

Holbeach Food Enterprise Zone (FEZ), Lincolnshire

Flood Risk Mitigation Strategy

On behalf of: **South Holland District Council**







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Introduction

This 'Flood Risk Mitigation Strategy' Report has been prepared by Peter Brett Associates LLP, on behalf of our client, South Holland District Council (SHDC), as part of a Local Development Order for a proposed 'Food Enterprise Zone' (FEZ) to the west of Holbeach in Lincolnshire.

This report focusses on assessing the practical flood risk issues at the site, which include:

- Identification of sources of flooding to the site and assessment of the flood risk, both current and including the potential impact of climate change;
- National, regional and local planning policy in relation to flood risk;
- Consideration of the flood risk implications, taking into account the potential allowance for climate change over the lifetime of any development;
- The identification of flood risk constraints and the proposed design parameters to provide mitigation.

The requirements for new development in relation to flood risk are contained within the National Planning Policy Framework (NPPF) dated March 2012 and associated Planning Practice Guidance (PPG), together with relevant local planning documents, including the SHDC Strategic Flood Risk Assessment (SFRA).

The Environment Agency (EA) Flood Zone map shows the site lies within tidal Flood Zone 3 'High Probability', defined as follows:

Flood Zone 3 'High Probability' (greater than 1 in 100 (1%) annual probability of river flooding, or greater than 1 in 200 (0.5%) annual probability of tidal flooding)

This classification ignores the presence of flood defences. The proposed development is classed as a 'Less vulnerable' use ("*Buildings used for...professional and other services...offices...general industry*") which is considered appropriate within Flood Zone 3a and do not require the Exception Test.

The report confirms that appropriate mitigation can be incorporated into the proposed FEZ to address the flood risk to the site, to ensure the development is safe and there is no detrimental impact on third parties.

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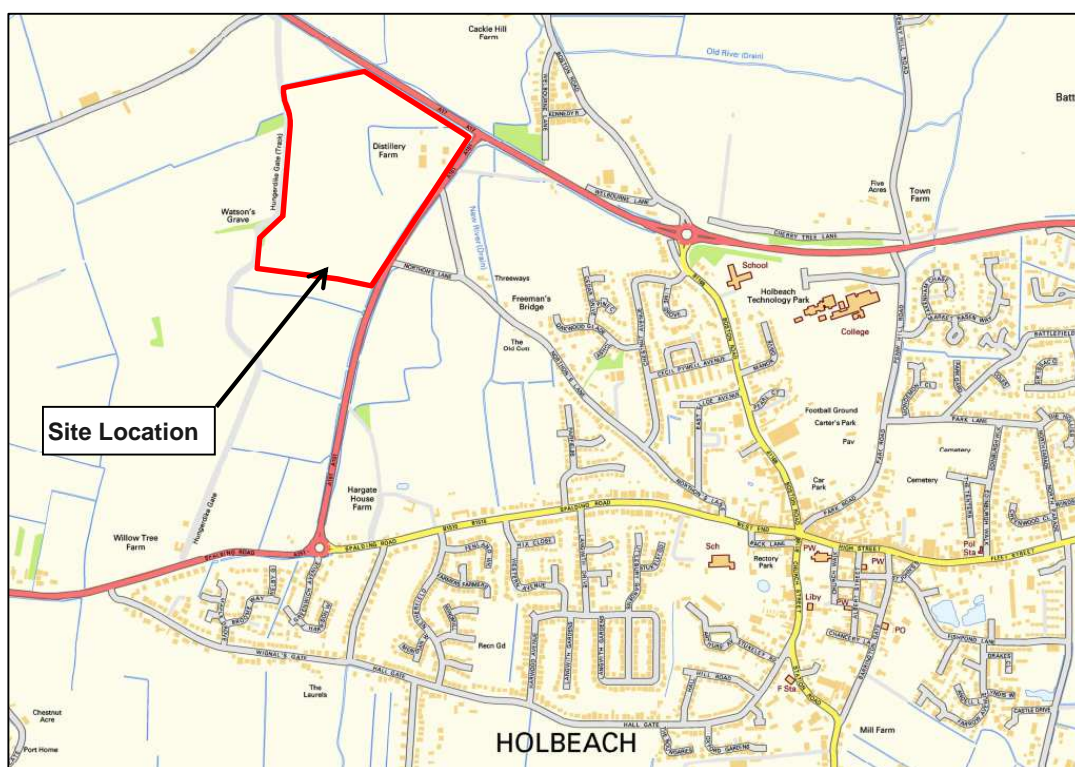
1 Site Setting

1.1 Site Description

1.1.1 The 16ha hectare (ha) site consists of primarily agricultural land and a distillery farm on the western flank of the town of Holbeach in Lincolnshire (site centre OS grid reference 534,735m E, 325,745m N) – see **Figure 1.1**.

1.1.2 Holbeach lies within the administrative boundary of South Holland District Council (SHDC).

Figure 1.1: Site Location Plan



1.1.3 The site is bordered to the east by the A151 and the A17 Washway Road to the north, by the Hungerdike Gate to the west and agricultural land to the immediate south

1.1.4 The south-eastern part of the site was recently the subject of an outline planning application by the University of Lincolnshire for a 'proposed centre of excellence in agri food' and associated works (SHBC planning reference H09-0771-16, approved November 2016). This will form part of the wider FEZ and it is anticipated the wider site will utilise the proposed main access via a roundabout off the A151 (the application also included for a new roundabout at the junction of the A17 and A151 (the Peppermint Junction)).

1.2 Proposed Development

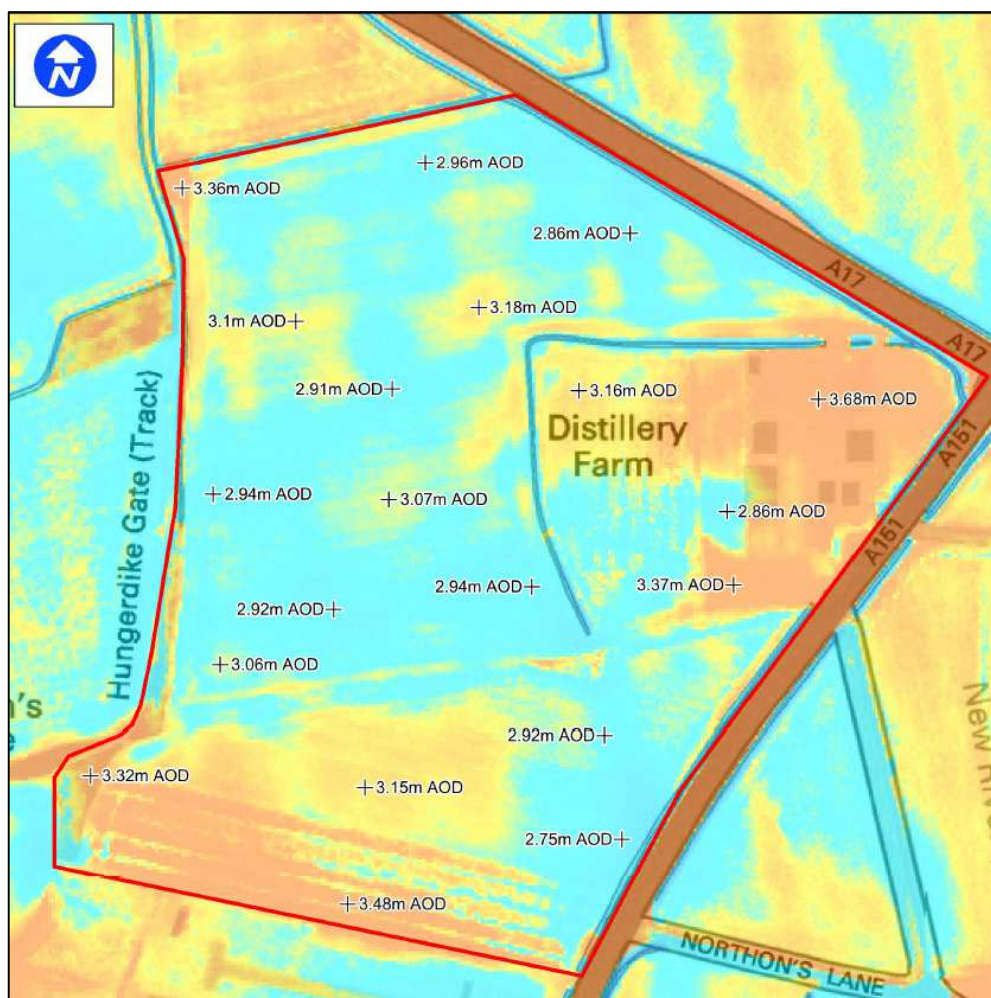
1.2.1 The proposal is for a new 'Food Enterprise Zone' (FEZ); a centre of excellence for research and development in the field of food and agriculture.

1.2.2 The concept is for a central hub accessed off the A151 to the east, with discrete zones across the site covering a range of specialisms. The masterplan for the site by Robert Doughty Consultancy (RDC) is provided in **Appendix A**.

1.3 Topographic Survey

- 1.3.1 LiDAR has been obtained for the site and spot levels are shown on **Figure 1.2**. This indicates site levels vary between approximately 2.8m AOD and 3.7m AOD.
- 1.3.2 There are two main high spots (denoted in orange) in the southern and eastern parts of the site. Levels fall from these high spots towards the lower central areas of the site.

Figure 1.2: Overview of Site Topography (LiDAR data)



- 1.3.3 A detailed topographic survey of the site has been undertaken by Axis Surveys in August 2016 and is included in **Appendix B**. This confirms levels are consistent with the LiDAR information discussed above.

1.4 Geology

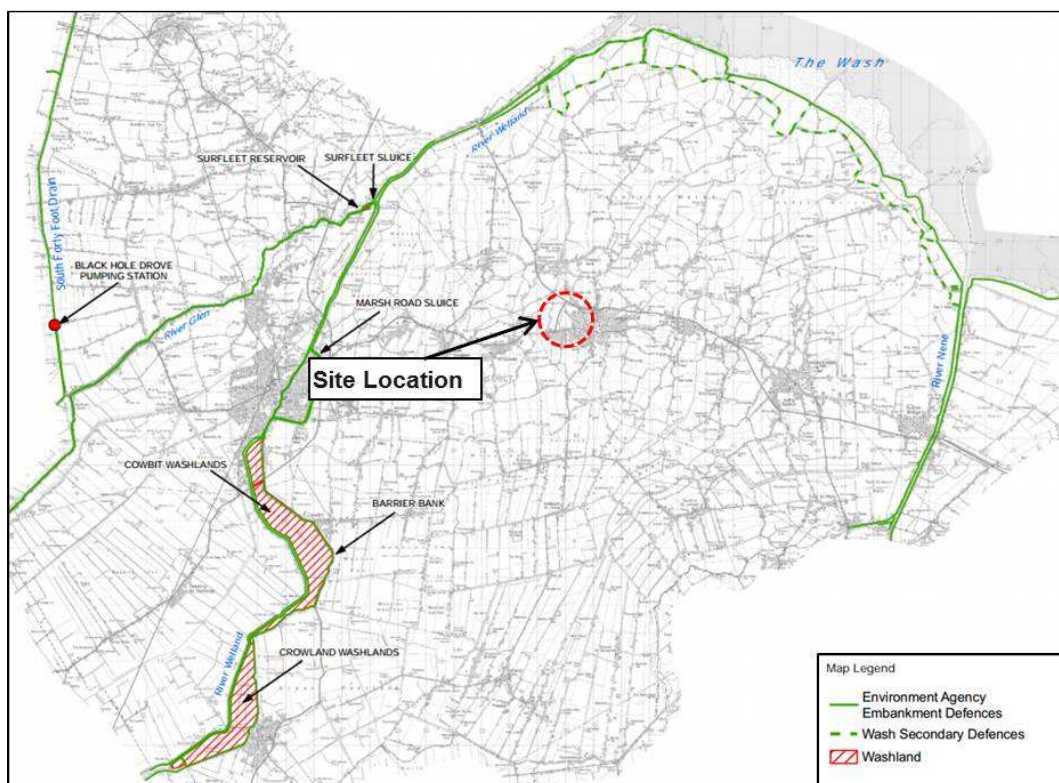
- 1.4.1 An initial overview of the site geology has been made by using the online British Geological Society (BGS) 'Geology of Britain Viewer'. This advises that the Holbeach area geology is a bedrock of 'West Walton Formation - Mudstone and Siltstone', with superficial deposits of 'Tidal Flat Deposits - Clay and Silt'.
- 1.4.2 The Cranfield University 'Soilscapes' resource indicates the land is 'Loamy and clayey' and described as 'Loamy and clayey soils of coastal flats with naturally high groundwater'.

1.5 Watercourses and Existing Flood Defences

Main River Watercourses

- 1.5.1 The **River Welland** is the nearest ‘main river’ watercourse and is located approximately 7km to the north of the site.
- 1.5.2 The Welland is one of four main river watercourses that flow through South Holland District – the others being the Nene, the Glen and the South Forty Foot Drain – draining the low lying fens and ultimately discharging to the Wash estuary, and is tidally influenced downstream of Spalding.
- 1.5.3 All watercourses in the region drain into the Wash, located approximately 12km to the north-west of the site. SFRA Figure 5, an extract of which is displayed in **Figure 1.3**, confirms the location of EA maintained embankment defences along the River Welland, whilst the coastline with the Wash is defended by an EA-controlled line of ‘primary’ flood defences with lines of ‘secondary’ and ‘tertiary’ defences under the control of local landowners.

Figure 1.3: Extract of SFRA Map 5 ‘Tidal and Fluvial Defences’



- 1.5.4 The SHDC SFRA confirms that “the main river watercourses are embanked and so have no direct floodplain in the District other than at designated flood storage areas... However, they do have indirect floodplains being that which would arise if there was a failure in one of the embankments”.
- 1.5.5 SFRA Table 3R shows the reference tidal flood levels and the comparison with the right bank defence crest levels along the tidal River Welland. This confirms that:
- the defences are not overtopped in the current 1 in 200 (0.5%) annual probability or the extreme 1 in 1000 (0.1%) annual probability tidal flood events.

- allowing for sea level rise projected to the year 2115, the crest levels are still above the 1 in 200 (0.5%) annual probability level, although isolated locations drop marginally below the extreme 1 in 1000 (0.1%) annual probability tidal flood events (albeit by less than 300mm).
- 1.5.6 Further afield, the area is protected from severe tidal flooding by The Wash estuary and is necessarily defended against tidal inundation by substantial sea defences which prominently feature along the Lincolnshire coastline. In addition to protection of the major settlements, these defences protect an extensive area of valuable fenland and numerous properties from flooding.
- 1.5.7 The EA have confirmed in their email of 3rd March 2014 (see copy in **Appendix E**) that:
- “The tidal defences protecting this site consist of earth embankments. They are in good condition and provide protection against a flood event with a 0.67% chance of occurring in any year (1 in 150). We inspect these defences regularly to ensure that any potential defects are identified early”.*
- 1.5.8 However, the SFRA indicates that the flood defences along the frontage of the Wash currently have insufficient freeboard above the current 1 in 200 (0.5%) annual probability tidal flood event, with isolated points below this level.
- 1.5.9 When the allowance for sea level rise as a result of climate change is also considered, the SFRA confirms that *“none of the Wash front line defences would have adequate freeboard to be considered secure”* and recommends improvements to both primary and secondary defences in the area. Notwithstanding this point, the significant distance of Holbeach from the coastline would ensure that any minor overtopping due to the deficiencies in the defence crest level would not impact the area (see EA data in **Section 3.5** for further details).

IDB Watercourses

- 1.5.10 The land drainage in the Holbeach area is managed by the South Holland Internal Drainage Board (IDB), whose role is to manage surface water discharge and land drainage through a network of arterial drainage channels which discharge into the higher level main rivers, with water level control assisted by pumping stations and sluices.
- 1.5.11 The South Holland IDB have provided maps showing the network of the IDB watercourses in the area, which form part of the **Holbeach River** catchment (see **Appendix C**). The map shows that the site is bordered by riparian owned watercourses which drain to the nearby **IDB P09 ‘Distillery Channel’** in the north-eastern corner of the site.
- 1.5.12 The **IDB P16 ‘Gander Ground’** watercourse is located approximately 90m to the south of the site and some of the riparian watercourses traversing the eastern boundary of the site drain to this watercourse before it passes under the A151 (see **Figure 1.4**).

