Associated British Ports

Immingham Eastern RoRo Terminal

Preliminary Environmental Information:
Appendix 11.1 Preliminary Flood Risk Assessment

January 2022





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Immingham Eastern Ro-Ro Terminal

Preliminary Flood Risk Assessment

Associated British Ports (ABP)

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December 2021

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Quality information

Prepared by	Checked by	Verified by	Approved by
Frances Lee Flood and Coastal Consultant	Joanne Somerton Principal Flood Risk Consultant	Andrew Heath-Brown Associate, Water	Kirsty Cobb Technical Director

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Prepared for:

Associated British Ports (ABP)

Prepared by:

AECOM Limited
5th Floor, 2 City Walk
Leeds LS11 9AR
United Kingdom

T: +44 (0)113 391 6800
aecom.com

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1. Introduction

1.1 Commission

AECOM Limited (AECOM) has been commissioned by Associated British Ports (ABP) (known as 'The Client' hereafter) to produce a Flood Risk Assessment (FRA) to support a planning application for the proposed Immingham Eastern Ro-Ro Terminal, a new terminal located at the Port of Immingham (The 'Proposed Development'). The Proposed Development is located at Immingham Dock in Immingham, DN40 2LZ.

1.2 Background

The Site is located on the eastern side of Immingham Dock, approximately 2.4 km north-east of Immingham. The works are proposed to provide a service for the embarkation and disembarkation of commercial and automotive traffic. The Proposed Development will require marine works within the Humber Estuary and landside works on the existing statutory port estate.

The Environment Agency Flood Map for Planning (FMfP) available online[1] (and reproduced as Figure 4.2), shows the Site is located in Flood Zone 3. The definition of flood zones, according to the Planning Practice Guidance[2] (PPG), are summarised in Table 1.1 below.

The National Planning Policy Framework[3] (NPPF) and the PPG specifies that planning applications for development proposals located within Flood Zone 2 or 3 (river and sea flooding) should be accompanied by a Flood Risk Assessment (FRA) that identifies and assesses all forms of flooding to and from the development. The FRA should demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking into account the vulnerability of the Proposed Development and the potential impact of climate change on flood risk.

Table 1.1 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 has to flow or be stored in times of flood.	Very High

Source: Planning Practice Guidance (2021)

1.3 Scope of Services

The aim of this study is to undertake a FRA that is appropriate to the nature and scale of the Proposed Development. The FRA determines flood risk posed to the Site and arising as a result of the Proposed Development and recommends suitable mitigation measures where required.

The objectives of this report are to:

- Consult with the Environment Agency, North East Lincolnshire Council (in their role as Lead Local Flood Authority (LLFA)), and North East Lindsey Internal Drainage Board (IDB) (via the Witham IDB) in relation to flood risk and their requirements for management of any risk (data consultation responses are presented as Appendix A);

[1] Environment Agency. Flood Map for Planning. Available online
[2] Communities and Local Government, (2021); Planning Practice Guidance. Available online
[3] Communities and Local Government, (2021); National Planning Policy Framework. Available online

- Collect and review existing information relating to flood risk posed to the Site from all sources (including tidal, fluvial, surface water, groundwater, artificial sources and sewer and drainage infrastructure);
- Assess the flood risk to the Site under existing and post-development conditions (taking into account climate change); and
- Outline any mitigating measures needed to ensure the Proposed Development and its users will be safe for the lifetime of the development.

1.4 Data Sources

The baseline conditions for the Site have been established through a desk study using publicly available information. This information has been utilised to inform the assessment made within the FRA.

Data collected and used to inform this assessment is summarised in Table 1.2.

Table 1.2 Sources of Data Reviewed

Purpose	Data Source	Comments
Identification of Hydrological Features	1: 10,000 Ordnance Survey (OS) mapping	Identifies the position of the Site, local hydrological features, and riparian owners.
Historical Land Use and Hydrological Features	Historic OS maps dating back from 1842- Present[4]	Identifies historical land use change and hydrological features over the last 176 years.
Identification of Existing Flood Risk	Environment Agency FMfP (online1)	Identifies fluvial/ tidal inundation extents.
	Environment Agency Long Term Flood Risk Maps (online[5])	Identification of flood risk from surface water and reservoirs.
	EA Groundwater Conditions Map[6]	Identification of groundwater designations through geology.
	Grimsby and Ancholme: Catchment Flood Management Plan[7] North East Lincolnshire Council Preliminary Flood Risk Assessment (PFRA) [8] North East Lincolnshire Council Strategic Flood Risk Assessment (SFRA) – 2011[9] North East Lincolnshire Council Local Flood Risk Management Strategy (2015) (LFRMS)[10] Consultation with Environment Agency, North East Lincolnshire Council and North East Lindsey IDB. (Appendix A)	Assesses flood risk across the North East Lincolnshire Council boundary area. Includes flood risk from fluvial/tidal, sewers, overland flow and groundwater.
	British Geological Survey (BGS) records[11] Immingham Eastern Ro-Ro Terminal Phase 1 Desk Study[12]	Provides details of geology and hydrogeology in the vicinity of the Site.
Identification of Historical Flooding	North East Lincolnshire SFRA North East Lincolnshire PFRA Consultation with Environment Agency, North East Lincolnshire Council and North East Lindsey IDB.(Appendix A)	Provides details of historical flooding.
Details of the Proposed Development	Layout Plan (Appendix B)	Provides a layout of the Proposed Development.

[4]Ordnance Survey. Maps from 1857-1986.
[5] Environment Agency. Flood Risk from Surface Water Available online
[6] Environment Agency. Groundwater. Available online
[7] Environment Agency (2009). Grimsby and Ancholme: Catchment Flood Management Plan.
[8] North East Lincolnshire Council (2011) Preliminary Flood Risk Assessment (PFRA).
[9] North East Lincolnshire Council (2011). Strategic Flood Risk Assessment (SFRA).
[10] North East Lincolnshire Council (2015). Local Flood Risk Management Strategy.
[11] British Geological Survey (BGS) records. Available online
[12] Immingham Eastern Ro-Ro Terminal Phase 1 Desk Study

2. Site Information

2.1 Site Location and Context

The Site is located adjacent to the main deep-water shipping channel at the Port of Immingham, approximately 2.4 km North-East of Immingham. The Site is centred on National Grid Reference (NGR) TA 19976 16154. The maximum extent of the Proposed Development is shown in the Layout Plan (Appendix B).

The Site currently comprises of a number of discrete operational areas with bulk commodities such as liquid fuels, solid fuels and ores, as well as 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).

The Site lies adjacent to the River Humber (Humber Estuary) and access is gained via Alexandra Road through Immingham Dock.

2.2 Local Water Features

The following local water features in close proximity to the Site have been identified through the inspection of OS 1: 10,000 mapping:

- Tidal River: The Humber Estuary (River Humber) originates at Trent Falls, by the confluence of the tidally influenced rivers Ouse and Trent and flows south-east into the North Sea;
- Environment Agency Main River: Stallingborough North Beck Drain flows into the River Humber approximately 0.4 km South-East of the Site. The Drain, an embanked upland river, originates at Little London and receives pumped surface water runoff from south, central and east Immingham as well as land drainage run off from West Lindsey. The Stallingborough North Beck discharges by gravity, via a sluice gate, into the Humber Estuary;
- Ordinary Watercourses: Habrough Marsh Drain, an ordinary watercourse under the jurisdiction of the North East Lindsey IDB and drains a significant proportion of Immingham Dock. . The watercourse largely skirts the southern and western perimeters of the port estate flowing between the northern and southern parcels of land and discharges partly to the Humber Estuary and partly to the Stallingborough North Beck through the Immingham Pumping Station; and.
- Numerous drains and small watercourses located in proximity to the Site and the wider Port of Immingham form part of the North East Lindsey IDB land drainage system for the low- lying coastal area.

There are no other surface water features located in the area local to the Site.

2.3 Historical Land Use and Water Features

Historical OS mapping dating from 1887 to the present day was reviewed. The earliest known mapping shows undeveloped agricultural land and a sluice prior to the development of Immingham Dock in 1912. The original Dock was enclosed and had an entrance lock. Much of the existing structures have since been removed following changes to the trade through the port. A single pair of lock gates now provide entrance and exit to the Dock, with the addition of many new structures that extend out to sea. The Stallingborough North Beck Drain and Habrough Marsh Drain watercourses are configured as they exist today.

2.4 Topography

Review of the OS mapping indicates that the Site is generally flat with an average elevation of 5-6m AOD.

2.5 Geology and Hydrogeology

Information considered pertinent to the Site has been taken from the Phase 1 Geo-Environmental Report and is summarised in Table 2.1.

Table 1.3 Geological and Hydrogeological Information for the Site

	Geological Unit	Permeability	Aquifer Status
Made Ground	Made ground (undivided) is mapped under the entire site. There are small areas of infilled ground indicated on mapping at the southern end of the site. This is congruent with the development history of the site.	N/A	N/A
Superficial Geology	Tidal Flat Deposits – Clay and Silt deposits formed up to 2 million years ago in the Quaternary Period (majority of the site, apart from the Humber estuary). Underlying these deposits is Devensian (Glacial) Till.	Very low to high	Unproductive Aquifer – Rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
	Beach and Tidal Flat Deposits (undifferentiated) – Clay, Silt, and sand deposits formed up to 3 million years ago in the Quaternary Period (along the bank of the Humber estuary).	Very low to high	Secondary Undifferentiated Aquifer – Assigned where it is not possible to attribute either category A or category B to a rock type. Layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of rock type.
Solid Geology	Burnham Chalk Formation (underlying the north west trending arm of the site). Flamborough Chalk Formation (underlying the majority of the site, apart from the north west trending arm).	Low	Principal Aquifer – Layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

Source: Immingham Eastern Ro-Ro Terminal Phase 1 Desk Study

The Environment Agency Groundwater Mapping indicates the south east corner of the Site falls within a Source Protection Zone (SPZ). Groundwater SPZs monitor the risk of contamination from any activities that may cause pollution to the surrounding area.

2.6 The Proposed Development

The Proposed Development involves the construction of a new terminal within the eastern sector of the Port.

The Proposed Development comprises:

Marine Works:

- An approach jetty from the shore
- A linkspan with bankseat
- Two floating pontoons with guide piles or articulated restraint arms
- Two separate finger piers with two berths each, one either side with the stern ramps of the ships resting upon two floating pontoons
- A capital dredge of the new berth pocket
- Disposal of dredged material at sea

Landside Works:

- The utilisation of existing cargo storage areas within ABP's port estate immediately adjacent to where the finger pier is attached to the land. These areas will be required to accommodate the throughput of the Ro-Ro cargo as it is either waiting to be embarked or awaiting pick-up after being disembarked
- A number of terminal buildings will be constructed to provide appropriate facilities for lorry drivers and passengers. A small office, workshop and gatehouse may also be required.
- An internal bridge will need to be constructed within the port estate to cross over an adjacent access road and ABP managed rail track

A plan showing the layout of the proposed development works is presented as Appendix B.

3. Planning Policy and Guidance

The Sections below consider the planning policies and guidance of relevance to the Proposed Development with regards to flood risk from all sources and appropriate mitigation measures which should be considered.

3.1 National Planning Policy Context

3.1.1 National Planning Statement for Ports

The National Policy Statement for Ports[13] (NPSfP) is the framework for decisions on proposals for new port development. The aims of the NPSfP for 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 water compatible development and, therefore, acceptable in high flood risk areas (Paragraph 5.2.3).

The policy states "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).

The minimum requirements for FRAs are that they should:

- Be proportionate to the risk and appropriate to the scale, nature and location of the project;
- Consider the risk of flooding arising from the project, in addition to the risk of flooding to the project;
- Take the impacts of climate change into account, clearly stating the development lifetime over which the assessment has been made;
- Be undertaken by competent people, as early as possible in the process of preparing the proposal;
- Consider both the potential adverse and beneficial effects of flood risk management infrastructure, including raised defences, flow channels, flood storage areas and other artificial features, together with the consequences of their failure;
- Consider the vulnerability of those using the site, including arrangements for safe access;
- Consider and quantify the different types of flooding (whether from natural or human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;
- Consider the effects of a range of flooding events, including extreme events on people, property, the natural and historic environment and river and coastal processes;
- Include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular project;
- Consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems;
- Consider if there is a need to be safe and remain operational during a worst-case flood event over the development's lifetime; and
- Be supported by appropriate data and information, including historical information on previous events.

The policy notes that the latest set of UK Climate Projections should be used in assessments to ensure the appropriate adaptation measures have been identified. "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).

[13] Department for Transport (2012) National Planning Statement for Ports

Paragraph 5.2.18 of the Policy 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 longterm climate change as it affects their own facilities"

3.1.2 National Planning Policy Framework

The NPPF is supported by the PPG, an online resource originally published in March 2014 and last revised in 2021

The NPPF and PPG must be taken into account in the preparation of local and neighbourhood plans and are a material consideration in planning decisions. It constitutes guidance for local planning authorities (LPAs) and decision-takers, both in drawing up plans and as a material consideration in determining applications.

The NPPF and PPG recommend that Local Plans should be supported by a SFRA and develop policies to manage flood risk from all sources. This should take into account advice from the Environment Agency and other relevant flood risk management bodies, such as LLFAs and Internal Drainage Boards (IDBs). Local Plans should apply a sequential, risk-based approach to the location of developments. This is done to seek to mitigate flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:

- Applying the Sequential Test;
- Applying the Exception Test, if necessary;
- Safeguarding land from development that is required for current and future flood management;
- Using opportunities offered by new development to reduce the causes and impacts of flooding; and
- Seeking opportunities to facilitate the relocation of existing development, including housing, to more sustainable locations if climate change is expected to increase flood risk.

The NPPF states that when determining planning applications, Local Planning Authorities (LPA) should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific Flood Risk Assessment. 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 Sustainable Drainage Systems (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.

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 Lead Local Flood Authority;
- 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.

3.1.2.1 The Sequential and Exception Tests

The overall aim of the Sequential Test is to steer new development to areas designated as Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1 areas, LPAs allocating land in Local Plans or determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 areas, applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zone 1 or 2 areas should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

For the Exception Test to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and,
- A site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall.

Both elements of the test will have to be passed for development to be allocated or permitted.

3.1.2.2 Development and Flood Risk Vulnerability

The NPPF considers the vulnerability of different forms of development to flooding and classifies proposed uses accordingly.

Section 7, Paragraph 066 of the PPG illustrates a matrix which identifies which vulnerability classifications are appropriate within each flood zone. This can be seen below in Table 3.1.

Table 1.4 Flood Risk Vulnerability and Flood Zone Compatibility

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	✓	Exception test required	✓	✓
Flood Zone 3a	Exception test required	✓	×	Exception test required	✓
Flood Zone 3b (Functional Floodplain)	Exception test required	✓	×	×	×

Key
✓ Development is appropriate.
× Development should not be permitted

The NPSfP, which takes precedent in terms of planning policy, states that port development is considered 'water compatible'.

The Proposed Development is also classed overall as water compatible (docks, marinas and wharves) by the Environment Agency in Table 3.1 (flood risk vulnerability classification) of the Flood Risk and Coastal PPG[14]. However, development such as the terminal buildings, the small office, workshop and gatehouse can be classified as 'less vulnerable development'.

The Environment Agency FMfP indicates the Site is located in Flood Zone 3, and as such, based on the classification shown in Table 3.1, the Exception Test is not required for water compatible/less vulnerable development.

3.2 Local Planning Policy

3.2.1 North East Lincolnshire Council Local Plan

The North East Lincolnshire Council Local Plan was adopted by the council in January 2018[15] and sets out the Council's vision and strategy for development, including why, where and how the Borough will grow up to 2028.

Relevant development and flood risk policies include Policy 6: Infrastructure, Policy 31: Renewable and Low Carbon Infrastructure and Policy 33: Flood Risk and are summarised n Table 1.5.

[14] Environment Agency (2014). Flood Risk and Coastal Guidance.
[15] North East Lincolnshire Council (2018) Local Plan. Available online

Table 1.5 Relevant Core Strategy Policies

Relevant Policy	Sub-Category	Summary
Policy 6: Infrastructure	2	The Council will work with developers and partner organisations to ensure the delivery of infrastructure, services, and community facilities necessary to develop and maintain sustainable communities.
Policy 33: Flood Risk	All	Development 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. Sustainable Drainage Systems (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; 202 Building the places we need G. access to any watercourse or flood defence asset for maintenance, clearance, repair or replacement is not adversely affected; and, H. the restoration, improvement or provision of additional flood defence infrastructure represents an appropriate response to local flood risk, and does not conflict with other Plan policies.

Source: < https://www.nelincs.gov.uk/planning-and-building-control/planning-policy/the-local-plan/>

3.3 Other Relevant Policy and Guidance

3.3.1 Shoreline Management Plan 3:Flamborough Head to Gibraltar Point

Shoreline Management Plan (SMP) 3; Flamborough Head to Gibraltar Point[16] 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.

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.

[16] Scott Wilson (2010) Humber Estuary Coastal Authorities Group Flamborough Head to Gibraltar Point Shoreline Management Plan. Non-Technical Summary

3.3.2 Humber Flood Risk Management Strategy

The Humber Strategy[17] 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.

The Immingham Eastern Ro-Ro Terminal project area 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. Again, it is assumed that the coastal defences on site will therefore be maintained and upgraded in order to implement this policy.

3.3.3 Grimsby and Ancholme Catchment Flood Management Plan (CFMP)

In 2009, a CFMP was produced by the Environment Agency for the Grimsby and Ancholme catchment[18] 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 proposed development, (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.

3.3.4 North East Lindsey Drainage Board Byelaws

Internal Drainage Boards (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. 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 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.

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 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.

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

As LLFA, North East Lincolnshire Council has a responsibility to develop a LFRMS[19] 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.

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.

[17] Environment Agency (2008) The Humber Flood Risk Management Strategy. Summary Document March 2008, Planning for the rising tides
[18] Environment Agency (2009) Grimsby and Ancholme Catchment Flood Management Plan
[19] North East Lincolnshire Council (2015) North East Lincolnshire Local Flood Risk Management Strategy

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

North and North East Lincolnshire Council Level 1 SFRA[20] was published in 2011 to support the assessment of development sites in relation to flood risk. The SFRA was completed in consultation with the Environment Agency and North East Lindsey IDB to provide information on the probability of flooding. The report also takes into account the impacts of climate change.

It is intended that the SFRA will be used by North East Lincolnshire Council's planning and building control department to inform the application of the Sequential Test when allocating land or determining applications, in line with the NPPF.

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 SFRA for Flood Compartment 1T3 – Immingham and North Killingholme (which contains the Port of Immingham area) which indicates the Immingham area is liable to flooding should a breach of the flood defences occur.

[20] North Lincolnshire Council and North East Lincolnshire Council (2011) North and North East Lincolnshire Strategic Flood Risk Assessment

4. Baseline Flood Risk Assessment

The NPPF requires the effects of all sources of flood risk to and from a development are considered within a FRA. The FRA should demonstrate how identified risks should be managed so that the development remains safe throughout its lifetime, taking into account climate change.

This review was undertaken using publicly available information to assess the flood risk at the Proposed Development Site.

4.1 Historical Flooding

Environment Agency records show historical flooding of Immingham during the January 1953 and December 2013 tidal surge events, presented as Figure 4.1 below.

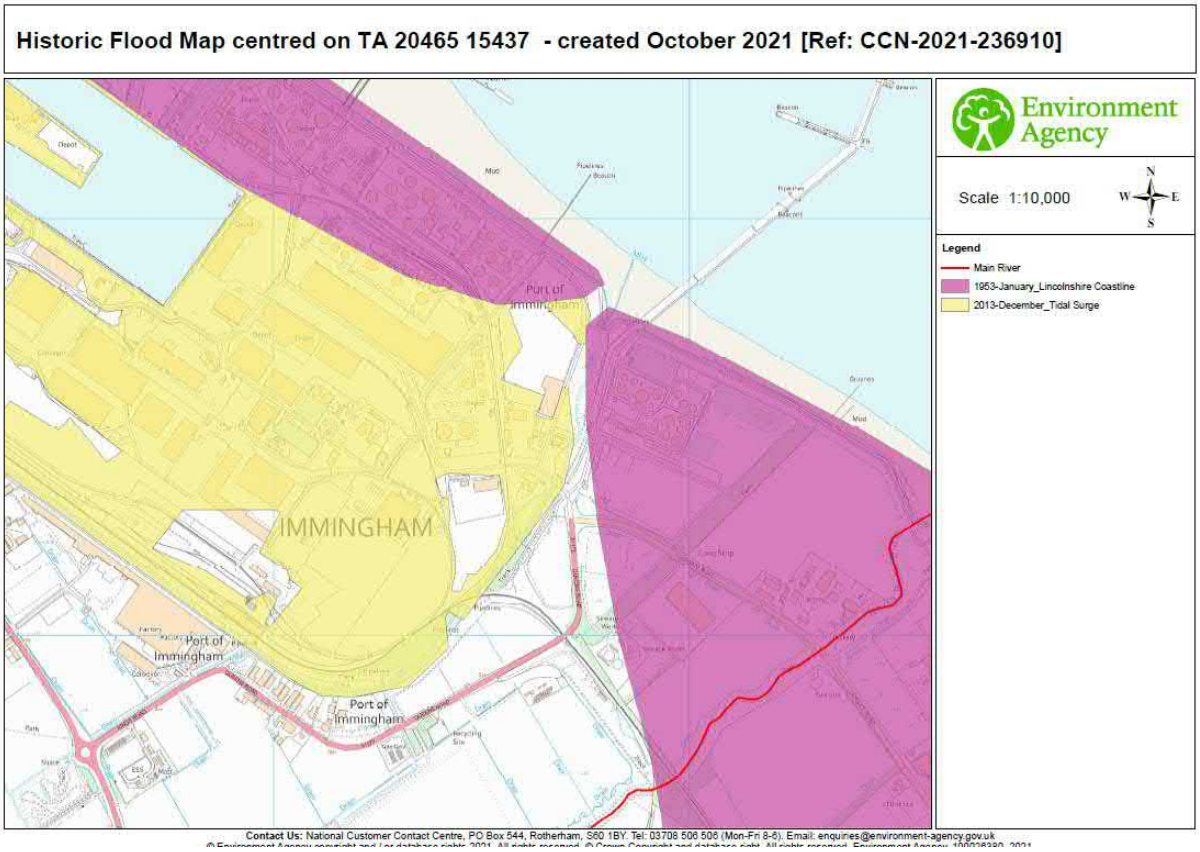


Figure 1-1 Environment Agency Historic Flood Map of Immingham

In December 2013, the flooding at Immingham 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 section of gabion baskets along the frontage on the western part of the port, approximately 3 km away from the project area (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 – 1m 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 lockgates 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).

Although the Environment Agency historical flood map suggests that the Proposed Development area was flooded during the December 2013 tidal surge event, subsequent surveys undertaken post flood event by ABP indicate the application area did not flood during this event.

4.2 Flooding from Tidal Sources

The Environment Agency FMfP, presented as Figure 4.2 below, indicates that the Site is located in Flood Zone 3, which is defined in Table 1.1. The map shows the extent of Flood Zone 3, assuming no defences exist. The SFRA states that the main source of flooding in the area is a combination of large waves and high-water levels in the Humber Estuary.

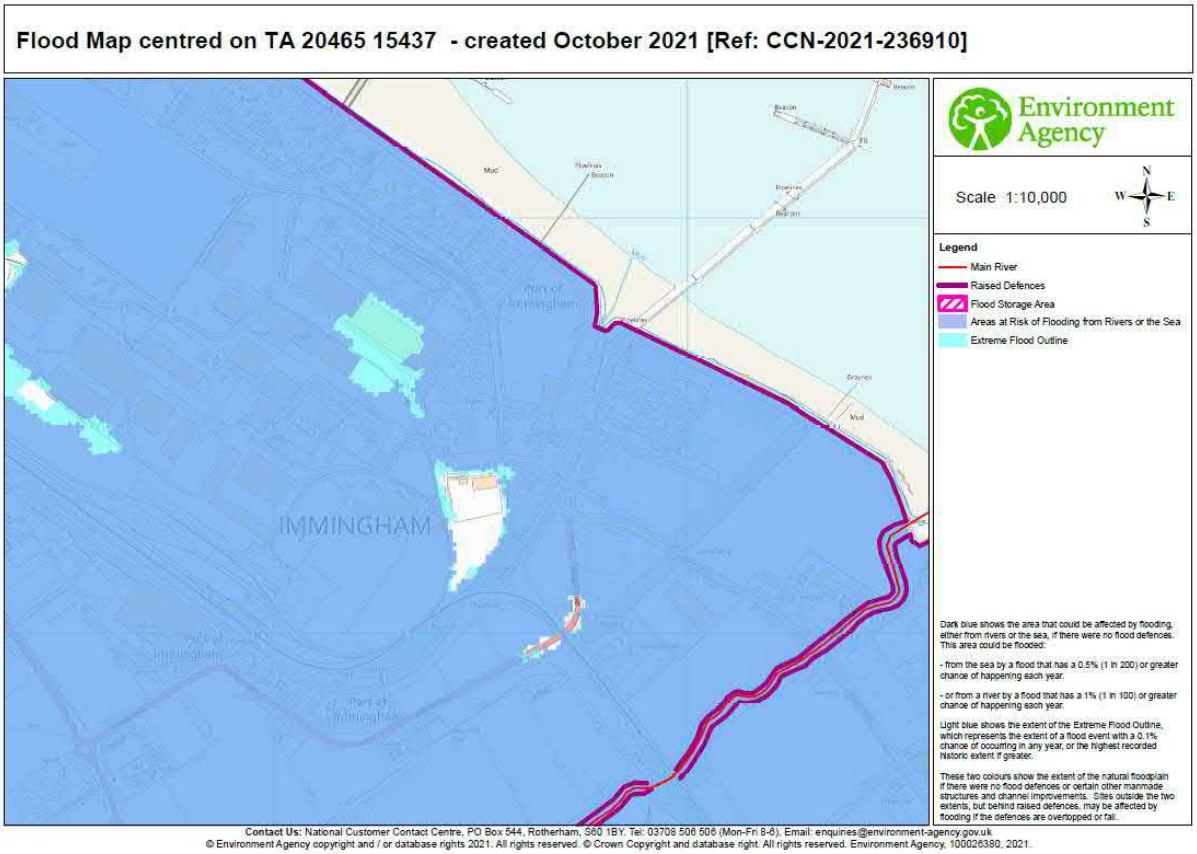


Figure 1-2 Environment Agency Flood Map for Port of Immingham

4.2.1 Extreme Water Levels

Current extreme still tidal water level predictions determined by the Environment Agency for the Port of Immingham are considered to be the most up-to-date and appropriate for this review (Appendix A). These are provided in Table 4.1 for a baseline year of 2017.

