk and drainage could arise as a result of other relevant developments and activities and have been considered as necessary as part of the cumulative impacts and in-combination effects assessment (see Chapter 20 of this ES).

Summary of resource/ receptor value

11.8.4 This assessment considers the following resources/ receptors:

- Human health;
- Flood defences;
- Surface waterbodies;
- Existing and proposed development; and
- Surface water drainage infrastructure.

11.8.5 The sensitivities of the identified resources/ receptors are described in Table 11.9.

Table 11.9. Resource/ Receptor Value (sensitivity)

Aspect/ Criteria	Resource/ Receptor	Location	Sensitivity	Justification
Human health	Public and visitors to site	On-site	High	Public and visitors on-site will be the most at risk as human health receptors due to the proximity to flood risk sources and lack of knowledge of on site procedures should flooding occur.
	Construction crew and operatives with prior knowledge of site conditions	On-site	Medium	Construction workers and operatives on-site are at risk as human health receptors due to the proximity to flood risk sources. However, given prior knowledge of site conditions there is an increased awareness of flood risk issues and evacuation procedures.
Flood defences	Flood defence walls	On-site (along the IERRT project site boundary frontage)	High	Floodplain or defence protecting between 10 and 100 residential properties or industrial premises from flooding.
		Off-site (along the wider Port of Immingham frontage)	Very High	Floodplain or defence protecting more than 100 residential and industrial properties from flooding.

Aspect/ Criteria	Resource/ Receptor	Location	Sensitivity	Justification
Existing/ proposed development	Built development	On-site	Low	Development on site comprises port related storage/ commercial use and compatible dock activities requiring a waterside location classed as Water Compatible Development under both the NPSfP and NPPF.
		Off-site (within the wider Port of Immingham)	Low to Very High	Development within the wider Port of Immingham consists of port related storage/ commercial/ industrial use classified as a mixture of Less Vulnerable/ Water Compatible and Essential Infrastructure development.
Surface water drainage infrastructure	Piped drainage network	On-site	Low	There are no discharges to the regional Anglian Water surface water sewer system from the site. Effluent generated on-site within the Port of Immingham is treated via on-site sewage treatment plants before being discharged to the Humber Estuary.
	Habrough Marsh Drain	Off-site	High	Habrough Marsh Drain forms part of the locally pumped IDB drainage network managing surface water across low-lying land and receives surface water discharges from the development site via outfalls to the watercourse.

Construction phase

11.8.6 This section contains an assessment of the potential impacts to coastal protection, flood risk and drainage receptors as a result of the construction phase of the IERRT project. The following impact pathways have been assessed:

- Exposure to floodwater;
- Changes in tidal regime;
- Floodplain inundation from flood sources;
- Changes to flow regimes and/or water levels; and
- Changes to surface water run-off rates and volumes.

11.8.7 The construction of the whole IERRT project may be completed at the same time, or it may be sequenced such that construction of the southernmost pier takes place at the same time as operation of the northernmost pier (see Chapter 3 of this ES). In the case of a sequenced construction, the duration of construction activity will be extended but it will not increase the scale of construction activity. In either scenario, all capital dredging (and associated disposal activity) will be undertaken together at one time, before operation of the northernmost pier commences. Therefore, the below impact pathway assessment is considered the worst case and will not be altered by a sequenced construction period.

Exposure to floodwater

11.8.8 The site is situated in Flood Zone 3a. However, it is protected by flood defences, and the baseline assessment suggests a low risk of flooding from all sources, with the exception of groundwater flooding which is assessed as a medium risk (see paragraph 11.6.59).

11.8.9 The location of the site (immediately adjacent to the Humber Estuary and directly behind flood defences) presents a risk to site workers and visitors to the site during the construction phase from predominantly tidal sources. Should a storm surge, overtopping or breach of the flood defences occur exposure of construction workers/ site visitors to floodwater includes risk of drowning, risk of injury, risk of swallowing contaminated water and risk of hyperthermia.

11.8.10 Overtopping or a breach of flood defences would represent a significant to extreme hazard at the site, however, the likelihood of an overtopping or breach event occurring is low.

11.8.11 It is difficult to estimate the likely severity of any flood events or storms which may occur during construction as events cannot be forecast so far into the future. For the purposes of the assessment, it is conservatively assumed as a worst-case scenario that a major flood would occur during the construction period.

11.8.12 As receptors, site workers are considered as being of medium sensitivity (site workers with prior knowledge of the risks of flooding and what to do in the event of a flood as part of their site induction, as defined in Table 11.8 to this chapter) whilst site visitors (who are less aware of possible flood risks, as defined in Table 11.9 to this chapter), are considered to be receptors of high sensitivity.

