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# ENVIRONMENT WATER

Lincolnshire County Council
Nene Marina
Sutton Bridge

Flood Risk Assessment

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NG2 3DQ

Date: June 2015

| | | Signed |
|---|---|---|
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*All comments and proposals contained in this report, including any conclusions, are based on information available to BWB Consulting during investigations. The conclusions drawn by BWB Consulting could therefore differ if the information is found to be inaccurate or misleading. BWB Consulting accepts no liability should this be the case, nor if additional information exists or becomes available with respect to this scheme.*

*Except as otherwise requested by the client, BWB Consulting is not obliged to and disclaims any obligation to update the report for events taking place after:-*

*(i) The date on which this assessment was undertaken, and*
*(ii) The date on which the final report is delivered*

*BWB Consulting makes no representation whatsoever concerning the legal significance of its findings or the legal matters referred to in the following report.*

*The information presented and conclusions drawn are based on statistical data and are for guidance purposes only. The study provides no guarantee against flooding of the study site or elsewhere, nor of the absolute accuracy of water levels, flow rates and associated probabilities.*

## EXECUTIVE SUMMARY

In accordance with the requirements of the National Planning Policy Framework (NPPF) and subject to mitigation measures recommended, the development is not considered to be at significant risk from flooding and will not have adverse impact elsewhere in the wider catchment.

The site is located to the east of Sutton Bridge, Lincolnshire and is currently given over to existing hardstanding adjacent to the river with existing jetties within the water. The development proposal is for a marina use to utilise the site location on the River Nene. The proposals include for the removal of existing jetties and the construction of new leisure and commercial moorings.

With reference to the Environment Agency Flood Map for Planning, the entire site is shown to be situated within Flood Zone 3 (High Probability), given the nature of the proposals within the river. Flood Zone 3 comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Based on modelled flood levels and existing bank and defence levels there is not considered to be a significant risk of direct flooding posed from the River Nene in the current situation or when considering climate change to the year 2055. Flood risk from other sources is also not considered to be significant.

Based on Environment Agency guidance, the marina supporting structures should be designed to allow moorings to float up to a level of 6.35m AOD.

The proposed development will have no adverse impact on flood risk in the wider catchment due to the form of the proposals in conjunction with no material changes to existing drainage arrangements.

In accordance with the requirements of the National Planning Policy Framework and subject to mitigation measures recommended, the development is not considered to be at significant risk from flooding and will not have adverse impact on flood risk elsewhere in the wider catchment.

## 1.0 SUMMARY INFORMATION

### Introduction

1.1 This Flood Risk Assessment (FRA) is compliant with the requirements set out in the National Planning Policy Framework (NPPF). The FRA has been produced on behalf of Lincolnshire County Council in respect of a proposed marina development located at Sutton Bridge, Lincolnshire.

| | |
|---|---|
| Site Name | Nene Marina |
| Address | Sutton Bridge, Lincolnshire |
| NGR | 462700, 283300 |
| Development Type | Marina |
| EA Development Control Area | Anglian Region, Northern Area Office |
| Local Planning Authority | South Holland District Council |
| Planning Application Ref | N/A |

**Table 1 – Site Summary**

1.2 The report is based on the following information:

(i) OS Explorer Series Mapping
(iii) Environment Agency consultation and model information
(iv) Topographical Survey, reference NTW/484/APP A
(v) Existing & Proposed Layouts, reference P122\10\C
(vi) South Holland District Council Strategic Flood Risk Assessment

### Existing Site

1.1 The site is located to the east of Sutton Bridge, Lincolnshire. An approximate site location plan is shown in **Figure 1**.

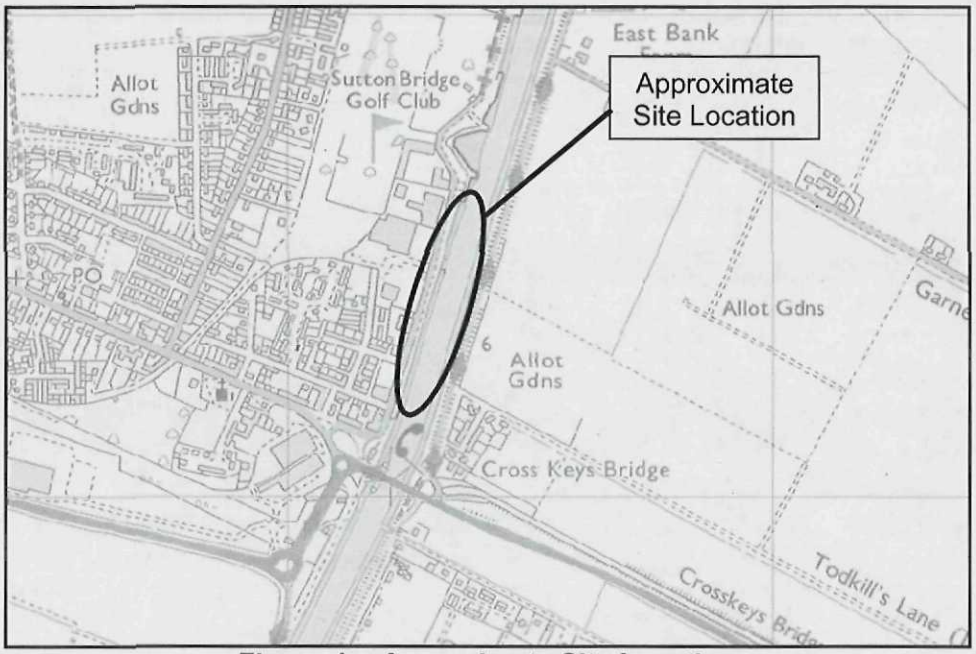



**Figure 1 – Approximate Site Location**

1.2 The site is currently given over to existing hardstanding adjacent to the river with existing jetties within the water.