Table 1.6 Predicted extreme water levels for the Port of Immingham

Return Period (Years)	Annual Exceedance Probability (%)	Extreme Water Level (mODN)
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
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

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

4.2.2 Flood Defences

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

The Environment Agency has stated that tidal flood defences adjacent to the Site provide protection against a flood event with a 0.5% (1 in 200) chance of occurring in any year, based on the Still Water Tidal Water Levels.

The flood defences are maintained by the Environment Agency who has 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 regularly to ensure that any potential defects are identified early.

ABP are responsible for the sea walls around their land at Immingham Docks which is offered by concrete sheet piled walls, concrete 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 5.05m AOD and a wall height of 0.84m resulting in a total defence elevation of 5.89m AOD.

Topographic survey undertaken for ABP in 2018 indicates a varying crest height along the Immingham Dock frontage with levels between 5.52m AOD and 6.15m 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 5.80mAOD – 6.0m AOD with a low spot of 5.52m AOD.

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

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.

In relation to the flood defences located within Compartment IT3 Immingham and North Killingholme, as mapped in the NELC 2011 SFRA, which includes the Port of Immingham frontage, the FRA 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'.

The initial draft Humber Flood Risk Management Strategy (2021 – 2027)[21] advises that improvements to Humber Estuary modelling have been completed as part of the developing Humber 2100+ project, which is redefining the strategic approach to managing tidal risk on the Humber. A further phase of improvements to the tidal defences adjacent to the port is planned from 2022, in continuation of the defence improvements in 2017.

4.2.3 Breach of Defences

The Environment Agency has provided breach location and associated breach flood extent maps from the Northern Area Tidal Breach Mapping Study (Appendix A). 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 and the defences assumed to breach down to the ground level behind the defence. The defences were raised within the model to create reservoir cells, ensuring that the most precautionary volumes of water were driven through the breach opening.

The breach modelling was based on the Still Water Tidal Levels from the Northern Area Tidal Model Analysis 2006 including a 100% AEP (1 in 1) wave height allowance (current year 2006 and 2115) on top of the 0.5% AEP and 0.1% AEP (1 in 1000) flood events. The breach locations nearest the site are located to the north east of the lockgates access to Immingham Docks and along the frontage between Habrough Marsh Drain and

[21] Environment Agency (2021) Humber Flood Risk Management Strategy. Available online. (currently out for public consultation until January 2022)

Stallingborough North Beck. The hazard classification methodology is based on Flood Risk Assessment Guidance for New Development known as FD2320/TR213[22], presented in Table 4.2.

Table 1.7 Flood Hazard Classification

Flood Hazard	Classification
Low	**Caution** - Flood zone with shallow flowing water or deep standing water
Moderate	**Dangerous for some** (i.e. Children) – Danger: Flood zone with deep or fast flowing water
Significant	**Dangerous for most people** – Danger: Flood zone with deep fast flowing water
Extreme	Dangerous for all – Extreme Danger: Flood zone with deep fast flowing water

Source: DEFRA, 2021

The Environment Agency breach location and flood extent maps are contained in Appendix A and indicate:

- For a current day (2006) 0.5% and 0.1% AEP breach event the west and southern areas of the Site are not located within the breach flood extent;
- The southern parcel of land (to the south of Habrough Marsh Drain, is located in a 'Danger to All' hazard area with a maximum water depth of 1.8+m and a maximum water velocity of 0.3-1 m/s for both the 0.5% and 0.1% AEP events; and
- the 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 0-0.3m/s for both the 0.5% and 0.1% AEP flood events. Maximum water depth increases from 0.25-0.5m (0.5% AEP flood event) to a depth of 1-1.8m (0.1% AEP flood event).

Though a breach of flood defences would represent a significant to extreme hazard, the likelihood of a breach is low. The NPPF guidance requires that plans and mitigation are put in place to manage the risks if failure should occur. Mitigation measures for the Site are outlined in Section 8.1.

4.2.4 Overtopping of Flood Defences

The Environment Agency has provided flood extent maps from the Northern Area Tidal Overtopping Hazard Mapping Study for the 0.5% AEP and the 0.1% AEP overtopping scenarios. The modelling is based on the Still Water Tidal Levels from the Northern Area Tidal Model Analysis 2006 including a 100% AEP (1 in 1) wave height allowance (current year 2006 and 2115).

The extent maps are contained in Appendix A and indicate that for both the 2006 0.5% AEP and 0.1% AEP overtopping events:

- the west and south of the Site are located outside of a hazard area;
- the southern parcel of land (to the south of Habrough Marsh Drain, is partially located in an area of 'Low Hazard' with a maximum water depth of 0-0.25 and a maximum water velocity of 0.3 – 1m/s; and
- the 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 1-1.8m and a maximum water velocity of 0-0.3m/s.

Though overtopping of the flood defences would represent a significant hazard, the likelihood of overtopping is low. The NPPF guidance requires that plans and mitigation are put in place to manage the risks should overtopping occur. Mitigation measures for the Site are outlined in Section 8.1.

4.3 Coastal and Estuarial Processes

Consideration is given in Chapter 7: Physical Processes of the Immingham Eastern Ro-R-Ro Terminal Preliminary Environmental Impacts Report to the effects on water levels and flow speeds within the Estuary and the consequence of these changes to sediment accretion/erosion patterns and suspended sediment concentrations (SSC), including the effects of the changes in sediment supply as a result of dredging and disposal operations.

[22] DEFRA (2021) Flood Risk Guidance for New Development. Available online

In summary, Chapter 7: Physical Processes concludes:

- The proposed dredging and piling works will not affect the tidal prism (the volume of water to raise the tidal level), in the estuary, between High Water and Low Water;
- Maximum flow speed changes are generally within the range of ±0.15 m/s and are predominantly reduced flows;
- The Proposed Development has no/ little impact of significance on water levels;
- The hydrodynamic modelling for the operational phase has shown that flow directions at peak flows are generally unaffected along the waterfront, including when vessels are on-berth;
- The modelling has shown that the direction of wave propagation will be unaffected by the dredge pocket or facility. Small increases in wave height occur but are generally confined to the dredge pocket and adjacent coastline and do not extend estuary wide.

The modelling has not identified that the coastal defences will be subject to increased tidal flows (hence potential for toe scour) or increased water levels at High Water (therefore no change to the flood risk).

4.4 Fluvial Sources

The Flood Map for Planning (shown in Figure 4.2) illustrates that the Proposed Development Site 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.

Mapping in Section 2.4 of the North East Lincolnshire PFRA gives some indication of fluvial flood zones and indicates that the Immingham Eastern Ro-Ro Terminal project site is located in Flood Zone 1.

4.4.1 Main River

The main source of flooding to the Site is from the Humber Estuary (Main River) and the risk of flooding from this source is assessed in Section 4.2 above.

The Site is not considered to be at risk of flooding from fluvial main rivers. The nearest Environment Agency Main River (fluvial) is the Stallingborough North Beck Drain located approximately 0.4 km south-east of the Site which has flood defences.

The NELC SFRA (Paragraph H.49) notes that hydraulic modelling of the Stallingborough North Beck was undertaken in 2009. The modelling 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 3km upstream. Based on these modelled flood water levels, the average site level of 5-6m AOD and intervening topography, flood water would not enter the Site.

Based on the above information, the risk of flooding from fluvial Main River sources is considered to be low.

4.4.2 Ordinary Watercourses

Habrough Marsh Drain, designated as an ‘Ordinary Watercourse’ under the jurisdiction of the North East Lindsey IDB, skirts the southern and western perimeters of the port estate flowing between the northern and southern parcels of land.

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.

Tide-locking is a common problem in watercourses where defences occur. Habrough Marsh Drain is a gravity system with a flapped outfall to the Humber to prevent the incoming tide from entering the channel. When high tides prevent the watercourse from discharging into the Humber Estuary, water levels within the drains will increase temporarily until the tidal level has decreased sufficiently to allow the outfall to operate again.

High levels within the North East Lindsey IDB system are a potential flood risk to the area with high rainfall events aggravated by high water levels in the Humber Estuary.

The SFRA states that 'the drainage system managed by the North East Lindsey IDB is understood to be able to accommodate events with 0.1% AEP by a combination of storage and pumping, without flooding the surrounding area'.

Based on the above information, the risk of flooding from fluvial ordinary watercourses sources is considered to be a low risk.

4.5 Surface Water (Overland Flow)

Surface water flooding is caused by overland flow that results from rainfall that fails to drain into the ground through infiltration, instead of 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.

The Environment Agency RoFSW maps indicate areas at risk from surface water flooding when rainwater does not drain away through the normal drainage systems or soak into the ground, but instead lies on or flows over the ground. The RoFSW flood map for the Proposed Development can be viewed on the Environment Agency website. Risk from surface water flooding is defined in Table 4.3.

Table 1.8: Definition of risk from surface water flooding

Risk of flooding	Definition
Very Low	Each year, the area has a chance of flooding of less than 1 in 1000 (0.1%)
Low	Each year, the area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%)
Medium	Each year, the area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
High	Each year, the area has a chance of flooding of greater than 1 in 30 (3.3%)

The map shows that the 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.

There are small, isolated areas of the Site shown to be at low, medium and high risk of surface water flooding predominantly to the southern corner of the 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.

The risk of flooding from surface water sources is assessed as low.

4.6 Artificial Waterbodies

Artificial flood sources include raised channels such as canals or storage features such as ponds and reservoirs. The Environment Agency Long-term Flood Risk maps indicate the Proposed Development Site is not located in an area that would flood should a reservoir failure occur.

With the exception of Immingham Dock there are no other significant artificial water sources in proximity to the Site. Flooding from Immingham Dock is assessed in Section 4.2 – Tidal Sources.

The risk of flooding to the Proposed Development Site from all artificial waterbodies is therefore considered to be low.

4.7 Groundwater Sources

Groundwater flooding can occur when groundwater levels exceed ground surface levels as a result of periods of sustained high rainfall. The underlying geology has a major influence on where this type of flooding takes place; it is most likely to occur in low-lying areas underlain by permeable rocks (aquifers) where the water table is more likely to be at shallow depth.

4.7.1 Geology and Hydrogeology

The 1:50,000 British Geological Survey (BGS) Map of Britain indicates that most of the Site is mapped on superficial deposits consisting of beach and tidal flats (clay, silt and sand). The bedrock geology mapped underlying the Site

comprises of Burnham Chalk Formation and Flamborough Chalk Formation. Further information is presented in Section 2.5 – Geology and Hydrogeology.

4.7.2 Groundwater Levels

There are eight historic boreholes located within the proposed development site boundary. Seven of these boreholes are labelled as confidential and therefore data is not accessible. The remaining borehole onsite has a depth of 31.09m and there is no record of groundwater presence.

The Immingham Eastern Ro-Ro Terminal Phase 1 Geo-environmental and Geotechnical Desk Study includes historical borehole records in proximity to the Site, however although these logs show the geology encountered, groundwater strikes were not recorded.

It is unlikely groundwater will be encountered in excavations during construction works with limited below ground works expected to take place. However, should localised groundwater emergence occur it is considered this can easily be dealt with by the use of a small pump, and would not increase flood risk from groundwater sources to the area during or after the construction process.

4.7.3 Groundwater Flooding

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).

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 in the North East Lincolnshire SFRA for the Eastern Coastal Area where the Immingham Eastern Ro-Ro Terminal project is located.

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

Given the limited information on groundwater and potential for groundwater flooding in the area, the risk of flooding from groundwater sources is preliminarily assessed as a medium risk.

4.8 Drainage and Sewerage Infrastructure

Flooding from drains, sewers and surface waters are normally interconnected. Insufficient or reduced drainage capacity within the sewer network can result in drainage capacity being exceeded causing extensive surface water flooding. Likewise, increased volumes of surface water can overload sewers and drains, causing the drainage network to backup and surcharge causing surface water flooding.

4.8.1 Existing Drainage Infrastructure

Anglian Water asset mapping shows there is no surface water drainage infrastructure for which Anglian Water have responsibility located within the proposed development site boundary and that drainage of surface water within both the Site and the wider Port of Immingham is privately owned.

A 600mm diameter Anglian Water foul sewer main runs parallel with the right (southern) bank of Habrough Marsh Drain.

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 (either directly or indirectly via Immingham Dock);
- Drain interceptors across the port estate prevent contaminants from entering the drainage systems;
- Sewage treatment plants provide on-site treatment of effluent before being discharged to the Humber Estuary; and

- An extensive network of drainage pipes, channels and manholes.

For the Immingham Eastern Ro-Ro Terminal project site there is at present limited available information on the existing drainage network. Large paved areas comprising either roller compacted concrete, pavement quality concrete or asphalt appear to have very little surface water drainage. Initial drainage investigations undertaken in 2019[23] noted some gullies have been identified but appear blocked and have been deemed unusable.

There appears to be a small amount of drainage infrastructure that discharges to the existing pumping station in the area near the proposed terminal building. The pumping station receives surface water drainage and process water from the Port of Immingham to the west of the site and this is pumped out into the Humber Estuary, along with treated foul effluent via a 600mm pumped main.

There are four discharge outfalls along Habrough Marsh Drain within the Site boundary. In addition, there is a discharge to the Humber Estuary at the northern corner of the Site, adjacent to the location of the proposed jetty.

4.8.2 Flood Risk from Drainage Infrastructure

Anglian Water is the water company that serves the North-East Lincolnshire administrative area. As part of the SFRA, Anglian Water provided records from their Floods Registers which are used to record flood incidents attributable to their sewer networks, whether that be from foul and / or surface water sewers. The historical mapping, included within the SFRA, shows that the Site is not located in an area that is known to flood from sewer networks.

In addition, there are no historical records of flooding from the private drainage system within the wider Port of Immingham and the limited nature of drainage infrastructure within the Site suggests a limited probability of flooding from this source.

On the basis of the available information, the Site is considered to be at low risk of flooding from drainage and sewerage infrastructure.

[23] Jacobs (2019) Project Nordic

5. Climate Change

The Environment Agency published updated climate change guidance in July 2021[24]. The guidance indicates that climate change is likely to increase

- peak river flows;
- peak rainfall intensity;
- sea level rise; and
- wave height and offshore wind speed.

5.1 Sea Level Allowances

5.1.1 Environment Agency guidance

The Proposed Development lies within the Humber River Basin District. Table 5.1 shows the tidal climate change allowances for the catchment. These allowances account for slow land movement due to 'glacial isostatic adjustment' from the release of pressure at the end of the last ice age. The northern part of the UK is slowly rising, and the southern part is slowly sinking.

Table 5.1: Sea Level Allowance for the Humber River Basin District.

Allowance Category	Total potential change anticipated for '2020s' (2000 to 2035)	Total potential change anticipated for '2050s' (2036 to 2065)	Total potential change anticipated for '2080s' (2066 to 2095)	Total potential change anticipated for '2100s' (2096 to 2125)	Cumulative rise 2000 to 2125
Upper End	6.7 mm	11 mm	15.3 mm	17.6 mm	1.55 m
Higher Central	5.5 mm	8.4 mm	11.1 mm	12.4 mm	1.15 m

Based on the expected lifetime of the Proposed Development, approximately 50 years (from 2021), the potential sea level rise, based on the projections in Table 5.1 that should be added to the water levels provided in Table 4.1 are as follows:

- Higher Central: an increase of 0.452m
- Upper End: an increase of 0.531m

5.1.2 UK Climate Projections 2018 (UKCP18) allowance

Published in November 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.

In coastal locations, where developments are sensitive to flood risk and/or have a lifetime of at least 100 years, it is recommended that assessment of the impact of both the current allowance in 'Flood risk assessments: climate change allowances' 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.

Given the assumed design life of 50 years from 2021, using the latest UKCP18 relative sea level research and assuming a RCP 8.5 95%ile scenario, sea levels are expected to increase by 0.52 m over the duration of the proposed development lifetime.

[24] Environment Agency (2021) Flood risk assessments: climate change allowances. Available online.

5.2 Offshore Wind Speed and Extreme Wave Height Allowance

Wave heights may change because of:

- increased water depths
- changes to the frequency, duration and severity of storms

Table 5.2 shows the climate change allowances for the English coast.

Table 5.2: Offshore Winds Speed and Extreme Wave Height Allowance for the English Coast

Allowance Category	Total potential change anticipated for '2020s' (2000 to 2055)	Total potential change anticipated for '2080s' (2056 to 2125)
Offshore wind speed allowance	5%	10%
Offshore wind speed sensitivity test	10%	10%
Extreme wave height allowance	5%	10%
Extreme wave height sensitivity test	10%	10%

5.3 Peak River Flow Allowances

The Proposed Development lies within the Grimsby and Ancholme Management Catchment. Table 5.3 shows the climate change allowances for the catchment.

Table 5.3: Peak River Flow Allowance for the Grimsby and Ancholme Management Catchment

Allowance Category	Total potential change anticipated for '2020s' (2015 to 2039)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Upper End	21%	19%	33%
Higher Central	9%	5%	12%
Central	4%	-1%	4%

5.3.1 Peak River Flow Allowances for Different Assessments

For FRAs, the "Flood Risk Vulnerability Classification" must be used to categorise the development in order to determine its compatibility with the Flood Zone. The NPSfP designates port development as 'water compatible' whilst the NPPF designates the Proposed Development as 'port development (installations for bulk storage of materials with port or other similar facilities that require coastal or water-side locations)' and therefore classed as 'Essential Infrastructure.'

The vulnerability classification and flood zone designation should be used to decide which peak river flow allowances (allowance category) to use based on the lifetime of the development. The lifetime of the Immingham Eastern Ro-Ro development is 50 years.

Table 5.4 summarises the peak river flow allowances for the different flood risk vulnerability classifications for each flood zone.

Table 5.4: Environment Agency Climate Change Allowances to apply based upon the Flood Zone and Development Land Use Vulnerability

	Water Compatible	Less Vulnerable	More Vulnerable	Highly Vulnerable	Essential Infrastructure
Flood Zone 1	CA	CA	CA	CA	CA
Flood Zone 2	CA	CA	CA	CA	HCA
Flood Zone 3a	CA	CA	CA	X	HCA
Flood Zone 3b	CA	X	X	X	HCA

CA = Central Allowance; HCA = Higher Central Allowance; X = Development not permitted

As the Proposed Development is located in Flood Zone 3 and is classified as water compatible/less vulnerable (NPPF) and water compatible (NPSfP), the central allowance is assessed.

5.4 Peak Rainfall Intensity Allowance

Increased rainfall affects river levels and land and urban drainage systems. Table 5.5 shows anticipated changes in extreme rainfall intensity in small and urban catchments. For FRAs and SFRAs, both the central and upper end allowances need to be assessed to understand the range of impacts.

Table 5.5. Peak Rainfall Intensity Allowance in small and urban catchments

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

5.5 Climate Change Allowances for the Proposed Development

It is assumed that the lifetime of the development is 50 years; therefore, the peak climate change allowances for the lifetime of the Proposed Development should be assessed appropriately as shown in Table 5.6.

Table 5.6: Peak River Flow Allowances for the Proposed Development

Proposed Development: Immingham East Ro-Ro Terminal	
River Basin District	Humber
Management Catchment	Grimsby and Ancholme
Flood Zone	Tidal - Flood Zone 3
	Fluvial – Flood Zone 1
Flood Risk Vulnerability Classification	Essential Infrastructure
Lifetime of Development	50 (Yr 2073)
Tidal Climate Change Allowance	Sea Level Rise Upper End (0.531m)
	Sea Level Rise Higher Central (0.451m)
	Sea Level Rise UKCP18 (0.52m)
Fluvial Climate Change Allowance	2080s Central Allowance (4%)
Peak Rainfall Intensity Allowance	Upper End (40%)

6. Post-Development Flood Risk Assessment

The NPPF requires site specific FRAs accompanying planning applications to assess the risk of all sources of flooding to and from the Proposed Development, and to demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

6.1 Tidal Flood Risk

A horizon of 2073 provides an allowance for climate change over 50 years, the expected lifetime of the Proposed Development. An allowance for the year 2121 goes beyond the predicted lifetime of the project as it is expected the site and quay will continue to operate with port related development beyond the lifetime of the Immingham East Ro-Ro Ferry Terminal.

The impact of climate change on peak still tidal water levels is presented in Table 6.1 and shows climate change is projected to increase water levels in the Humber Estuary. Based on the Higher Central Allowance, as set-out in the Environment Agency Climate Change Guidance (see Section 5), the total allowance for the impact of climate change on still tidal water levels at Immingham has been calculated as:

- 0.451 m for a climate change horizon of 2073; and
- 1.01 mm for a climate change horizon of 2121.

The predicted increases in water levels were calculated using an incremental rate of sea level rise from the date the Northern Area Tidal Model Analysis water levels were published in 2017.

Table 6.1: Extreme Still Water Levels for the Port of Immingham, including climate change scenarios (mAOD)

Year	Annual Probability of Occurrence			
	Based on Environment Agency Guidance Higher Central Allowances		Based on UKCP18 8.5 95%ile scenario	
	0.5%	0.1%	0.5%	0.1%
2017	5.03	5.34		
2073	5.48	5,79	5.55	5.86
2121	6.04	6.35		

The allowance for climate change has been added to the 0.5% AEP event maximum still water level value, 5.03 m AOD, to consider the maximum increase in still water level over the lifetime of the proposed development and beyond. Therefore, the maximum still water level with climate change for the 2073 scenario, based on the Higher Central Environment Agency Climate Change Allowances is 5.48m AOD and the maximum still water level for the 2121 scenario is 6.04m AOD. The 0.5% AEP water level for the year 2073, based on the UKCP18 8.5 95%ile scenario, is 5.55 mAOD.

Based on the Humber Flood Risk Management Strategy[25] (FRMS) the Environment Agency intends to continue maintaining defences for the stretch of the Humber Estuary between North Killingholme and Grimsby, including Immingham, to protect the area in the future. The defences here will be improved as necessary to protect people, businesses and nationally important industry from tidal flooding.

Independent of the planning application for the Immingham Eastern Ro-Ro-Terminal, ABP have agreement with the Environment Agency to raise the flood defences under their jurisdiction along the Port of Immingham frontage to a crest height of 6.1m AOD. It is expected that this would be completed within the lifetime of the proposed development.

As it is proposed to maintain a standard of defence in this location, it is assumed that the Proposed Development site will be protected from tidal flood risk for the lifetime of the proposed development. The risk of direct tidal flooding to the Proposed Development site is therefore not considered to be significant although a residual risk will remain if overtopping or breach of the defences were to occur.

[25]Environment Agency (2008) Humber Flood Risk Management Strategy

6.1.1 Breach of the Flood Defences

The residual flood risk at the Site due to the breaching of the tidal flood defences is not likely to increase due to climate change. However, if a breach event did occur climate change would result in an increase in the depth of floodwater, flow velocity and hazard classification at the Site.

Environment Agency breach mapping for the Year 2115 (presented in Appendix A) shows:

- For the 2115 0.5% and 0.1% AEP breach event the whole Site, with the exception of small, isolated areas, is located within the breach flood extent;
- The southern parcel of land (to the south of Habrough Marsh Drain, is remains as a 'Danger to All' hazard area with a maximum water depth of 1.8+m and a maximum water velocity of 1-1.5 m/s for both the 0.5% and 0.1% AEP events; and
- the north east of the site, directly adjacent to the Humber Estuary is predominantly located in a hazard area classified as 'Danger to Most', however, the area directly behind the flood defences is now classified as 'Danger to All'. Maximum water levels have increased to 1-1.8+m whilst maximum water velocity remains the same as the baseline flood risk scenario.
- Land to the south and east is located in a hazard area classified as 'Danger to Most' for both the 0.5% and 0.1% AEP breach events with a maximum water velocity of 0-1m/s for the 0.5% AEP event and 1-1.5m/s for the 0.1% AEP flood event. Maximum water depth increases from 0.5-1m (0.5% AEP flood event) to a depth of 0.5-1.8m (0.1% AEP flood event).