11.8.13 The probability of a surge event, overtopping or a breach of the flood defences with a localised or regional effect being low, but the magnitude of change is considered to be moderate. The significance of effect for both site workers and site visitors is considered to be **moderate adverse** and therefore significant.

Changes to tidal regime

11.8.14 Dredging associated with the marine element of the IERRT project will change seabed levels and has the potential to change wave heights, tidal water levels and the rates of erosion or accretion on the foreshore in proximity to the flood defences during the construction phase. Impacts from the IERRT project on the tidal hydrodynamic regime are discussed in detail within the Physical Processes chapter (Chapter 7 of this ES).

11.8.15 As the local hydrodynamics will remain comparable to the baseline scenario it is considered that there will be no change to wave heights, tidal water levels and the rates of erosion or accretion on the foreshore (above natural variations) both on-site (along the frontage of the IERRT project site) and off-site (along the frontage of the wider Port of Immingham).

11.8.16 Given the physical processes of the Humber Estuary, the magnitude of any changes in tidal regime is considered to be negligible and therefore the significance of effect for the flood defences along the frontage of the IERRT project (high sensitivity) and the flood defences along the frontage of the wider Port of Immingham (offsite) (very high sensitivity) is considered to be **neutral** and therefore not significant.

Floodplain inundation from flooding sources

11.8.17 During periods of inclement weather there is the potential that flooding to the IERRT project could occur from tidal, fluvial, surface water, groundwater and drainage sources during the construction phase.

11.8.18 The IERRT project site, the Port of Immingham and the area surrounding the Port is afforded protection by tidal flood defences up to and including the 0.5% AEP flood event and is therefore considered to be at low risk of tidal flooding. However, the residual risk of site inundation remains should the defences overtop (during a storm surge) or breaching of the defences occur.

11.8.19 In addition to the impact on human receptors (site workers and visitors as assessed above), inundation of the floodplain can also cause damage to existing development and construction equipment, and disrupt site operations, both within the IERRT project site, the Port of Immingham and the surrounding area. Construction activities, stockpiles of construction material and structures located on the site has the potential to change flood flow routes and increase the risk of flooding to neighbouring sites and within the wider Port of Immingham.

11.8.20 Development under construction for the IERRT project (i.e. within the defined IERRT project site boundary) during the construction phase comprises water compatible development (assessed as receptors of low importance).

11.8.21 Existing development within the wider Port of Immingham is classified as water compatible development whilst development on neighbouring sites

comprises mixed use development, including commercial, industrial/warehouse uses, and tanked bulk storage uses with hazardous substance consents etc., assessed as receptors of medium sensitivity to very high sensitivity (based on the PPG (DLUHC, 2022) development vulnerability classifications outlined in Table 11.1)).

11.8.22 The IERRT project is considered to be at low risk of flooding from all other sources with the exception of groundwater flooding which is assessed as a medium risk. Flooding from these sources, although considered to be temporarily disruptive on site should flooding occur, are not considered significant when compared to the impact of a tidal flood event.

11.8.23 The most recent significant flood event at the Port of Immingham occurred in 2013 when a storm surge event flooded the wider areas of the port to a water level of approximately 5.22 m AOD. The IERRT project site did not flood during this event, however, should a tidal breach flood event occur during the construction period the baseline flood risk assessment indicates that areas of the IERRT project site could flood to a maximum water depth of 1-1.8 m.

11.8.24 The probability of a surge event, overtopping or a breach of the flood defences with a localised or regional effect is low, with the magnitude of change considered to be negligible.

11.8.25 The significance of effect for existing development on site, the development present during the construction phase and the wider Port of Immingham is considered to be **neutral** and therefore not significant.

11.8.26 The significance of effect for existing development on neighbouring sites (based on the highest sensitivity receptor – essential infrastructure (very high sensitivity)) is considered to be **slight adverse** and therefore not significant.

Changes to flow regimes and/ or water levels

11.8.27 The fluvial and surface water baseline flood risk could be exacerbated during the construction phase from an increase in impermeable areas such as compacted soils (further details below), and the presence of stockpiled materials and equipment temporarily stored on the floodplain. In addition, changes in existing flood flow routes due to the presence of stockpiles and equipment also has the potential to exacerbate the risk of flooding from fluvial, surface water and drainage infrastructure sources.