1.3 Existing levels on the road adjacent to the site vary from 6.20m AOD to the north to 5.20m AOD to the south. Levels slope down towards the River Nene which has bottom bed levels in the region of 4.60 to 4.50m AOD. A topographical survey is included for reference as **Appendix A**.

**Proposed Development**

1.4 The development proposal is for a marina use to utilise the site location on the River Nene. The proposals include for the removal of existing jetties and the construction of new leisure and commercial moorings. A plan showing the existing and proposed layouts is included as **Appendix B**.

**Flood Zone Classification**

1.5 The Environment Agency website identifies areas considered to be at some risk of flooding without taking into account structures such as flood defences.

1.6 With reference to the Environment Agency Flood Map for Planning, the entire site is shown to be situated within Flood Zone 3 (High Probability), given the nature of the proposals within the river. An extract of the mapping is included as **Figure 2**.

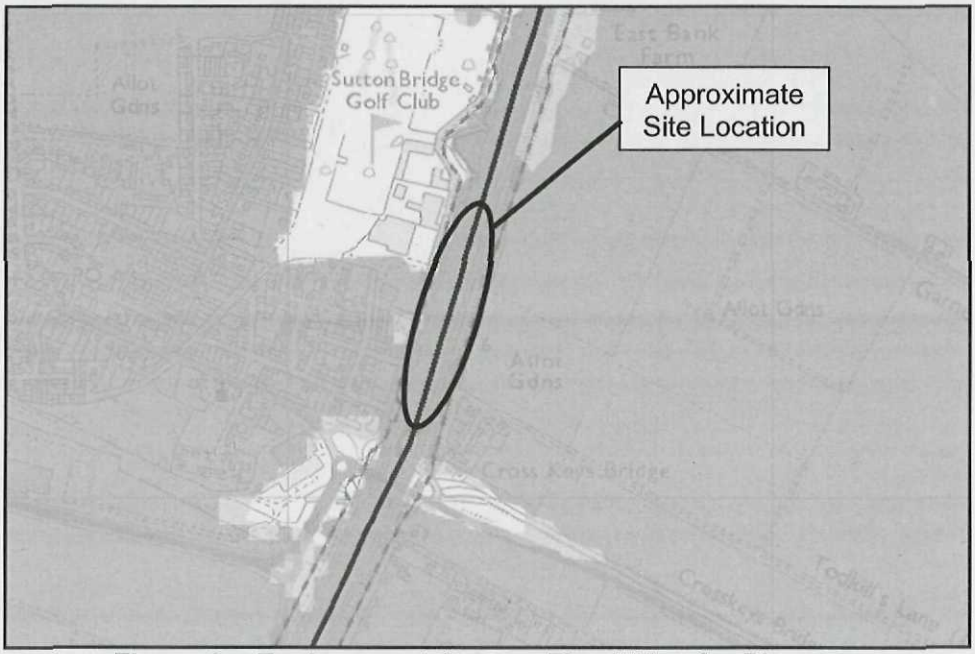



**Figure 2 – Environment Agency Flood Map for Planning**

1.7 Flood Zone classifications are described within the National Planning Policy Framework.

1.8 Flood Zone 3 comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

1.9 As the site is shown to be within Flood Zone 3, a Flood Risk Assessment is required. The purpose of this document is to provide an assessment of the anticipated flood risk to the existing site and proposed development and consider the potential impacts of the development on flood risk in the wider catchment.

## 2.0 SOURCES OF FLOOD RISK

2.1 This section identifies the potential sources of flood risk to the site. The significance of these sources of flood risk is investigated further in **Section 3.0** of this report.

| Flood Source | Presence | Description |
|---|---|---|
| Fluvial | ✓ | River Nene |
| Tidal | ✓ | River Nene, East Coast |
| Canals | X | Not present |
| Groundwater | X | No anticipated risk |
| Sewers | X | No anticipated risk |
| Reservoirs | X | Not present |
| Pluvial runoff | X | Not considered to be significant |
| Development Drainage | X | No material change to surface water regime |

**Table 2 – Potential Flood Sources**

2.2 As a function of the marina nature of development, the site is located on the River Nene and therefore this presents the primary source of flood risk. A fluvial and tidal regime can be present in the river in this location.

2.3 The Lincolnshire coast is located approximately 7.0km north of the site at its closest.

## 3.0 FLOOD RISK ASSESSMENT

### Risk of Flooding to Proposed Development

*Historic Flooding*

3.1 The Environment Agency provided evidence of historic flooding in the vicinity of the site. During January 1978 some flooding from the tidal River Nene is shown to have affected adjacent areas on the south and south-west of the site, as demonstrated on the Environment Agency Historic Flood Extent Map which is attached as **Appendix C**.

*River Nene*

3.2 The proposals are for moorings to generally add to and replace existing jetties for boats, which by their nature may include sleeping accommodation. However, due to the nature of the proposals essentially being development within the river this is considered appropriate and can be managed by the site operators accordingly.