Over the lifetime of the proposed development, should a breach in the flood defences occur, the hazard, depth and velocity of floodwater would increase above the current baseline. However, though a breach of flood defences would represent an extreme hazard, the likelihood of a breach occurring remains low.

6.1.2 Overtopping of the Flood Defences

The extreme tidal water levels for the year 2115 scenario are in general higher than the current flood defence crest levels. These still water levels do not include an allowance for wave height. When wave height is taken into account, the defences would be insufficient to defend the land behind them from these higher return period events in the future. On this basis, the flood risk at the Site due to overtopping of the tidal flood defences will increase with climate change.

Environment Agency overtopping maps for the Year 2115 (presented in Appendix A) shows:

- For both the 0.5% and 0,1% AEP events in 2115 the flood hazard maps show the Site is located in an area classified as 'Danger for All' hazard area with a maximum water depth of 1.8+m and a maximum flood velocity of 0.3 to 1.0 m/s.

In the HFRMS, outlining the flood risk management plan for the Humber Estuary for the next 25 years and beyond, the Site is located on the boundary of two Flood Areas, Flood Area 23 Halton and Killingholme Marshes and Flood Area 24 Immingham to River Freshney. The proposed management approach in both of these areas is to continue to protect the area and improve the defences that protect existing development.

In addition, ABP plan to increase the crest level of the flood defences along the Port of Immingham frontage, including the location of the proposed development site, within the lifetime of the Immingham Eastern Ro-Ro development. It is therefore considered that the existing defences will be maintained to an appropriate standard to keep providing protection to the area and therefore the risk of flooding to the Site from an overtopping will not increase above the existing scenario.

6.2 Fluvial Flooding

Based on the Environment Agency peak river flow climate change allowances the central allowance (4%) is assessed for the proposed development site.

Under the climate change scenario, water levels within Stallingborough North Beck and Harbrough Marsh Drain will increase and as a consequence, there is potential for flood extents along the watercourses to increase. Given the distance of Stallingborough North Drain from the site and comparing the current modelled flood water levels, as reported in Section 4.4.1, a 4% increase in peak flood flows is not significant and is unlikely to impact the proposed development site.

As a proxy, the EA RoSWF maps, primarily used to represent surface runoff; can also be used to identify flooding from smaller watercourses where there is no associated hydraulic model or modelled flood water data available to inform the assessment. The 1% to 0.1%AEP (low risk) extent can be used as an indication of the impacts or climate change. The mapping shows that the flow from Habrough Marsh Drain stay within bank and do not impact the proposed development site.

It is considered that the risk of fluvial flooding over the lifetime of the proposed development remains the residual risk associated with tide-locking which is a common problem for the watercourses in proximity to the Proposed Development. The occurrence of tide locking is likely to increase in future with rising sea levels and higher peak river flows (expected to increase by 4% between the current baseline and 2073 (Table 5.3)), however the risk of flooding from fluvial sources is expected to remain low.

Should an extreme event occur, the mitigation provided to keep the development safe from tidal flooding is sufficient to protect against the much lower water levels associated with a fluvial flood event which may be encountered over the lifetime of the development.

6.3 Surface Water Runoff Generation and Overland Flow

Climate change must be taken into account when considering surface water runoff generated by development sites. This is usually represented by increasing the peak rainfall intensities (Table 5.5). An increase in rainfall intensity will result in an increase in runoff rates and volumes from the development, exacerbated by increased areas of impermeable surface associated with the Proposed Development, though the impact of this is expected to be minimal due to the scale of the development and existing infrastructure.

As the rainfall intensities and storm events are likely to increase under the climate change scenario, the risk of flooding from surface water, which is currently considered to be very low to low, is expected to increase at the Site unless mitigation measures are taken. Surface water drainage will be required to ensure that any increase in impermeable surface area compared to the existing site does not increase the risk of flooding from surface water, both on the Site and to the surrounding area. Therefore, design of the drainage infrastructure will need to take this into account in accordance with the NPPF and North East Lincolnshire Council policies.

A drainage strategy detailing how surface water runoff will be managed on-site post development will be undertaken to inform the final Environmental Statement. This will include surface water attenuation, consideration of climate change and proposed restricted surface water run-off rates to the Habrough Marsh Drain in line with North East Lindsey IDB requirements.

6.4 Artificial Waterbodies

There are no canals, reservoirs, lakes or ponds nearby to the Site, therefore the risk of flooding from artificial waterbodies is considered to be ‘very low’.

The Port of Immingham dock is considered an artificially enclosed basin. Given the crest level of the lock gates, which have a reverse head system, the dock would only flood if defences breached or were overtopped.

6.5 Groundwater Flooding

The predicted increase in the wetness of winters and the intensity of storm events could impact groundwater level fluctuations across the Site, and possibly increase the level of the water table. As the likelihood of groundwater emergence under the climate change scenario is likely to increase, the potential for groundwater flooding to impact the Proposed Development may also increase.

Given the lack of data with regards groundwater levels at the Site, the Site is considered to remain at medium risk of groundwater. The presence of hardstanding ground associated with the Proposed Development will create an impermeable barrier at the surface. This will prevent groundwater emergence across the Site. Therefore, the risk of groundwater flooding is considered to remain a medium risk throughout the lifetime of the development.

6.6 Flooding from Drainage Infrastructure

It is difficult to precisely predict the impact of climate change on flooding from drainage infrastructure. However, with the projected increases in rainfall intensity, a greater amount of surface water runoff will be generated on site. In order to account for this increase, new drainage and sewer systems will be required on site and should be designed to accommodate flows under climate change scenarios, incorporating SuDS where possible. Existing

drain and sewer systems may require upgrading to maintain the same level of service or new infrastructure be designed to allow for greater hydraulic capacities. The risk of flooding from drainage infrastructure will remain low over the lifetime of the development.

A drainage strategy detailing how surface water runoff will be managed on-site post development will be undertaken to inform the final Environmental Statement.

7. Flood Risk Management Measures

The following mitigation measures will be considered to reduce the probability of flooding during extreme events and residual risks should also be considered. These measures will help to reduce the impact of a flood event should it occur.

7.1 Development Levels

There are three specific levels that must be considered for a proposed development at risk of flooding:

- Finished floor levels;
- Advisory levels for critical plant/equipment; and
- Safe refuge level for personnel.

7.1.1 Finished Floor Levels

The NPSfP classifies port development as 'water compatible' and as such the North East Lincolnshire SFRA states "*essential electrical equipment should be raised at least 300mm above the Critical Flood Level and that appropriate mitigation measures/flood resilience techniques are incorporated into the development*". The Critical flood level is noted as the estimated flood water level for the 0.5% AEP climate change breach flood event.

The NPPF and associated guidance classifies the proposed development as 'water compatible' with offices, terminal building etc, classified as 'less vulnerable' development. For less vulnerable development the SFRA states '*the FRA should contain evidence to justify the chosen finished floor level, which should be raised as high as possible. Where practicable the floor level of single storey buildings should be set at least 300mm above the Critical Flood Level. If this is not practicable the FRA should identify an area of safe refuge or an appropriate evacuation strategy'.*

Where practicable, finished floor levels will be set in line with the SFRA standing advice, i.e. 300mm above the 0.5% AEP climate change breach flood event. Where this is not possible safe refuge will be provided on-site (see Section 7.1.3).

7.1.2 Advisory levels for critical plant/equipment

The minimum installation level for critical plant and machinery should be considered. To ensure that they remain dry, it is advised that critical plant/equipment (as defined by ABP), should be raised and secured above the expected 0.5% AEP climate change breach scenario floodwater level where it is practicable to do so.

7.1.3 Safe refuge level for personnel

In the event that flooding occurs with such speed that personnel on the proposed development site are not able to evacuate, safe refuges should be provided within buildings on the Site. These areas will allow any individuals trapped on the proposed development site to wait safely until the flooding subsides or rescue can be affected.

Safe refuge areas should have a freeboard of 0.5m above the flood level corresponding to the 0.5% AEP breach flood event with climate change allowance. This could be achieved by accessing a second level of office or a mezzanine area. Provision for disabled persons to reach these areas should also be considered as part of the design.

7.2 Flood Resistant and Resilient Design

Flood resistant and resilient design can reduce the damage that occurs to buildings from flooding and reduce recovery time.

The following methods of flood resistant and resilient construction will be included:

- Office and Welfare Facilities - solid floor construction *e.g.* continuous concrete ground floor slab minimum of 150 mm thick reinforced with mesh on lapped and tapped 1200 gauge visqueen damp proof membrane;
- Office and Welfare Facilities - flood resilient construction techniques to 300 mm above the 0.5% AEP breach water level with climate change allowance.

- If technically feasible, electricity supply cables will enter buildings from roof level and wired downwards; electrical sockets to be positioned at least 600 mm above floor level;
- If technically feasible, critical equipment (to be defined by ABP) will be raised above the expected 0.5% breach scenario water level with climate change allowance;
- Anti-flood valves will be installed on internal building drainage; and
- Watertight external door construction will be considered where reasonably practical.

7.3 Emergency Evacuation and Planning

The Northern Area Tidal Breach Mapping Study outputs provided by the Environment Agency (Appendix A), suggest that the Site is at risk of being flooded to significant depths (>1.8 m) in the event of a breach in the defences coinciding with the 0.5% AEP climate change flood event. Although the risk to the proposed development site in the event of a breach is high, the probability of a breach occurring is considered to be low.

Developments in flood risk areas must provide safe, dry access and egress to enable evacuation of people, routes for emergency services and flood defence authorities to carry-out the necessary duties during a flood event.

As the Site is located within an extreme hazard area a Flood Warning and Evacuation Plan (FWEP) is required for the site (either a standalone FWEP for the proposed development or inclusion of the proposed development in the wider Port of Immingham response plan).

A FWEP will inform and assist the site owner/ occupier on the protocols and procedures required to reduce the risk to site occupants and infrastructure from flooding and detail the emergency evacuation procedures required in the event of a breach of the tidal flood defences during both construction and operation of the site.

Any no notice flooding events following breaches in defences or surface water flooding will require a safe refuge such that all occupants can take immediate action to keep themselves safe without relying on intervention from outside (see Section 7.1.3 for further details).

7.4 Flood Warnings and Alerts

The Environment Agency operates a Flood Warning Service[26] for many areas at risk of fluvial and tidal flooding. The service currently consists of three stages:

- Flood Alert - flooding is possible and that you need to be prepared;
- Flood Warning - flooding is expected and that you should take immediate action. Action should be taken when a flood warning is issued and not wait for a severe flood warning; and
- Severe Flood Warning - there is severe flooding and danger to life. These are issued when flooding is posing significant risk to life or disruption to communities.

Each code gives an indication of the expected level of danger. Although some members of the public find Flood Alerts useful, they are predominantly targeted towards professional partners, alerting them to expected flooding of low-lying land and roads.

All stages of warning are disseminated via the ‘Flood Warning Service’ which is a free service that provides warnings to registered customers by telephone, mobile, email, SMS text message and fax. Local radio, TV, loudhailers, sirens and Floodline are also used to deliver flood warning messages.

The Floodline number is 0345 988 1188, and it is always kept up to date with the Environment Agency's latest flooding information. More detailed information on the likely extent and time scale of these warnings can be obtained by request from the Environment Agency, by their ‘Quickdial’ recorded information service, or via their website.

The Port of Immingham is already subscribed to this service and it is assumed that the proposed development will receive warnings and alerts as part of this ongoing service. The relevant details will be included in the FWEP for the proposed development site.

[26] Environment Agency. 2018 Flood Warning Service- Flood warnings for England.

The Environment Agency aim to issue fluvial Flood Warnings at least 2 hours prior to the onset of flooding mainly based upon actual river level rise. Tidal flood warnings are issued based on forecast information, and therefore the lead time provided is longer. The Environment Agency aim to issue tidal Flood Warnings a minimum of 6 hours in advance but depending on confidence in the forecast they could be issued 24 or even 36 hours in advance.

Tidal flood warnings are triggered by a combination of forecast high water (astronomical tide level plus any additional surge), forecast wind speed, and forecast wind direction. Due to the flood defences in place, it is quite rare that Flood Warnings are issued for tides. It is more common to issue the lower-level Flood Alerts, which are issued when the Environment Agency expect wave splash and wind-blown spray to cause localised pooling of water on land but no actual flooding of properties.

Information regarding *'What to do in the event of a flood?'* will be included in the site health and safety plan and as a controlled site; all personnel entering the site will be inducted and be aware of all health and safety procedures. In addition, site notices, including methods of evacuation and notification of dry refuge areas, will be provide information to the general public using the Immingham Eastern Ro-Ro terminal.

7.5 Continuity of the Tidal Flood Defences

The Proposed Development includes the construction of the jetty approach road and pipework over the top of the existing flood defences.

The Environment Agency require assurance that the integrity of any existing flood defence on site, whether maintained by the Environment Agency or other parties, would be maintained at all times during the construction of new jetty and over the duration of the operational lifetime of the development.

Detailed design development is currently on-going however ABP has confirmed the following:

- 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
- access to and along the flood defence frontage will not be affected

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.

The works to cross the flood defences will require a Flood Defence Consent (or Protective Provisions if the application is an Order). Once detailed design development drawings are available these will be forwarded to the Environment Agency to gain their agreement in principle to the design.

7.6 Surface Water Management

Given the limited drainage infrastructure within the proposed development site (see Section 4.8.1), a new, separate foul and surface water drainage system will be constructed for the Proposed Development. Further details on the design of the drainage system, including attenuation, restricted discharge to Habrough Marsh Drain and accounting for climate change, will be provided as part of the full Environment Statement.

8. Off-Site Impacts and Residual Risk

8.1 Off-Site Impacts

A new surface water drainage system will be constructed that includes surface water attenuation and restricts surface water run-ff to the Habrough Marsh Drain therefore betterment will provided compared to the baseline scenario and there will be no off-site impacts associated with surface water run-off.

No ground raising is proposed as part of the Immingham Eastern R0-Ro terminal. The proposed development site will utilise existing port areas for HGV/trailer/container storage comprising of large, flat parking areas. The only built development are the proposed terminal buildings, the footprint of the internal bridge that crosses the railway and internal access roads, and the approach road to the jetty that passes above the flood defences. Given the footprint of new development and considering the extent of flooding throughout the Port of Immingham and the wider area should overtopping or breach of flood defences occur, it is unlikely that any increase in tidal flood water level due to loss of floodplain storage will significantly increase the risk of flooding offsite.

The proposed development is unlikely to increase impermeable area above that present on site for the baseline scenario therefore no increases in surface water run-off as a consequence of the proposed development will occur. However, over the lifetime of the proposed development, climate change will increase the intensity of storm events and surface water run-off rates and volumes will increase. A surface water drainage strategy (to be submitted as part of the full Environmental Statement) will outline how the drainage infrastructure within the proposed development site will be designed to not increase flood risk elsewhere. Provided surface water is managed in accordance with the final drainage strategy, the Immingham Eastern Ro-Ro Terminal will not result in any offsite flood risk impacts over the duration of its the operational lifetime.

8.2 Residual Risk

Over the lifetime of the proposed development there remains a residual risk of tidal flooding should the flood defences over-top or a breach event occur. The mitigation measures outlined in Section 7 detail how this residual risk of flooding can be managed via flood warnings, minimum development levels, flood resistance and resilience measures etc. so that proposed development site and its occupants remain safe. In addition, the tidal flood defences are inspected twice a year by the Environment Agency to ensure that they remain fit for purpose.

With an increase in tidal water levels and peak fluvial flood water levels, tidelocking of the Habrough Marsh Drain remains a residual risk over the lifetime of the proposed development. It is unlikely that significant flooding would occur over a tidal cycle, however mitigation included on-site to protect against tidal flooding will be sufficient to protect the proposed development should fluvial flooding from a tidelocking scenario occur.

Failure, blockage or exceedance of the drainage systems (including drains and any attenuation features) are a potential residual risk to the Site and the surrounding area. Regular inspection and maintenance will be undertaken to prevent blockages of drainage infrastructure.

Legislation requires that LPAs are responsible for the clear agreements to be put in place for ongoing maintenance requirements for proposed SuDS over the lifetime of the development, however, the proposed drainage system will be privately owned infrastructure and as such it will be ABP who will responsible for the drainage features on-site whilst the Habrough Marsh Drain will continue to fall under the jurisdiction of the North East Lindsey IDB.

Drainage infrastructure will be regularly inspected and maintained to certify their design standard is not compromised over the lifetime of the development.

There also remains the risk of surface water flooding in the event of a storm in excess of the ‘design storm’. To manage the risk from exceedance flows, the drainage design will follow appropriate guidance (i.e. CIRIA C635[27]) to provide flow paths such that any overland flow is directed away from impacting any surrounding development.

[27] Balmforth et al. (2006) Designing for Exceedance in Urban Drainage – Good Practice (CIRIA 635).

9. Conclusions

AECOM has prepared this FRA on behalf of Associated British Ports in accordance with the NPSfP, and the NPPF and associated PPG, to support a planning application for the Immingham Eastern Ro-Ro Terminal located at the Port of Immingham.

The following conclusions can be made regarding flood risk to the proposed development site and to off-site areas as a result of the proposed development:

- The FRA has considered all potential sources of flooding to the proposed development site, including tidal, fluvial, groundwater, land drainage, overland flow, artificial sources, and sewer drainage arrangements. Climate change has also been considered, which is expected to increase the peak rainfall intensity by up to 40%, increase peak river flows by up to 4% and increase sea levels by up to 0.55m over the lifetime of the development;
- The Environment Agency FMfP shows the site is located in Flood Zone 3 (not taking into account the presence of flood defences), and as such is at high risk of tidal flooding from the River Humber.
- The Site is located behind tidal flood defences along the south bank of the Humber Estuary. Tidal flood defences adjacent to the development site provide a standard of protection for the 0.5% AEP event (based on the Still Water Level, not taking into account tidal surges or wave height).
- The North East Lincolnshire SFRA indicates that the principal residual risks in the Immingham area would be a failure or overtopping of the flood defences. The breach assessment identified that the site is located in an area with a 'Significant to Extreme' hazard rating, representative of water that is both deep and fast flowing and a danger to all whilst the overtopping assessment identified that the site is currently located in an area with a 'Low to Moderate' hazard rating, but this would increase to an 'Extreme' hazard rating when climate change is taken into account. It is noted, however, that the probability of a breach or overtopping of the defences occurring is considered to be low;
- The risk of flooding from fluvial sources, both Main River and Ordinary is considered to be low over the lifetime of the proposed development, however, there remains a residual risk of fluvial flooding from Ordinary Watercourses under tidelocking scenarios during extreme events;
- The NPSfP and PPG considers port related development to be classed as 'water compatible' development. In addition, commercial buildings such as the offices and terminal buildings, are considered to be 'less vulnerable' development under the PPG. It is therefore considered appropriate in the planning context for development in Flood Zones 2 and 3, subject to appropriate mitigation measures being implemented for any identified flood risk.
- Based on the conclusions of the PEIR Chapter 7: Physical Processes, the marine element of the proposed development will have no / little impact of significance on water levels, flow speed, flood direction or wave propagation;
- The Environment Agency RoFSW maps indicate the Site is generally at very low risk of flooding from surface water and the construction of the Proposed Development will result in a minimal increase;
- The risk of flooding from artificial sources and drainage infrastructure is considered to be low;
- Given the limited data with regards groundwater levels at the proposed development site, the preliminary assessment of flooding from groundwater sources is considered to be a medium risk;
- Flood resilience and resistance measures for managing the residual flood risk to the proposed Development will be adopted;
- The Site will subscribe to the Environment Agency's Flood Warning Service and a Flood Warning Evacuation Plan will be created for the site. The plan will detail the procedures for site occupants to undertake in the event that a flood warning is issued, including the details of appropriate evacuation routes from the site and the location of safe refuge areas, should evacuation not be possible;
- 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

- A drainage strategy detailing how surface water runoff will be managed on-site post development will be provided as part of the full Environmental Statement. This will outline requirements for attenuation storage and restricted run-off rates (in line with North East Lindsey IDB requirements) to ensure that betterment over the baseline scenario is achieved; and
- It is considered that there will be no off-site impacts as a result of the proposed development in relation to flood risk.

At this preliminary stage, based on the findings to date, AECOM considers that the flood risk from all sources, to and from the Site can be mitigated to a level which is low and acceptable.

Appendix A Statutory Consultation Responses

will.madge@aecom.com

Our ref: CCN-2021-236910

Date: 08/11/2021

Dear William

Provision of Flood Risk Information for Immingham Eastern Ro-Ro Terminal.

Thank you for your request to use our flood risk information for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

If you are preparing a Flood Risk Assessment (FRA) for this site, please note this information may not be sufficient by itself to produce an adequate FRA to demonstrate the development is safe over its lifetime. Additional information may be required to carry out an appropriate assessment of all risk, such as consequence of a breach in defences.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

1. Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

2. Historic Flood Event Outlines

A copy of the Historic Flood Event Outlines Map showing the extent of previous recorded flooding in your area is attached. This only covers information we hold and it is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change. It is possible other flooding may have occurred which other organisations, such as the Lead Local Flood Authority (ie top tier council), Local Authority or Internal Drainage Board (where they exist), may have records.

3. Schemes in the area

There are no ongoing capital projects to reduce or sustain the current flood risk to this site.

4. 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 (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

5. Tidal Flood Risk Information

The existing tidal defences protecting this site consist of wave walls, revetments and flood doors.

They are in fair condition and reduce the risk of flooding (at the defence) to a 0.5% (1 in 200) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Refer to paragraph 3 for details of any ongoing capital projects to reduce the flood risk to this site.

5.2 Tidal Flood Levels

The attached data sheets show our current best estimate for extreme tide levels.

Please read the information notes on the data sheets.

5.3 Tidal Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available.

The number of locations we have this information for is expected to increase in time.

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

5.3.1 Tidal Hazard Mapping – Breaches

- Year 2006 0.5% (1 in 200) chance
- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

5.3.2 Tidal Hazard Mapping – Overtopping

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from simulated overtopping of defences for the following scenarios:

- Year 2006 0.5% (1 in 200) chance
- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

6. Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at lnplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals.

General advice on flood risk assessment for planning applications can be found on GOV.UK at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Climate change will increase flood risk due to overtopping of defences. Please note, unless specified otherwise, the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in February 2016. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

7. Data Licence and Other Supporting Information

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

This information is provided in accordance with the Open Government Licence which can be found here: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Further information on flood risk can be found on the GOV.UK website at:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

8. Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. Additional information may be available from other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist).

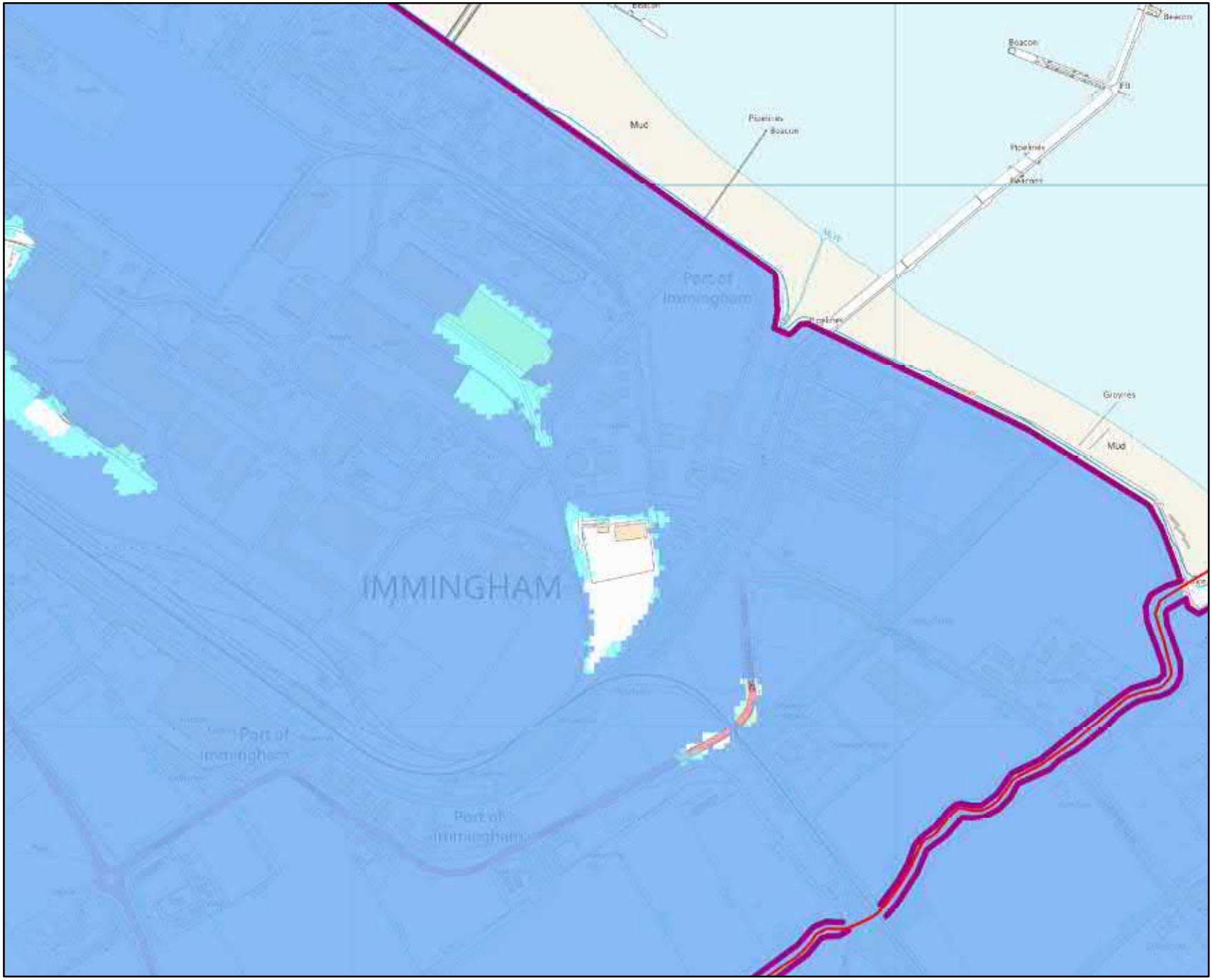
I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact Frederic Stuhldreer using the email address below.