Figure 1.4: View south across A151 showing section of Gander Ground watercourse east of site



1.5.13 These channels drain into the ‘**Holbeach New River**’ (Drain) – IDB reference P20 – which runs north through the land east of the A151 and outfalls into the Holbeach River to the north of Holbeach. From this point the Holbeach River continues north, to eventually outfall into the River Welland via Holbeach River Sluice.

1.5.14 With regard to the standard of protection provided by the IDB watercourses, the South Holland SFRA states:

“In the present-day 1% annual probability event, the IDBs consider that most of their drains may reach bank-full conditions but in urban areas there should be no flooding to property. In agricultural areas there would probably be shallow flooding of the lower lying parts but with only isolated instances of flooding to properties or roads”.

1.5.15 The South Holland IDB have previously advised as follows in relation to the standard of protection:

“The Boards target standard protection of the watercourses are 1:100 in urban areas with a 300mm freeboard and 1:10 Agricultural areas with a 600mm freeboard”.

1.5.16 Modelled flood data provided by the IDB is discussed in **Section 3.4**.

1.6 Future Flood Defences

1.6.1 The site is located with the area covered by the EA River Welland Catchment Flood Management Plan (CFMP), which sets out the policies proposed for the long term management of flood risk for the catchment – see **Section 2.3**. The CFMP confirms that the long term strategy is to maintain the existing defence standards for the District, along with those in other fenland areas. Under these policies they would aim to enhance the defences over time as may become necessary to keep pace with climate change effects.

1.6.2 If the policies are put into effect then the present-day flood risks identified by the SFRA would remain in the future, but the potential increase in flood risk (i.e. resulting from potential climate change impacts) would not arise.

- 1.6.3 The main risk of flooding to the site is from a potential breach in the flood defences, either on the tidal River Welland to the north-west or from the tidal defences along the coastline to the north-east. The potential improvements to such tidal defences would have the potential to significantly reduce the residual risk of a breach impacting the area.

2 Planning Policy

2.1 National Planning Policy

- 2.1.1 The '**National Planning Policy Framework**' ('NPPF') was issued by Communities and Local Government in March 2012 as part of the Government's reforms of the planning system of England and Wales to make it less complex and more accessible, to protect the environment and to promote sustainable growth.
- 2.1.2 This was supplemented in March 2014 with the accompanying '**Planning Practice Guidance to the National Planning Policy Framework**' (PPG).
- 2.1.3 The previous planning policy setting out the requirements for floodplain development in areas at risk of flooding was detailed in Planning Policy Statement 25: Development and Flood Risk (PPS25). PPS25 provided a '*risk based approach*' where risk is defined as a combination of probability and consequence; it of course follows that probability on its own does not create risk, there must also be consequence (i.e. harm to a sensitive receptor). This definition is confirmed in the Flood and Water Management Act 2010 at Paragraph 2(1).
- 2.1.4 The NPPF follows the same overarching principles of PPS25, i.e. '*Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere*'. Indeed, a significant amount of the NPPF and the PPG is imported directly from PPS25 and the PPS25 Practice Guide.

2.2 Local Planning Policy

- 2.2.1 Local planning policy relevant to the site is currently contained within the emerging **South East Lincolnshire Local Plan**, currently being prepared by SHDC alongside Boston Borough Council and Lincolnshire County Council.
- 2.2.2 Previous planning policy within the South Holland Local Plan (July 2006) Policy SG9 'Development and Flood Risk' is no longer valid, following Direction by the Secretary of State.

2.3 River Welland Catchment Flood Management Plan

- 2.3.1 The **River Welland Catchment Flood Management Plan (EA, December 2009)** gives an overview of the flood risk in the River Welland catchment and sets out the EA's preferred plan for sustainable flood risk management over the next 50 to 100 years. It identifies flood risk management policies to assist all key decision makers in the catchment, and was produced through a wide consultation and appraisal process.
- 2.3.2 For the Holbeach area, the CFMP indicates a preferred Flood Risk Management Policy as follows:

"Policy option 4: Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.

- 2.3.3 The explanatory text considering the flood risk management in the area further states:

"Historically, the Fens have been heavily managed by a number of organisations to reduce the probability of river and tidal flooding. Flood risk is expected to increase in the future to people, property and the environment. In the short term it will be feasible and effective to maintain the existing flood defences at the current level of flood risk management. However, in the future the protection given by these

defences may decline as future flooding is expected to become more intense. It may be difficult to maintain the current level of flood risk management into the future for all low lying areas. Where it is technically, environmentally and economically viable, the policy is to undertake further activities to maintain the current level of flood risk management into the future.”

2.4 EA Climate Change Guidance

- 2.4.1 In considering flood risk to the site, it is necessary to fully consider the potential impacts of climate change for the lifetime of the development within the mitigation measures. This is detailed in the EA ‘Flood risk assessments – climate change allowances’ guidance, released February 2016.
- 2.4.2 The potential impacts of climate change are taken into account in the EA modelled flood data discussed in **Section 3.5** through the provision of flood levels based on sea level rise projected to the year 2115 (i.e. approximate 100-year development design life).
- 2.4.3 Given that the development will include uses for engineering, development and research, the proposed buildings are considered to have a potentially lower development life than equivalent residential development, and therefore the assessed impact of climate change is considered to be conservative.

Table 2.1: Recommended contingency allowances for net sea level rise

Administrative Region	Net Sea Level Rise (mm/yr) Relative to 1990			
	1990 to 2025	2026 to 2055	2056 to 2085	2086 to 2115
East, east Midlands, London, south east	4.0	8.5	12	15

- 2.4.4 The sea level allowances in **Table 2.1** have been used to derive the still water levels in **Table 3.1**.

3 Flood Risk

3.1 Sources of Information

3.1.1 This section provides an overview of the current and future flood risk to the site, based on the following information:

- EA online flood maps (<http://maps.environment-agency.gov.uk/wiyby/>);
- EA **Product 8 flood risk data** (EA reference CCN/2016/18410, dated July 2016), including modelled breach hazard mapping and tidal flood data;
- **South Holland District Council 'Update of Strategic Flood Risk Assessment'** (SFRA) dated January 2010;
- Email correspondence with the **South Holland IDB**;
- **Anglian Water** online mapping.

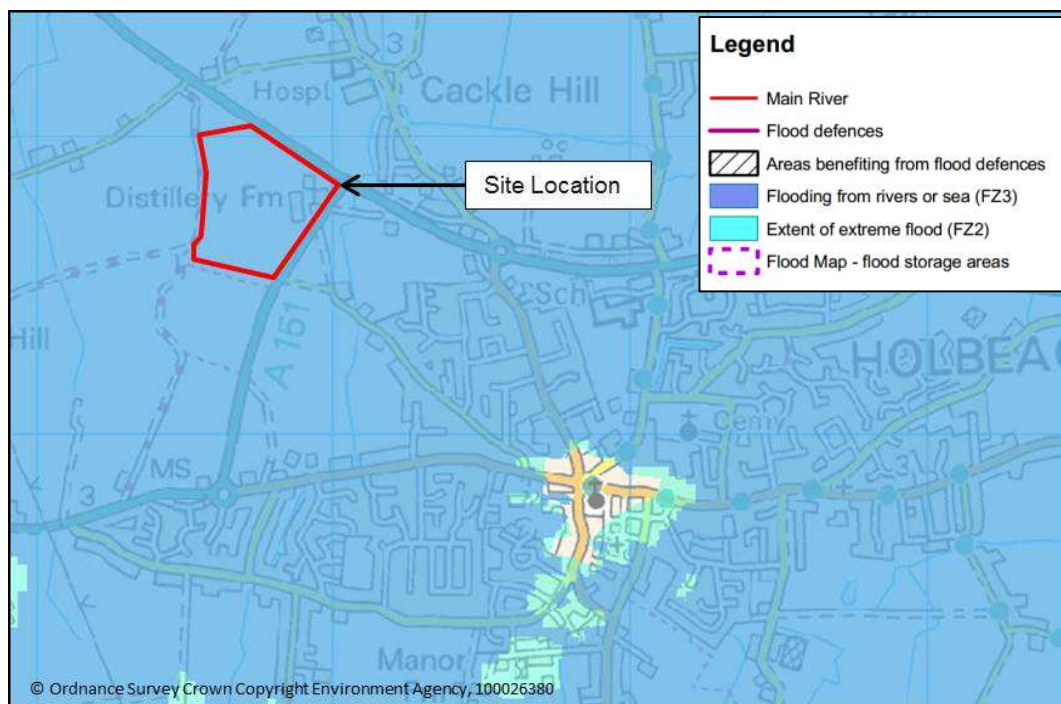
3.1.2 **Section 3.7** provides a summary of the key flood risk issues/constraints, based on a review of the above.

3.2 EA Flood Maps

Flood Zone Map

3.2.1 The first phase in identifying whether a site is potentially at risk of flooding is to consult the EA's Flood Zone maps, available on the EA's website. This provides an initial indication of the extent of the Flood Zones, which is refined by the use of more detailed site-specific level survey and modelled flood levels.

Figure 3.1: EA Flood Zone Map



- 3.2.2 As shown on **Figure 3.1** above, the site lies within **Flood Zone 3 'High Probability'** (greater than 1 in 100 (>1.0%) annual probability of river flooding or greater than 1 in 200 (>0.5%) annual probability of tidal flooding).
- 3.2.3 The tidal Flood Zone 3 is extensive across the low lying area behind the Lincolnshire coastline, extending inland either directly from the coastline (the Wash estuary, approximately 12km to the north-west), or via a tidally influenced watercourse (the nearest 'main river' being the River Welland, located approximately 7km to the north of the site).
- 3.2.4 It is noted that the IDB channels in the area are not marked as bold blue lines on the above drawing, confirming their status as ordinary watercourses.

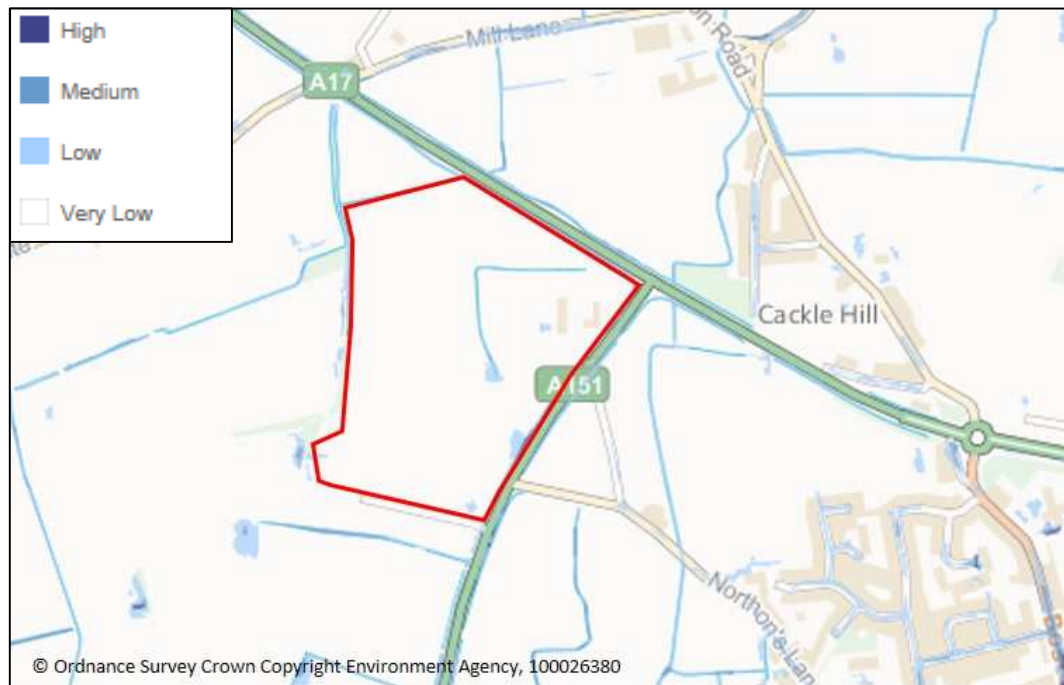
EA Flood Risk from Reservoirs Map

- 3.2.5 The EA provide maps showing the risk of flooding in the event of a breach from reservoirs, based only on large reservoirs (over 25,000 cubic metres of water). These confirm that the Holbeach area is not at risk of flooding from such sources.

EA Flood Risk from Surface Water

- 3.2.6 The EA 'Surface Water Flood Risk Map' shows where areas could be potentially susceptible to surface water flooding in an extreme rainfall event. It should be noted that these are generated using a relatively coarse methodology whereby rainfall inflows are routed over a ground surface model. As such, the analysis does not take account of any below-ground drainage infrastructure, but does provide a guide to potentially vulnerable areas based on the general topography of an area.

Figure 3.2: EA Flood Risk from Surface Water Map



- 3.2.7 **Figure 3.2** indicates that the site lies mainly within the (unshaded) 'Very Low' risk areas – i.e. less than 1 in 1000 (<0.1%) annual probability of surface water flooding.
- 3.2.8 There are small areas within the 'Low' (between 1 in 100 (1.0%) and 1 in 30 (3.3%) annual probability) risk area; these consist of isolated ponding in the fields or alongside the existing drainage channels through the area.

3.3 South Holland Strategic Flood Risk Assessment (SFRA)

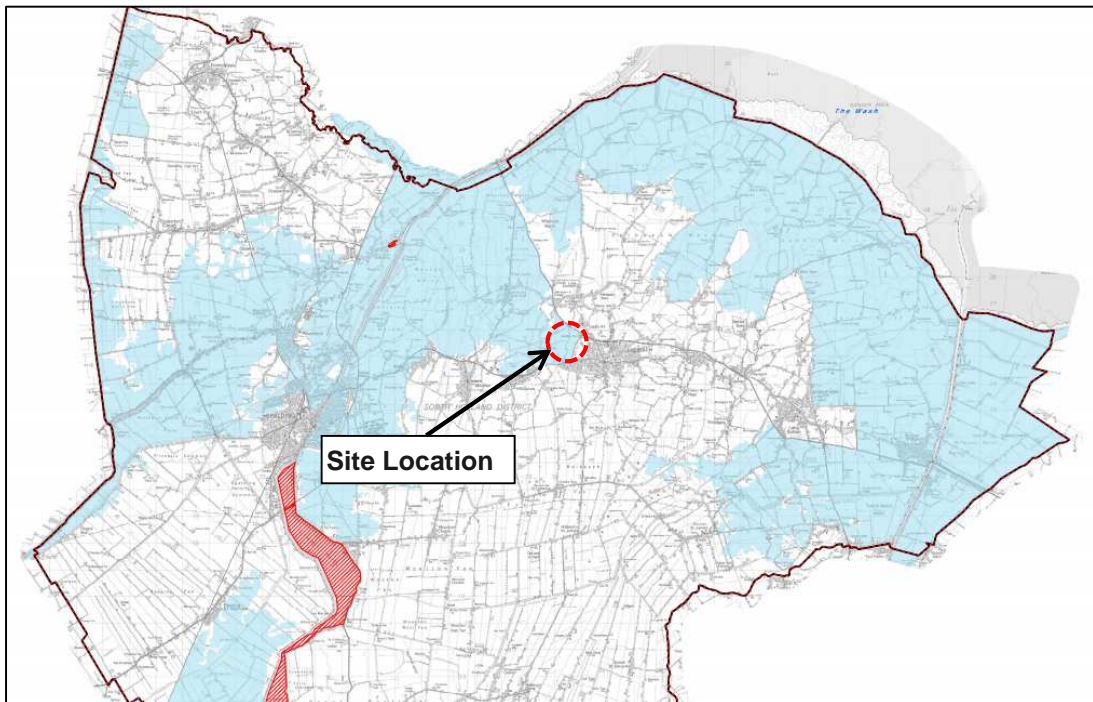
- 3.3.1 The SHDC ‘Update of Strategic Flood Risk Assessment’ Report was issued in June 2010. The document provides an overview of the flood risk issues across the district and an assessment of the risks associated with a breach in the sea defences including further information on the flood hazard, should a breach occur in the defences, and the relative probability of flooding.
- 3.3.2 Copies of referenced maps are included in **Appendix C**.
- 3.3.3 The reference tidal flood levels for the area are as set out in **Table 3.1** below. These are taken from the SFRA Appendix A and are the reference flood levels at the outfall of the River Welland into the Wash (location reference ‘W1’ on SFRA Figure A1). There is some variation of the reference tidal levels moving along the Lincolnshire coastline in the vicinity of the site but this variation is typically less than 50mm.