11.8.28 The baseline flood risk from Habrough Marsh Drain could be exacerbated during construction works as a consequence of sediment and construction materials entering the watercourse via overland flow paths or via existing surface water drainage outfalls. This could lead to temporary constriction or the altering of flow within the channel and could lead to blockages within the channel causing a temporary increase in water levels and therefore an increase in the risk of fluvial flooding during the construction phase.

11.8.29 Given the potential for short term, temporary increases in water levels and changes to flow regimes during the construction phase, when considering Habrough Marsh Drain (high importance) the magnitude of change is considered to be minor and therefore the significance of effect on flood risk from the watercourse is assessed as **slight adverse** and not significant.

Changes to surface water run-off rates

11.8.30 The site is classed as a brownfield site (i.e. comprising previously developed/ developed land) and includes a mixture of permeable and impermeable surfaces, including hardstanding, gravelled areas and vegetation.

11.8.31 During the construction phase of the IERRT project, the impermeable area within the site may temporarily decrease whilst areas of the site are cleared and below ground construction (e.g. foundations) is undertaken. In areas where ground is exposed there is potential for surface water to drain to ground via infiltration, albeit potentially limited given the use of heavy machinery which can compact the soils.

11.8.32 The site would, in general, not be at risk from surface water flooding. The Environment Agency RFfSW maps indicate the majority of the site to be at very low risk of flooding from surface water as outlined in the baseline and the FRA (Appendix 11.1 to this ES). However, during the works, existing surface flow paths may be disrupted and altered due to site clearance, earthworks, and excavation work. The exposure and compaction of bare ground and the construction of new structures and impermeable surfaces may increase the rates and volume of runoff and increase the risk from surface water flooding.

11.8.33 A temporary increase in surface water runoff and changes in existing surface water flow paths has the potential to temporarily exacerbate the risk of flooding from fluvial and drainage infrastructure sources via temporary uncontrolled discharges to the onsite drainage system and Ordinary Watercourses (Habrough Marsh Drain).

11.8.34 Given the potential for increased run-off during the construction phase and the potential for flood risk from existing drainage infrastructure sources (a receptor of low sensitivity) due to a decrease in capacity or surcharge caused by blockages the magnitude of change is considered to be moderate and therefore the significance of effect on flood risk from drainage infrastructure is assessed as **slight adverse** and not significant.

11.8.35 When considering the increase of surface water runoff rates and the potential for fluvial flood risk from Habrough Marsh Drain (a receptor of high sensitivity), the magnitude of change is considered to be minor, therefore significance of effect assessed as **slight adverse** and not significant.

Operational phase

11.8.36 This section provides an assessment of the potential effects to coastal protection, flood risk and drainage receptors as a result of the operational phase of the IERRT project. Impact avoidance/ reduction measures that will have been designed and incorporated as part of the IERRT project during the construction phase (see Section 11.9 of this chapter) will remain for the operational life of the development and is therefore included in the assessment. The following impact pathways have been assessed:

- Exposure to floodwater;
- Changes in tidal regime;
- Floodplain inundation from flood sources;
- Changes to flow regimes and/ or water levels; and
- Changes to surface water run-off rates and volumes.

Exposure to floodwater

11.8.37 Given the location of the IERRT project the risk of human receptors being exposed to flood water over the operation of the development remains, although the majority of human receptors will be transient in nature. Receptors may differ from the baseline conditions and include not only site workers, but commercial users, and visitors/ general public.

11.8.38 As with the construction phase, overtopping or a breach of the flood defences would represent a significant to extreme hazard at the site during the operation phase, however, the likelihood of an overtopping or breach event occurring remains low.

11.8.39 Although the severity of any flood events or storms which may occur is difficult to estimate it is likely that the risk of flooding from a storm surge or extreme storm event will increase as a consequence of climate change over the operation of the development. The depth of tidal flooding, flood water velocity and flood hazard will increase both on the IERRT project site and across the wider Port of Immingham area.

11.8.40 As receptors, site operatives are considered as being of medium sensitivity (workers with prior knowledge of the risks of flooding and what to do in the event of a flood, as defined in Table 11.9 to this chapter) whilst site visitors and general public (who are less knowledgeable about potential flood risks, as defined in Table 11.9 to this chapter), are considered to be receptors of high sensitivity.

11.8.41 The probability of a surge event, overtopping or a breach of the flood defences with a localised or regional effect is low, but the magnitude of change is considered to be moderate therefore the significance of effect for both site workers, site visitors/ general public and commercial users is considered, in the absence of mitigation, to be **moderate adverse** and therefore significant.