Yours sincerely,

for Paul Payne
South Humber and East Coast Partnerships and Strategic Overview Team Leader
e-mail PSO_Coastal@environment-agency.gov.uk

Enc.
Flood Map
Historic Flood Event Outlines Map
Tidal Level Data Sheets - Map and Tables
Tidal Breach Points – Locations Map
Hazard Mapping – Breaching
Hazard Mapping – Overtopping

Flood Map centred on TA 20465 15437 - created October 2021 [Ref: CCN-2021-236910]



Environment Agency

Scale 1:10,000

N
W E
S

Legend

- Main River
- Raised Defences
- Flood Storage Area
- Areas at Risk of Flooding from Rivers or the Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.

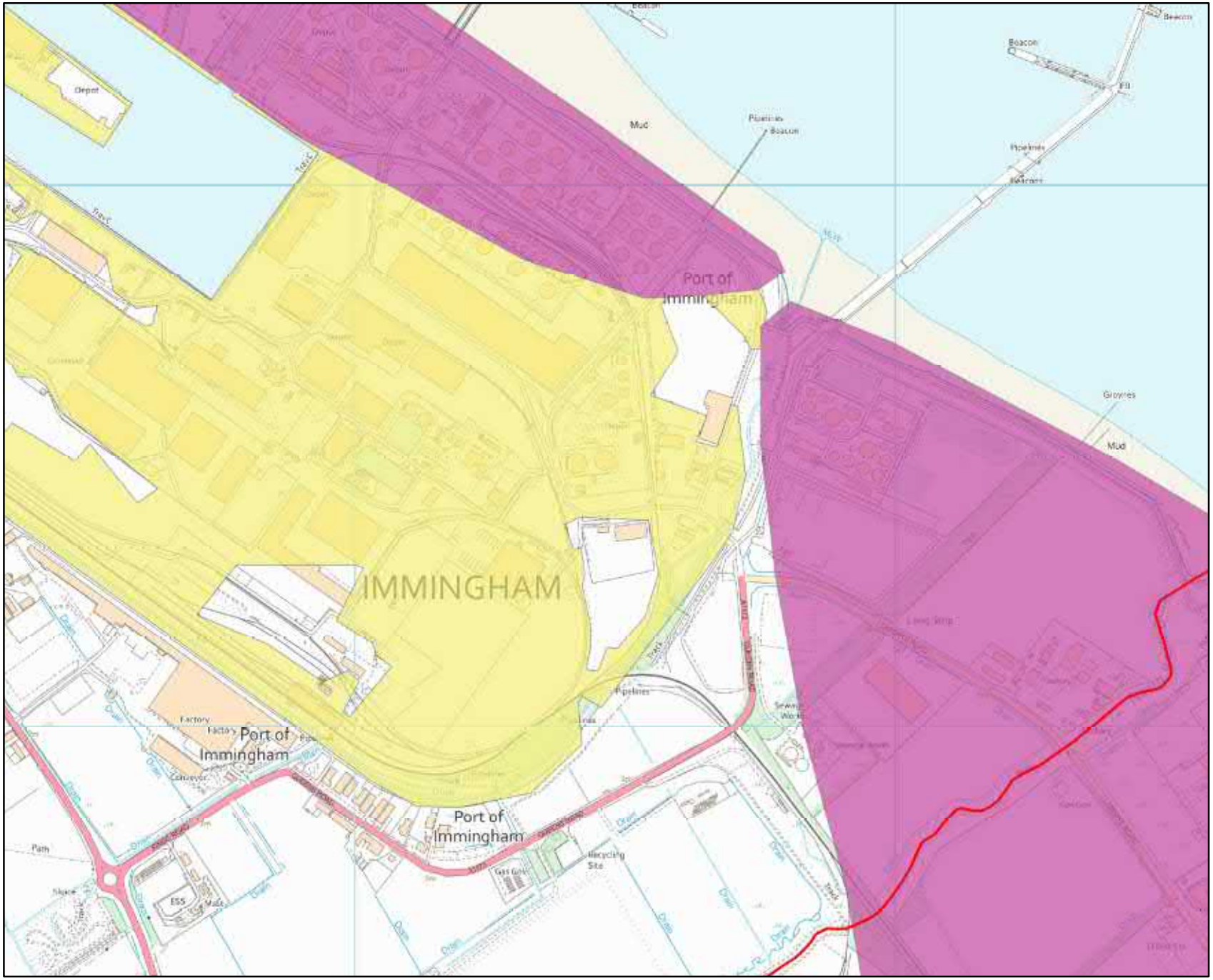
- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Historic Flood Map centred on TA 20465 15437 - created October 2021 [Ref: CCN-2021-236910]



Environment Agency

Scale 1:10,000

N
W E
S

Legend

- Main River
- 1953-January_Lincolnshire Coastline
- 2013-December_Tidal Surge

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

East Coast and Wash - 2018 Coastal Flood Boundary [CFB] Dataset
Key Node Points

Environment Agency

Scale 1:550,000

N
W E
S

▲ East Coast and Wash

See seperate data sheet for predicted flood levels

Created by the Partnerships and Strategic Overview Team, Lincoln

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

CFB Ref	Location	Easting	Northing	Annual Chance (1 in x) of Tide Level in metres ODN																		
				1			10			50			100			200			300			1000		
				Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound		
				2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
3888	**Immingham**	520440	417625	4.16	4.17	4.19	4.50	4.53	4.62	4.73	4.80	5.00	4.83	4.93	5.19	4.93	5.06	5.41	4.98	5.14	5.55	5.15	5.38	6.01
3890	**Haborough Marsh**	522100	416512	4.14	4.15	4.17	4.48	4.51	4.60	4.70	4.77	4.97	4.80	4.90	5.16	4.90	5.03	5.38	4.94	5.10	5.51	5.11	5.34	5.97
3898	**Grimsby**	529295	413162	3.98	3.99	4.01	4.31	4.34	4.43	4.53	4.60	4.80	4.61	4.71	4.97	4.71	4.84	5.19	4.74	4.90	5.31	4.88	5.11	5.74
3906	**Buck Beck**	534709	407369	3.87	3.88	3.90	4.19	4.23	4.31	4.41	4.50	4.68	4.50	4.61	4.86	4.61	4.75	5.10	4.64	4.82	5.22	4.80	5.05	5.66
3910	**Tetney**	538035	405537	3.85	3.86	3.89	4.17	4.22	4.30	4.40	4.50	4.67	4.49	4.61	4.86	4.60	4.75	5.10	4.63	4.82	5.21	4.80	5.06	5.66
3918	**Donna Nook**	544641	401997	3.82	3.83	3.86	4.14	4.19	4.27	4.38	4.48	4.65	4.47	4.60	4.85	4.58	4.74	5.10	4.63	4.82	5.22	4.81	5.08	5.68
3928	**Saltfleet**	549131	393360	3.78	3.79	3.82	4.11	4.16	4.26	4.36	4.46	4.64	4.47	4.59	4.86	4.57	4.74	5.11	4.63	4.83	5.25	4.83	5.11	5.74
3942	**Boygrift**	555131	380860	3.72	3.74	3.77	4.06	4.11	4.22	4.33	4.43	4.65	4.43	4.57	4.87	4.56	4.73	5.13	4.62	4.83	5.28	4.85	5.15	5.82
3968	**Gibraltar Point**	557652	356181	4.16	4.17	4.20	4.51	4.56	4.67	4.76	4.85	5.08	4.85	4.97	5.27	4.94	5.10	5.49	4.99	5.18	5.63	5.14	5.41	6.09
3992_14	**Hobhole**	535990	340116	4.96	4.97	5.01	5.40	5.44	5.56	5.66	5.76	5.98	5.78	5.90	6.20	5.88	6.04	6.44	5.92	6.11	6.57	6.03	6.31	6.99
	Grand Sluice*	532366	344510	4.93	4.94	4.98	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
3992_9	**Boston Barrier**	532754	342852	4.93	4.94	4.98	5.41	5.45	5.57	5.73	5.83	6.05	5.85	5.97	6.27	5.93	6.09	6.49	5.94	6.13	6.59	5.98	6.26	6.94
3992_5	**Fosdyke Bridge**	531886	332234	4.87	4.88	4.92	5.31	5.35	5.47	5.58	5.68	5.90	5.71	5.83	6.13	5.82	5.98	6.38	5.87	6.06	6.52	6.01	6.29	6.97
4008	**West Lighthouse**	550094	329971	4.87	4.88	4.91	5.21	5.26	5.37	5.46	5.56	5.78	5.56	5.68	5.98	5.66	5.82	6.21	5.71	5.90	6.35	5.86	6.14	6.81
-	**Marsh Road**	525988	324065	-	5.04	-	-	5.44	-	-	5.73	-	-	5.85	-	-	5.98	-	-	-	-	-	-	-
-	**Wisbech**	546110	309940	-	4.83	-	-	5.25	-	-	5.53	-	-	5.66	-	-	5.78	-	-	-	-	-	-	-
-	**Dog-in-a-Doublet**	527200	299287	-	3.67	-	-	4.00	-	-	4.22	-	-	4.32	-	-	4.42	-	-	-	-	-	-	-

See next page for notes

Customer services line: 03708 506 506
Calls to 03 numbers cost the same as calls to standard geographic numbers
(i.e. numbers beginning with 01 or 02)

Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

NOTES:

The following notes apply to all CFB sites (ie all on table excluding Marsh Road, Wisbech, Dog-in-a-Doublet)

- The base date for the data is 2017.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590

The following notes apply to all Marsh Road, Wisbech, Dog-in-a-Doublet

- The base date for the data is 2006
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- These levels will be updated as their respective tidal river models are updated.

The following notes apply to Grand Sluice

- The data is based on CFB 2018 data for Boston Barrier site, capped at 5.3mAOD to reflect use of the barrier.
- The base date for the data is 2017
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590

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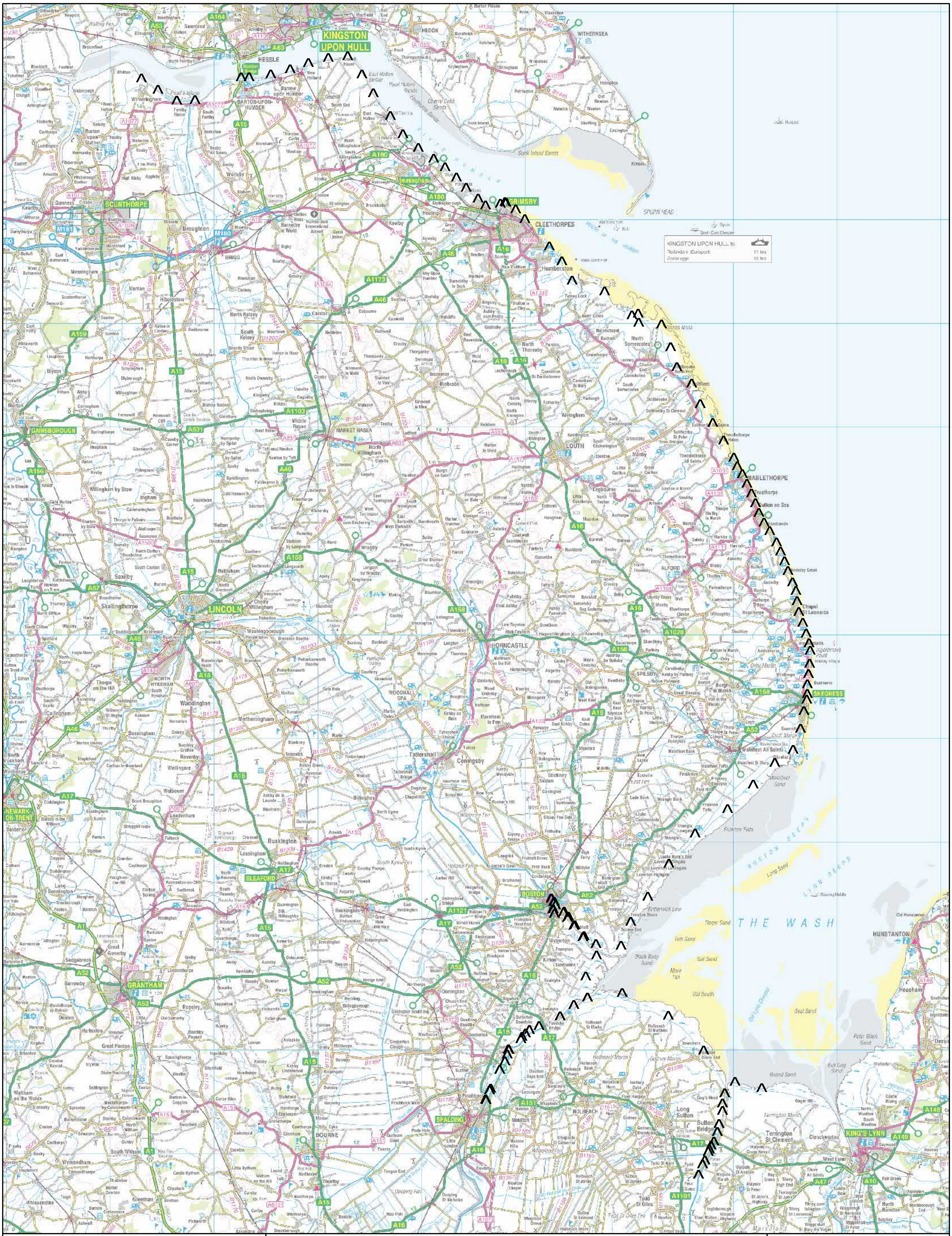
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency



^ **Modelled Breach Locations**

0 3.5 7 14
Kilometres

This map indicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

General Enquiries No: 03708 506 506.
Weekday daytime calls cost 5p plus up to 6pm from BT Weekend Unlimited. Mobile and other providers charges may vary

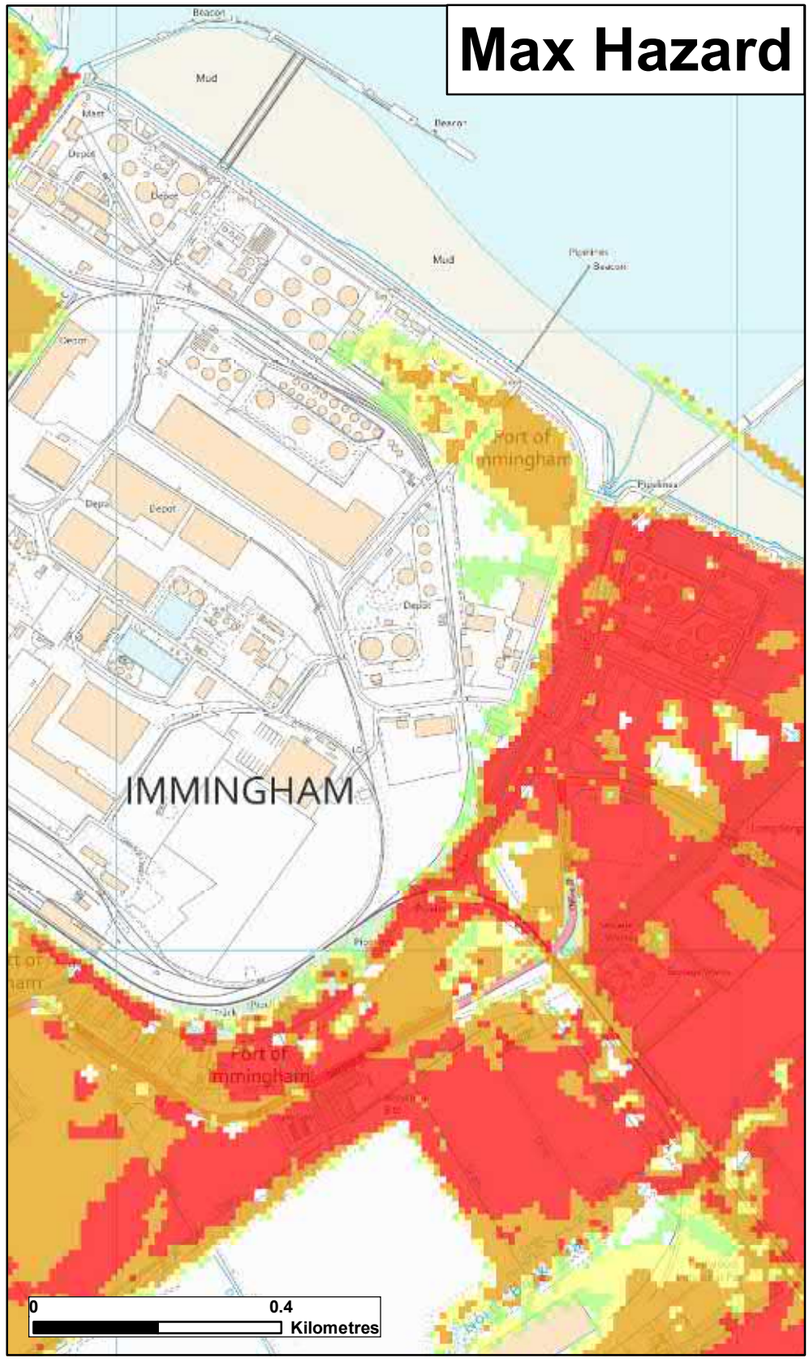
Environment Agency

Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

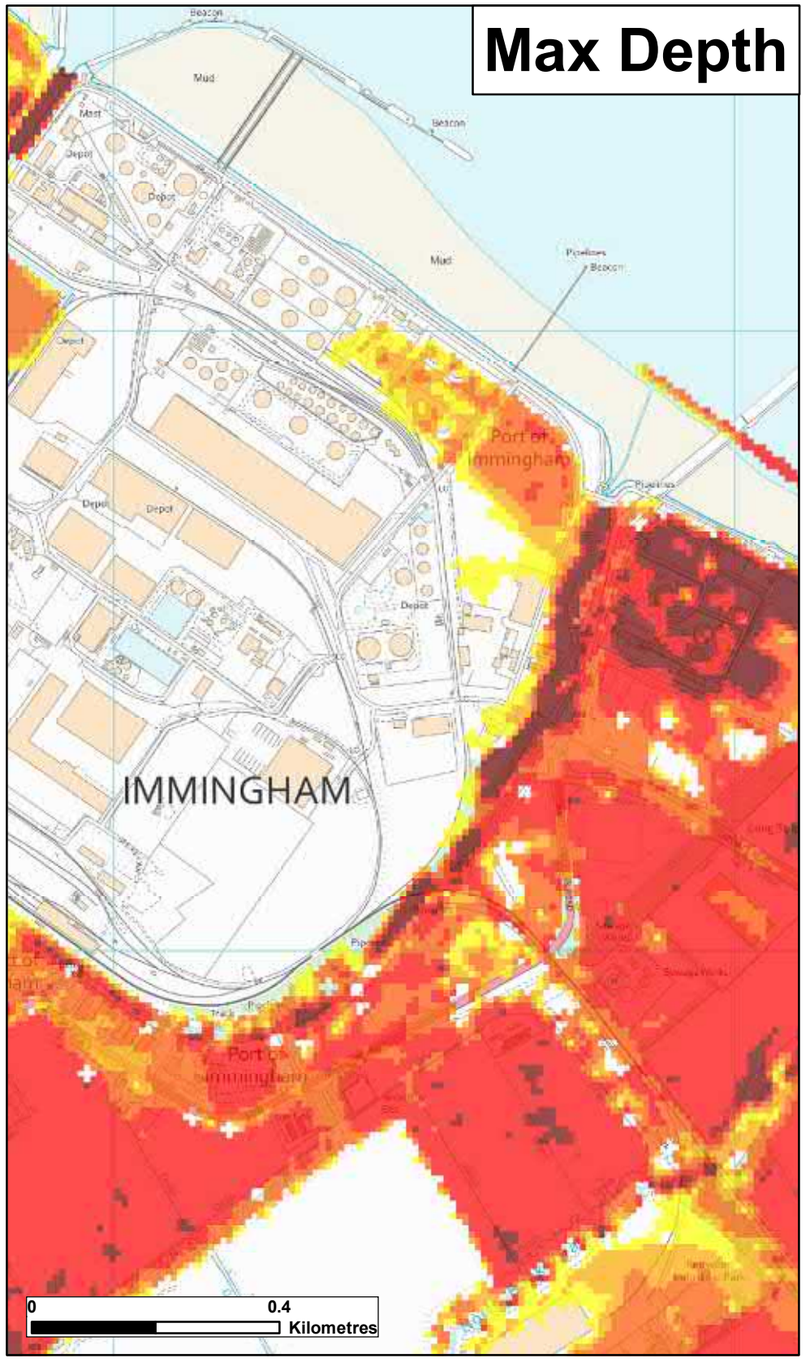
Northern Area Tidal Hazard Mapping

Location of Modelled Breaches

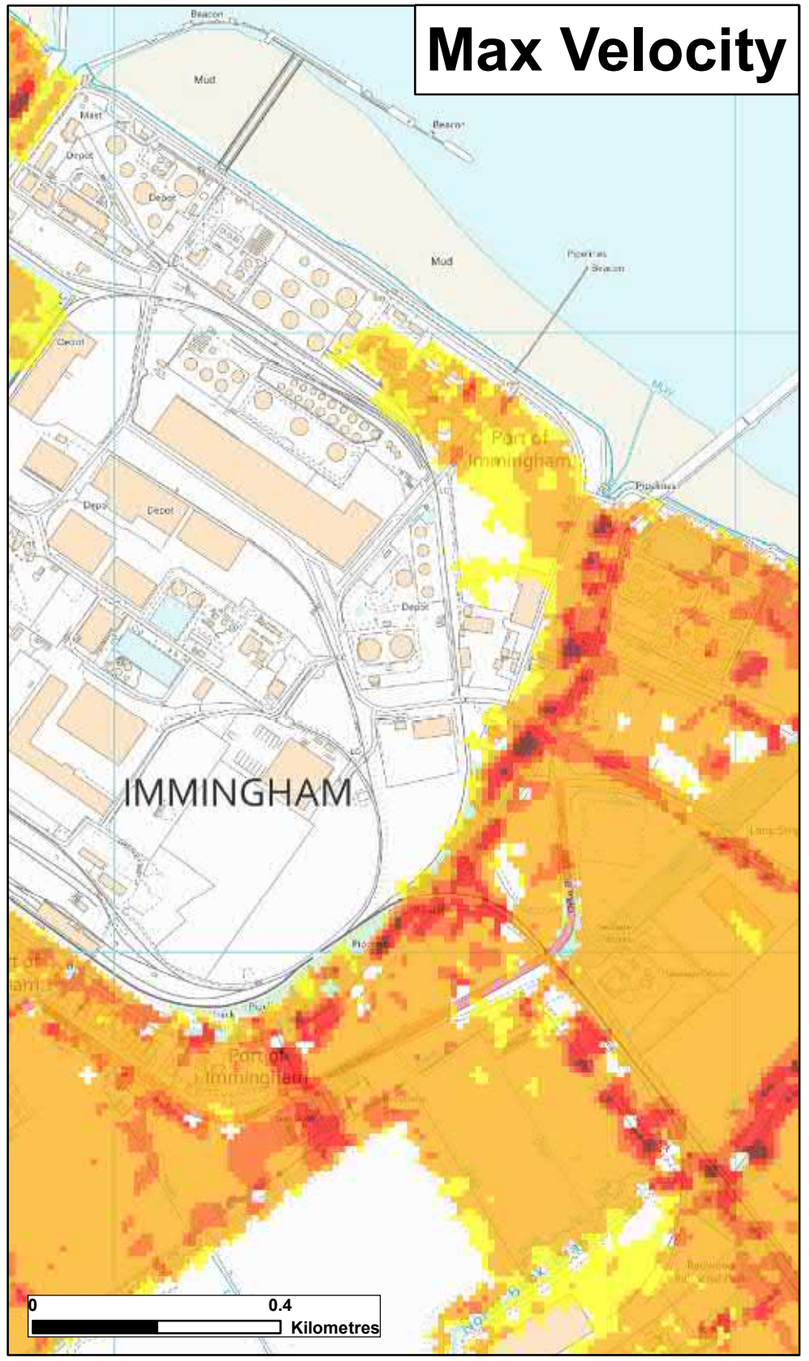
Max Hazard



Max Depth



Max Velocity



★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	October 2021	Scenario year	2006	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2021-236910