Table 3.1: EA Still Water Tide Levels (see SFRA Fig. A1)

Flood Event (Annual Probability)	Year	Still Water Tidal Level (m AOD)
1 in 200 (0.5%)	2007	5.98
	2055	6.31
	2115	7.12
1 in 1000 (0.1%)	2007	6.32
	2055	6.50
	2115	7.46

- 3.3.4 The SFRA states “*There are no reports of groundwater flooding occurring in the District. This issue is therefore taken as having no strategic significance in relation to flood risk.*”
- 3.3.5 SFRA Maps 5, 12 and 13 show the ‘actual’ flood risk across the district for a range of timescales, based on a 1 in 100 (1.0%) annual probability fluvial event and a 1 in 200 (0.5%) annual probability tidal event.
- **Map 5** shown the flood risk under current conditions. Areas at high probability of flooding are confined to land immediately behind the Wash coastline and primarily along the north-west boundary of the District. The Holbeach area is unaffected;
 - **Map 12** shows the flood risk projected to the year 2055. This shows more extensive flooding along the Wash coastline and on the western part of the district, but Holbeach remains a significant distance from any impacted areas (a minimum of approximately 8km);
 - **Map 13** shows the flood risk projected to the year 2115. This shows extensive flooding of the district, particularly inland along the Wash coastline and along the floodplain of the River Welland. Flooding extends onto the site and as far as the A151 road running along the eastern boundary of the site (see **Figure 3.3**).

Figure 3.3: Extract of SFRA Figure 13 'Actual Risk Extent – Year 2115'



3.3.6 It should be noted that the analysis contained within the SFRA is inherently conservative as it does not consider any potential improvements to existing flood defence levels, and it is superseded by the more detailed EA modelling discussed in **Section 3.5**.

3.4 South Holland IDB Hydraulic Modelling

3.4.1 As discussed in Section 1.5, the South Holland IDB has responsibility for the land drainage across the South Holland area, and the site is bordered by riparian owned drainage channels draining into the IDB Distillery Channel in the north-eastern corner of the site, which outfalls into the Holbeach New River a short distance east of the site.

3.4.2 The IDB have recently undertaken hydraulic modelling of their land drainage network in the area and have provided results as detailed in **Table 3.2** in the vicinity of the Holbeach site (the result is provided on the Holbeach New River to the east of the site – see IDB email and attachment dated 12th January 2017 in **Appendix C**).

Table 3.2: IDB Modelled Flood Levels

Flood Event (Annual Probability)	Flood level (Holbeach New River) m AOD
1 in 10 (10%)	2.05
1 in 50 (2%)	2.34
1 in 100 (1%)	2.45
1 in 100 plus climate change (to 2085)	2.67

3.4.3 The IDB have advised that the modelling indicated a 300mm to 600mm freeboard in the area, and comparison with site ground levels (see **Section 1.3**) confirms ground levels over the site are above these flood levels.

- 3.4.4 It is noted the IDB advise that their modelling was undertaken based on climate change rainfall events established in 2015 – i.e. prior to the release of the new EA guidance discussed in **Section 2.4**. The previous guidance ('Climate change allowances for planners', September 2013) required consideration of a +20% increase in peak rainfall intensity to the year 2085, whereas the new EA guidance requires consideration of a range between +20% and +40% for the period 2070 to 2115.
- 3.4.5 The results are therefore considered robust, but the potential future increases in rainfall intensity emphasise the need to ensure development does not place greater demands on the IDB network, through incorporation of a sustainable surface water drainage with a controlled discharge rate agreed with the IDB. It is also recommended that ground floor levels include a significant freeboard above the reference IDB modelled flood levels.

3.5 EA Tidal Breach and Overtopping Modelling

- 3.5.1 The EA have also provided details of their tidal breach/overtopping hazard mapping in the area. These provide modelled flood extents based on the modelled overtopping and the composite maximum flood extents from the series of simulated breaches in the flood defences along the Lincolnshire coastline.
- 3.5.2 The overtopping scenario model and the breach scenario model are two discrete EA models, constructed as part of the 'Northern Area Tidal Hazard Mapping Study' and are considered the best available information on tidal flood risk to the area.
- 3.5.3 One important distinction between the two scenarios is that the overtopping scenario is representative of the 'actual' flood risk to the site (as the probability and consequence are clearly assessed), whereas it is a point of debate as to whether a breach scenario is realistic to assess in respect of third party impacts, as this is a residual (hypothetical rather than an actual) flood risk and the probability of flood defence failure combined with such a flood event is considered very small.
- 3.5.4 The EA flood data (EA reference CCN-2016-18410) is provided in **Appendix D** and discussed below.

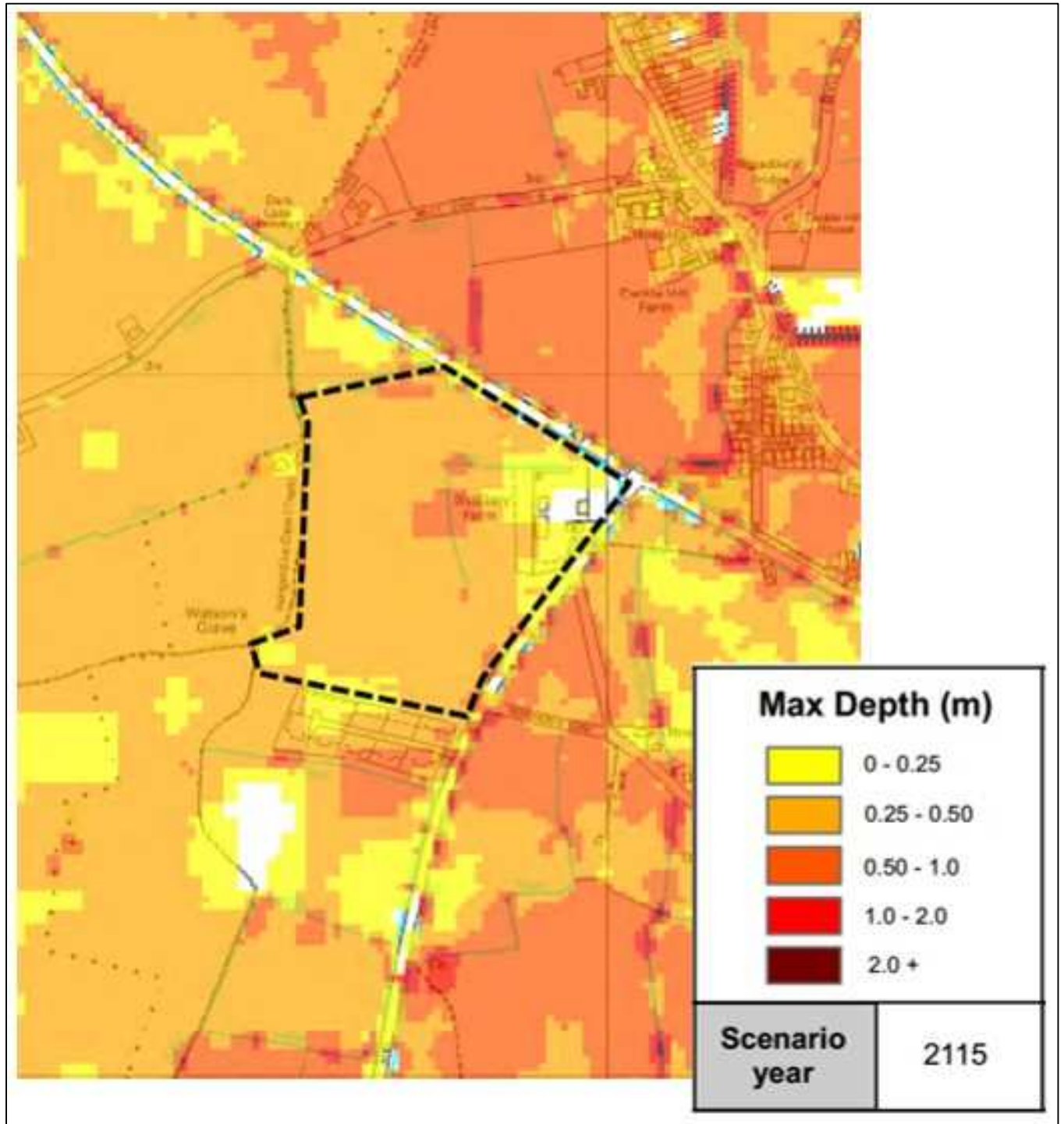
Overtopping Model

- 3.5.5 The EA response confirms that the site is not affected in the conventional 'overtopping scenario', in either the 1 in 200 (0.5%) annual probability tidal event, or in the extreme 1 in 1000 (0.1%) annual probability tidal event.
- 3.5.6 This applies both under current conditions and when considering sea level rise to the year 2115.

Breach Model

- 3.5.7 The EA results indicate the site is unaffected in a 1 in 200 (0.5%) annual probability tidal breach event, or in the extreme 1 in 1000 (0.1%) annual probability tidal breach event under current conditions (as confirmed in the EA correspondence dated 25th July 2016 – see **Appendix E**).
- 3.5.8 When allowing for sea level rise to the year 2115, the site is affected in both the 1 in 200 (0.5%) annual probability breach scenario and the extreme 1 in 1000 (0.1%) annual probability breach scenario.
- 3.5.9 The maximum depth output for the 2115 1 in 200 (0.5%) annual probability breach scenario is shown in **Figure 3.4**.

Figure 3.4: Extract of EA 2115 1 in 200 (0.5%) Annual Probability Breach Scenario (Max Depth)



3.5.10 The key results of the breach modelling in relation to the site can be summarised as set out in **Table 3.3**.

Table 3.3: EA Tidal Breach Modelling – Summary of Impacts at Site

Breach Scenario		Impact at Site	
Year	Annual Probability	Maximum Hazard	Maximum Depth
2006	1 in 200 (0.5%)	Site unaffected	
	1 in 1000 (0.1%)	Site unaffected	
2115	1 in 200 (0.5%)	10% 'Low Hazard' 88% 'Danger for Some' 2% 'Danger for Most'	30% 0 to 0.25m 65% 0.25m to 0.5m 5% 0.50m to 1.0m
	1 in 1000 (0.1%)	5% 'Low Hazard' 90% 'Danger for Some' 5% 'Danger for Most'	22% 0 to 0.25m 70% 0.25m to 0.5m 8% 0.50m to 1.0m

3.5.11 A comparison between the topographic data and the EA flood depths grid provides indicative peak breach levels over the site as follows:

- 1 in 200 (0.5%) annual probability tidal flood level = 3.2m AOD,
- 1 in 1000 (0.1%) annual probability tidal flood level = 3.3m AOD.

3.5.12 The above flood levels across the site are indicative only and would be subject to further analysis using more detailed topographic information for the site. It should be reiterated that this is a residual flood risk, and the probability of flood defence failure combined with such a flood event is considered very small.

3.5.13 A request for site-specific flood levels was previously been made to the EA but the response confirmed that these are not available for issue and the above methodology (i.e. comparison of level survey with modelled flood depths) is the conventional approach.

3.6 Anglian Water Information

3.6.1 An online search on the 'DigDat' portal has confirmed that there are no Anglian Water public sewers within or in the immediate vicinity of the site.

3.7 Summary of Flood Risk

3.7.1 The following table provides an overview of the flood risk to the site, based on the information obtained and detailed in Section 3.

Table 3.4: Summary of Sources of Flood Risk

Source of Flooding	Risk of Flooding to Site	Comment/Justification	Source of data	Mitigation requirements for new development (see Section 4 for further consideration)
Tidal	High	The site is not impacted under the current 1 in 200 (0.5%) or 1 in 1000 (0.1%) annual probability overtopping or breach events. The site is impacted in the 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability plus climate change breach events.	EA Data (see Section 3.5)	Elevate floor levels above 2115 breach flood level (with suitable freeboard). Incorporate flood resistance/resilience measures
Fluvial	Low	The site outside 1 in 1000 (0.1%) annual probability fluvial floodplain (the closest main-river watercourse is the River Welland)	South Holland SFRA (see Section 3.3)	n/a
Land Drainage (i.e. Surface Water/ Pluvial)	High	The site is bordered by riparian watercourses and IDB drains are located to the south and east of the site. South Holland IDB have undertaken hydraulic modelling of the system to verify the flood risk., which indicates the site is not impacted in the 1 in 100 annual probability flood event (to year 2085)	South Holland SFRA South Holland IDB (see Section 1.4)	Allow for in floor level recommendations. Provide buffer zone along IDB channels through site to allow for potential upgrades (if required) Liaise with IDB in development of surface water drainage strategy
Ground water	High	SFRA indicates no records of groundwater flooding. However, online geology resources suggest clayey soils with high water table.	South Holland SFRA BSG Viewer Soilscapes website	Allow for within floor level recommendations and consider within surface water drainage strategy.
Reservoir, Canals, Ponds and Other Artificial Sources	Low	There are no artificial sources of flooding in the vicinity of the site and the EA data indicates the site is not at risk in a potential breach of local reservoirs. This is restated in the South Holland SFRA.	EA data (see Section 3.2) South Holland SFRA	n/a
Sewers	Low	Anglian Water sewer records indicate there are no sewers running across the site.	Online search (see Section 3.6)	n/a
Key:	Low	Low/Negligible Risk – No noticeable impact to site and not considered to be a constraint to development		
	High	Medium Risk – Issue requires consideration but not a significant constraint to development		
	High	High Risk – Major constraint to development requiring active consideration in mitigation proposals		

4 Flood Mitigation Strategy

4.1 Introduction

- 4.1.1 The following section provides an overview of the flood risk constraints and opportunities/mitigation requirements for future development over the site, to inform the LDO and future proposals over the FEZ.

4.2 Ground Floor Levels

- 4.2.1 The site is at low probability of flooding from fluvial/tidal sources, but the majority of the site is potentially at residual risk of flooding to depths of up to approximately 500mm if a breach occurs in the tidal defences, with an estimated flood level of 3.2m AOD.
- 4.2.2 It is therefore recommended that ground floor levels are set a minimum of 3.2m AOD, with flood resilient measures incorporated up to 300mm above the reference flood level. Flood resilient measures are incorporated where it is accepted that, in severe flood events, water may enter parts of the building so it is necessary to ensure the building will remain useable after the floodwater has receded and the area has been cleaned. Therefore, the key issue is to incorporate materials that retain their structural integrity and have good drying and cleaning properties (e.g. the use of suitable tiling over areas, with water resilient grout). It is also recommended that services are secured and sockets etc. are located a suitable freeboard above floor level.
- 4.2.3 It is also recommended that a suitable freeboard is provided above surrounding ground (minimum 150mm) to mitigate the residual flood risk associated with excess surface water runoff in an extreme rainfall event. Similarly, exterior ground levels across the site should also be appropriately contoured to direct surface water away from buildings in such a scenario.
- 4.2.4 A minimum floor level of 3.2m AOD also ensures a minimum freeboard of over 500mm above the modelled IDB 1 in 100 annual probability plus climate change flood level (to year 2085).

4.3 Flood Storage and Flow Routes

- 4.3.1 Any new development located in the vicinity of a watercourse should be constructed such that it does not detrimentally impact on flow routes or reduce the available fluvial floodplain storage over a site; either of which could potentially cause an increase in flood levels on-site or elsewhere. This requirement is considered up to the benchmark of the fluvial 1 in 100 (1.0%) annual probability plus allowance for climate change floodplain.
- 4.3.2 The site is shown as falling outside the fluvial floodplain of the River Welland. An IDB channel is located within the north-east corner of the site and riparian watercourses run in parallel to the northern and eastern boundary of the site and within the north-eastern part of the site.
- 4.3.3 The South Holland IDB have undertaken modelling for the area and the IDB Byelaw 10 states that nothing is permitted within 9m of any of the Board's watercourses without gaining consent from the Board.
- 4.3.4 It is therefore recommended that an appropriate buffer zone is provided either side of the channels, with due consideration of the above requirement for the IDB channel in the north-east corner, to allow for any potential overtopping in extreme flood events.