3.3 However, modelled flood levels were requested from the Environment Agency to determine any potential risk to the development. Their correspondence is included as **Appendix C**.

3.4 From the model node at West Lighthouse, the design 200-year return period event is 6.01m AOD, applicable for assessing tidal flood risk from the river. Existing defences along this reach protect to the 150-year (0.67%) standard and at this location are described as raised earth embankments. They are in good condition and the Environment Agency inspect these defences regularly to ensure that any potential defects are identified early.

3.5 Adjacent to the site, bank levels of the Nene are shown to be in the region of approximately 6.35m AOD, elevated above the design flood level. There is therefore not considered to be a direct risk of flooding to adjacent areas from the tidal River Nene.

3.6 Furthermore, the Environment Agency have provided modelled breach and hazard mapping data for the area which identifies that the 2006 scenario mapping considers areas adjacent to the site to have a 'low hazard' or 'danger for some' hazard with a maximum depth of between 0.00 – 0.50m and a maximum velocity of between 0.3 – 1.0 m/s in both the 200 year and 1000 year events.

3.7 There is therefore not considered to be a significant residual risk from a breach of defences from the tidal River Nene in the current situation.

*Climate Change Impacts*

3.8 The Environment Agency requested that the potential effects of climate change are considered for the design life of the development when assessing the residual risk. Climate change flood levels were not provided as part of the Environment Agency data. The anticipated increase in tidal flood levels for the East of England has therefore been estimated based on guidelines of sea level increase as a result of climate change.

3.9 The modelled data from the Environment Agency has been provided from a 2006 study, this is therefore taken as the baseline when estimating the increase in flood levels.

3.10 The design life of the development is likely to be in the order of 40 years and the anticipated increase in the flood level has been calculated to the year 2055. The potential increase to the year 2115 has also been considered. This is shown in **Table 3** below.

| Net increase in sea level (Design life of development) | | Net increase in sea level (To year 2115) | |
|---|---|---|---|
| 2006 to 2025 | 2025 to 2055 | 2055 to 2085 | 2085 to 2115 |
| 19 x 4.0mm/y = 76.0mm | 30 x 8.5mm/y = 255.0mm | 30 x 12.0mm/y = 360.0mm | 30 x 15.0mm/y = 450.0mm |

**Table 3 - Climate Change Impacts on Flood Levels**

3.11 Based on this criteria the 200-year plus climate change design flood level will rise from 6.01m AOD to 6.34m AOD in the year 2055 and 7.15m AOD in the year 2115.

3.12 Environment Agency defence breach and hazard mapping data for the 2115 scenario mappings highlights that areas adjacent to the site would have a 'danger for most' and 'danger for all' hazard with a maximum depth of between 0.50 – 2.0m and a maximum velocity between 1.0 – 1.5 m/s in both the 200 year and 1000 year events. It should be noted that this analysis includes a greater impact of climate change when compared to the anticipated design life of the development to the year 2055. These outputs are therefore not entirety applicable to the site.

3.13 Although there is a residual risk of flooding when including potential climate change impacts to the year 2115, it is considered that appropriate mitigation can be provided in the form of securing proposed moorings/jetties for the 40-year design life of the development and beyond.

*Coastal Flooding*

3.14 Again due to the nature of the development there is not considered to be a significant risk posed from coastal flooding. However tidal flood levels were provided for the coast to the north of the site.

3.15 The node at West Lighthouse is also appropriate to assess coastal flooding, and is approximately 5.5km to the north of the site. As with the modelled flood level considered for the River Nene, the 200-year design flood level at this point is 6.01m AOD, rising to 6.34m AOD when adding climate change to the year 2055.

3.16 Due to the distance from the site there is unlikely to be a direct impact of this coastal flood level. Furthermore, existing bank and road levels to the north of the development are also elevated above these levels at approximately 6.2m AOD to 6.4m AOD demonstrating that a flow route would be somewhat impeded.

3.17 Therefore there is not considered to be a significant risk of flooding directly from the coast over and above that posed from the River Nene.

*Pluvial (Rainfall) Events*

3.18 There is not considered to be a significant risk posed to the proposed moorings as they are within the river channel and separated from adjacent land. Existing highway drainage and road levels would generally assist in preventing overland flows being directed towards the site.

3.19 Based on this, there is not considered to be a significant risk from pluvial events.

**Effect of Development on Wider Catchment**

*Impedance of Flood Flows*

3.20 The proposed development may have an adverse impact as a result of impedance of flood flows. If flows were impeded then flood risk could be transferred elsewhere.

3.21 The nature of the development proposal means that new floating moorings will be placed within the River Nene channel. However there are existing jetties in this location, of which some are perpendicular to the river bank. The development will remove some existing jetties which will lower the potential for impedance and the proposed new moorings will be parallel to the direction of flow and would rise with water levels, further reducing the risk of flood flows being impeded.

3.22 It is therefore considered that the proposed development will have no significant impact on the impedance of flood flows and would not result in any adverse effect in the wider catchment.

*Surface Water Drainage*

3.23 If the proposed development were to introduce an increased impermeable area on site it may act to increase surface water run-off rates. As some of the proposed moorings are replacing existing jetties and are located within the river then there is not considered to be a significant impact from the development.