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

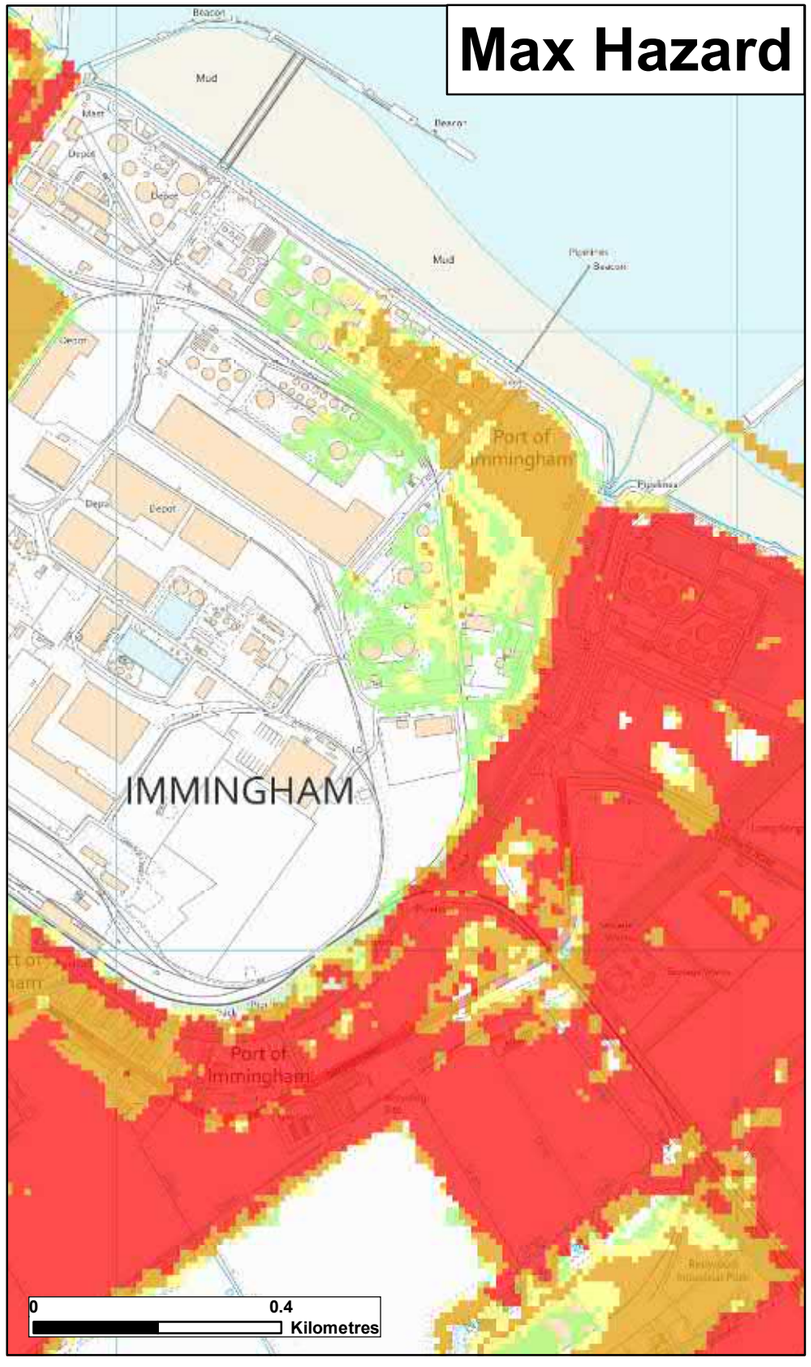
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

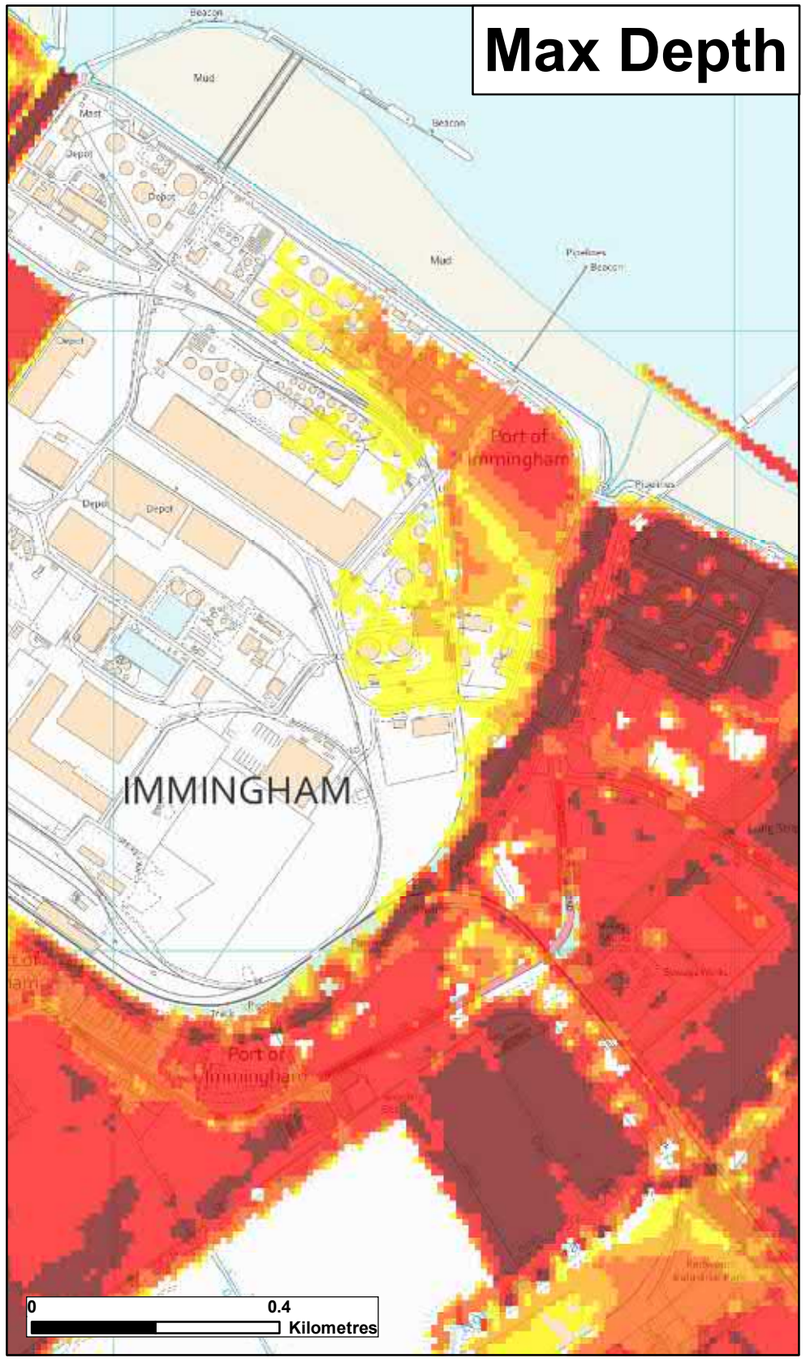
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

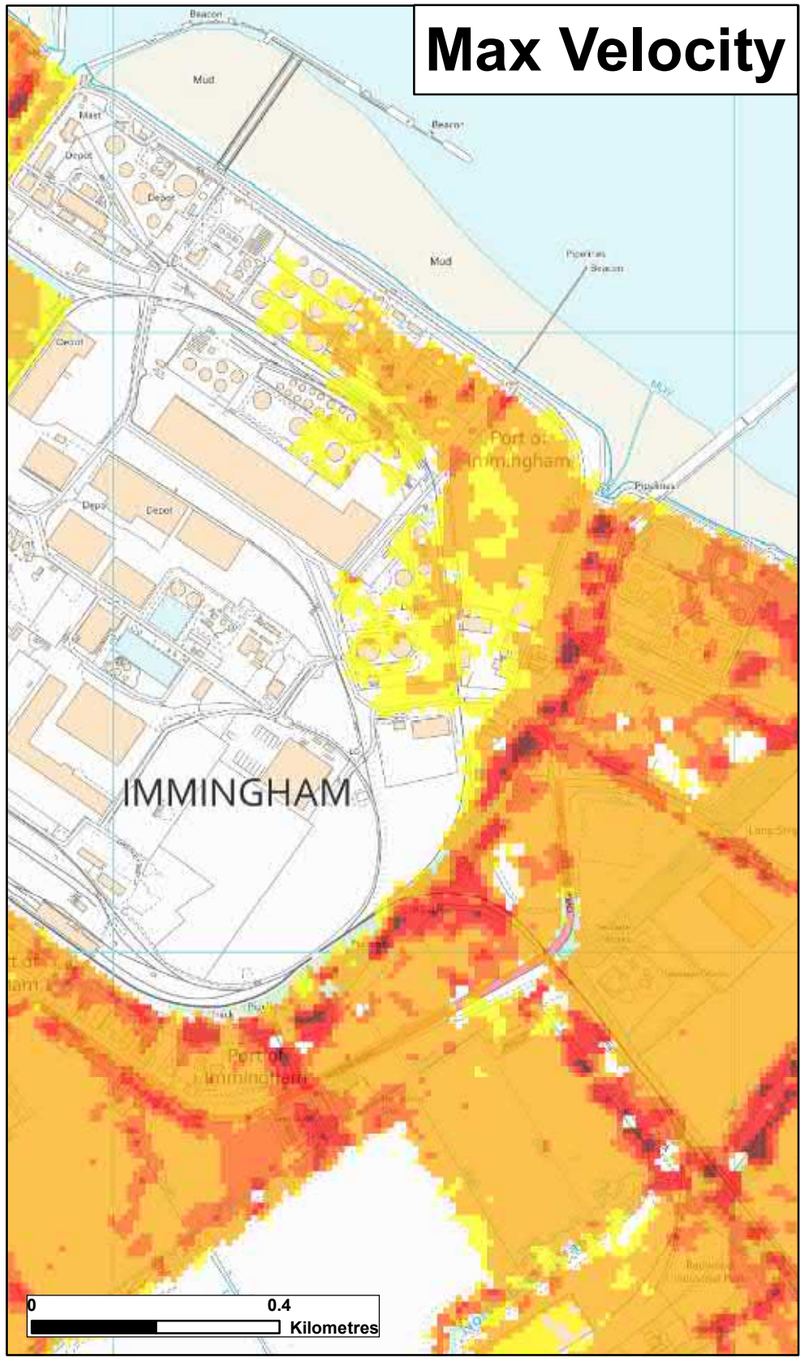
Environment Agency

Lincolnshire and Northamptonshire Hazard mapping

Map Centred on TA 20465 15437







★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	October 2021	**Scenario year**	2006	**Scenario Annual Chance**	0.1% (1 in 1000)	**CCN Number**	CCN-2021-236910

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

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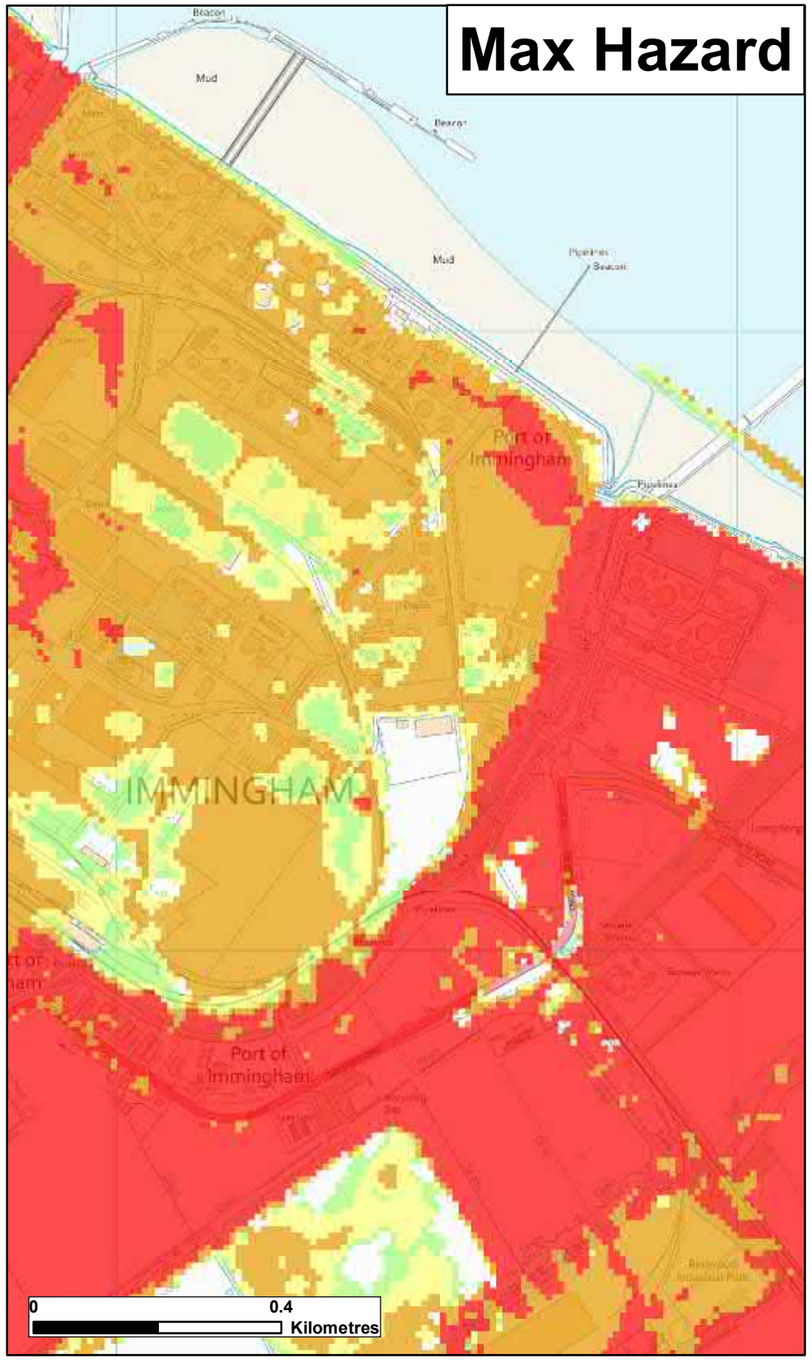
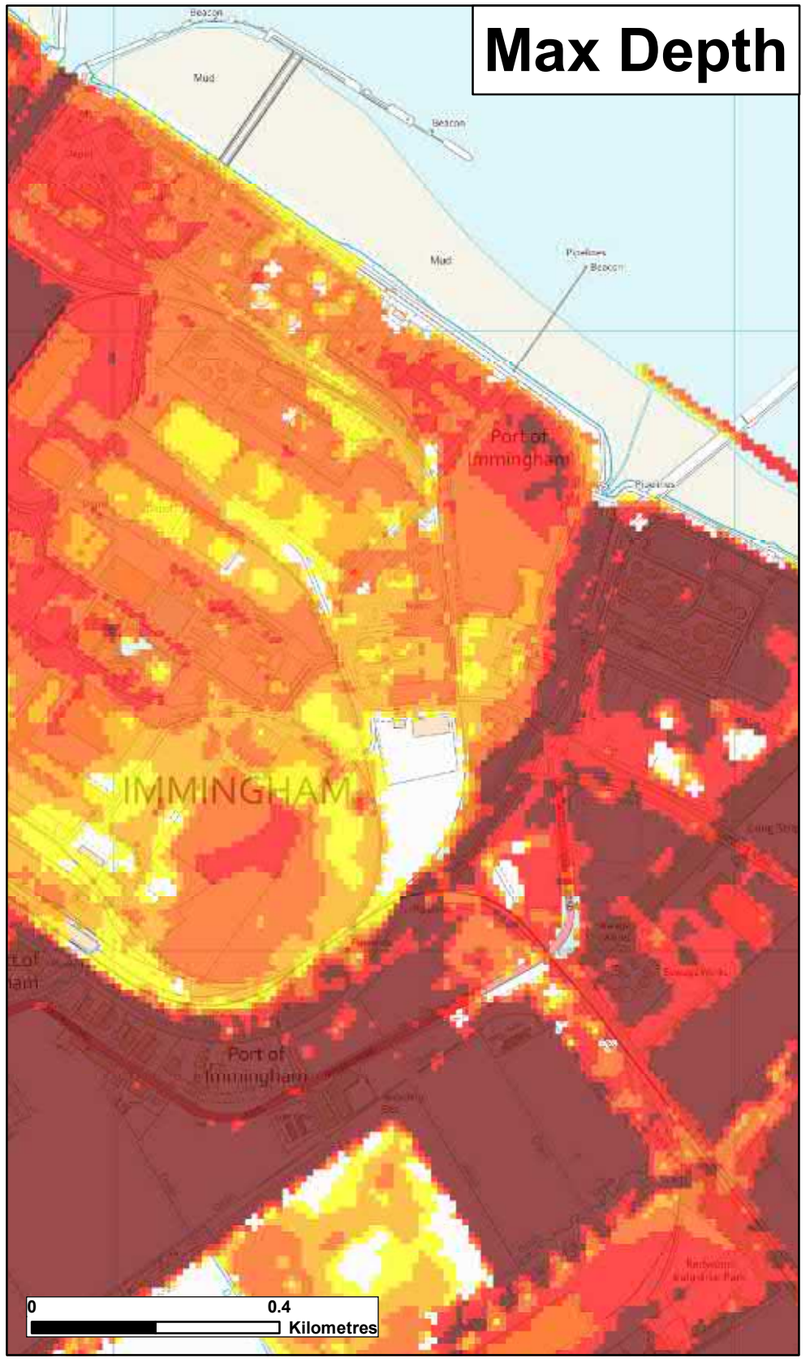
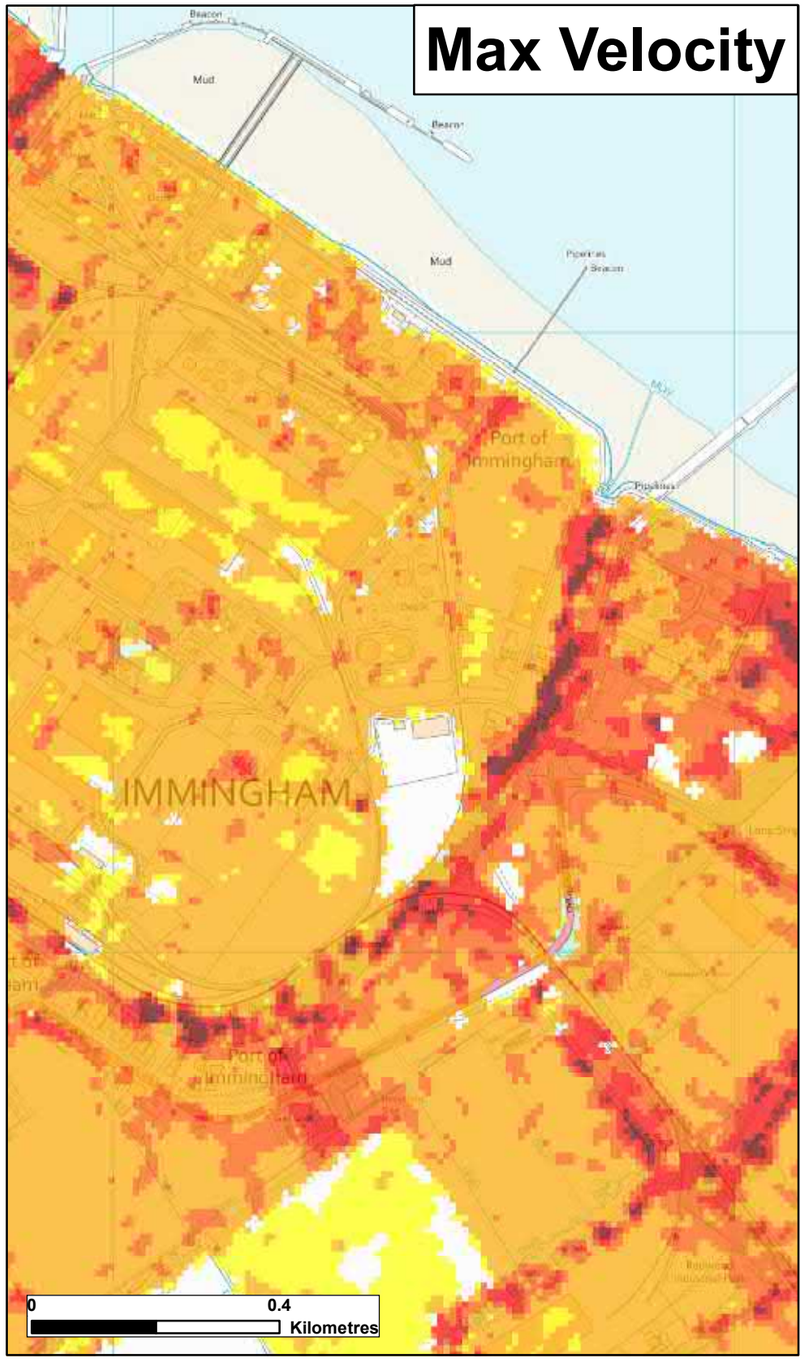
Environment Agency

Lincolnshire and Northamptonshire Hazard mapping

Map Centred on TA 20465 15437







★ Modelled Breach Locations

- see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
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Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	October 2021	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2021-236910