4.4 Safe Access Arrangements

4.4.1 Safe access arrangements need to be appropriately considered for development on the site given the residual flood risk in a breach of the tidal defences. The situation can be summarised as follows:

- Under current conditions, continuous safe access is available for the site in both the 1 in 200 (0.5%) annual probability event and the extreme 1 in 1000 (0.1%) annual probability event. This applies under normal 'overtopping' conditions and in the event of a breach in the tidal flood defences.
- Under future (year 2115) conditions, continuous safe access is available for the site in both the 1 in 200 (0.5%) annual probability event and the extreme 1 in 1000 (0.1%) annual probability event under normal 'overtopping' conditions;
- In a breach scenario under future (year 2115) conditions, continuous safe access is potentially disrupted for the site in the 1 in 200 (0.5%) annual probability event and the extreme 1 in 1000 (0.1%) annual probability event, although maximum flood depths on the surrounding access roads are typically less than 250mm.

4.4.2 Due to the considerable low lying nature of the area, combined with the significant increases in peak tidal flood level resulting from the climate change allowances, the floodplain in a major breach flood event is extensive, and it is not feasible to provide a raised pedestrian safe access route beyond the site to continuous higher land.

4.4.3 It should be noted that as a development of 'Less Vulnerable' uses, no sleeping accommodation is proposed and the development could be vacated and secured in the event of potential flooding in the area, due to the wider disruption of the flood event.

4.4.4 The EA operate a 'Flood Information Service', covering the Lincolnshire area. This service can be found online at the following address:

<https://flood-warning-information.service.gov.uk/warnings?location=lincolnshire>

4.4.5 The Flood Information Service provides an array of flood data for the area, including:

- An overview of the national flooding situation, identifying total number and location of flood alerts, flood warnings and severe flood warnings;
- A five-day flood risk overview;
- A feed of the local river level information (updated hourly) including peak river levels in the River Welland at Fosdyke Bridge

4.4.6 The EA's service, where available, aims to minimize the risk to life and property from flooding from rivers and the sea. However, it would not claim in any way to eliminate the risk. There are limitations inherent within the operation of the flood warning system that mean the issue of a timely warning is in no way guaranteed.

4.4.7 In conclusion, the emphasis will be on:

- (i) Ensuring the buildings over the development are safe and above reference flood levels;
- (i) A coordinated approach to flood warning over the site, with sign up to the EA's flood warning service to allow early indication of any defence breach which may hinder either access or egress to the development;

- (ii) Provision of a site-wide 'Flood Risk Management Plan' to formalise the actions for users of the FEZ in the event of a severe tidal flood impacting the area.

4.5 Surface Water and SuDS

- 4.5.1 The NPPF recognises that flood risk and other environmental damage can be managed by minimising changes in the volume and rate of surface runoff from development sites, and recommends that priority is given to the use of Sustainable Drainage Systems (SuDS) in new development, this being complementary to the control of development within the floodplain.
- 4.5.2 A standalone 'Surface Water Drainage Assessment' has been prepared by PBA for the site. This outlines the relevant national, local and regional drainage policy/guidance and the SuDS principles to be incorporated into the strategy for the FEZ, following liaison with the South Holland IDB.

5 Conclusions

- 5.1.1 This 'Flood Risk Mitigation Strategy' Report has been prepared for South Holland District Council to accompany the Land Development Order (LDO) for the Food Enterprise Zone (FEZ) at Holbeach, Lincolnshire
- 5.1.2 The report sets out the available information on flood risk, and identifies the requirements to mitigate the risk of flooding within the development, allowing for the potential impact of climate change.
- 5.1.3 The available information from the Environment Agency (EA) indicates the site lies within tidal Flood Zone 3a 'High Probability' (greater than 1 in 200 (>0.5%) annual probability of tidal flooding).
- 5.1.4 This classification ignores the presence of flood defences; the site is a significant distance inland and is protected from tidal flooding by the series of raised embankments along the Wash coastline and along the tidal River Witham.
- 5.1.5 The detailed flood risk information obtained as part of this report confirms that:
- There are no historic records of flooding over the site;
 - The site is outside the modelled fluvial floodplain of the River Welland and outside the modelled 1 in 100 annual probability plus climate change floodplain (to 2085) of the South Holland Internal Drainage Board (IDB) system;
 - The EA modelling indicates the site is not affected in the conventional tidal 'overtopping' scenario, for either the 1 in 200 (0.5%) annual probability tidal event, or in the extreme 1 in 1000 (0.1%) annual probability tidal event. This applies both under current conditions and allowing for sea level rise to the year 2115;
 - The site is not affected in a 1 in 200 (0.5%) annual probability tidal breach event, or in the extreme 1 in 1000 (0.1%) annual probability tidal breach event under current conditions;
 - The site is affected in a 1 in 200 (0.5%) annual probability tidal breach event and in the extreme 1 in 1000 (0.1%) annual probability tidal breach event under future conditions (i.e. allowing for sea level rise to the year 2115). Maximum flood depths typically range from 0m to 0.5m across the site, and indicate a reference 1 in 200 (0.5%) annual probability 2115 breach flood level of 3.2m AOD.
- 5.1.6 It is recommended that the new development within the FEZ incorporates appropriate mitigation measures as follows:
- **Ground floor levels** are to be set at are set a minimum of 3.2m AOD, with flood resilient measures incorporated up to 3.5m AOD (300mm above the reference breach flood level). It is recommended that a freeboard is provided above surrounding ground (minimum 150mm) to mitigate the residual flood risk associated with excess surface water runoff in an extreme rainfall event;
 - **Safe access** is currently available, but in the event of a breach the wider area would potentially be severely impacted by tidal flooding. As such, the emphasis will be on ensuring the development itself is safe (safe refuge) and above any reference flood level, combined with a Flood Risk Management Plan to formalise the actions for users to vacate the site in the event of a severe tidal flood impacting the area.

- The **surface water drainage arrangements** for the development will be prepared based on sustainable drainage principles, incorporating on-site attenuation measures and limiting runoff to meet the requirements of the IDB. The proposed strategy is outlined in the PBA 'Surface Water Drainage Assessment' provided separately.
- 5.1.7 In conclusion, the report confirms that appropriate mitigation can be incorporated into the proposed FEZ to address the flood risk to the site, to ensure the development is safe and there is no detrimental impact on third parties.

Appendix A Site Masterplan

RDC Masterplan Drawing 1202-1-MP02 (December 2015)

THIS DRAWING IS FOR THE
PURPOSE OF OBTAINING
PLANNING PERMISSION ONLY

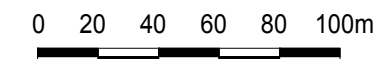
CDM NOTE:

The design has been undertaken as far as possible to avoid risks to health and safety or to reduce and control the effects of any unavoidable risks.

All relevant information identifying the unavoidable risks has been passed to the planning supervisor for inclusion in the Health & Safety plan.

The Health & Safety plan will be issued by the planning supervisor with these drawings.

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Rev.	By	Notes	Date
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rdc
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Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client:
SHDC & LCC

Project:
Food Enterprise Zone (FEZ) Holbeach

Drawing title:
Masterplan

Drawing No. 1202-1-MP02	Rev.	Drawn WW
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Scale 1:2500@A3	Date 03/12/15	Checked LMS/MB
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All measurements should be checked against on site conditions and any discrepancies should be brought to the attention of the Robert Doughty Consultancy.



Appendix B Topographic Information

Axis Survey Drawings AS2020/6 and AS2020/7 (August 2016)
0/7 (August 2016)

Appendix C South Holland IBD Correspondence

IDB email dated 4th August 2016

Watercourse Network Maps

Catchment Map

IDB email dated 12th January 2017 (providing model results)

Richard Fisher

Subject: FW: Holbeach Food Enterprise Zone - Local Development Order
Attachments: Holbeach New River SHDC.pdf

From: Dominic Morris [<mailto:Dominic@wlma.org.uk>]
Sent: 04 August 2016 13:43
To: Elizabeth Edney <eedney@peterbrett.com>
Cc: Rachael Yeowell <Rachael@wlma.org.uk>
Subject: RE: Holbeach Food Enterprise Zone - Local Development Order

Elizabeth

Please see plan attached showing the Board's watercourses highlighted in the royal blue colour. As you can see from the plan there are no Board maintained watercourses surrounding the site. However I believe the Private/Riparian watercourses adjacent to the A151 are maintained by LCC and these all drain into the Board's watercourses eventually entering the Board's Holbeach New River watercourse which drains out through Holbeach River Sluice into the River Welland.

The Board would allow 1.4litres a second per hectare and there would be a Surface Water Development Contribution payable of £74,740 per impermeable hectare draining into the watercourse. The rate payable would be 20% of the overall total providing the flow rate is kept to 1.4litres.

The whole of catchment P has been modelled. The Board can provide you with model information, however there will be a charge for doing so. If you provide us with return periods you require, we will issue you with the fee payable for the information required.

Regards

Dom

Dom Morris
Assistant Engineer, South Holland IDB
dd: +44 (0)1406 421702 | **m:** +44 (0)7920 792389 | **e:** dominic@wlma.org.uk

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Consisting of:
[Broads Drainage Board](#), [East Suffolk Drainage Board](#), [King's Lynn Drainage Board](#)
[Norfolk Rivers Drainage Board](#) and [South Holland Drainage Board](#)

[Defenders of the Lowland Environment](#)

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With our commitment to ISO 14001, please consider the environment before printing this e-mail.

From: Elizabeth Edney [<mailto:eedney@peterbrett.com>]
Sent: Monday, August 1, 2016 4:13 PM
To: Dominic Morris <Dominic@wlma.org.uk>
Subject: Holbeach Food Enterprise Zone - Local Development Order

Dominic

We have been instructed by our Client for the preparation of flood risk reports to support a Local Development Order at a site adjacent to the A17 in Holbeach (please see attached site location plan). I would be grateful if you could advise on the allowable discharge rates in l/s/ha that you would accept into the adjacent IDB watercourses and if you could provide an update on the modelling for the area.

Many thanks.

Kind Regards,

Elizabeth Edney

Flood Risk/Drainage Engineer

For and on behalf of Peter Brett Associates LLP - [Reading](#)



t 01189520314
e eedney@peterbrett.com
w peterbrett.com

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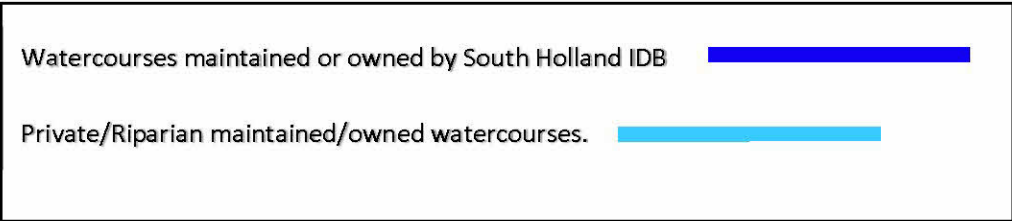
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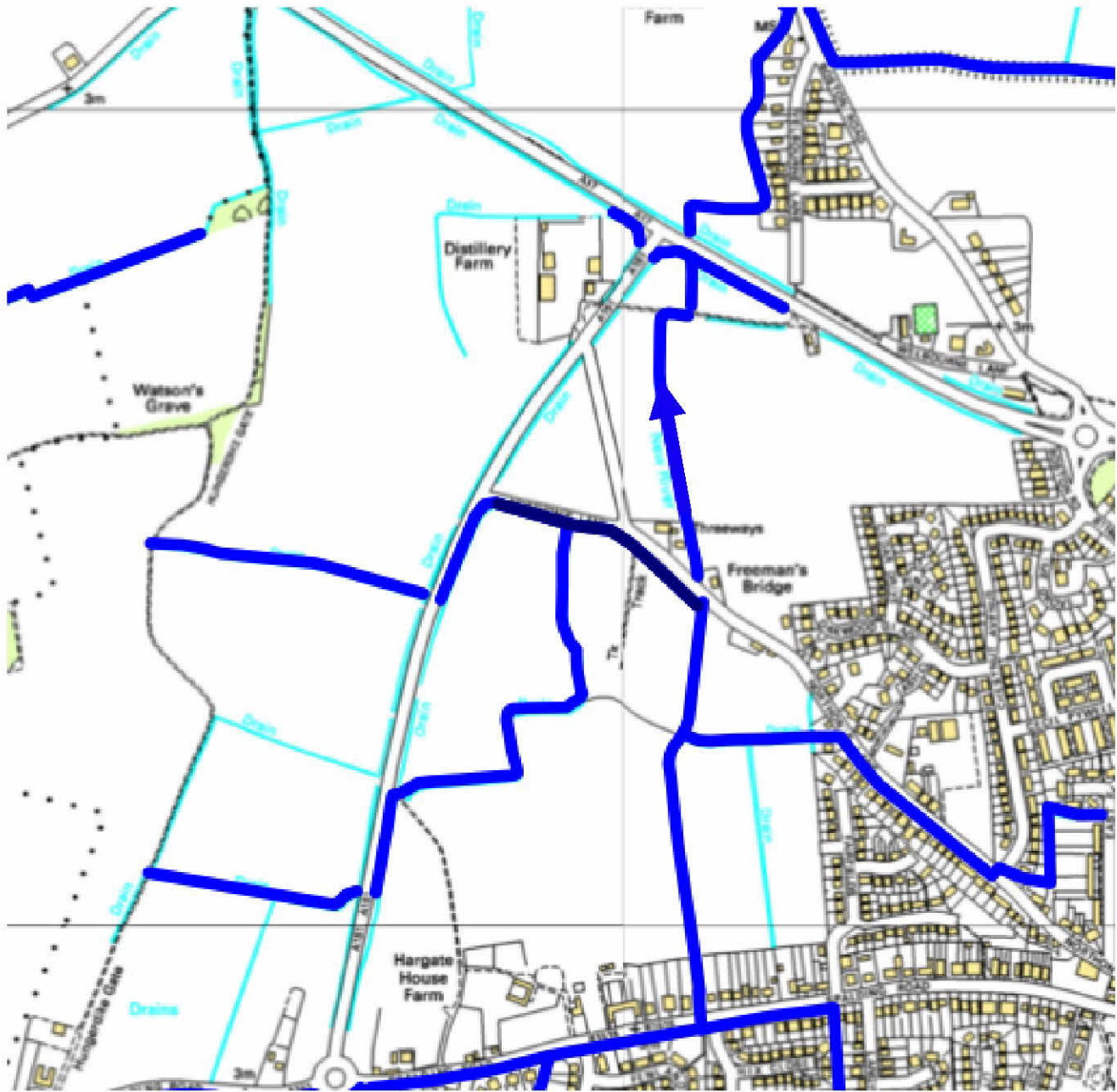
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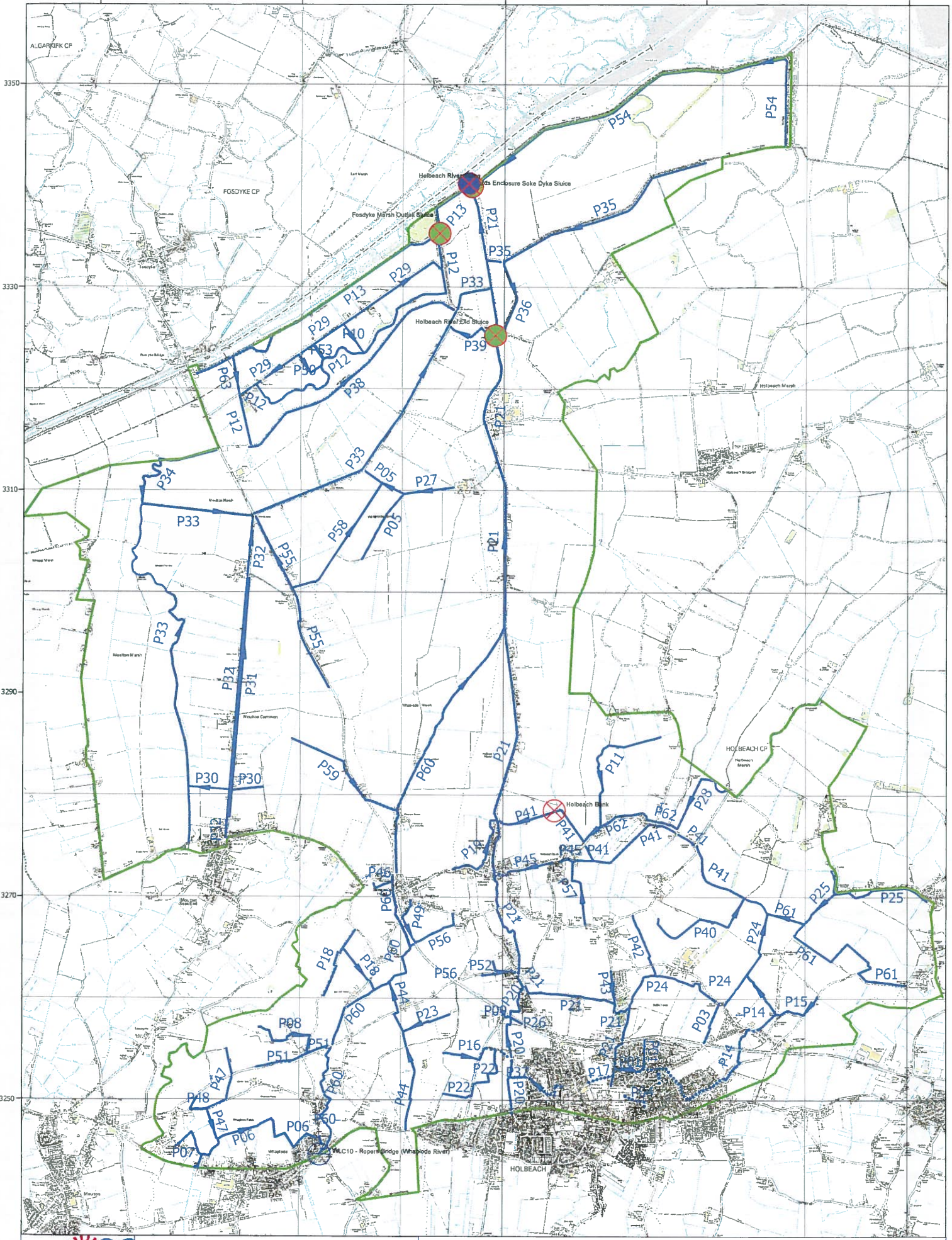
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South Holland IDB
Catchment P - Holbeach River