## 4.0 MITIGATION MEASURES

### Finished Levels

4.1 The Environment Agency have recommended that the moorings are secured to the supporting structure to allow for floatation up the to 1000-year return period event. Based on a modelled flood levels provided then the supporting structure should be designed to secure the moorings to a level of 6.35m AOD.

### Safe Access and Egress

4.2 Based on modelled flood levels of the River Nene and existing defence levels, the roads adjacent to the site would be adequately protected up to the design 200-year return period event in the current situation and when considering climate change to the development design life in the year 2055. Safe access and egress is therefore considered to be available for site users and emergency vehicles.

### Flood Warning and Evacuation

4.3 For residual protection beyond the design life of the development, flood warning and evacuation procedures should be considered.

4.4 With reference to the Environment Agency website, the site is covered by a flood warning area known as "Tidal Nene including Sutton Bridge and Wisbech". The wider geographical area of is also covered by Flood Watch for early alert to possible flooding.

4.5 In the first instance it is recommended that the operators are registered with the free FloodLine service available. This would ensure that any staff in attendance could receive flood warning and implement appropriate procedures. This may include an evacuation of the marina dependent on the severity of such warnings.

4.6 In the event of evacuation, routes to the west and south should be taken which lead to areas outside of the indicated floodplain and within Flood Zone 1. With reference to Flood Zone mapping and the site location, these routes should be along roads such as the A17, A151 A1101 and A47. The closest places within Flood Zone 1 are in Whaplode Drove to the west and Newton and Fitton End to the south. Further afield to the west, places such as Peterborough, Market Deeping and Rippingale are also shown to remain in Flood Zone 1.

4.7 A flood evacuation plan could be prepared by the operators for agreement with the Local Authority. Those responsible for the management of the marina could implement suitable procedures in line with any existing procedures for dealing with flood warnings. The above flood warning procedures and evacuation route information should be considered within any evacuation plan.

### Drainage Arrangements

4.8 The proposals are generally being constructed on water or re-using areas of existing impermeable surfaces. There will therefore be no increase in run-off when compared to the existing situation and no material impacts on the surface water regime.

## 5.0 SEQUENTIAL TEST CONSIDERATIONS

5.1 Land use vulnerability is categorised within the NPPF. For this marina development, the use can be categorised as 'Water Compatible'.

5.2 From the mapping available on the Environment Agency website the site is shown to be within Flood Zone 3. This Flood Zone is described as being:

*Zone 3 – High Probability*

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea

Appropriate Uses – The water-compatible and less vulnerable uses of land are appropriate in this zone.

5.3 Based on this Flood Zone classification and the fact the proposals are for a water compatible use, the proposed development is considered to be appropriate in this location.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 There is not considered to be a direct risk of flooding from the River Nene in the current situation or when considering climate change to the year 2055. There is not considered to be a significant risk posed from any other source.

6.2 The Environment Agency have recommended that the moorings are secured to the supporting structure to allow for floatation up to the 1000-year return period event. Based on a modelled flood levels provided then the supporting structure should be designed to secure the moorings to a level of 6.35m AOD.

6.3 An appropriate flood warning and evacuation plan could be produced in accordance with the Local Authority and operator considerations.

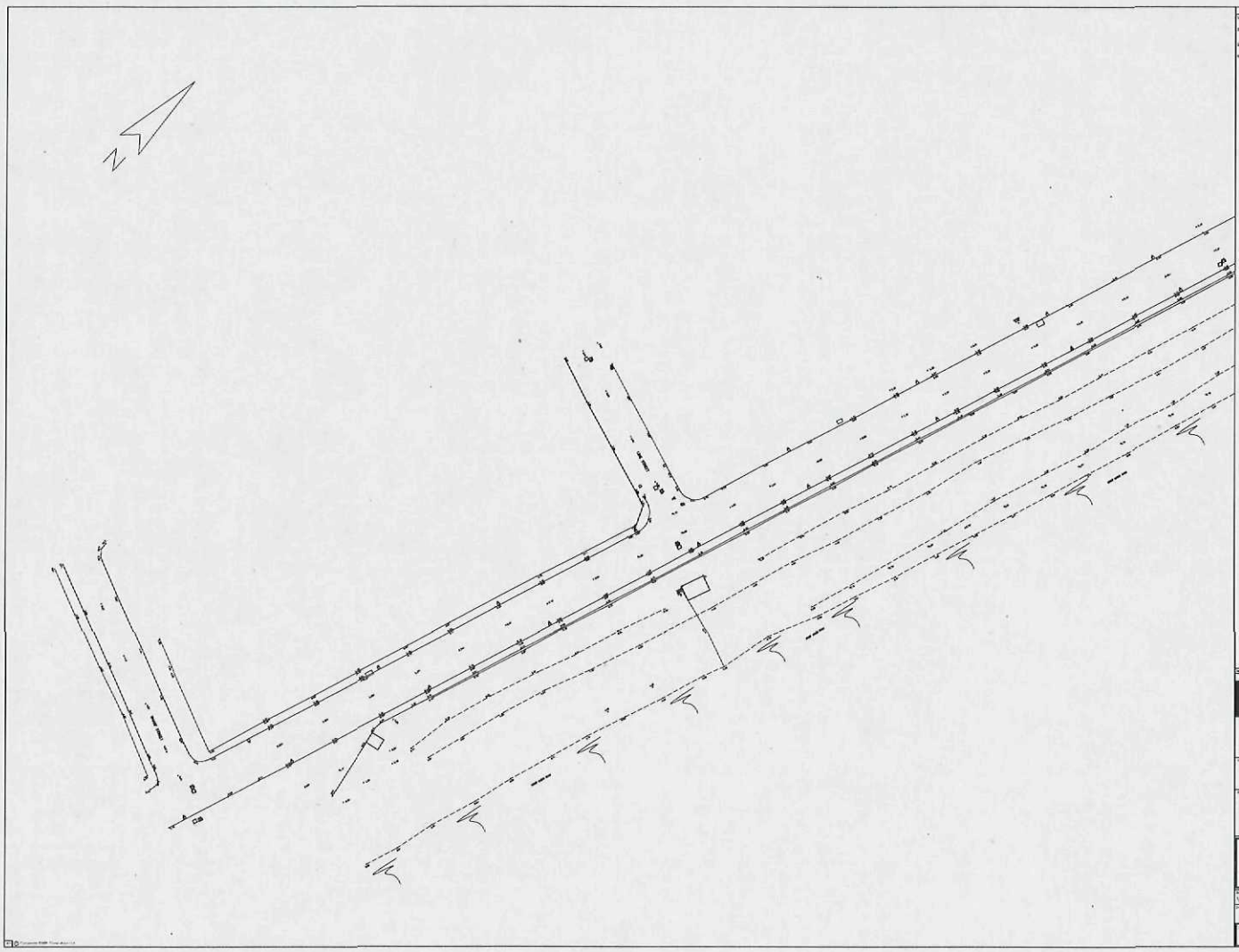
6.4 The development may proceed without causing an increase in flood risk in the wider catchment given the nature of the proposals.