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

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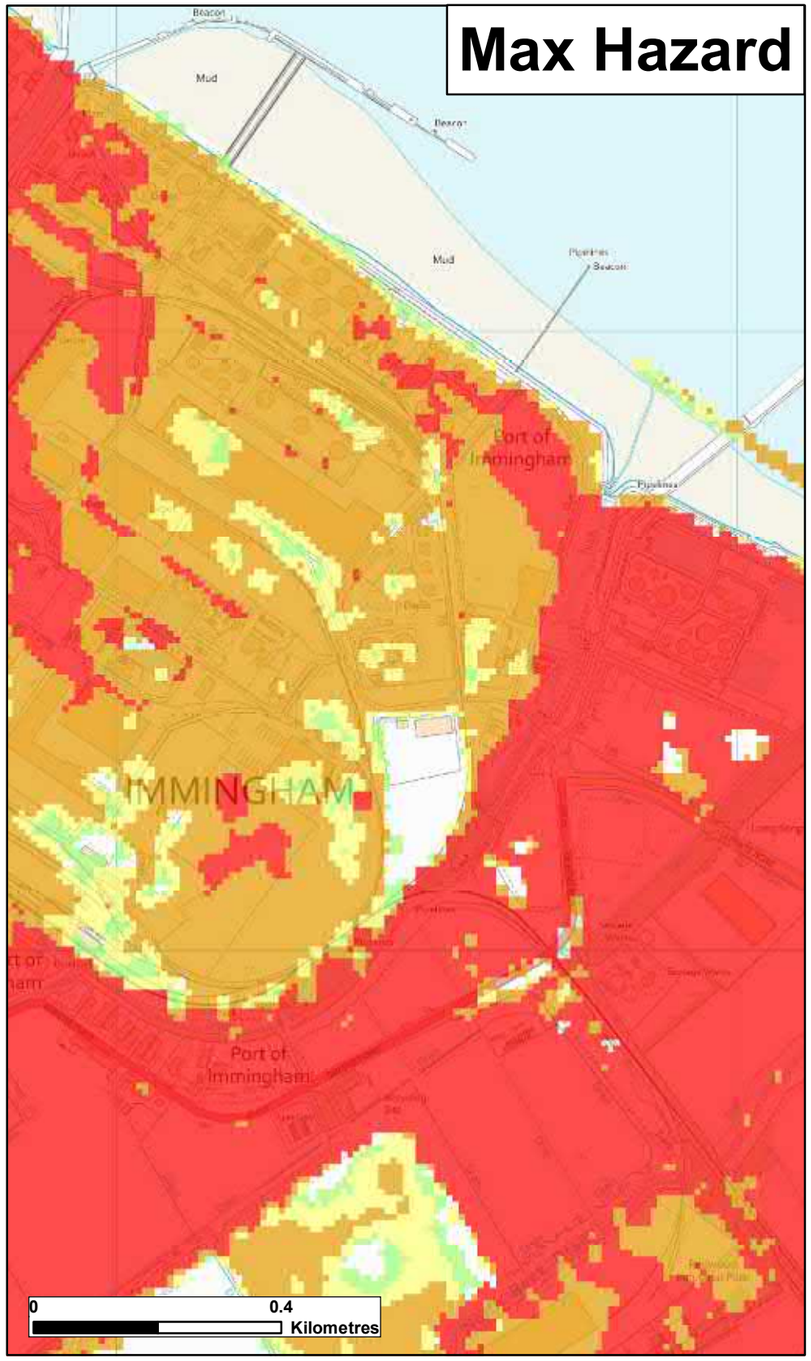
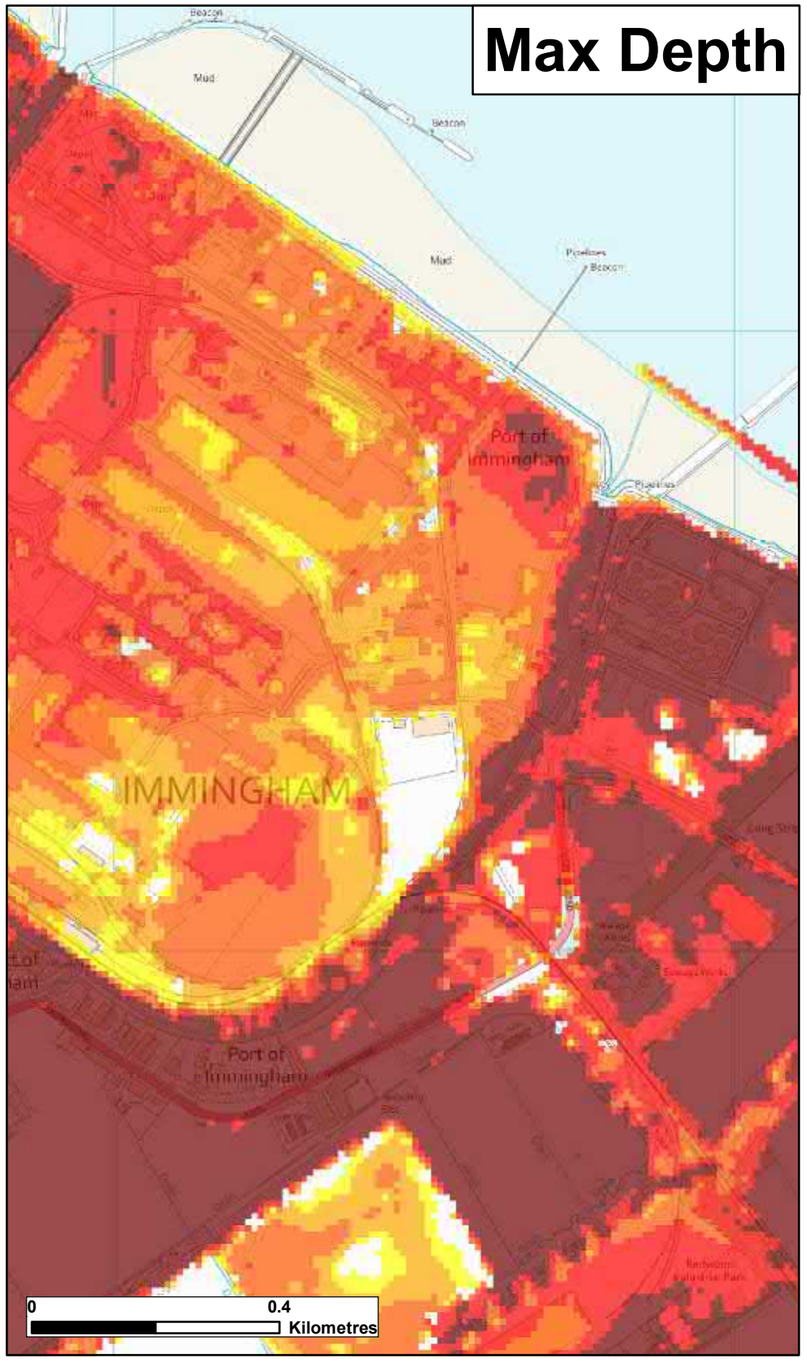
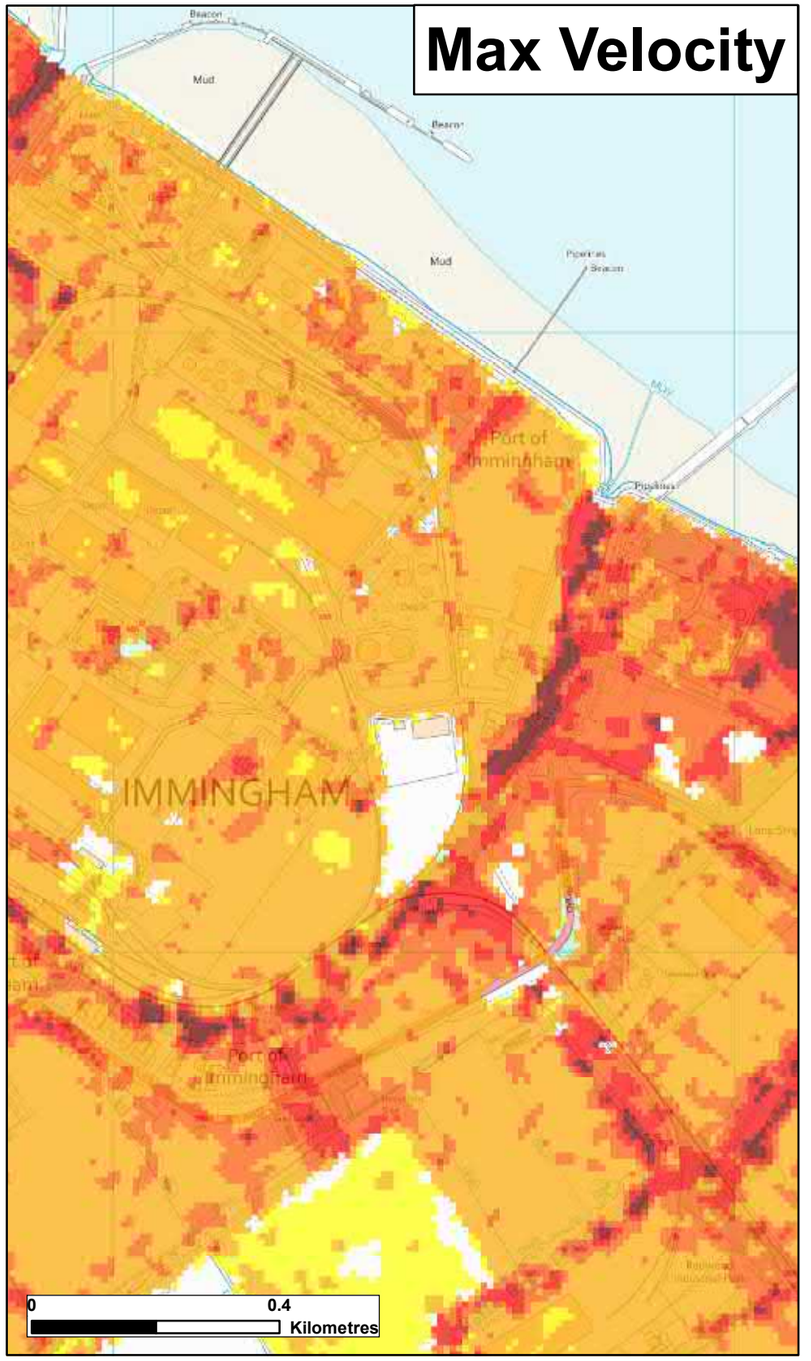
Lincolnshire and Northamptonshire Hazard mapping

Map Centred on TA 20465 15437







★ Modelled Breach Locations

- see also the accompanying plan "Location of Modelled Breaches"

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(Flood Risk to People : FD2320)

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- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	October 2021	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2021-236910

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

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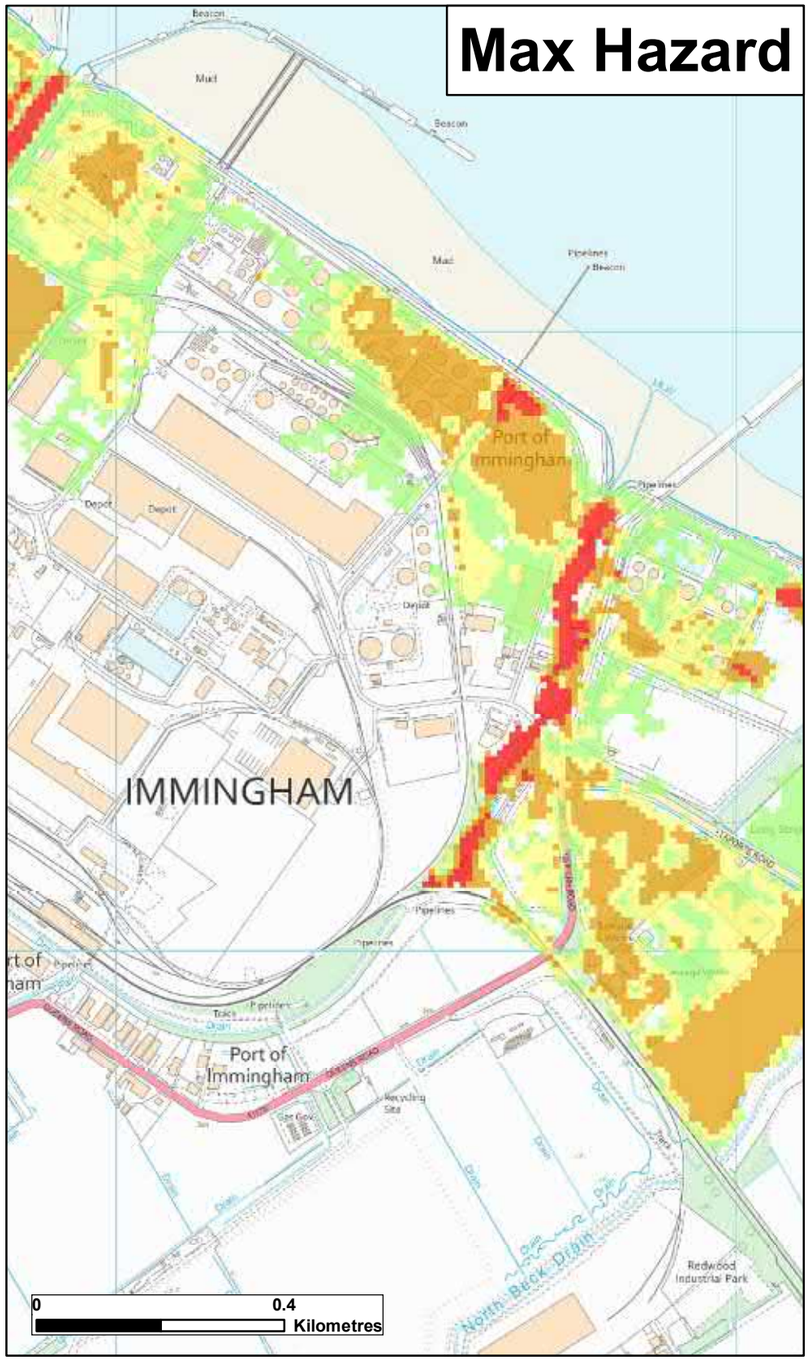
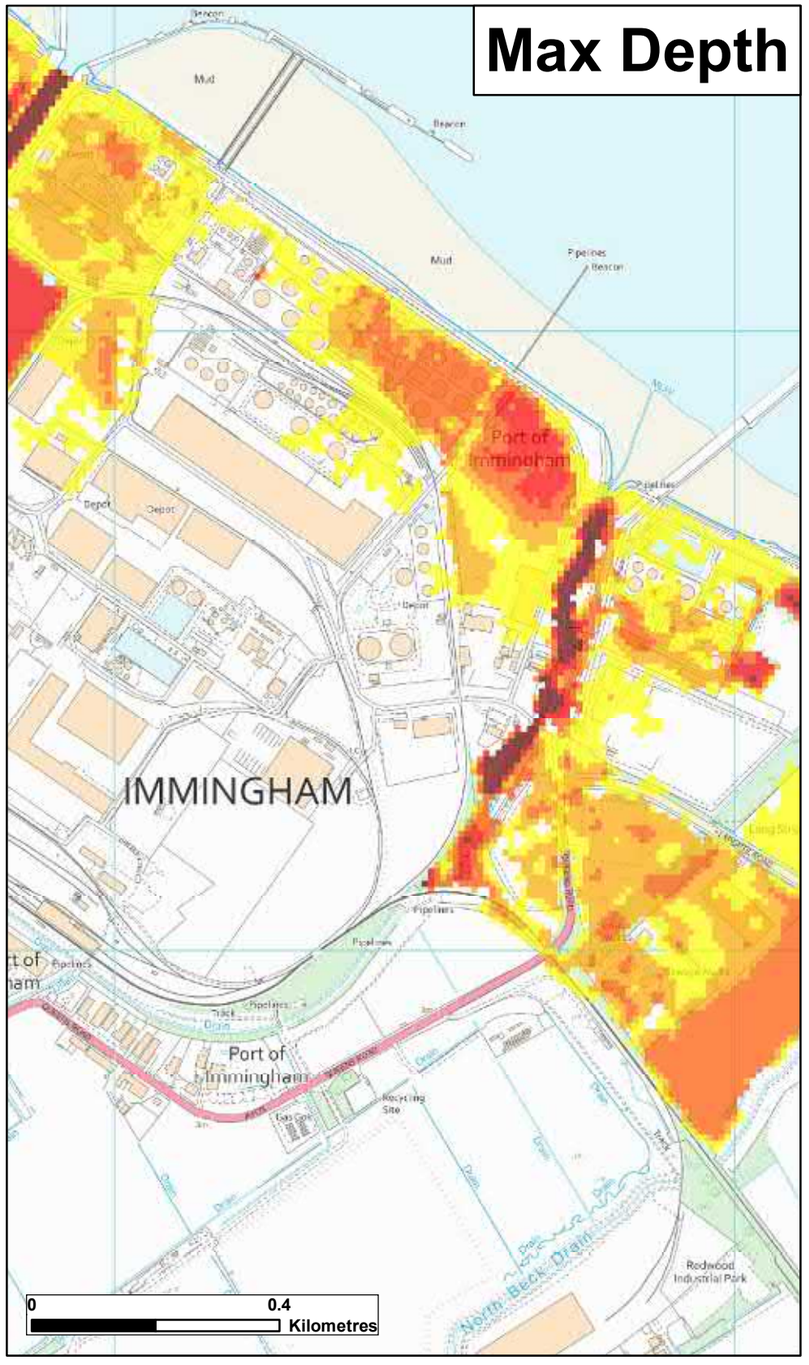
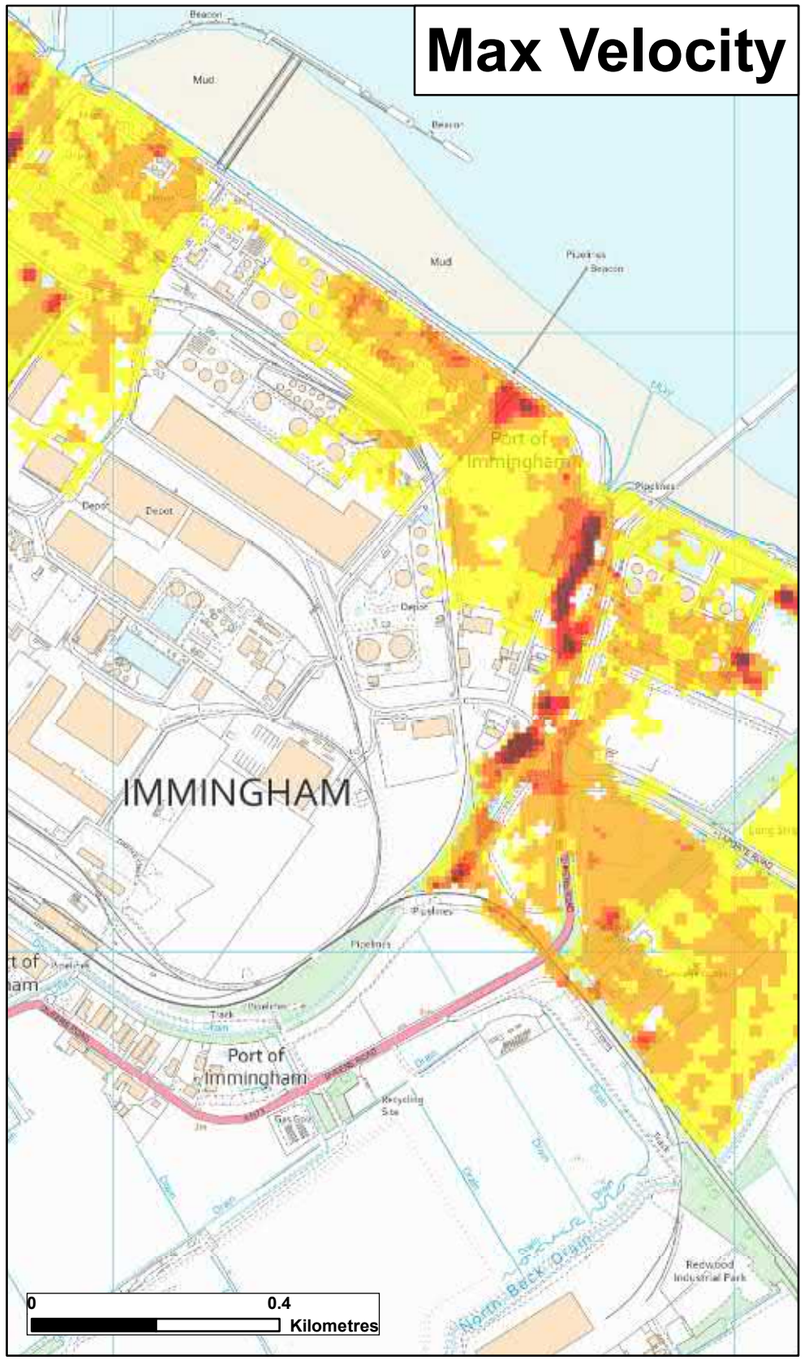
Environment Agency

Lincolnshire and Northamptonshire Hazard mapping

Map Centred on TA 20465 15437







Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	October 2021	Scenario year	2006	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2021-236910

The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge)

The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

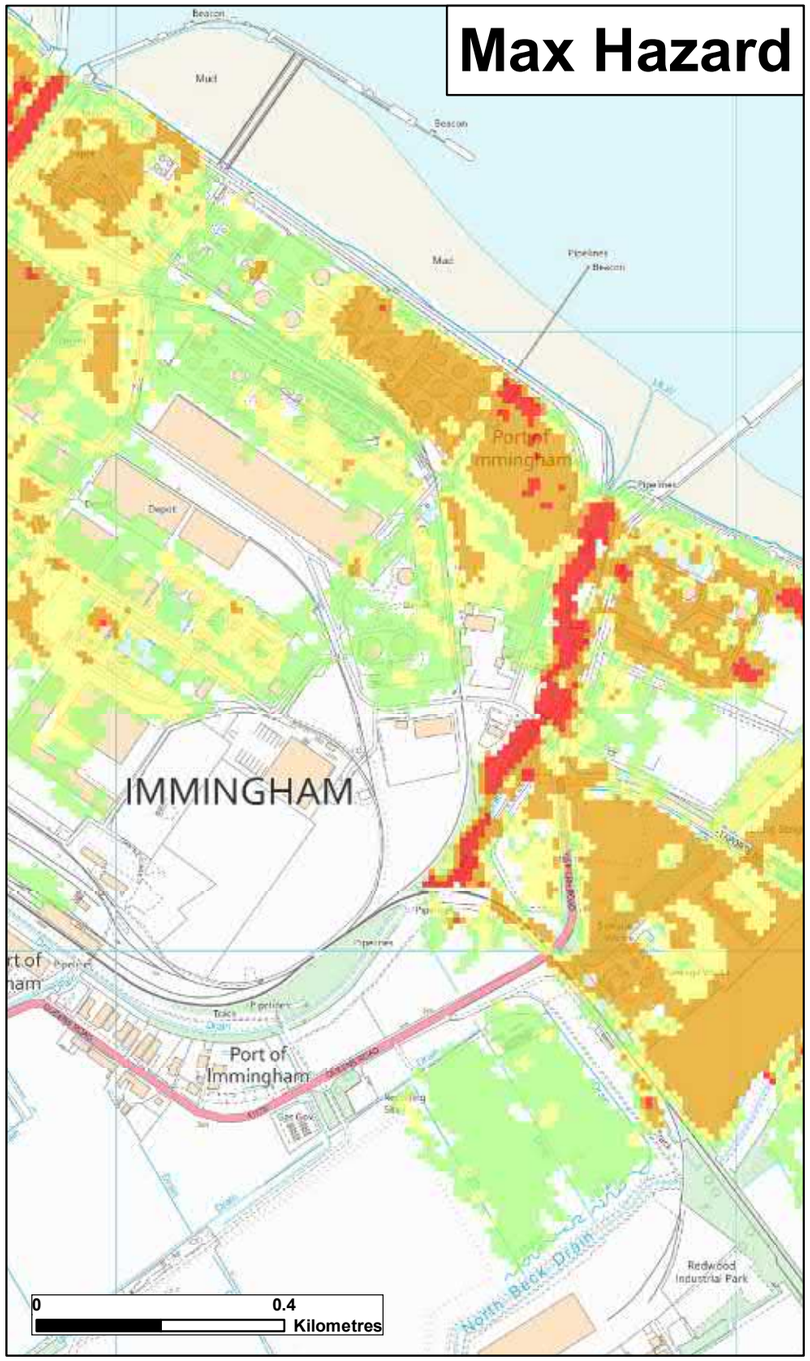
For future climate change scenarios it is assumed that defences remain at 2006 heights.

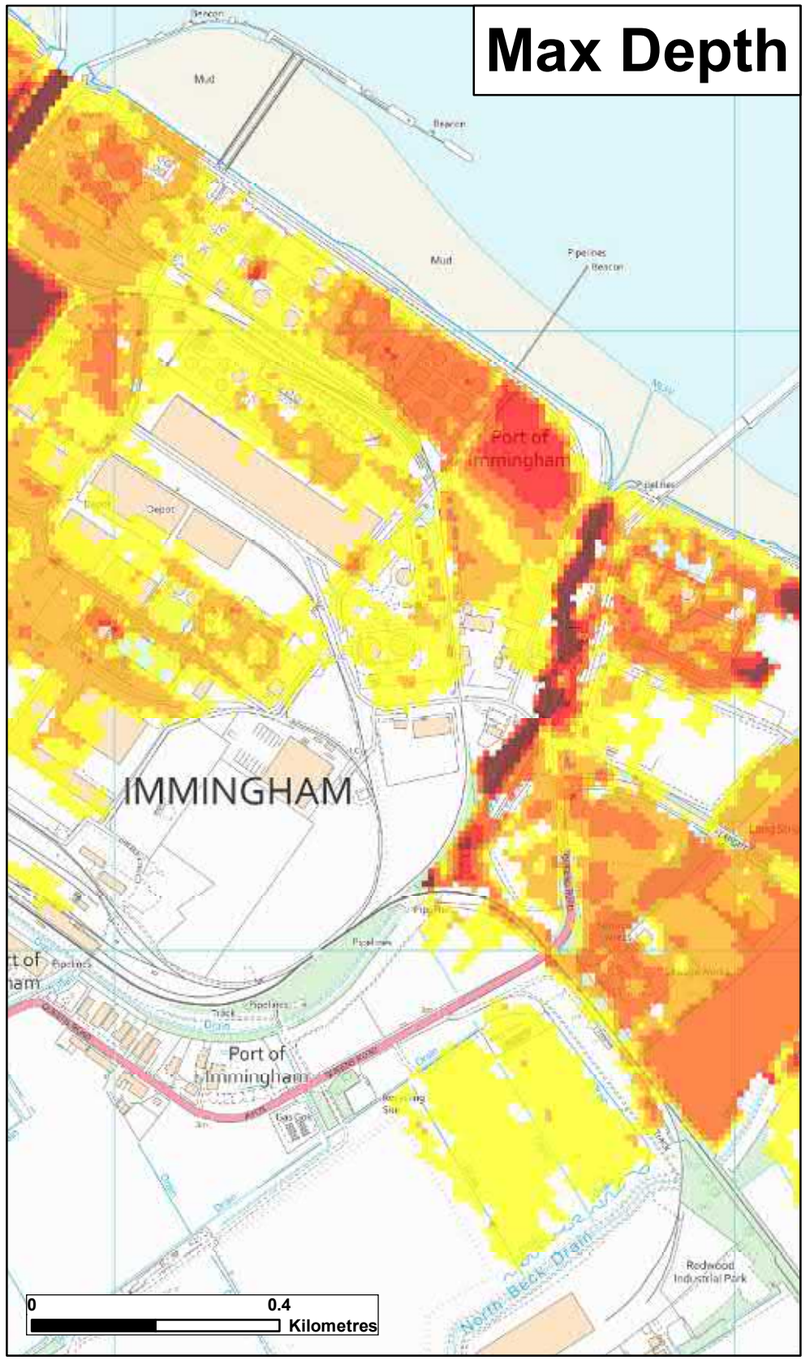
These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)