Changes to tidal regime

11.8.42 The marine development and associated maintenance dredging will change sea bed levels and, in addition to the predicted increases in wave height and peak water levels associated with climate change, has the potential to change the rates of erosion and/ or accretion on the foreshore in proximity to the flood defences over the operation of the IERRT project.

11.8.43 Impacts relating to the marine development and changes to the tidal regime for the operational phase are discussed in detail within the Physical Processes chapter (Chapter 7 of this ES).

11.8.44 There is potential for the current hydrodynamic processes to change over the operation of the IERRT project. It is possible that flow speeds and wave heights may increase in the area between the berth pocket and the IERRT project frontage as well as along the wider Port of Immingham frontage. Any change is, however, predicted to be negligible and unlikely to affect the integrity of the flood defences in these areas. It is unlikely that changes to tidal water levels and the rates of erosion or accretion on the foreshore (above natural variations) both on-site (along the frontage of the IERRT project) and off-site (along the frontage of the wider Port of Immingham) will increase above that which would currently occur when climate change is taken into account.

11.8.45 The magnitude of change for changes in tidal regime is considered to be negligible and therefore the significance of effect for the flood defences onsite (high sensitivity) and the flood defences in the wider area offsite (very high importance) is considered to be **slight adverse** and therefore not significant.

Floodplain inundation

11.8.46 With rainfall intensity, peak water levels, sea water level and wave heights set to increase, as a consequence of climate change, over the operation of the IERRT project, the likelihood of flooding occurring to the IERRT project and the wider Port of Immingham from all sources will increase. This potential increase in flood risk will result in damage to the development and disruption of site and port operations. In addition, the presence of newly built structures located on the site has the potential to change flood flow routes and increase the risk of flooding to neighbouring sites and within the wider Port of Immingham through displacement of flood water.

11.8.47 In line with SMP 3 and FRMP ‘Hold the Line’ management policy it is assumed that the crest height of the Environment Agency flood defences will be raised to maintain the 0.5% AEP standard of protection afforded by the flood defences over the operation of the development. It is the intention of ABP to also raise the crest level of the flood defences under their jurisdiction at some future point in time. However, the residual risk of flooding from overtopping and breach events will remain. By the year 2115, should a breach event occur, the site will be located in a ‘Danger to All’

(landward side of the approach jetty) or 'Danger to Most' (land to the northwest and west) hazard area. For an overtopping event, the entire IERRT project site, and the Port of Immingham, is located in a 'Danger for All' hazard area with maximum flood depths exceeding 1.6 m in places.

11.8.48 The IERRT project will comprise a mixture of general port development uses defined by the NPSfP as water compatible development and assessed as receptors of low sensitivity, whilst the wider Port of Immingham continues to comprise development classed as water compatible (as summarised in the PPG (DLUHC, 2022)) assessed as receptors of low sensitivity.

11.8.49 Development on neighbouring sites comprises mixed use development, including commercial, industrial/warehouse uses, and tanked bulk storage uses with hazardous substance consents etc., assessed as receptors of medium sensitivity to very high sensitivity (based on the PPG (DLUHC, 2022) development vulnerability classifications outlined in Table 11.1)).

11.8.50 The probability of a surge event, overtopping or a breach of the flood defences with a localised or regional effect is low, and the magnitude of change is considered to be minor adverse.

11.8.51 The significance of effect for the IERRT project during operation and for existing development within the wider Port of Immingham is considered in the absence of mitigation to be **slight adverse** and therefore not significant.

11.8.52 There would be no increase in the risk of flooding to neighbouring sites due to the presence of the development, therefore no change in the magnitude of change. The significance of effect for neighbouring sites, based on receptor sensitivity (medium to very high), is considered to be **neutral** and therefore not significant.

Changes to flow regimes and/or water levels

11.8.53 .As a consequence of climate change an increase in rainfall intensity will increase surface water runoff rates and volumes from impermeable surfaces on site. There is a potential for an increased risk of flooding from fluvial, surface water and drainage infrastructure sources if provision for surface water management is not put in place.

11.8.54 In addition, changes in existing flood flow routes due to the presence of the built development also has the potential to exacerbate the risk of flooding from fluvial, surface water and drainage infrastructure sources.

11.8.55 Given the potential for increases in water levels and changes to flow regimes over the operation of the IERRT, when considering Habrough Marsh Drain (high importance) the magnitude of change is considered to be moderate and therefore the significance of effect on flood risk from the watercourse, in the absence of mitigation, is assessed as **moderate adverse** and significant.