6.5 Appropriate consents would be required for the proposed development and confirmation should be sought from the appropriate regulatory authority following planning approval but prior to construction.

6.6 In accordance with the requirements of the National Planning Policy Framework and subject to mitigation measures recommended, the development is not considered to be at significant risk from flooding and will not have adverse impact on flood risk elsewhere in the wider catchment.

**Appendix A**

Topographical Survey



NOTES

Key

AMENDMENTS

BWB

Integrated Engineering and Environmental Consultants

LINCOLNSHIRE WATERWAYS PARTNERSHIP

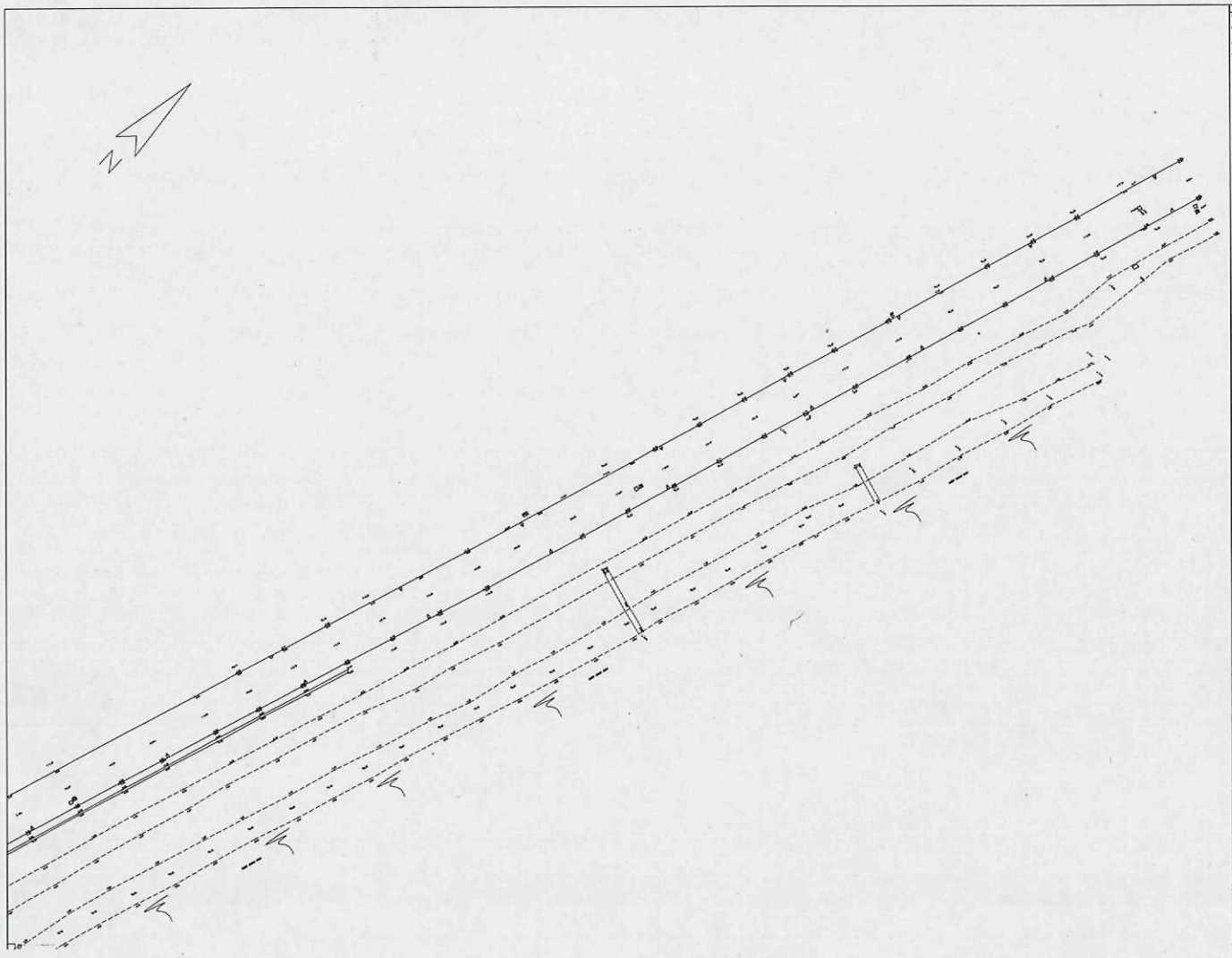
NENE MARINA

TOPOGRAPHIC SURVEY (SHEET 1 OF 2)

FOR REPORT PURPOSES

NTW/484/APP A

A



NOTES

Key

BWB

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LINCOLNSHIRE WATERWAYS PARTNERSHIP

NENE MARINA

TOPOGRAPHIC SURVEY (SHEET 2 OF 2)