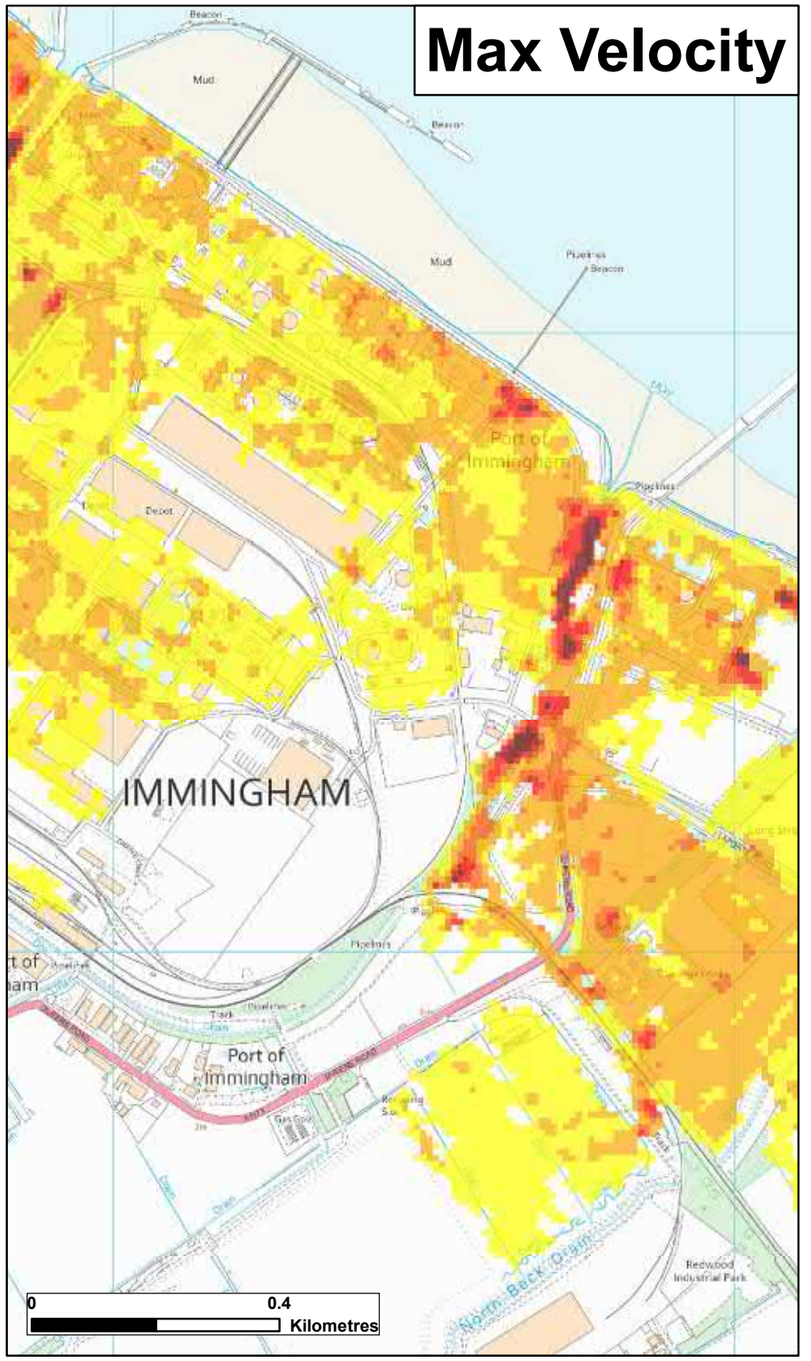
Environment Agency

Lincolnshire and Northamptonshire Overtopping Hazard Mapping

Map Centred on TA 20465 15437







Max Hazard
(Flood Risk to People : FD2320)

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- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	October 2021	Scenario year	2006	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2021-236910

The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge)

The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

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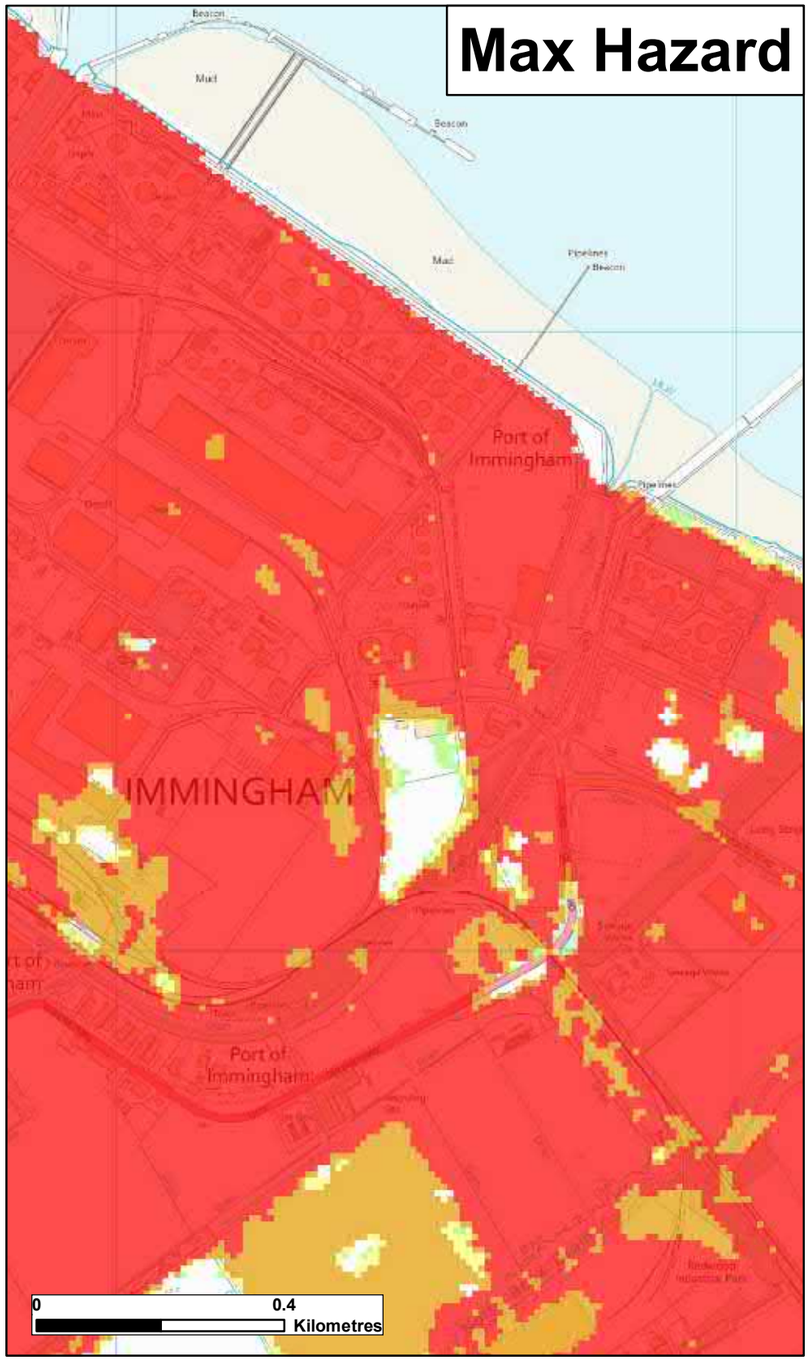
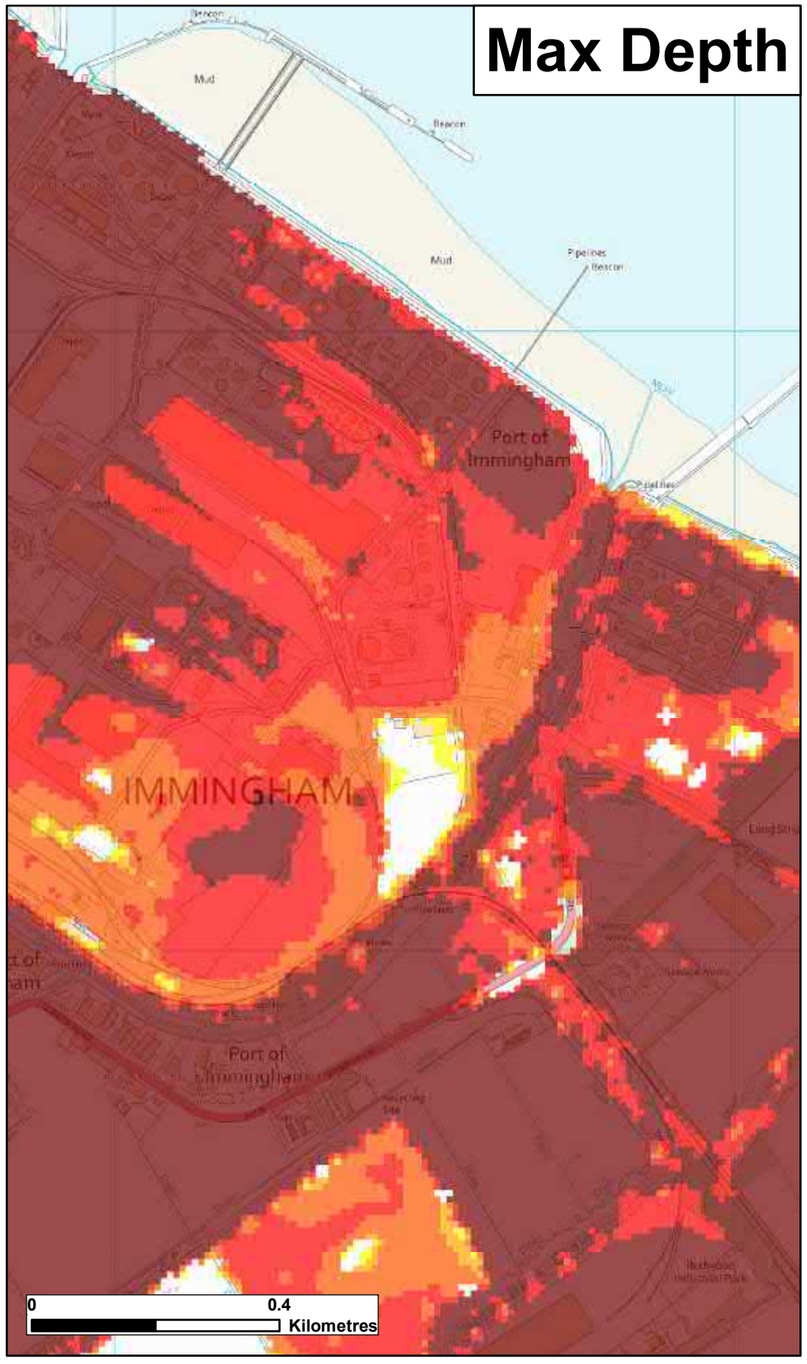
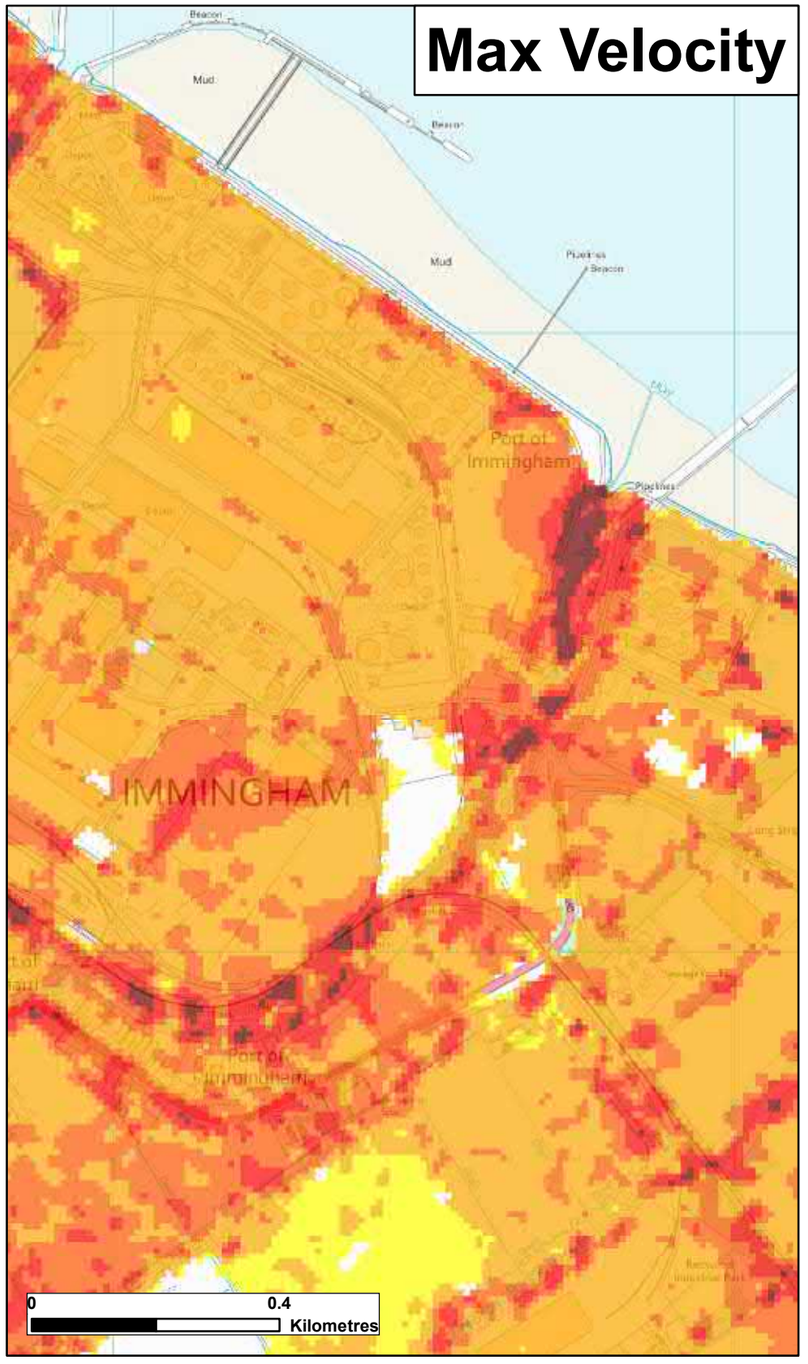
Environment Agency

Lincolnshire and Northamptonshire Overtopping Hazard Mapping

Map Centred on TA 20465 15437







Max Hazard
(Flood Risk to People : FD2320)

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- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	October 2021	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2021-236910

The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge)

The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

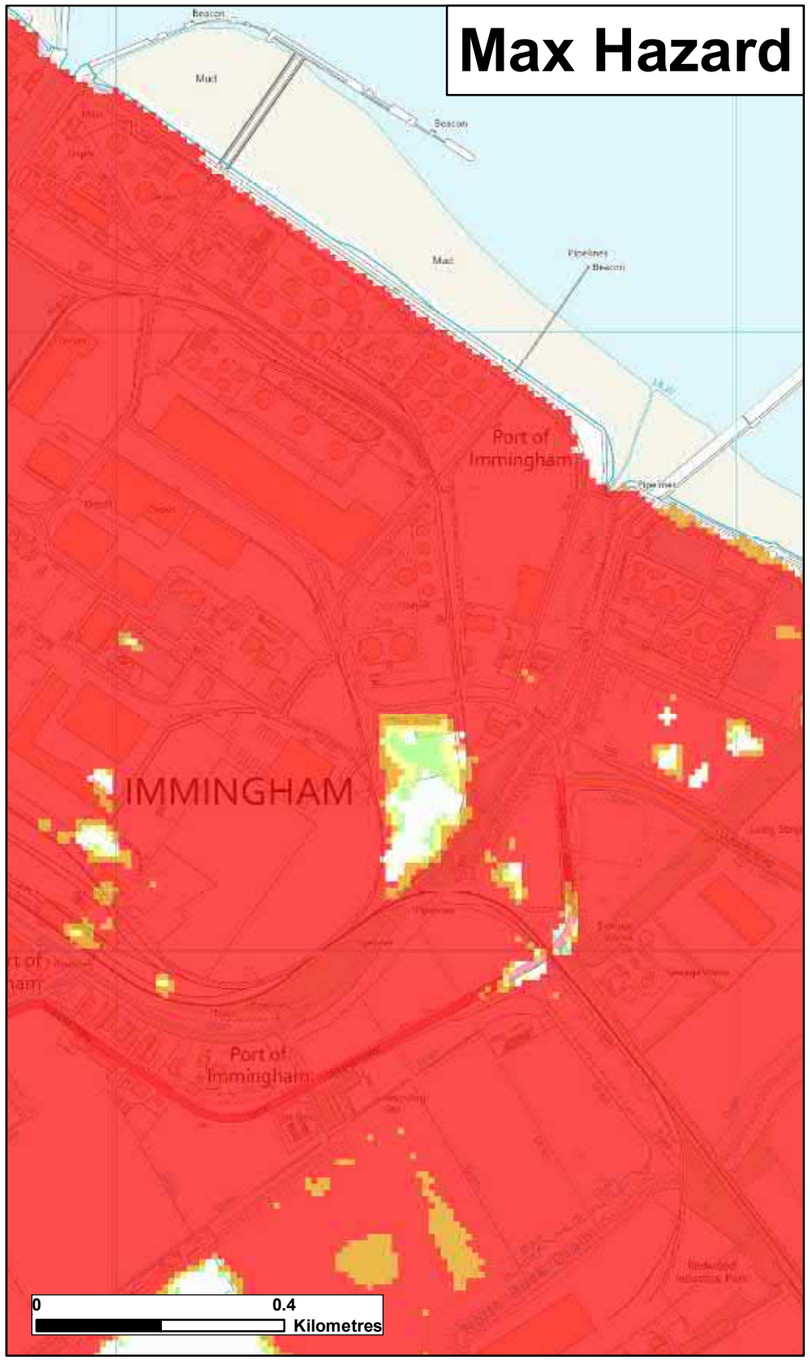
For future climate change scenarios it is assumed that defences remain at 2006 heights.

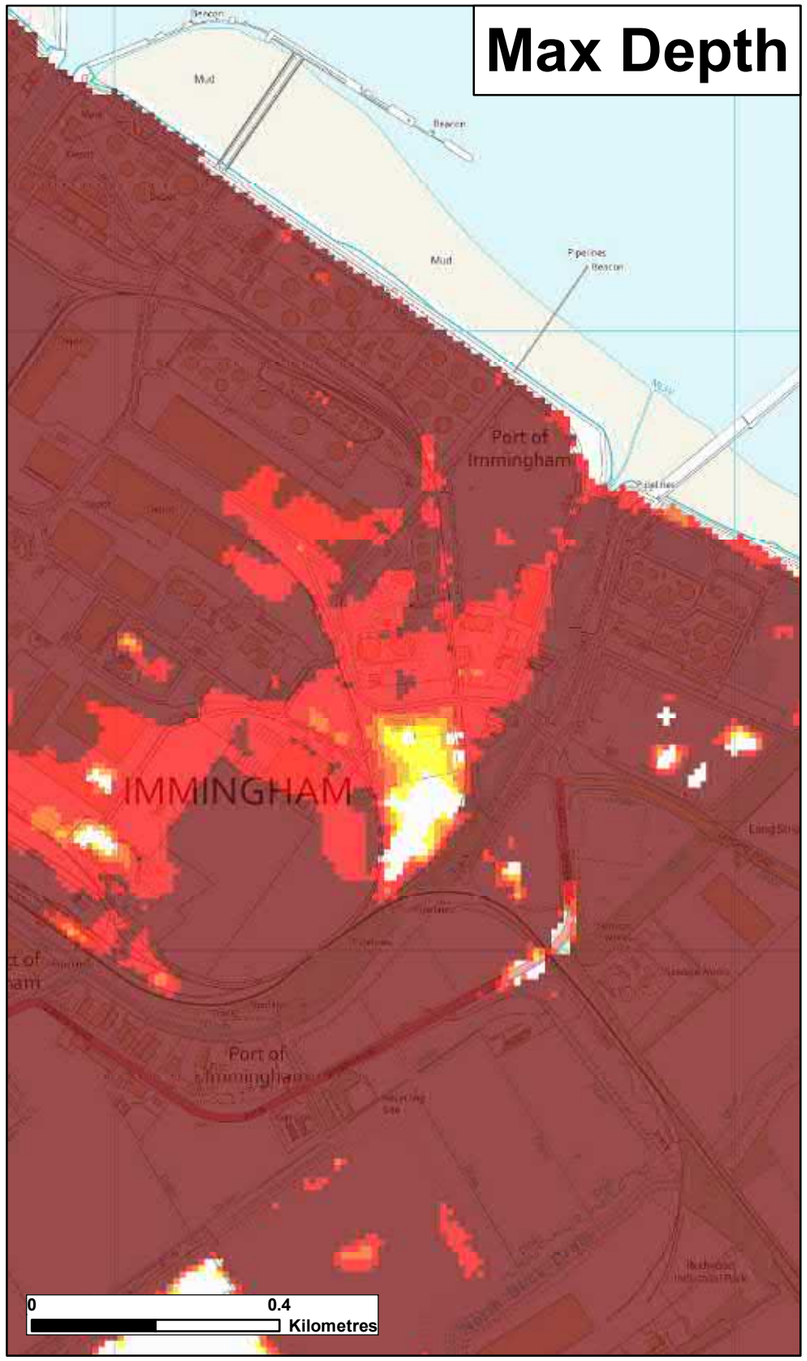
These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)

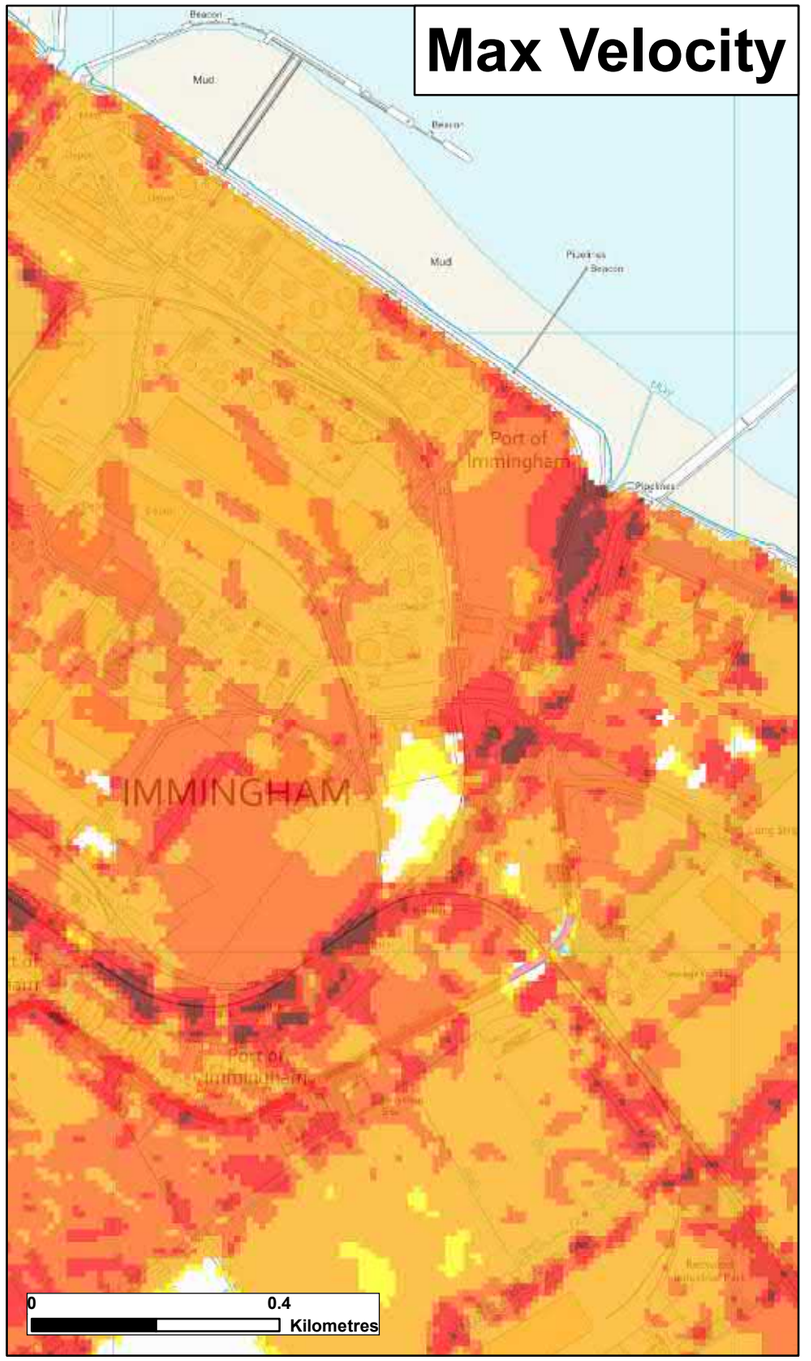
Environment Agency

Lincolnshire and Northamptonshire Overtopping Hazard Mapping

Map Centred on TA 20465 15437







Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

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- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	October 2021	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2021-236910

The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge)

The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

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These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)