Changes to surface water run-off rates

11.8.56 Impermeable surfacing across the site will increase as a consequence of the IERRT project therefore it is likely that the rates of surface water run-off will increase above those of the baseline scenario.

11.8.57 An increase in rainfall intensity by 35% – 40% will occur over the operation of the IERRT project (assessed to be 75 years – see Annex B Drainage Strategy of the FRA) . As a consequence of climate change surface water runoff rates and volumes from impermeable surfaces on site will increase with potential for the increased risk of flooding from fluvial, surface water and drainage infrastructure sources if provision for surface water management is not put in place.

11.8.58 Given the potential for increased surface water run-off over the operation of the IERRT project and the potential for fluvial flood risk from Habrough Marsh Drain (a receptor of high importance), the magnitude of change is considered to be moderate, therefore significance of effect is assessed in the absence of mitigation as **moderate adverse** and significant.

11.9 Mitigation measures

11.9.0 Where the significance of the effect is determined to be moderate adverse or higher, mitigation measures are proposed. Mitigation measures are summarised in the next section and presented in Table 11.10 to this chapter.

Construction phase mitigation

11.9.1 Construction phase mitigation measures that are proposed to be implemented in relation to coastal protection, flood risk and drainage are summarised below.

Management of flood risk

11.9.2 During the construction phase, the Contractor will monitor weather forecasts on a monthly, weekly and daily basis, and plan works accordingly. For example, works adjacent to the channel of any watercourse will be avoided or halted where there to be a risk of high flows or even flooding. In addition, the Contractor will sign up to the Environment Agency's flood warning alerts and produce an Emergency Response Plan which details the actions to be taken on-site by the Contractor should a flood event occur during the construction phase. This is important to ensure all workers, the construction site and third-party land, property and people are adequately protected from flooding during the construction phase.

11.9.3 If water is encountered during below ground construction, suitable de-watering methods will be used. Any significant groundwater dewatering required will be undertaken in line with the requirements of the appropriate regulatory authority.

11.9.4 All construction workers will undergo site induction training prior to being allowed access onto site. This will include instructions on what to do in the event of emergency incidents such as flooding, access and egress routes and the location of safe refuge, if required.

11.9.5 It is ABP's intention that the standard of protection afforded by the existing flood defences under their jurisdiction, along the both the site frontage and the wider Port of Immingham, will be kept under consideration and reviewed as appropriate to account for climate change in line with 'Hold the line' management policies in the FRMP and SMP 3. Improvements to the flood defences will, potentially, be undertaken during the construction phase providing increased protection to the site from tidal flood events.

11.9.6 In line with best practice, the following flood resilience measures will be used in the design of the IERRT project to minimise the amount of damage and reduce recovery time in the unlikely case of the site becoming inundated:

- Finished floor level raising;
- Use of flood resistant building materials;
- Use of water-resistant coatings;
- Use of galvanised and stainless-steel fixings;
- Raising electrical sockets and switches; and
- Provision of an appropriate safe refuge.

11.9.7 The resilient construction measures listed above will be included in building design during the construction phase and have been taken into account in the assessment. The measures will remain in place for the operational phase.

11.9.8 Further details regarding the management of flood risk are available within the FRA at Appendix 11.1 to this ES.

Management of construction site runoff

11.9.9 The measures outlined below, which are also included in the CEMP (Application Document Reference number 9.2), are required for the management of surface water runoff, including sediment/ materials in surface water runoff as a result of the construction activities:

- Construction waste/ debris will be prevented from entering any surface water drainage or water body.
- Surface water drains on roads or within the construction compound will be identified and, where there is a risk that fine particulates or spillages could enter them, the drains will be protected (e.g. using covers or sand bags).
- Debris and other material will be prevented from entering surface water drainage, through maintenance of a clean and tidy site, provision of clearly labelled waste receptacles, grid covers and the presence of site security fencing.

- Temporary drainage facilities will be provided during the construction phase, where necessary, to ensure controlled discharge of surface water run-off. Measures that will be considered for temporary drainage include installation of measures such as swales, silt fences, and appropriately sized settlement tanks/ ponds to reduce sediment load and thus prevent blockages.

Operational phase mitigation

11.9.10 A number of embedded mitigation features have been incorporated into the design of the IERRT project in order to avoid, minimise and reduce potential adverse impacts on coastal protection, flood risk and drainage, and these are described in the following sections.