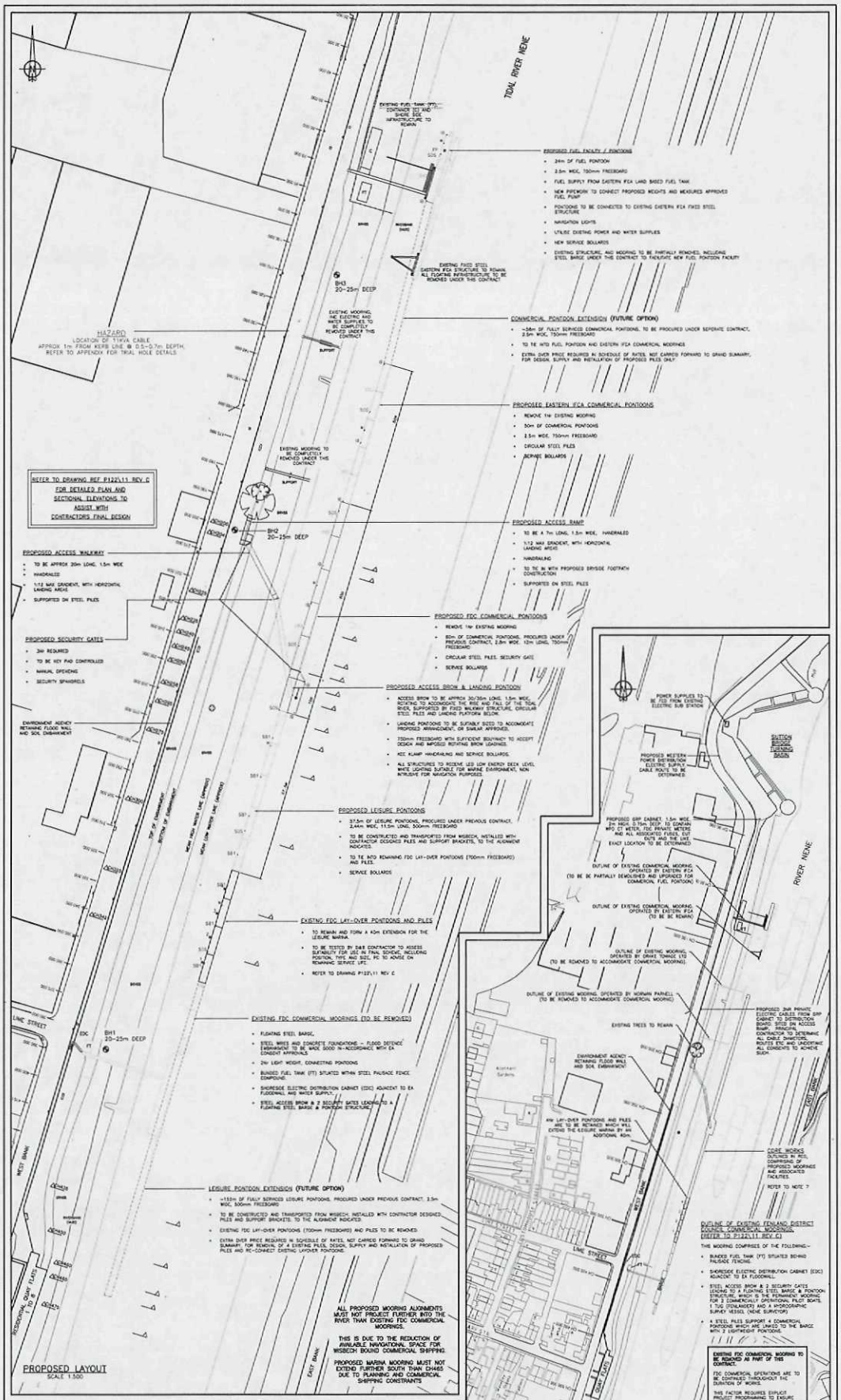
FOR REPORT PURPOSES

NTW/484/APP A

A

**Appendix B**

Existing & Proposed Layouts




NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE STATED
3. TIDE LEVELS:
   MHWS = +3.8m OD (-7.00m CD)
   MHWN = +1.8m OD (-5.10m CD)
   MLWN = +1.5m OD (-2.20m CD)
   MLWS = -2.2m OD (-1.00m CD)
4. CHART DATUM (2m CD) IS 3.20m BELOW ORDNANCE DATUM (NEWLYN)
5. FLOOD DEFENCE LEVEL = +8.4m OD (+8.6m CD)
6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH:-
   - P122\10 Rev C — EXISTING AND PROPOSED LAYOUTS
   - P122\11 Rev C — DETAILED LAYOUTS
   - P122\12 — NOT USED
   - P122\13 — NOT USED
   - P122\14 — NOT USED
   - P122\15 Rev A — HYDROGRAPHIC SURVEY PLAN (2011)
   - P122\16 Rev A — HYDROGRAPHIC SURVEY, SECTIONS - SHEET 1 OF 2
   - P122\17 Rev A — HYDROGRAPHIC SURVEY, SECTIONS - SHEET 2 OF 2
7. THE CORE WORKS OF THIS CONTRACT, ALTHOUGH NOT FULLY EXHAUSTIVE, INCLUDE THE DESIGN, CONSTRUCTION AND UNDERTAKING OF THE FOLLOWING:-
   - ACCESS RAMP AND WALKWAY
   - ACCESS BROW AND LANDING PLATFORM
   - LEISURE PONTOONS (513m)
   - FDC COMMERCIAL PONTOONS (80m)
   - EASTERN IFCA COMMERCIAL PONTOONS (30m)
   - FUEL PONTOON (24m) AND ASSOCIATED WSW APPROVED DELIVERY
   - ALL SUPPORTING CIRCULAR STEEL PILES
   - CHECKING EXISTING FDC LAY-OVER PONTOONS FOR RE-USE SUITABILITY
   - REMOVAL AND DISPOSAL OF EXISTING STEEL STRUCTURE MOORINGS
   - PROVISION OF 3nr ELECTRIC AND 3nr WATER SUPPLIES
   - APPROX 200m OF DUCTING,CABLING AND DRAW PITS FOR NEW 3 PHASE POWER SUPPLIES.
   - DESIGN SUPPLY AND INSTALLATION OF ALL PONTOON SERVICE INFRASTRUCTURE, WATER, ELECTRIC, NAVIGATION LIGHTS, SAFETY LADDERS ETC
   - APPLICATION TO THE ENVIRONMENT AGENCY FOR CONSENT TO WORKS IN THEIR FLOOD DEFENCE

LEGEND

- LIGHT AND POWER BOLLARD 4nr 16AMP SOCKETS - METERED
- LIGHT AND POWER BOLLARD 2nr 16A & 1nr 32 AMP SOCKET - UNMETERED
- LIGHT, LIFE BUOY AND FIRE EXTINGUISHER BOLLARD
- LIGHT ONLY BOLLARD
- NAVIGATION LIGHTS 2 FIXED VERTICAL GREEN LIGHTS, LOCATED 1m APART AND 1.5m ABOVE DECK LEVEL.
- GALVANISED WATER STAND, 1nr WATER TAP WITH HOSE REEL AND 20m HOSE PIPE
- WEIGHTS AND MEASURES APPROVED FUEL PUMP

| Revisions | | | | |
|---|---|---|---|---|
| No | Ref | By | Date | Description |