Upload date:
 Feb 2011

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Key:

- Catchment P Boundary
- IDB Ordinary Watercourse
- Pumping Station
- Water level control
- Tidal Sluice
- Inland Sluice



South Holland I.D.B. (March 2008)

DRAIN ID	DRAIN NAME	OWNED BY SHIDB	HIGH PRIORITY	TOTAL LENGTH (m)	* SOW LENGTH (m)	HIGH PRIORITY A LENGTH (m)	HIGH PRIORITY B LENGTH (m)
P: HOLBEACH RIVER CATCHMENT							
P01	BATTLEFIELDS	<input type="checkbox"/>	<input checked="" type="checkbox"/>	580	580	580	0
P02	BATTLEFIELDS OLD PIPELINE	<input type="checkbox"/>	<input type="checkbox"/>	625	625	0	0
P03	BATTLEFIELDS NORTHERN	<input type="checkbox"/>	<input type="checkbox"/>	440	0	0	0
P04	CEMETARY	<input type="checkbox"/>	<input checked="" type="checkbox"/>	390	240	0	0
P05	CHAPEL	<input type="checkbox"/>	<input type="checkbox"/>	1,250	0	0	0
P06	CROWN	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1,905	1,500	1,905	0
P07	CROWN BRANCH	<input type="checkbox"/>	<input checked="" type="checkbox"/>	580	0	440	0
P08	DAISY HALL	<input type="checkbox"/>	<input type="checkbox"/>	805	0	0	0
P09	DISTILLERY FARM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	80	0	0	0
P10	DRAIN NO 15	<input checked="" type="checkbox"/>	<input type="checkbox"/>	350	0	0	0
P11	FLINT HOUSE	<input type="checkbox"/>	<input type="checkbox"/>	1,325	0	0	0
P12	FOSDYKE MARSH MAIN	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4,150	0	0	0
P13	FOSDYKE MARSH SOKE DYKE	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3,550	0	0	0
P14	FOXES LOW	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2,515	2,000	2,515	0
P15	FOXES LOW BRANCH	<input type="checkbox"/>	<input type="checkbox"/>	570	0	0	0
P16	GANDER GROUND	<input type="checkbox"/>	<input type="checkbox"/>	615	0	0	0
P17	GAS HOUSE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	240	240	240	0
P18	GODDAMS LANE	<input type="checkbox"/>	<input type="checkbox"/>	1,285	0	0	0
P19	HOLBEACH CLOUGH	<input type="checkbox"/>	<input checked="" type="checkbox"/>	870	870	870	0
P20	HOLBEACH NEW RIVER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1,380	1,380	1,380	0
P21	HOLBEACH RIVER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10,350	3,000	10,350	0
P22	HUNGERDYKE - EAST	<input type="checkbox"/>	<input type="checkbox"/>	1,210	0	0	0
P23	HUNGERDIKE - WEST	<input type="checkbox"/>	<input type="checkbox"/>	495	0	0	0
P24	HURN SOUTH	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2,310	0	665	0
P25	HURN BANK DRAIN AND BRANCH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1,770	0	0	0
P26	LOW LANE	<input type="checkbox"/>	<input type="checkbox"/>	180	0	0	0
P27	MAJORS	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1,375	200	875	0
P28	MARSH LEVEL	<input type="checkbox"/>	<input type="checkbox"/>	1,015	0	0	0
P29	MIDDLE MARSH ROAD	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2,235	0	0	0
P30	MOULTON COMMON CONNECTION	<input type="checkbox"/>	<input type="checkbox"/>	735	0	0	0
P31	MOULTON COMMON - EAST	<input type="checkbox"/>	<input type="checkbox"/>	2,560	0	0	0
P32	MOULTON COMMON - WEST	<input type="checkbox"/>	<input checked="" type="checkbox"/>	3,175	500	3,175	0
P33	MOULTON RIVER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	8,375	0	3,445	0
P34	MOULTON RIVER BRANCH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1,295	0	0	0

* SOW = Strategic Ordinary Watercourse

South Holland I.D.B. (March 2008)

DRAIN ID	DRAIN NAME	OWNED BY SHIDB	HIGH PRIORITY	TOTAL LENGTH (m)	* SOW LENGTH (m)	HIGH PRIORITY A LENGTH (m)	HIGH PRIORITY B LENGTH (m)
P: HOLBEACH RIVER CATCHMENT							
P35	NEW SEA BANK	<input type="checkbox"/>	<input type="checkbox"/>	2,550	0	0	0
P36	NEW SEA BANK OLD OUTFALL ROUTE	<input type="checkbox"/>	<input type="checkbox"/>	820	0	0	0
P37	NORTHONS LANE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	700	0	160	0
P38	OLD SEA BANK SOKE DYKE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2,630	500	2,630	0
P39	OLD SLUICE	<input type="checkbox"/>	<input type="checkbox"/>	590	0	0	0
P40	OUNDL VICARAGE	<input type="checkbox"/>	<input type="checkbox"/>	1,250	0	0	0
P41	PEARTREE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	3,530	0	3,530	0
P42	PENNY HILL	<input type="checkbox"/>	<input type="checkbox"/>	640	0	0	0
P43	PENNY HILL ROAD	<input type="checkbox"/>	<input checked="" type="checkbox"/>	325	325	325	0
P44	RODIKE MILL	<input type="checkbox"/>	<input type="checkbox"/>	1,550	0	0	0
P45	ROMAN BANK	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1,020	1,020	1,020	0
P46	SARACENS HEAD	<input type="checkbox"/>	<input type="checkbox"/>	200	0	0	0
P47	SAVAGES LOW	<input type="checkbox"/>	<input type="checkbox"/>	1,100	0	0	0
P48	SAVAGES LOW BRANCH	<input type="checkbox"/>	<input type="checkbox"/>	345	0	0	0
P49	SCARLET GATE	<input type="checkbox"/>	<input type="checkbox"/>	460	0	0	0
P50	SECOND DROVE	<input checked="" type="checkbox"/>	<input type="checkbox"/>	380	0	0	0
P51	SPALDING GATE	<input type="checkbox"/>	<input type="checkbox"/>	755	0	0	0
P52	STOCKWELL GATE	<input type="checkbox"/>	<input type="checkbox"/>	525	0	0	0
P53	THIRD DROVE	<input checked="" type="checkbox"/>	<input type="checkbox"/>	360	0	0	0
P54	WARDS SOKE DYKE	<input type="checkbox"/>	<input type="checkbox"/>	4,340	0	0	0
P55	WASHWAY ROAD A17	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1,860	1,000	1,160	0
P56	WASHWAY ROAD - SARACENS HEAD	<input type="checkbox"/>	<input type="checkbox"/>	595	0	0	0
P57	WASHWAY MILL	<input type="checkbox"/>	<input type="checkbox"/>	730	0	0	0
P58	WHAPLODE LODGE	<input type="checkbox"/>	<input type="checkbox"/>	1,410	0	0	0
P59	WHAPLODE & MOULTON MARSH	<input type="checkbox"/>	<input type="checkbox"/>	1,345	0	0	0
P60	WHAPLODE RIVER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6,150	2,000	6,150	0
P61	WOODHOUSE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2,185	0	295	0
P62	OLD PEARTREE	<input type="checkbox"/>	<input type="checkbox"/>	1,100	0	0	0
P63	FOSDYKE MARSH SOKE DYKE CONNECTION	<input type="checkbox"/>	<input type="checkbox"/>	380	0	0	0
P64	FIELD MEADOWS PIPELINE	<input type="checkbox"/>	<input type="checkbox"/>	195	0	0	0
Total Length for Holbeach River Catchment (km)				100.61	15.98	41.71	0.00

* SOW = Strategic Ordinary Watercourse

Richard Fisher

From: Dominic Morris <Dominic@wlma.org.uk>
Sent: 12 January 2017 16:47
To: Richard Fisher
Subject: RE: Holbeach Food Enterprise Zone - Local Development Order
Attachments: Holbeach New River SHDC.pdf

Richard

Please see plan attached showing the Board's watercourses and water levels for return periods. With regards to flood maps it shows on our maps that given a 1:100year + climate change rainfall event there would be between 600mm -300mm freeboard in the proposed development area.

Regards

Dom

Dom Morris

Assistant Engineer, South Holland IDB

dd: +44 (0)1406 421702 | m: +44 (0)7920 792389 | e: dominic@wlma.org.uk

Water Management Alliance

Kettlewell House, Austin Fields Industrial Estate, King's Lynn, Norfolk, PE30 1PH, UK

t: +44 (0)1553 819600 | f: +44 (0)1553 819639 | e: info@wlma.org.uk | www.wlma.org.uk

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[Broads Drainage Board](#), [East Suffolk Drainage Board](#), [King's Lynn Drainage Board](#)
[Norfolk Rivers Drainage Board](#) and [South Holland Drainage Board](#)

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With our commitment to ISO 14001, please consider the environment before printing this e-mail.

From: Richard Fisher [mailto:RFisher@peterbrett.com]
Sent: 12 January 2017 14:41
To: Dominic Morris <Dominic@wlma.org.uk>
Subject: RE: Holbeach Food Enterprise Zone - Local Development Order

Thanks Dominic,

The site is outlined in red below – levels would be fine for this stage (I don't know if you have flood outlines also?)



Kind regards,

Richard Fisher

Associate

For and on behalf of Peter Brett Associates LLP - [Reading](#)



t 01189520612
e rfisher@peterbrett.com
w peterbrett.com



From: Dominic Morris [<mailto:Domonic@wlma.org.uk>]
Sent: 12 January 2017 14:39
To: Richard Fisher <RFisher@peterbrett.com>
Subject: RE: Holbeach Food Enterprise Zone - Local Development Order

Richard

I can supply you with water levels for different return period events, closest to the site, if you send a plan over to me showing the exact site location, for free. However, if you want the model information there would be a large cost involved.

Regards

Dom

Dom Morris
Assistant Engineer, South Holland IDB
dd: +44 (0)1406 421702 | **m:** +44 (0)7920 792389 | **e:** dominic@wlma.org.uk

Water Management Alliance
Kettlewell House, Austin Fields Industrial Estate, King's Lynn, Norfolk, PE30 1PH, UK
t: +44 (0)1553 819600 | **f:** +44 (0)1553 819639 | **e:** info@wlma.org.uk | www.wlma.org.uk

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From: Richard Fisher [<mailto:RFisher@peterbrett.com>]
Sent: 12 January 2017 12:45
To: Dominic Morris <Dominic@wlma.org.uk>
Cc: Rachael Yeowell <Rachael@wlma.org.uk>
Subject: RE: Holbeach Food Enterprise Zone - Local Development Order

Hi Dominic,

Thanks for the information below. Checking back through the file, I can't see if we requested the flood level data or not for this site?

It would be useful to get an idea of flood levels – can you confirm what events have been modelled? I notice you mentioned there is a cost for this data. Our work is being undertaken for the South Holland District Council – does that have an impact on any cost?

Kind regards,

Richard Fisher

Associate

For and on behalf of Peter Brett Associates LLP - [Reading](#)



t 01189520612
e rfisher@peterbrett.com
w peterbrett.com



From: Dominic Morris [<mailto:Dominic@wlma.org.uk>]
Sent: 04 August 2016 13:43
To: Elizabeth Edney <eedney@peterbrett.com>
Cc: Rachael Yeowell <Rachael@wlma.org.uk>
Subject: RE: Holbeach Food Enterprise Zone - Local Development Order

Elizabeth

Please see plan attached showing the Board's watercourses highlighted in the royal blue colour. As you can see from the plan there are no Board maintained watercourses surrounding the site. However I believe the Private/Riparian watercourses adjacent to the A151 are maintained by LCC and these all drain into the Board's

watercourses eventually entering the Board's Holbeach New River watercourse which drains out through Holbeach River Sluice into the River Welland.

The Board would allow 1.4litres a second per hectare and there would be a Surface Water Development Contribution payable of £74,740 per impermeable hectare draining into the watercourse. The rate payable would be 20% of the overall total providing the flow rate is kept to 1.4litres.

The whole of catchment P has been modelled. The Board can provide you with model information, however there will be a charge for doing so. If you provide us with return periods you require, we will issue you with the fee payable for the information required.

Regards

Dom

Dom Morris

Assistant Engineer, South Holland IDB

dd: +44 (0)1406 421702 | m: +44 (0)7920 792389 | e: dominic@wlma.org.uk

Water Management Alliance

Kettlewell House, Austin Fields Industrial Estate, King's Lynn, Norfolk, PE30 1PH, UK

t: +44 (0)1553 819600 | f: +44 (0)1553 819639 | e: info@wlma.org.uk | www.wlma.org.uk

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From: Elizabeth Edney [<mailto:eedney@peterbrett.com>]
Sent: Monday, August 1, 2016 4:13 PM
To: Dominic Morris <DominiC@wlma.org.uk>
Subject: Holbeach Food Enterprise Zone - Local Development Order

Dominic

We have been instructed by our Client for the preparation of flood risk reports to support a Local Development Order at a site adjacent to the A17 in Holbeach (please see attached site location plan). I would be grateful if you could advise on the allowable discharge rates in l/s/ha that you would accept into the adjacent IDB watercourses and if you could provide an update on the modelling for the area.

Many thanks.