Flood risk during operation

11.9.11 Mitigation measures to manage the current and future flood risk during operation are described in detail in the FRA (Appendix 11.1 to this ES). It includes:

- Provision of safe refuge within the terminal building and the production of a flood response plan for the development;
- Resilient/ resistant building design;
- Placement of buildings in the areas of lowest flood hazard (towards the west and south/ south-west of the IERRT project site), where possible, within the IERRT project site.

11.9.12 These mitigation measures will minimise the potential for building damage and impacts on human health as much as possible.

11.9.13 If the proposed improvement to the flood defences is not undertaken during the construction period it is ABP's intention that the standard of protection afforded by the existing flood defences under their jurisdiction, along the both the site frontage and the wider Port of Immingham, will be kept under consideration and reviewed, as appropriate to account for climate change in line with 'Hold the line' management policies in the FRMP and SMP 3 within the operation IERRT.

11.9.14 Elements of the development defined by ABP as critical infrastructure for the IERRT project will likely be located at the existing ground level for operational reasons therefore flood resilience and resistance measures will be put in place, as with other critical infrastructure within the wider Port of Immingham.

Surface water drainage

11.9.15 A suitable surface water drainage network and management system will be provided for the IERRT project that will provide appropriate interception, conveyance, treatment, and attenuation of surface water runoff. A Drainage Strategy is provided with the DCO application (Annex B to the FRA at Appendix 11.1 to this ES) detailing how surface water runoff will be managed for the IERRT project post development.

11.9.16 The maintenance required for the proposed surface water attenuation storage and drainage system (see the Drainage Strategy at Annex B of the FRA at Appendix 11.1 to this ES) will be based on standard guidance and practice. As the drainage system for the site will remain a private system the responsibility for management and maintenance will be undertaken by ABP. Management of the Habrough Marsh Drain will however remain under the jurisdiction of the North East Lindsey IDB.

11.9.17 Surface water run-off (untreated), after attenuation, will be discharged and will follow the existing site's drainage structures to the Habrough Marsh Drain, and an existing piped outfall into the Humber Estuary. A small amount of surface water will also be directed into an existing pipe into the dock basin.

11.10 Limitations and assumptions

11.10.1 This assessment has been undertaken based on the following assumptions:

- Final Construction Method Statements were not available at the time of writing, although a reasonable assumption has been made that all works will take place using best practice, as set out in the CEMP (Document Reference number 9.2) submitted with the DCO application.
- With the exception of surface water runoff and drainage, climate change has been assessed for a 100-year period which goes beyond the engineering design standard of the IERRT project. It is assumed that the site and infrastructure will continue to be upgraded and utilised, therefore, the assessment of climate change provides a worst-case scenario to inform mitigation.
- Climate change for surface water and drainage has been assessed as outlined in the Drainage Strategy presented as Annex B to this FRA.

11.11 Residual effects and conclusions

11.11.1 A summary of the impact pathways that have been assessed, the identified residual impacts and level of confidence is presented in Table 11.10 to this chapter. The majority of the effects (inclusive of embedded mitigation) are shown to be neutral or slight, and therefore not significant.

11.11.2 Following the implementation of the mitigation methods described, all identified construction effects will be reduced to either **slight adverse or neutral** residual effects which are expected to be predominantly localised and short term. No likely significant effects to coastal protection, flood risk and drainage have therefore been identified as a result of construction activities associated with the IERRT project.

11.11.3 Following the implementation of mitigation measures, the identified operational effects of the IERRT project will be reduced to no higher than **slight adverse**. The inclusion of a new surface water drainage system on-site, including surface water attenuation, has a **slight beneficial** (not significant) effect to **moderate beneficial** effect (significant effect) on Habrough Marsh Drain and drainage infrastructure respectively.

Table 11.10. Summary of potential impact, mitigation measures and residual impacts

Receptor	Impact pathway	Effect Significance	Mitigation measure	Residual Effect	Confidence
Construction Phase					
Human Health Public and visitors to the site	Exposure to floodwater via flooding from predominantly tidal sources e.g. overtopping, such as surge events or breach of defences.	Moderate adverse	Site induction, including evacuation routes, safe refuge, access, and egress. Site will be included in the current Port of Immingham flood response plan and will be registered with the Environment Agency Flood Warnings Direct Service. No visitors or access during periods of inclement weather.	Slight adverse	High
Human Health Construction workers and operatives	Exposure to floodwater via flooding from predominantly tidal sources e.g. overtopping, such as surge events or breach of defences.	Moderate adverse	Construction works would be carried out in accordance with the CEMP, including the Flood Response Plan. Site induction, including evacuation routes, safe refuge, access, and egress. Site will be included in the current Port of Immingham flood response plan and will be registered with the Environment Agency Flood Warnings Direct Service. No work onsite during a flood warning period.	Slight adverse	High
Flood Defences On-site along the IERRT project site frontage	Changes in tidal regime e.g. wave heights, water levels, erosion/ deposition due to dredging/ construction activities.	Neutral	No mitigation measures are proposed beyond the ongoing inspection and maintenance programme undertaken by the Environment Agency.	Neutral	High