| C | KS | KB/M | TDW | ISSUED FOR TENDER |
| B | KS | TJD/M | TDW | ISSUED TO NORTHERN POWER DISTRIBUTION AND CONNECTIVITY |
| A | KS | KB/M | TDW | ISSUED FOR COMMENT |

| | | | | | |
|---|---|---|---|---|---|
| Designed | K.BOYCE | MAY 2014 | Eng. Chk | R.EDWARDS | MAY 2014 |
| Drawn | K.BOYCE | MAY 2014 | Approved | T.MATSON | MAY 2014 |

PROJECT: SUTTON BRIDGE MARINA & COMMERCIAL MOORINGS 2014/15

TITLE: EXISTING & PROPOSED LAYOUTS

Fenland — Fenland District Council, Fenland Hall, County Road, March, Cambridgeshire, PE15 8NG, tel 01354 654321, www.fenland.gov.uk

| Scale | Drawing no. | Rev. |
|---|---|---|
| AS SHOWN | P122\10 | C |

**Appendix C**

Environment Agency Data

Environment Agency

Erika Tarlton – Weatherall
<Erika.TW@bwbconsulting.com>

**Our ref:** CCN-2015-39214
**Your ref:**

**Date:** 10 June 2015

Dear Erika

**Provision of Product 3 and 8 for Sutton Bridge Marina**

Thank you for your request of 29 April 2015 to use Environment Agency data, Product 3 in the development of the Flood Risk Assessment (FRA) for the above site. The information is attached.

If you have requested this information to help inform a development proposal, then you should note the detail in the attached advisory text on the use of Environment Agency Information for Flood Risk Assessments.

**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 event 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 event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

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

**Historic Flood Extent Map**
A copy of the Historic Flood Extent Map for your area is enclosed. This shows the extent of previous recorded flooding in your area, notably January 1978. It is possible that other flooding may have occurred that we do not have records for, and other organisations, such as the Local Authority or Internal Drainage Boards, may have records.

**Tidal Flood Levels**
Please find attached available **tidal** flood levels as requested. These levels have an assessment date of 2006, which should be used in any consideration of future increases due to climate change. The levels are in metres above Ordnance Datum Newlyn (mODN) and are valid for 12 months from the date of issue.