Kind Regards,

Elizabeth Edney

Flood Risk/Drainage Engineer

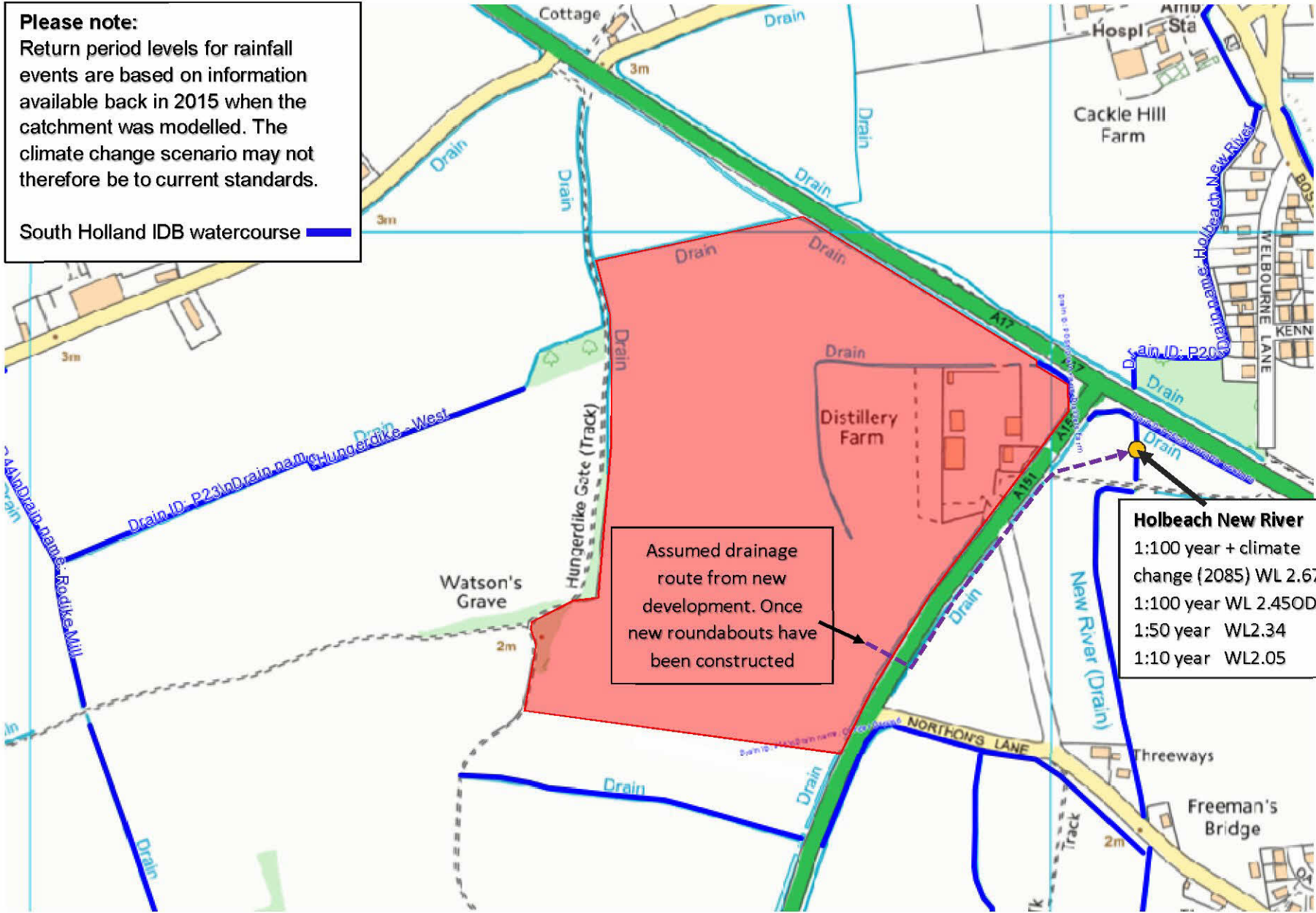
For and on behalf of Peter Brett Associates LLP - [Reading](#)



t 01189520314
e eedney@peterbrett.com
w peterbrett.com

Please note:
 Return period levels for rainfall events are based on information available back in 2015 when the catchment was modelled. The climate change scenario may not therefore be to current standards.

South Holland IDB watercourse



Assumed drainage route from new development. Once new roundabouts have been constructed

Holbeach New River
 1:100 year + climate change (2085) WL 2.67ODN
 1:100 year WL 2.45ODN
 1:50 year WL 2.34
 1:10 year WL 2.05

Appendix D SHDC SFRA Maps

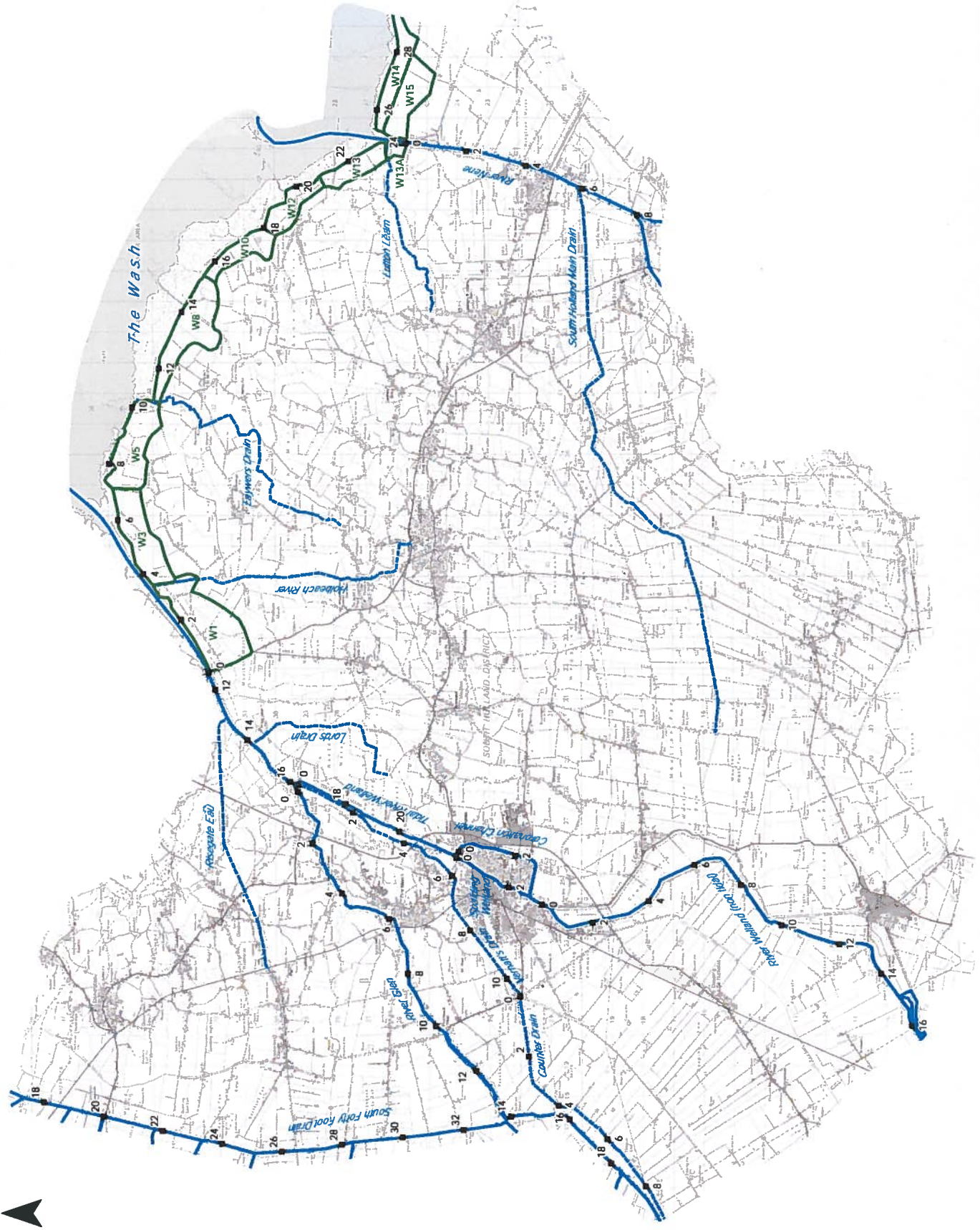
SFRA Figure A1 – Reference Chainages

SFRA Map 5 – Actual Risk Extent – Present Day – 1% Fluvial/0.5% Tidal Event

SFRA Map 12 – Actual Risk Extent – Year 2055 – 1% Fluvial/0.5% Tidal Event

SFRA Map 13 – Actual Risk Extent – Year 2115 – 1% Fluvial/0.5% Tidal Event

NOTES



- Map Legend
- Chalmers Points (Km)
 - Main River
 - - - IDB Main Drains
 - Wash Cells



REV	DATE	REMARKS

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ROYAL HOLLAND
 SOUTH HOLLAND DISTRICT COUNCIL
 COUNTY HOUSE
 PROBY ROAD
 SPALDING
 LINCOLNSHIRE
 PE11 2EE

UPDATE OF STRATEGIC
 FLOOD RISK ASSESSMENT

Reference Chalmers

DATE OF ISSUE: JUN 2010 REV NO:
 SCALE: 1:120,000 FIGURE NO: A1

NOTES

1. The potential flooding consequences shown on this map relate to flooding from the sea, main rivers and Internal Drainage Board systems taking into account the presence of current flood risk management measures such as sea walls, groynes, flood walls, etc.
2. In addition to the potential flood extents shown on this map, there may be shallow flooding in low-lying rural areas.
3. The consequences designated as being an Actual Risk arise from direct overtopping of defences, whereas sites would cover, together with assumed overtopping of defences, where the likelihood of flooding is considered to be high in places where the likelihood between peak sea or river water level and the defence crest level is less than the minimum desirable for structural accuracy of the defence.
4. Sites are designated as being a Potential Risk when there is direct overtopping of defences, where this would occur, together with breach failure which is assumed could occur at any point along the defences.
5. The potential flooding consequences relate to flood probability bandings as follows:

Probability Band	Annual probability of flooding from a river (daily)	Annual probability of flooding from the sea (total)
Low	<0.1%	<0.1%
Medium	0.1%-0.1%	0.1%-0.1%
High	>0.1%	>0.5%

6. Functional Floodplain encompasses areas where water is intended to flow or be stored in times of flood.
7. Land outside South Holland District is not considered.
8. This map shows the extents only of the flooding probability bands relevant to the map. This

Map Legend

Flooding Probability Bands

- High
- Low or medium, but relevant on protection by flood defences to the seafront
- Functional Floodplain
- South Holland District Boundary



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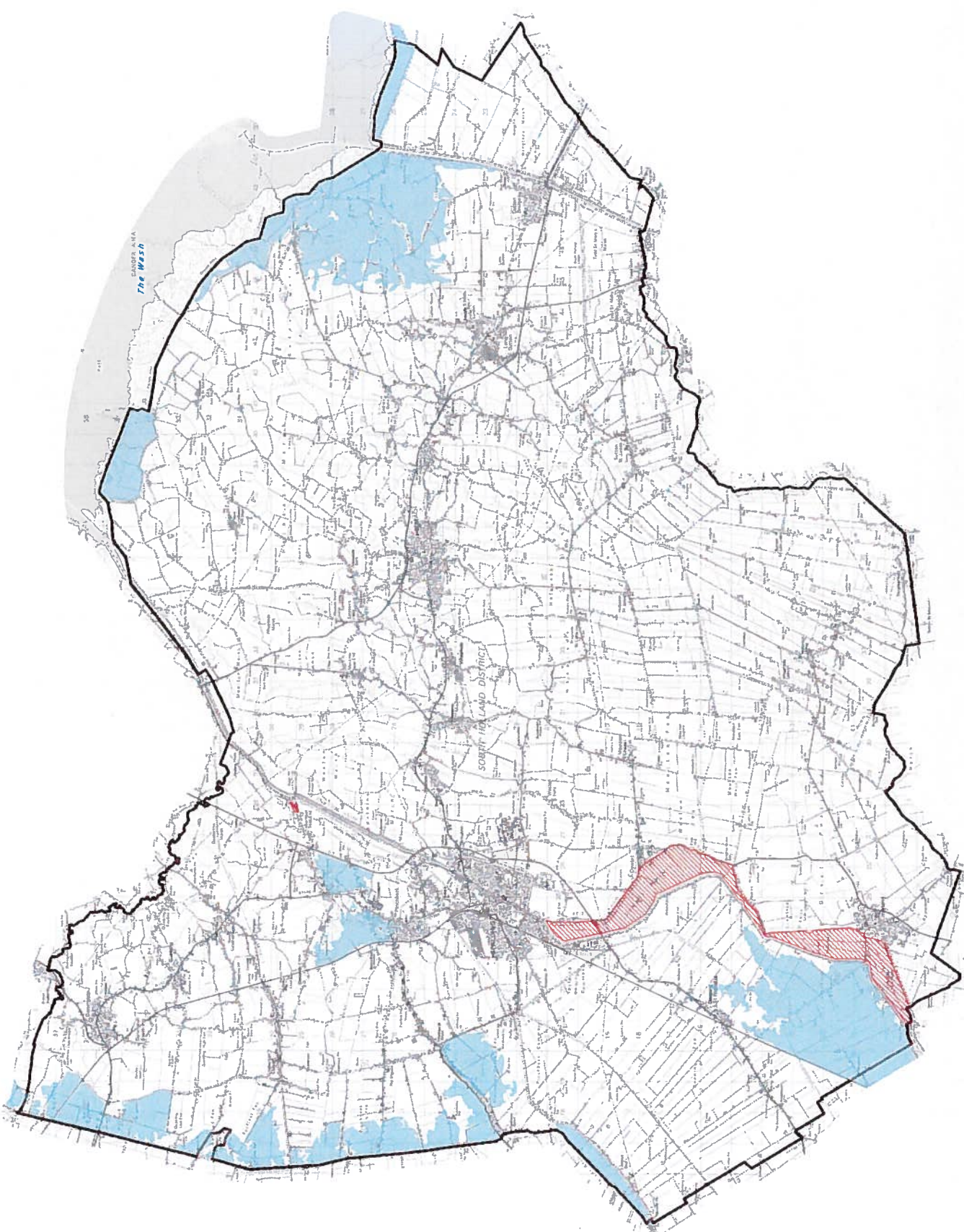
ROYAL HASKONING
 SOUTH
 HOLLAND DISTRICT COUNCIL

ROYAL HASKONING
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 PE3 8DW
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 FAX: 44 (0)1753 604112

SOUTH HOLLAND DISTRICT COUNCIL
 COUNCIL OFFICES
 PRIORY ROAD
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UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
 Actual Risk Extent
 District - Present day
 1% Fluvial / 0.5% Tidal Event Probability

DATE OF ISSUE: JAN 2010	REV NO:
SCALE: 1 : 60,000 @ A1	MAP NO: 5



NOTES

1. The potential flooding consequences shown on this map relate to flooding from the sea, main rivers and Internal Drainage Board systems taking into account the presence of current flood risk management measures such as sea walls, flood gates and pumps.
2. In addition to the potential flood extents shown on this map, there may be smaller flooding in low lying rural areas.
3. The consequences designated as being an Actual Risk arise from direct overtopping of defences, where this would occur, together with assumed flooding from the sea, main rivers and Internal Drainage Board systems in places where the likelihood between peak sea or river water level and the defence crest level is less than the minimum acceptable for structural safety of the defence.
4. Areas designated as being Potential Risk arise from direct overtopping of defences, where this would occur, together with assumed flooding from the sea, main rivers and Internal Drainage Board systems in places where it is assumed could occur at any point along the defences.
5. The potential flooding consequences relate to flood probability bandings as follows:

Probability Band	Annual probability of Flooding from a river (ducks)	from the sea (ducks)
Low	<0.1%	<0.1%
Medium	1%-0.1%	0.5%-0.1%
High	>1%	>0.5%

6. Functional floodplain encompasses areas where water is intended to flow or be stored in times of flood.
7. Land outside South Holland District is not considered.
8. This map shows the extents only of the flooding probability bands relevant to the map title.