Receptor	Impact pathway	Effect Significance	Mitigation measure	Residual Effect	Confidence
Flood Defences Off-site around wider Port of Immingham frontage	Changes in tidal regime e.g. wave heights, water levels, erosion/deposition due to dredging/ construction activities.	Neutral	No mitigation measures are proposed beyond the ongoing inspection and maintenance programme undertaken by the Environment Agency.	Neutral	High
Existing Development On-site and wider Port of Immingham	Floodplain inundation from tidal flooding, overland flow from fluvial/surface water sources	Neutral	Flood resilience and resistant measures embedded in design. Overland flow paths maintained and temporary drainage to control surface water discharge.	Neutral	High
Existing Development Off-site (neighbouring sites)	Floodplain inundation from tidal flooding, impedance of overland flow routes, from fluvial/surface water sources	Neutral	Overland flow paths maintained and temporary drainage to control surface water discharge.	Neutral	High
Surface Waterbodies Habrough Marsh Drain	Changes in flow regime/water level due to surface water discharge	Slight adverse	Temporary drainage facilities (swales etc) provided during the construction phase to control discharge of surface water run-off.	Neutral	High
Drainage Infrastructure	Increased rate and volume of surface water runoff due to impermeable surfacing/ compaction	Slight adverse	Temporary drainage facilities (swales etc) provided during the construction phase to control discharge of surface water run-off.	Neutral	High

Receptor	Impact pathway	Effect Significance	Mitigation measure	Residual Effect	Confidence
Operational Phase					
Human Health Public and visitors to the site	Exposure to floodwater via flooding from predominantly tidal sources e.g. overtopping or breach of defences.	Moderate adverse	Site induction, including evacuation routes, safe refuge, access, and egress. Site registered with the Environment Agency Flood Warnings Direct Service.	Slight adverse	High
Human Health Site operatives and future workforce	Exposure to floodwater via flooding from predominantly tidal sources e.g. overtopping or breach of defences.	Moderate adverse	Flood Response Plan. Site induction, including evacuation routes, safe refuge, access, and egress. Site registered with the Environment Agency Flood Warnings Direct Service. No work onsite during a flood warning period.	Slight adverse	High
Flood Defences On-site around the site frontage	Changes in tidal regime e.g. wave heights, water levels, erosion/deposition due to dredging/ construction activities.	Slight adverse	No mitigation measures are required beyond the continuation of the current inspection and maintenance regime undertaken by the Environment Agency.	Slight adverse	High
Flood Defences Off-site around wider Port of Immingham frontage	Changes in tidal regime e.g. wave heights, water levels, erosion/deposition due to dredging and offshore development.	Slight adverse	No mitigation measures are required beyond the continuation of the current inspection and maintenance regime undertaken by the Environment Agency.	Slight adverse	High

Receptor	Impact pathway	Effect Significance	Mitigation measure	Residual Effect	Confidence
Existing Development On-site and wider Port of Immingham	Floodplain inundation from tidal flooding, new overland flow routes and from fluvial/ surface water sources	Slight adverse	No additional mitigation is required beyond the flood resilience and resistant measures embedded in design. Drainage infrastructure designed in line with the Drainage Strategy includes attenuation storage to manage climate change over the operation of the development	Slight adverse	Medium
Existing Development Off-site (neighbouring sites)	Floodplain inundation from tidal flooding, new overland flow routes, flooding from fluvial/surface water sources	Neutral	Drainage infrastructure designed in line with the Drainage Strategy includes attenuation storage to manage climate change over the operation of the development	Neutral	Medium
Surface Waterbodies Habrough Marsh Drain	Changes in flow regime/water level due to increases in surface water discharge	Moderate adverse	Drainage infrastructure designed in line with the Drainage Strategy includes attenuation storage to manage climate change over the operation of the development and provides betterment over the current baseline drainage.	Slight beneficial	High
Drainage Infrastructure	Increased rate and volume of surface water runoff from impermeable surfaces	Moderate adverse	Drainage infrastructure designed in line with the Drainage Strategy including attenuation storage to manage climate change over the operation of the development	Moderate beneficial	High