General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

Environment Agency

Lincolnshire and Northamptonshire Overtopping Hazard Mapping

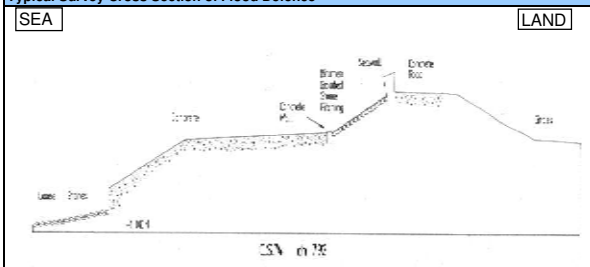
Map Centred on TA 20465 15437

NORTHERN AREA TIDAL MODELLING
OVERTOPPING
OVERTOPPING SECTION SUMMARY SHEET

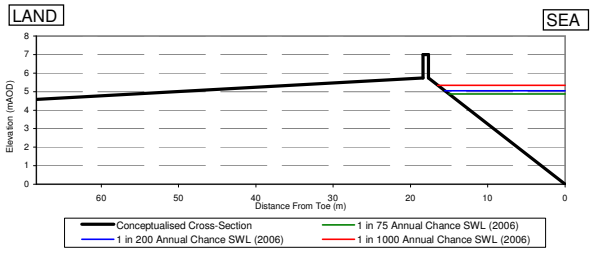
Overtopping Section	Section Location
	Immingham
OT-15	National Grid Reference
	521353, 415420

Defence Cross Section

Typical Survey Cross Section of Flood Defence



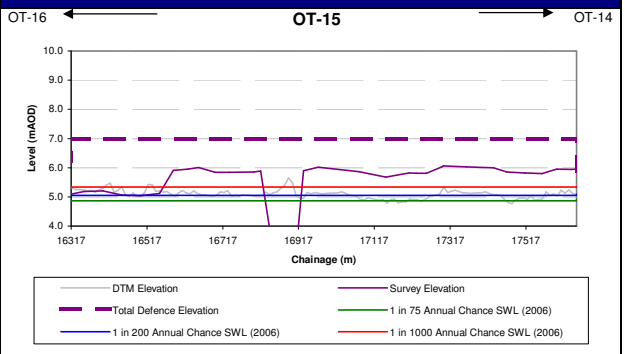
Conceptualised Cross Section of Flood Defence



Physical Parameters

Parameters	Value	Data Source
Crest Elevation (mAOD)	5.73	1987 Survey
Wall Height (m)	1.27	1987 Survey
Total Defence Elevation (mAOD)	7.00	1987 Survey
Toe Elevation (mAOD)	0.00	1987 Survey
[Crest - Toe] Height (m)	5.73	1987 Survey
Defence Width of Seaward Face (m)	18	1987 Survey
Crest Width (m)	0.71	1987 Survey
Gradient of Seaward Face (1 in x)	3.21	1987 Survey
Section Length (m)	1334	
Conceptualised Defence Type	Wave Return Wall	
Material of Seaward Face	Smooth concrete or asphalt	1987 Survey

Long Profile



Non-Physical Parameters

Annual Chance	Climate Conditions	Still Water Level (mAOD)	Significant Wave Height (m)	Calculation Range*	Maximum Overtopping Unit Discharge ($m^3/s/m$)
1 in 1	2006	4.08	1.20	1	0.0000
1 in 10	2006	4.49	1.20	1	0.0001
1 in 75	2006	4.87	1.20	1	0.0002
1 in 100	2006	4.88	1.20	1	0.0002
1 in 150	2006	5.00	1.20	1	0.0003
1 in 200	2006	5.05	1.20	1	0.0003
1 in 1000	2006	5.34	1.20	2	0.0009
1 in 200	2115	6.19	2.20	2	0.1001
1 in 1000	2115	6.48	2.20	2	0.2068

**Calculation Range Notes*

- *1 = Within valid range of EA Manual*
- *2 = Outside valid range of EA Manual and SWL is less than TDL +0.5m*
- *3 = Outside valid range of EA Manual and SWL is between TDL +1.0m and TDL +1.5m*
- *4 = Outside valid range of EA Manual and SWL is between TDL +1.0m and TDL +1.5m*
- *5 = Outside valid range of EA Manual and SWL is between TDL +1.5m and TDL +2.0m*

Additional Information/Comments

Revison Record

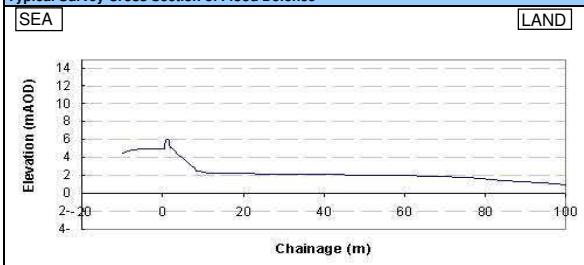
Revision	Date	Originator	Checker	Approver
E	16/11/2010	KS	MP	SYE

NORTHERN AREA TIDAL MODELLING
OVERTOPPING
OVERTOPPING SECTION SUMMARY SHEET

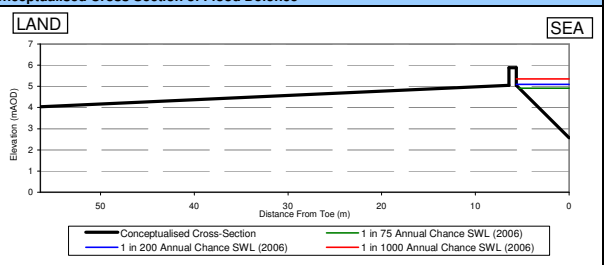
Overtopping Section	Section Location
	Immingham
OT-16	National Grid Reference
	519969, 416385

Defence Cross Section

Typical Survey Cross Section of Flood Defence



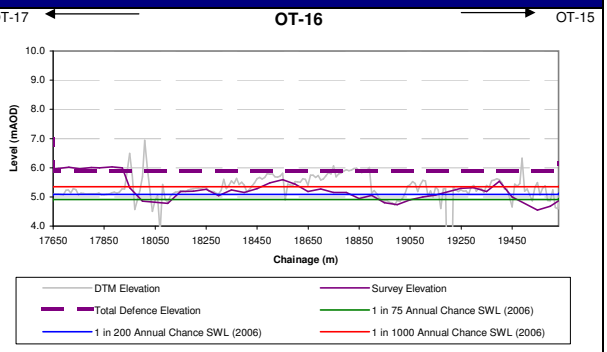
Conceptualised Cross Section of Flood Defence



Physical Parameters

Parameters	Value	Data Source
Crest Elevation (mAOD)	5.05	1998 Survey
Wall Height (m)	0.84	1998 Survey
Total Defence Elevation (mAOD)	5.89	1998 Survey
Toe Elevation (mAOD)	2.56	1998 Survey
[Crest - Toe] Height (m)	2.48	1998 Survey
Defence Width of Seaward Face (m)	6	1998 Survey
Crest Width (m)	0.77	1998 Survey
Gradient of Seaward Face (1 in x)	2.59	1998 Survey
Section Length (m)	1982	
Conceptualised Defence Type	Wave Return Wall	
Material of Seaward Face	One layer of rock armour on impermeable base	1998 Survey

Long Profile



Non-Physical Parameters

Annual Chance	Climate Conditions	Still Water Level (mAOD)	Significant Wave Height (m)	Calculation Range*	Maximum Overtopping Unit Discharge ($m^3/s/m$)
1 in 1	2006	4.13	1.29	1	0.0050
1 in 10	2006	4.54	1.29	1	0.0117
1 in 75	2006	4.91	1.29	2	0.0309
1 in 100	2006	4.94	1.29	2	0.0325
1 in 150	2006	5.04	1.29	2	0.0426
1 in 200	2006	5.09	1.29	2	0.0481
1 in 1000	2006	5.35	1.29	2	0.0887
1 in 200	2115	6.23	2.35	3	1.2452
1 in 1000	2115	6.49	2.35	4	1.7739

**Calculation Range Notes*

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- *2 = Outside valid range of EA Manual and SWL is less than TDL +0.5m*
- *3 = Outside valid range of EA Manual and SWL is between TDL +1.0m and TDL +1.5m*
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Additional Information/Comments

Revison Record

Revision	Date	Originator	Checker	Approver
E	16/11/2010	KS	MP	SYE

From: Freedom Of Information (NELC) <FOI@nelincs.gov.uk>
Sent: 13 October 2021 07:49
To: Madge, Will
Subject: [EXTERNAL] Freedom of information request, Ref- NELC/22975/2122

Dear Sir / Madam

Thank you for your information request, reference number FOI NELC/22975/2122. I wish to confirm that North East Lincolnshire Council holds the following information.

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 Drainage team is:

1. **Historic records of flooding**

   There was extensive flooding of the dock estate during the tidal surge on December 5th 2013.

2. **Known risks of flooding from any drains/ordinary watercourses**

   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.

3. **Any outputs from hydraulic models of drains/ordinary watercourses**

   As above, hydraulic models

If you believe that your request for information has not been handled in accordance with the Freedom of Information Act, you have the right to request an internal review by the Council. Please be clear about which elements of the Council's response or handling of the request you are unhappy with, and would like the Council to address during the internal review process. If following this you are still dissatisfied you may contact the Office of the Information Commissioner. If you wish to request an internal review, please contact me and I will make the necessary arrangements.

Yours sincerely on behalf of North East Lincolnshire Council

Feedback Officer

From: Madge, Will
Sent: 11 October 2021 10:10 AM
Subject: FOI Request - Immingham Eastern Ro-Ro Terminal, NELC/22975/2122

Good Morning,

AECOM are assisting Associated British Ports with the Immingham Eastern Ro-Ro Terminal project - please see the Briefing Note and Scoping Report at the below hyperlink for more information:
https://infrastructure.planninginspectorate.gov.uk/projects/yorkshire-and-the-humber/immingham-eastern-ro-ro-terminal/?ipcsection=docs

Please could you provide the following information in proximity of the site (see maps shown in the Briefing Note):

4. Historic records of flooding
5. Known risks of flooding from any drains/ordinary watercourses
6. Any outputs from hydraulic models of drains/ordinary watercourses

Many thanks,

William Madge BSc (Hons)

From: Guy Hird <guy.hird@witham3idb.gov.uk>
Sent: 13 October 2021 17:47
To: Madge, Will
Cc: Richard Wright
Subject: [EXTERNAL] FW: RFI - Immingham Eastern Ro-Ro Terminal
Attachments: NELDB map.jpg

ND-5814-2021-PLN

Will

Immingham Eastern Ro-Ro Terminal

The location is within the North East Lindsey Drainage Board area and there is a network of Board maintained watercourses near the site, see attached map. Habrough Marsh Drain is a gravity system with a flapped outfall into the Humber within the port site. There is link to the Immingham pumped drainage system which allows flow into it only when they is spare capacity available. High levels within this system have a potential flood risk for the area with high rainfall events aggravated by high water levels in the Humber.. The impact of climate chance will increase the risk.

There is flood risk from the Humber through over topping or breach, the Environment Agency should be contacted for further information.

In December 2013 the tidal surge caused flooding in the port via the dock, ABP should have records of this and any works done as a result of it.

Under the terms of the Board's Byelaws, the prior written consent of the Board is required for any proposed temporary or permanent works or structures in, under, over or within the byelaw distance (7m) of the top of the bank of a Board maintained watercourse. At this location this width is required to be keep clear of all obstructions. Note it is expected that revised Byelaws will be adopted in the near future with a revised distance of 9m.

Under the terms of the Land Drainage Act. 1991 the prior written consent of the Board is required for any proposed temporary or permanent works or structures within any watercourse including infilling or a diversion.

As a brown field site the surface water discharge into the Boards drainage system from any re-development will be expected to be reduced to 70% of the existing 'actual' discharge rate.

The proposals show new infrastructure in the Humber near to the gravity outfall of Habrough Marsh Drain, there is concern that this will result in siltation which will impede the discharge. The Flood Risk Assessment should address this and put in place measures to mitigate it.

Regards

Guy Hird
Acting Head of Technical & Engineering Services

Our office is closed to visitors but our staff are still working. Please email or telephone with all enquiries.

enquiries@witham3idb.gov.uk
accounts@witham3idb.gov.uk
planning@witham3idb.gov.uk
consents@witham3idb.gov.uk

Witham First District Internal Drainage Board
Witham Third District Internal Drainage Board
Upper Witham Internal Drainage Board
North East Lindsey Drainage Board

Witham House,
Meadow Lane
North Hykeham,
LINCOLN,
LN6 9QU (*for sat nav use LN6 9TP*)
Tel: 01522 697123

Four independent statutory Land Drainage and Flood Risk Management Authorities working in partnership.

www.witham3idb.gov.uk

From: Madge, Will <will.madge@aecom.com>
Sent: 11 October 2021 10:31
To: Richard Wright <richard.wright@witham3idb.gov.uk>
Cc: Enquiries <Enquiries@witham3idb.gov.uk>; Planning and Consents <planning@witham3idb.gov.uk>; Cobb, Kirsty <kirsty.cobb@aecom.com>; TJeynes@abports.co.uk; nrobinson@abports.co.uk
Subject: RFI - Immingham Eastern Ro-Ro Terminal

Good Morning,

AECOM are assisting Associated British Ports with the Immingham Eastern Ro-Ro Terminal project - please see the Briefing Note and Scoping Report at the below hyperlink for more information:
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Please could you provide the following information in proximity of the site (see maps shown in the Briefing Note):

1. Historic records of flooding
2. Known risks of flooding from any drains/watercourses
3. Any information on existing flood defence assets (i.e. location, crest level, if there are operational controls etc.)

Many thanks,

William Madge BSc (Hons), MCIWEM, C.WEM, CSci
Senior Flood Risk Consultant | Water
M +44 (0)7990 073 643
will.madge@aecom.com

Click here to connect with me on LinkedIn
www.linkedin.com/in/william-madge

AECOM

3rd Floor
Portwall Place, Portwall Lane
Bristol, BS1 6NA
aecom.com

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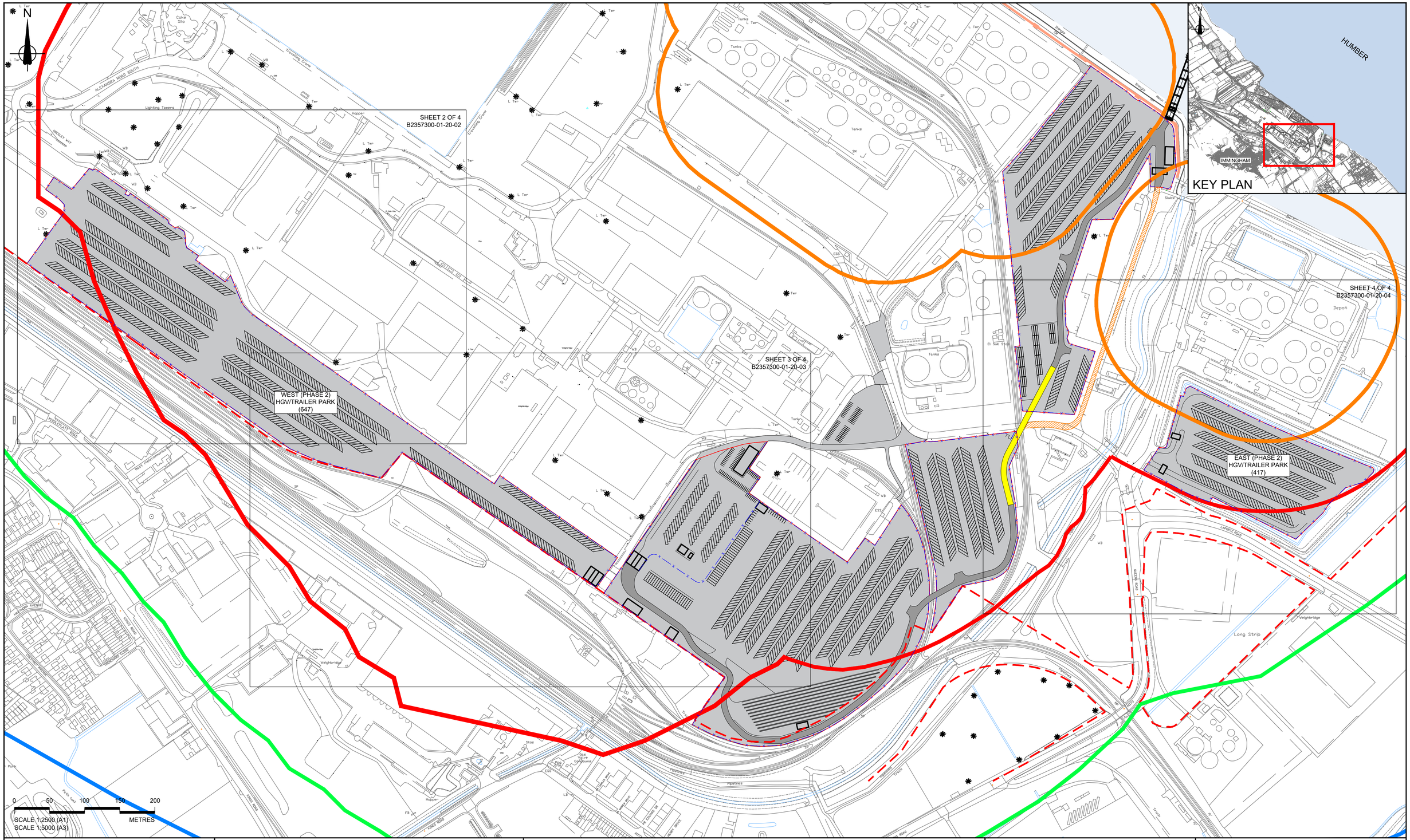
South Killingholme Drain
Habrough Marsh Drain Branch 4
Habrough Marsh Drain
Immingham Pump Drain
IMMINGHAM
Immingham PS
Middle Drain Branch 5
Middle Drain
Mauxhall Farm
Ashmaur House
Legend
North_East_Lindsey_IDB_Boundary
North_East_Lindsey_IDB_Extended_Boundary
NEL Drains
EA Main River
Contains OS data © Crown Copyright and database right 2020

Appendix B Proposed Development Layout



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

LEGEND:

- DEVELOPMENT PROXIMITY ZONE (DPZ)
- INNER ZONE (IZ)
- MIDDLE ZONE (MZ)
- OUTER ZONE (OZ)
- PORT BOUNDARY
- TERMINAL BOUNDARY
- TERMINAL FENCE

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	-	Issued for comment	PC	RH	RH	CN

JACOBS
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Client: ABP ASSOCIATED BRITISH PORTS

Project: PROJECT NORDIC CONCEPT STAGE

Drawing title: PROPOSED EASTERN ROPAX TERMINAL LAYOUT MASTERPLAN - PHASE 2 SHEET 1 OF 4

Drawing status: S3 - FOR REVIEW AND COMMENT

Scale	AS SHOWN @ A1	DO NOT SCALE
Jacobs No.	B2357300	Rev P03
Client no.		

Drawing number: B2357300-01-20-01

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

LEGEND:

- TERMINAL BOUNDARY
- TERMINAL FENCE

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Project
PROJECT NORDIC CONCEPT STAGE

Drawing title
PROPOSED EASTERN ROPAX TERMINAL LAYOUT MASTERPLAN - PHASE 2 SHEET 2 OF 4

Drawing status
S3 - FOR REVIEW AND COMMENT

Scale	AS SHOWN @ A1	DO NOT SCALE
Jacobs No.	B2357300	Rev P01
Client no.		

Drawing number
B2357300-01-20-02

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P03	-	Northern site boundary revised, trailer parking bays reduced	PC	RH	RH	-
P01	-	Issued for comment	PC	RH	RH	CN

\\UKSFPP02\Maritime\PROJECTS\Ports(VT)\B2429400 ABP Project Sugar\1100 Design & Engineering\1102 Drawings\01 Preliminary\2019 Concept Design Project\B2357300-01-20-01 to 03 - Proposed Terminal Masterplan P2.dwg - 26/10/2021 13:52:11 - 20-02 - CookP1

AUTOCAD DRAWING

\\UKSFPP02\Maritime\PROJECTS\Ports(VT)\B2429400 ABP Project Sugar\1100 Design & Engineering\1102 Drawings\01 Preliminary\2019 Concept Design Project\B2357300-01-20-01 to 03 - Proposed Terminal Masterplan P2.dwg - 26/10/2021 13:53:00 - 20-03 - CookP1

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

LEGEND:

- TERMINAL BOUNDARY
- TERMINAL FENCE

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P03	-	Northern site boundary revised, trailer parking bays reduced	PC	RH	RH	-
P01	-	Issued for comment	PC	RH	RH	CN

JACOBS
95 Bothwell St, Glasgow, G2 7HX
Tel:+44(0)141 243 8000 Fax:+44(0)141 226 3109
www.jacobs.com

Client: ASSOCIATED BRITISH PORTS

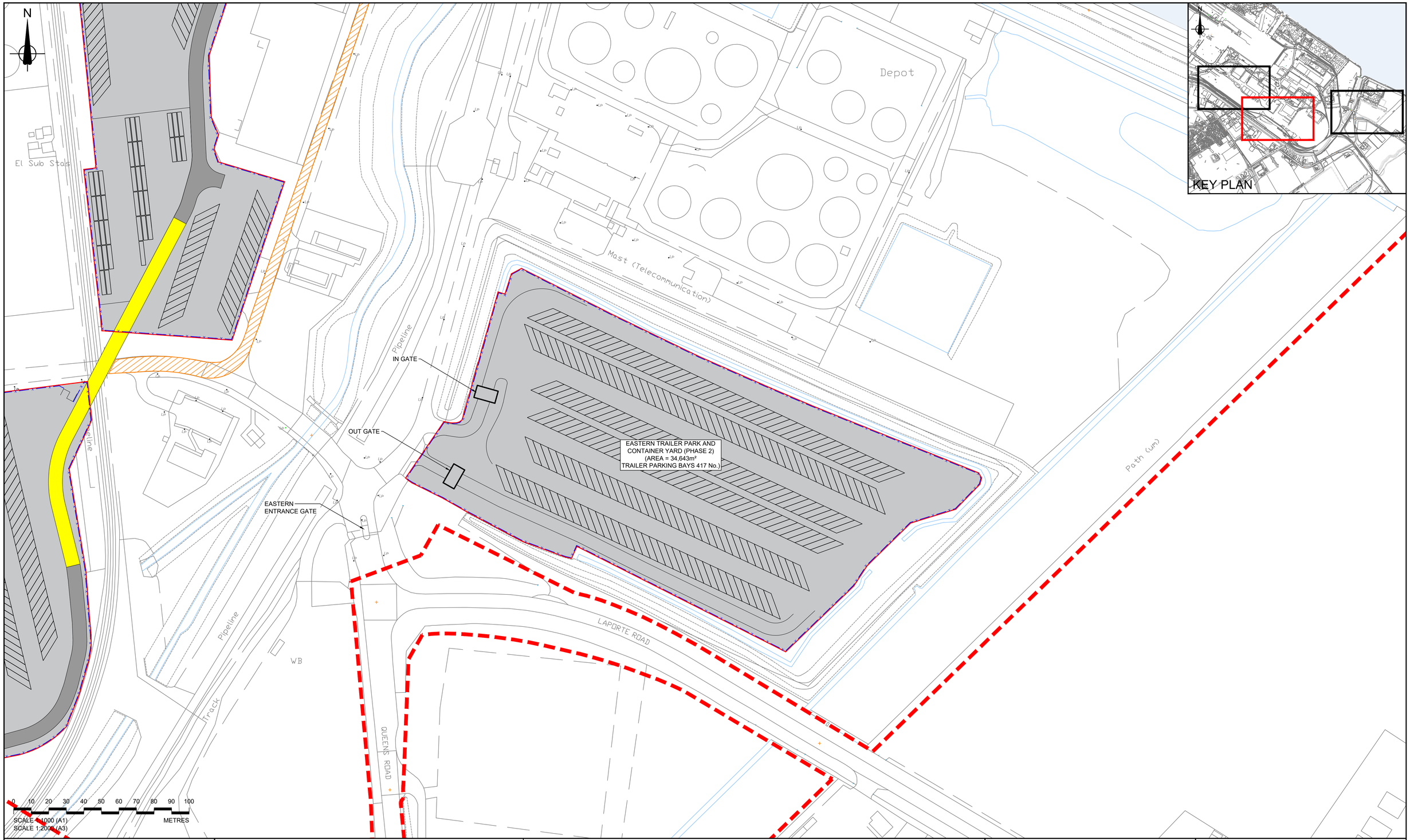
Project: PROJECT NORDIC CONCEPT STAGE

Drawing title:
PROPOSED EASTERN ROPAX TERMINAL LAYOUT MASTERPLAN - PHASE 2 SHEET 3 OF 4

Drawing status: S3 - FOR REVIEW AND COMMENT

Scale	AS SHOWN @ A1	DO NOT SCALE	
Jacobs No.	B2357300	Rev	P02
Client no.			

Drawing number: B2357300-01-20-03



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

LEGEND:

TERMINAL BOUNDARY

TERMINAL FENCE

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	-	Issued for comment	PC	RH	RH	CN
		All temp site boundary removed, parking bays reduced			RH	

JACOBS
95 Bothwell St, Glasgow, G2 7HX
Tel:+44(0)141 243 8000 Fax:+44(0)141 226 3109
www.jacobs.com

Client: ABP ASSOCIATED BRITISH PORTS

Project: PROJECT NORDIC CONCEPT STAGE

Drawing title: PROPOSED EASTERN ROPAX TERMINAL LAYOUT MASTERPLAN - PHASE 2 SHEET 4 OF 4

Drawing status: S3 - FOR REVIEW AND COMMENT

Scale	AS SHOWN @ A1	DO NOT SCALE
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