Map Legend

Flooding probability bands

- High (Blue)
- Low or medium, but robust on protection by flood defences for the standard (White)
- Functional Floodplain (Red hatched)
- South Holland District Boundary (Black outline)



REV	DATE	REMARKS

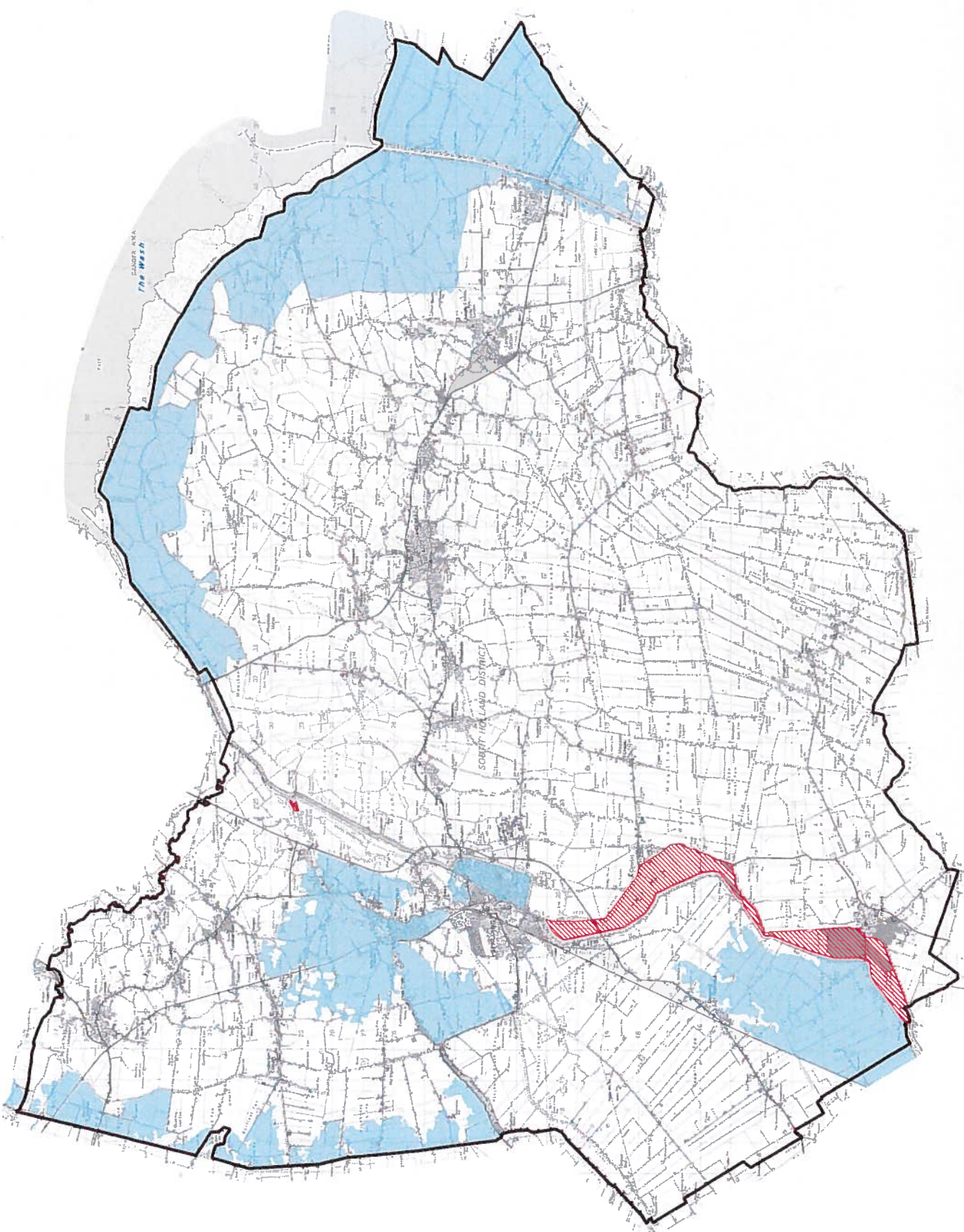
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 SOUTH HOLLAND DISTRICT COUNCIL
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 PRIORITY ROAD
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 Lincs. PE11 2BE

UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
 Actual Risk Extent
 District - Year 2055
 1% Fluvial / 0.5% Tidal Event Probability

DATE OF ISSUE: Jan 2010	REV NO:
SCALE: 1:60,000 @ A1	MAP NO: 12



Appendix E Environment Agency Information

EA email of 3rd March 2014

EA Product 8 information dated 25th July 2016 (EA ref: CCN/2016/18410)

- Modelled Breach Locations
- Tidal Breach Hazard Mapping – 2115 1 in 200 (0.5%) annual probability event
- Tidal Breach Hazard Mapping – 2115 1 in 1000 (0.1%) annual probability event

Richard Fisher

From: Richard Fisher
Sent: 12 January 2017 12:23
To: Richard Fisher
Subject: EA response dated 03/03/14 - flood defences - Holbeach area

From: Kirk, Emma [<mailto:emma.kirk@environment-agency.gov.uk>] **On Behalf Of** PSO LINC
Sent: 03 March 2015 16:22
To: Richard Fisher
Subject: RE: CCN/2015/38612 Provision of Product 8 Hazard Mapping for Land west of Holbeach

Hi Richard,

I apologise for the delay in responding.

To answer your queries;

The tidal defences protecting this site consist of earth embankments. They are in good condition and provide protection against a flood event with a 0.67% chance of occurring in any year (1 in 150). We inspect these defences regularly to ensure that any potential defects are identified early. Please note the changes from the paragraph you included.

Apologies for the confusion. Yes you are correct, the site is not impacted in the present day breach scenarios.

Regards,

Emma Kirk
Coastal Partnerships and Strategic Overview Officer
Lincolnshire and Northamptonshire
Tel - 01522 785533
Email - emma.kirk@environment-agency.gov.uk
www.gov.uk/environment-agency

☀ **Floods happen. Be prepared.** [Check if you are at risk from flooding and sign up for FREE flood warnings.](#)

Floodline
0345 988 1188

0845 988 1188

FLOODS
~~DESTROY~~
BE PREPARED

Richard Fisher,
RFisher@peterbrett.com

Our ref: CCN-2016-18410

Date: 25 July 2016

Dear Richard Fisher,

Flood Hazard Mapping – Holbeach Food Enterprise Zone NGR: 534780, 325700

Thank you for your request for copies of our flood hazard mapping for the above location.

Hazard Mapping – Breaching

Enclosed with this letter is a plan showing the location of the breaches we have modelled, together with two plans showing the maximum values of flood depth, velocity and hazard rating (danger to people) for the following scenarios:

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

Hazard Mapping – Overtopping

Your site is not affected by overtopping for the 0.5% (1 in 200) and 0.1% (1 in 1000) chance events in 2006.

I hope that we have correctly interpreted your request. Please see the Standard Notice or licence for details of permitted use. The Standard Notice can be found at the link below.

<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

If you have any queries about the hazard mapping please contact the PSO team using the telephone/email details below. Please quote our CCN reference number in all correspondence where data is referenced.

Yours sincerely



FOR Ian Cappitt
Partnerships and Strategic Overview Team Leader Lincolnshire

Direct dial 0203 0254 942
Direct fax 01522 785018
Direct e-mail PSOLINCS@environment-agency.gov.uk

Awarded to Lincolnshire & Northamptonshire Area



FLOODS
DESTROY
DESIRE
BE PREPARED

Enc.
FRA/FCA Advisory Text
Breach Location Plan
Breach Hazard Maps x 2

Use of Environment Agency Information for Flood Risk / Flood Consequence Assessments

Important

If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:-

<http://www.environment-agency.gov.uk/research/planning/33580.aspx>

Depending on the enquiry, we may also provide advice on other issues related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In **England**, you should refer to the Environment Agency's Flood Risk Standing Advice, the technical guidance to the National Planning Policy Framework and the existing PPS25 Practice Guide for information about what flood risk assessment is needed for new development in the different Flood Zones. These documents can be accessed via:

<http://www.environment-agency.gov.uk/research/planning/82587.aspx>

<http://www.communities.gov.uk/publications/planningandbuilding/nppftechnicalguidance>

<http://www.communities.gov.uk/publications/planningandbuilding/pps25guideupdate>

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

In **Wales**, you should refer to TAN15 for information about what flood consequence assessment is needed for new development in the different flood zones

<http://new.wales.gov.uk/splash;jsessionid=8ylGTfGZthmB0t2vhp6hS1GcB1LXvZzB3Ylczf20Xn7LK3zk0nMk!981825250?orig=/topics/planning/policy/tans/tan15/>

You should also consult the Strategic Flood Consequence Assessment if one has been produced by your local planning authority.

In both **England and Wales** you should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk / Consequence Assessment (FRA / FCA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. The information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires a FRA / FCA and this is not submitted or deficient, the Environment Agency may well raise an objection.
4. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your local planning authority.



^ **Modelled Breach Locations**

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

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

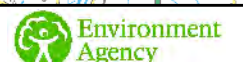
Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

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



General Enquiries No: 03708 506 506.

Weekday daytime calls cost 5p plus up to 6ppm from BT Weekend Unlimited. Mobile and other providers charges may vary

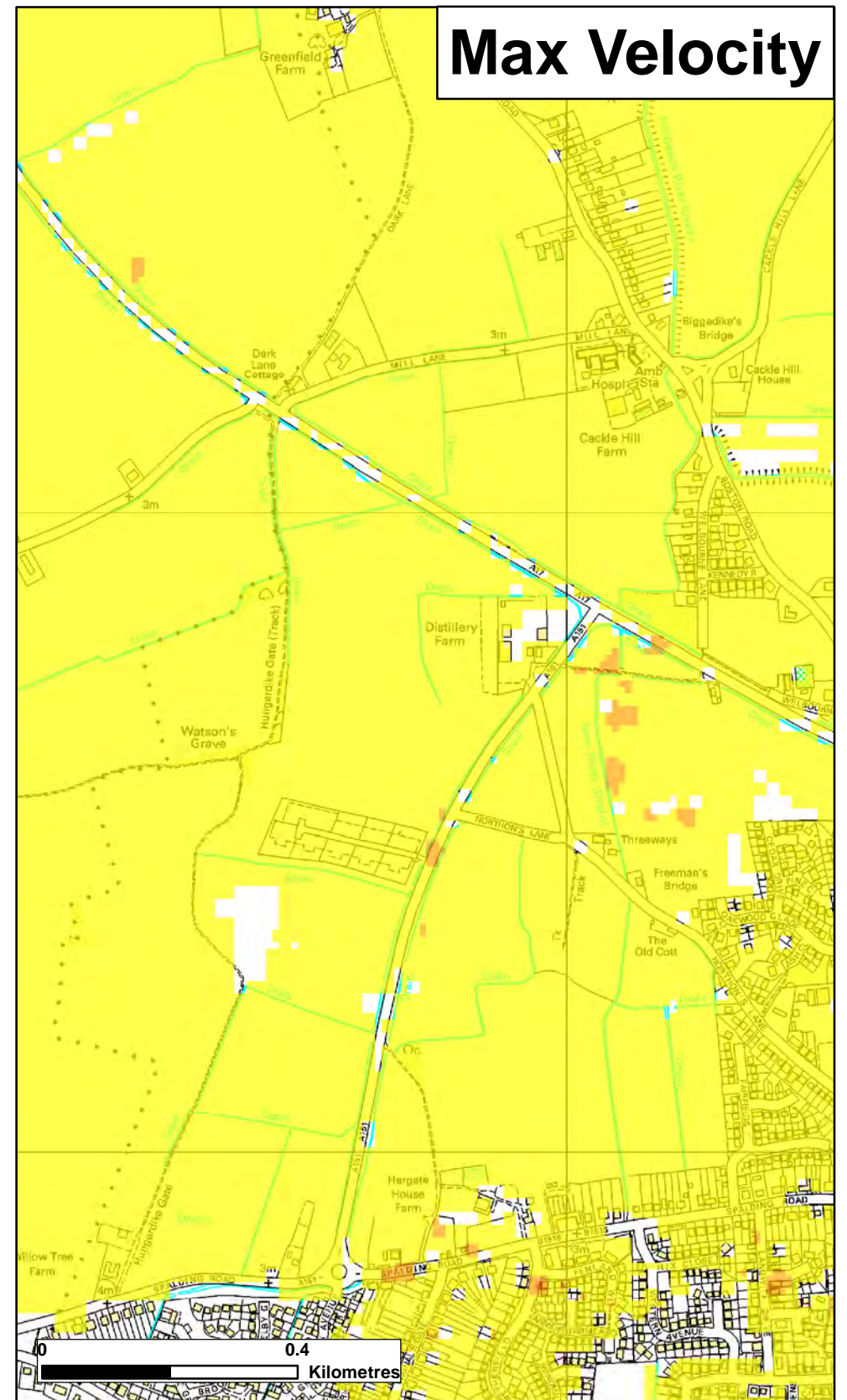
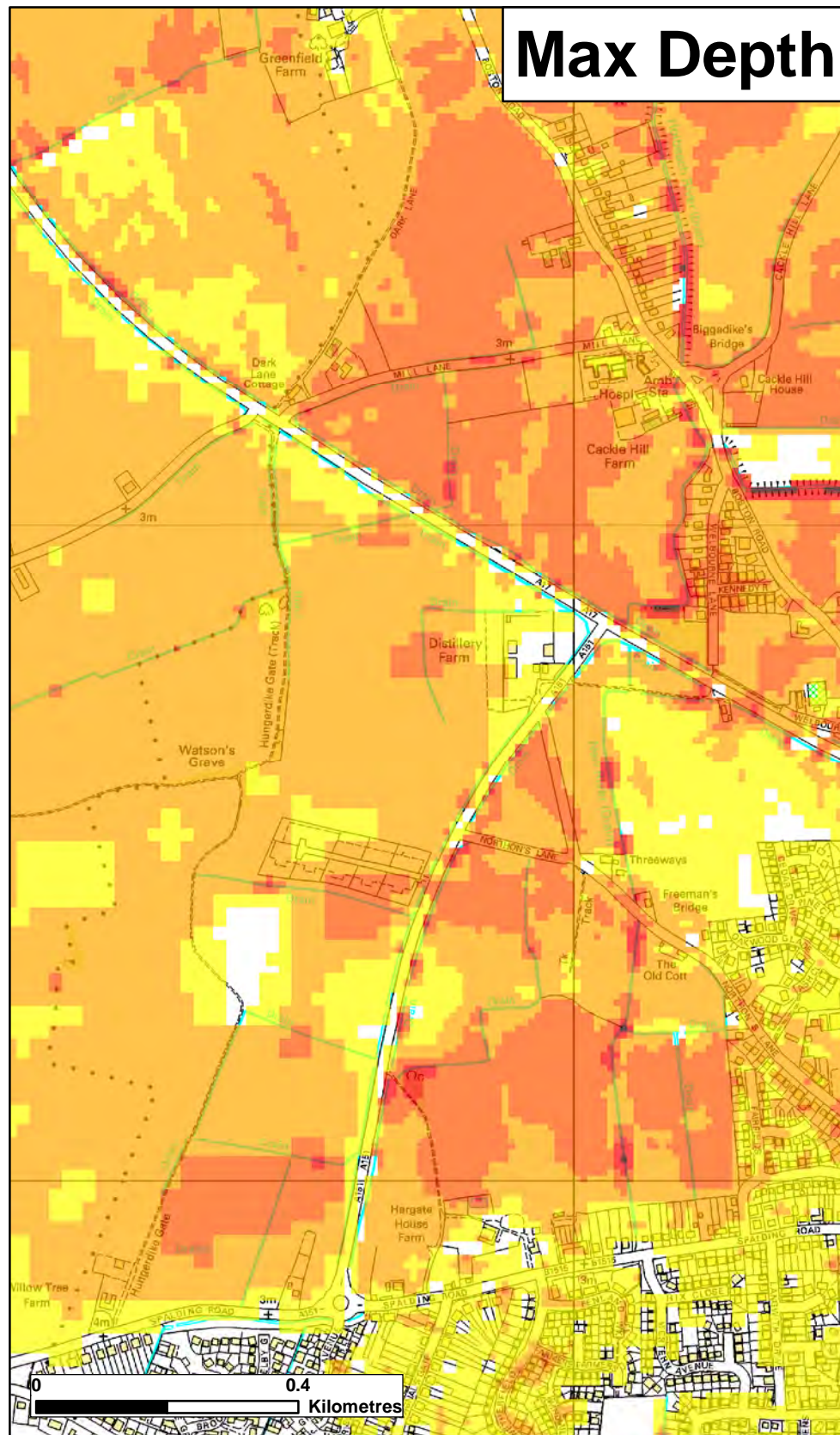
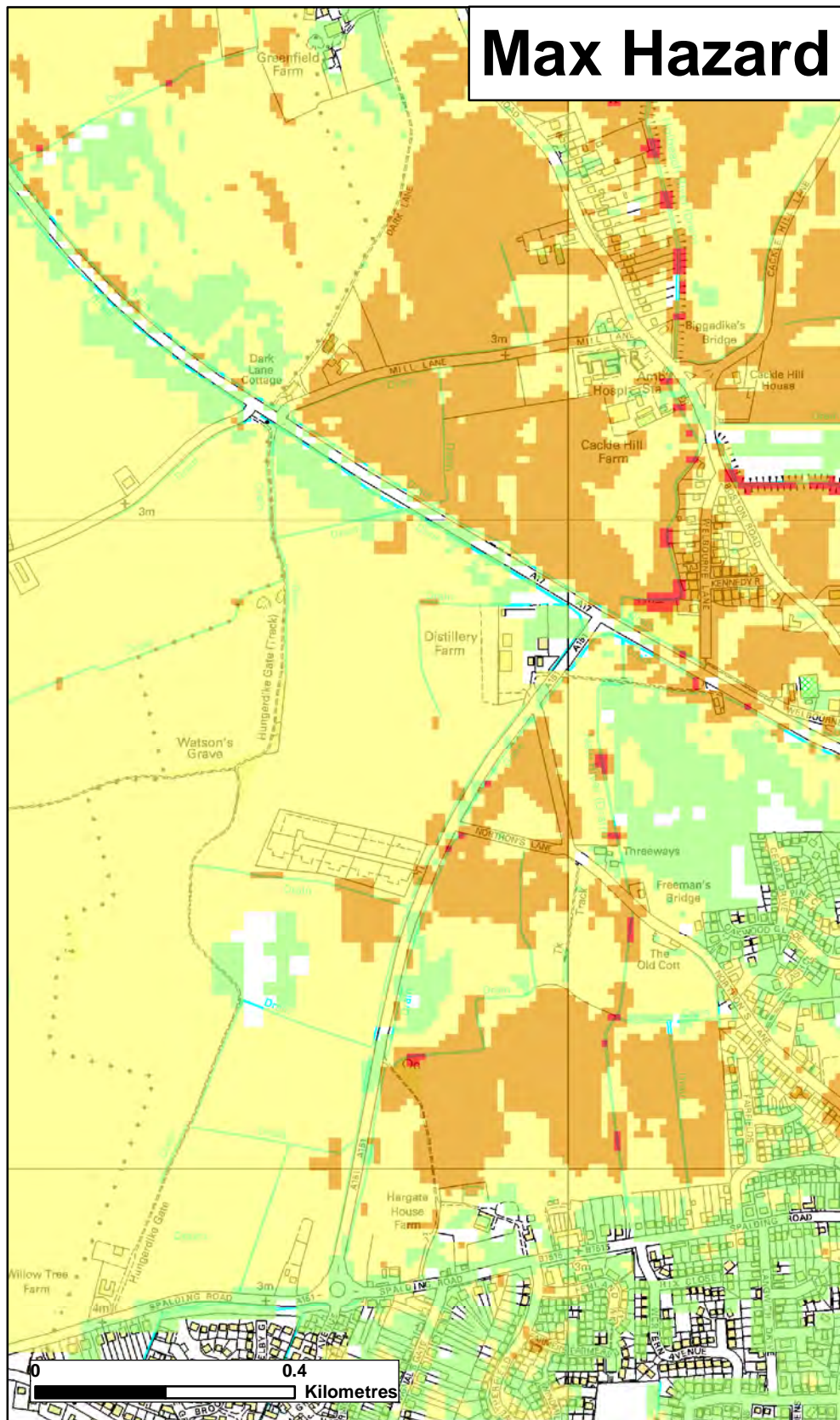


Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

Northern Area Tidal Hazard Mapping

Location of Modelled Breaches

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★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"							
Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)			
	Less than 0.75 (Low Hazard)		0 - 0.25		0 - 0.3		
	Between 0.75 and 1.25 (Danger for Some)		0.25 - 0.50		0.3 - 1.0		
	Between 1.25 and 2.0 (Danger for Most)		0.50 - 1.0		1.0 - 1.5		
	Greater than 2.0 (Danger for All)		1.0 - 2.0		1.5 - 2.5		
			2.0 +		2.5 +		
Date Printed	July 2016	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2016-18410

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.

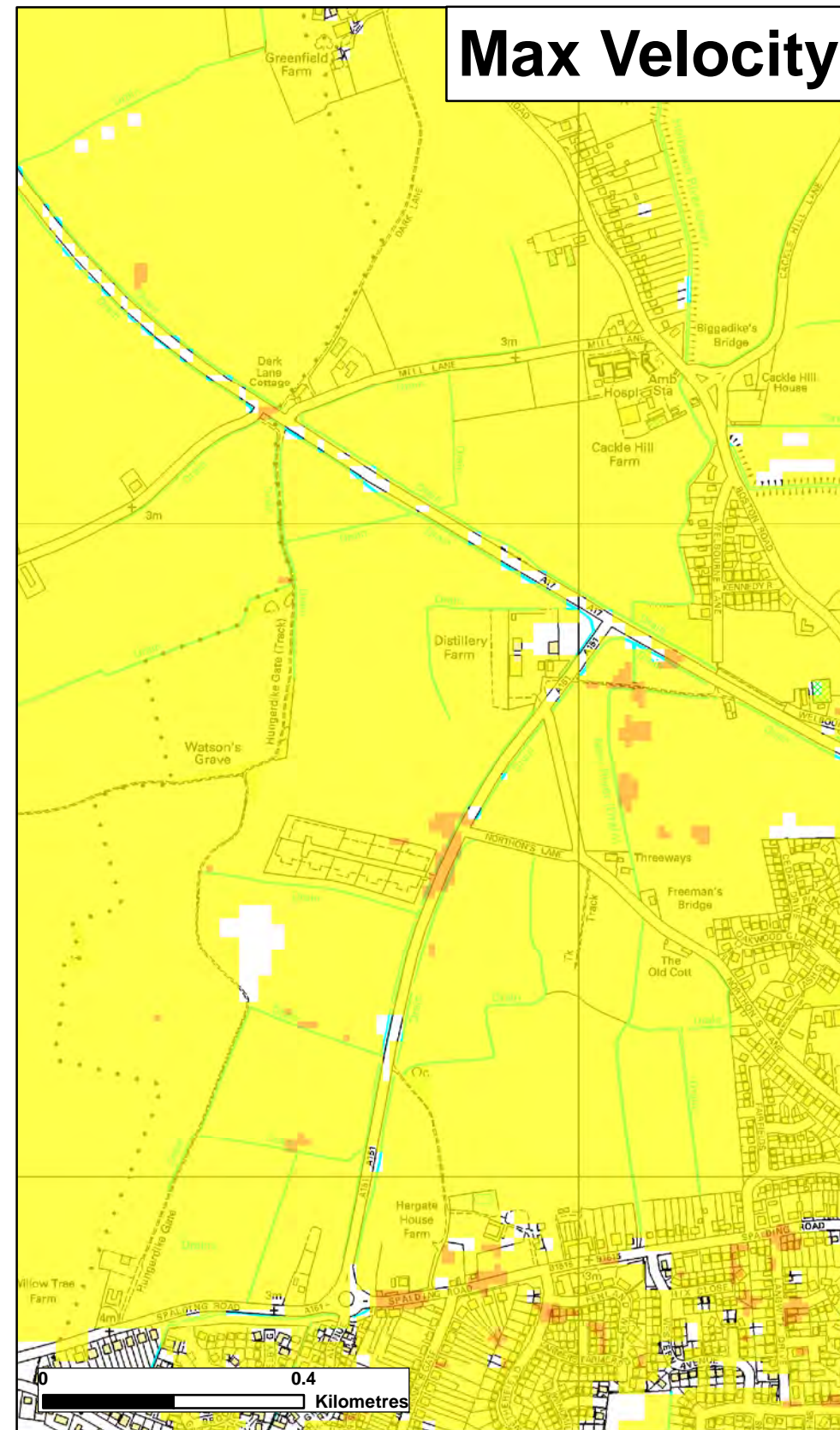
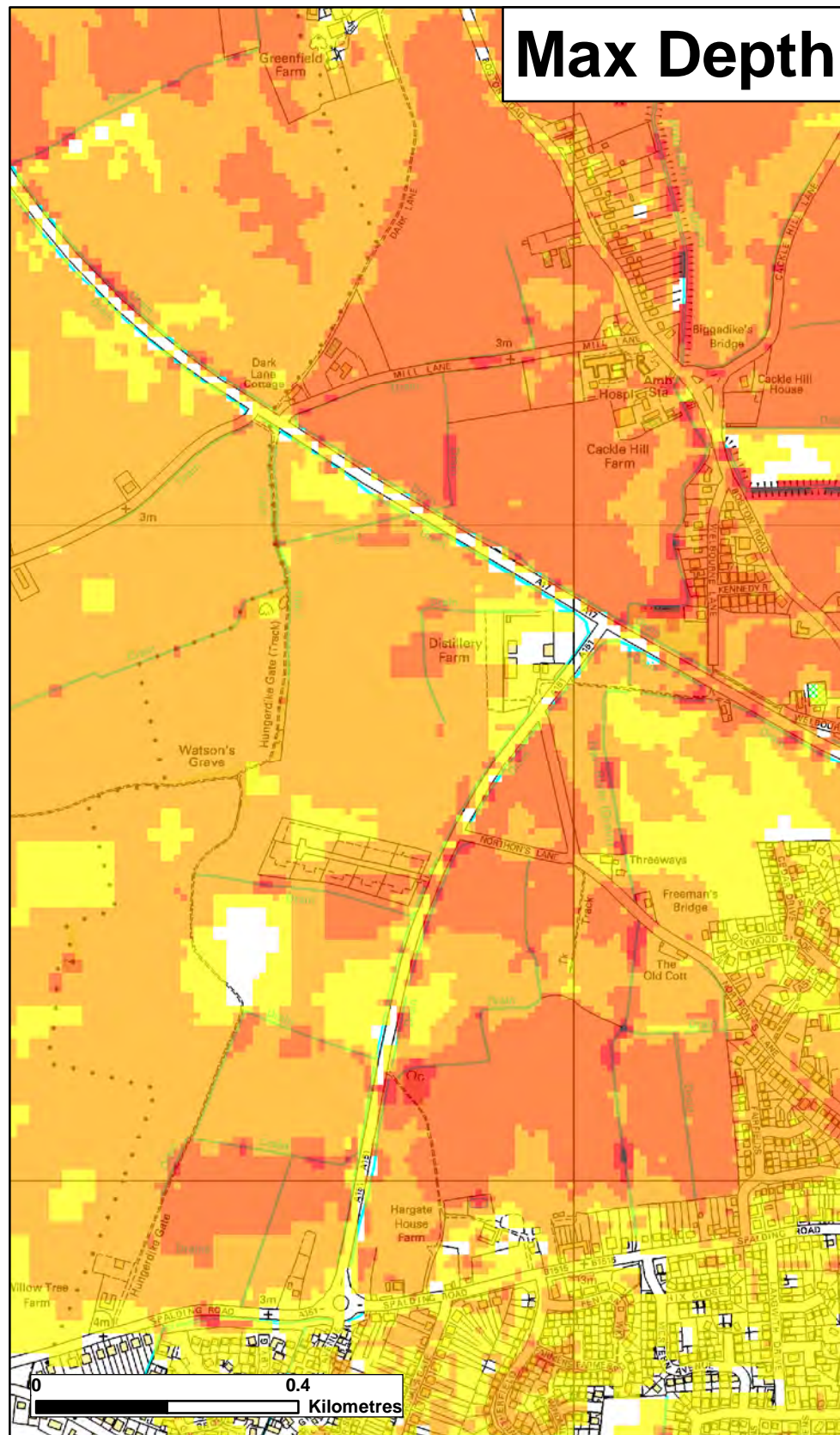
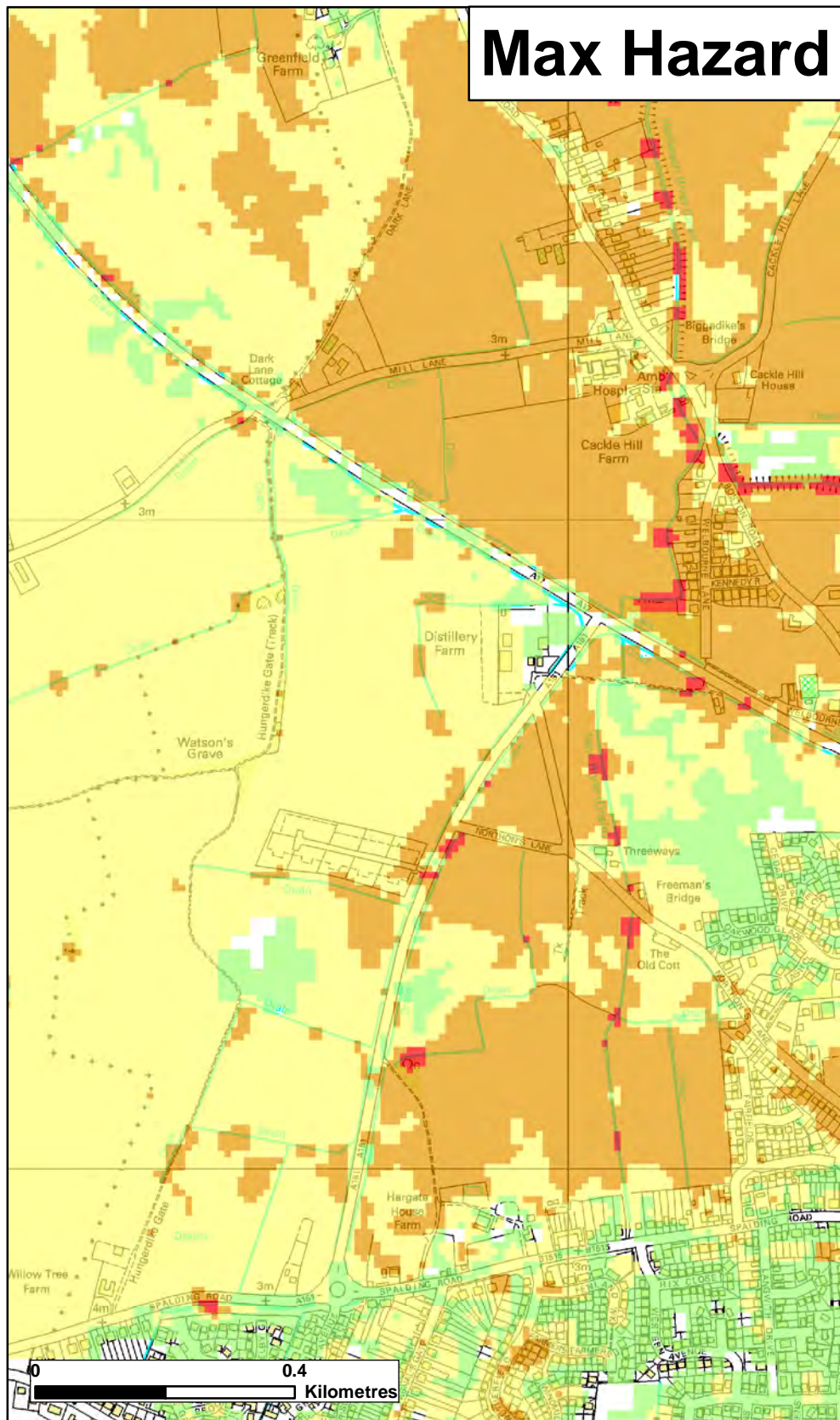
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary



Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 34780 25700

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★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"							
Max Hazard (Flood Risk to People : FD2320)		Max Depth (m)		Max Velocity (m/s)			
	Less than 0.75 (Low Hazard)		0 - 0.25		0 - 0.3		
	Between 0.75 and 1.25 (Danger for Some)		0.25 - 0.50		0.3 - 1.0		
	Between 1.25 and 2.0 (Danger for Most)		0.50 - 1.0		1.0 - 1.5		
	Greater than 2.0 (Danger for All)		1.0 - 2.0		1.5 - 2.5		
			2.0 +		2.5 +		
Date Printed	July 2016	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2016-18410

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



**Lincolnshire and Northamptonshire
Tidal Breaching Hazard
Mapping**

Map Centred on TF 34780 25700

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