11.12 References

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11.13 Abbreviations/Acronyms

Acronym	Definition
ABP	Associated British Ports
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
APT	Associated Petroleum Terminals (Immingham) Ltd.
bgl	Below Ground Level
BGS	British Geological Survey
CEMP	Construction Environment Management Plan
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information Association
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DLUHC	Department for Levelling Up, Housing and Communities
DMRB	Design Manual for Roads and Bridges
EC	European Commission
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
FFLs	Finished Floor Levels
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
FRMP	Flood Risk Management Plan
FRMS	Flood Risk Management Strategy
FWMA	Flood and Water Management Act
HIT	Humber International Oil Terminal
HTL	Hold the Line
ID	Identity
IDB	Internal Drainage Board
IEMA	Institute of Environmental Management & Assessment
IERRT	Immingham Eastern Ro-Ro Terminal
IOH	Immingham Outer Harbour
IOT	Immingham Oil Terminal
LA	Lifecycle Assessment
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority

MAGIC	Multi-Agency Geographic Information for the Countryside
mAOD	Meters Above Ordnance Datum
MHCLG	Ministry for Housing Communities and Local Government
MHWS	Mean High Water Springs
MPS	Marine Policy Statement
MR	Managed Realignment
NELC	North East Lincolnshire Council
NPPF	National Planning Policy Framework
NPSfP	National Policy Statement for Ports
NSIP	Nationally Significant Infrastructure Project
OS	Ordnance Survey
OS NGR	Ordnance Survey National Grid Reference
OT	Oil Terminal
PEIR	Preliminary Environmental Impact Report
PFRA	Preliminary Flood Risk Assessment
PINS	Planning Inspectorate
PPG	Planning Policy Guidance
RCP	Representative Concentration Pathway
RFfSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SuDS	Sustainable Drainage Systems / Strategy
TAG	Transport Analysis Guidance
UK	United Kingdom
UKCP	United Kingdom Climate Projections
WFD	Water Framework Directive
ZOI	Zone Of Influence

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

11.14 Glossary

Term	Definition
Aquifer	An aquifer is a geological formation which can contain or transmit groundwater. The type of aquifer indicates how permeable it is, its capability to store/yield significant quantities of water and also whether its quality is suitable for potable water supply
Areas Benefitting from Defences	Areas that benefit from flood defences in the event of a river flood with a 1% or tidal flood with a 0.5% chance of happening in any one year
Baseline conditions	Existing conditions and past trends associated with the environment in which a proposed activity may take place
Brownfield	Previously developed parcel of land
Catchment Flood Management Plan	Catchment Flood Management Plan- A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Climate change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Cumulative effects	Combined effects of multiple developments or the combined effect of individual impacts (e.g. where different project elements in different locations have a cumulative impact on a particular feature)
Flood Defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard)
Flood Risk Assessment	A site specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a main river or ordinary watercourse
Glacial Till	Unsorted and unstratified material deposited by glacial ice
Greenfield	Undeveloped parcel of land
Groundwater	Water present beneath Earth's surface in rock and soil pore spaces and in the fractures of rock formations
Hazard	A substance, operation or piece of equipment which has the potential to cause harm to people or the environment
Hold the Line	The current alignment of the defence is maintained with no movement seawards or landwards with the level of protection maintained

Internal Drainage Board	A type of operating authority which is established in areas of special drainage need in England and Wales with permissive powers to undertake work to secure clean water drainage and water level management within drainage districts
Lead Local Flood Authority	Local Authority responsible for taking the lead on local flood risk management
Made Ground	Disturbed soils which include man-made or artificial materials
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance
Overtopping	The rising of flood water levels above a river bank, wall or flood defence barriers
Pluvial Flooding	Flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity.
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Return Period	Is an estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.
Risk	The likelihood of a specified level of harm occurring within a specified period of time
Sewer Flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Standard of Protection	Defences are provided to reduce the risk of flooding from a river and within the flood and defence field standards are usually described in terms of a flood event AEP. For example, a flood embankment could be described as providing a 1% AEP standard of protection

Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
Storm Surge	The abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide.
SuDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques
Surface Water Flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
Tidal Flat Deposits	Soil deposits formed from mud flats in the intertidal zone
Topography	The arrangement of the natural and artificial physical features of an area
Unproductive Strata	Soil and/or rock layers with low permeability that have negligible significance for water supply or base flow for rivers

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