**Tidal Defence Information**
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.

FLOODS DESTROY BE PREPARED

Waterside House, Waterside North, Lincoln, LN2 5HA.
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

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

- Year 2006 0.5% (1 in 200) chance event
- Year 2006 0.1% (1 in 1000) chance event
- 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 scenarios.

Further details about the Environment Agency information supplied can be found on the GOV.UK website:

https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for Flood Risk Assessments

https://www.gov.uk/planning-applications-assessing-flood-risk
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

**Supporting Information**

This information is provided subject to the enclosed notice, which you should read.

I hope that we have correctly interpreted your request. Please see the attached Standard Notice or licence for details of permitted use.

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

If you are not satisfied with our response to your request for information you can contact us within 2 calendar months to ask for our decision to be reviewed.

If you have any queries or would like to discuss the content of this letter further please contact Vicki Hinds at the Environment Agency.

Yours faithfully

**FOR Claire Rose**
**Coastal Partnerships & Strategic Overview Team Leader**

FLOODS DESTROY BE PREPARED

Waterside House, Waterside North, Lincoln, LN2 5HA.
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

Direct dial 01522 785032
Direct fax 01522 785018
Direct e-mail PSOLINCS@environment-agency.gov.uk

Enc.
*FRA Advisory Text*
Basic FRA Map
Historic Flood Extent Map
Northern Area Tide Levels
Breach Location Plan
Breach Hazard Maps x 4
Standard Notice



Waterside House, Waterside North, Lincoln, LN2 5HA.
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

**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.

## Basic FRA Map centred on TF 48310 21295 - created June 2015 [Ref: CCN-2015-39214]




Environment Agency

Scale 1:10,000

N W E S

Main River
Raised Defences
Area 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.

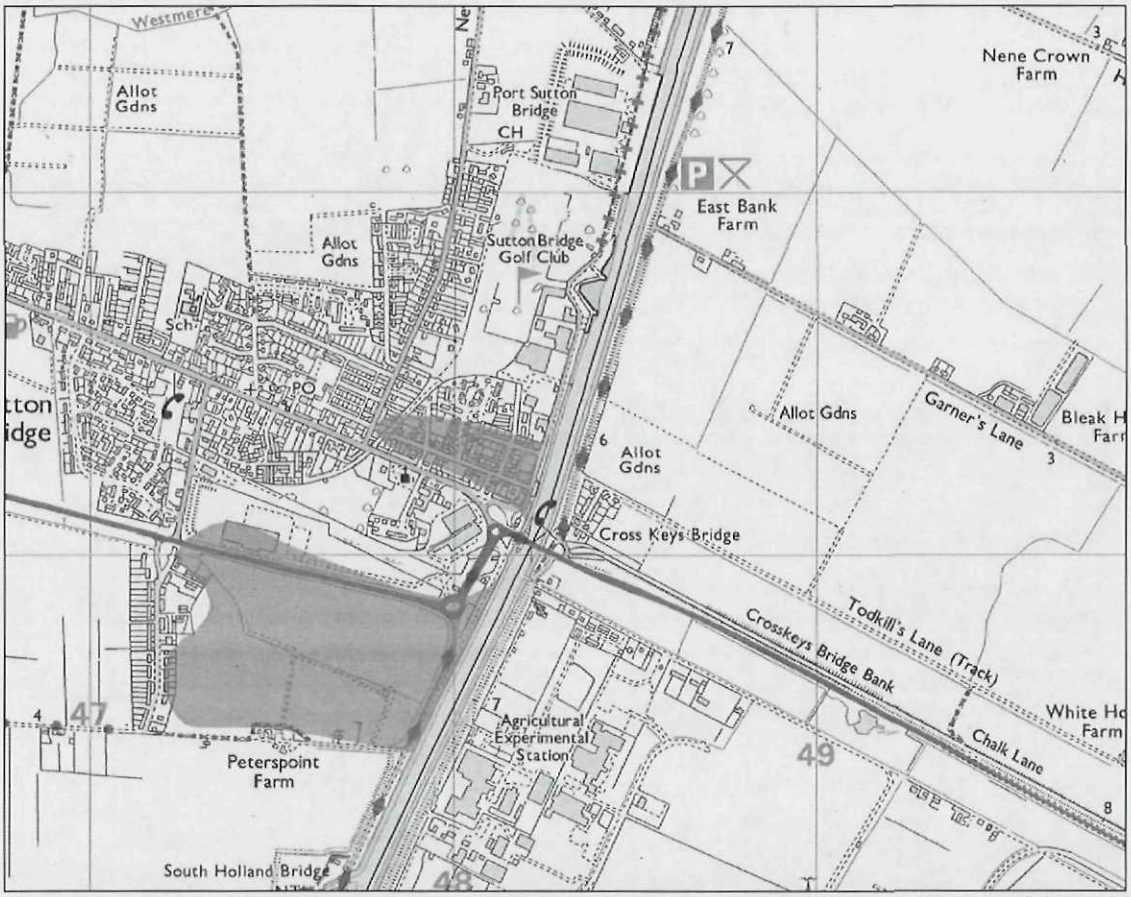
These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Lincoln

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Basic FRA Map centred on TF 48310 21295 - created June 2015 [Ref: CCN-2015-39214]




Environment Agency

Scale 1:10,000

N W E S

Main River

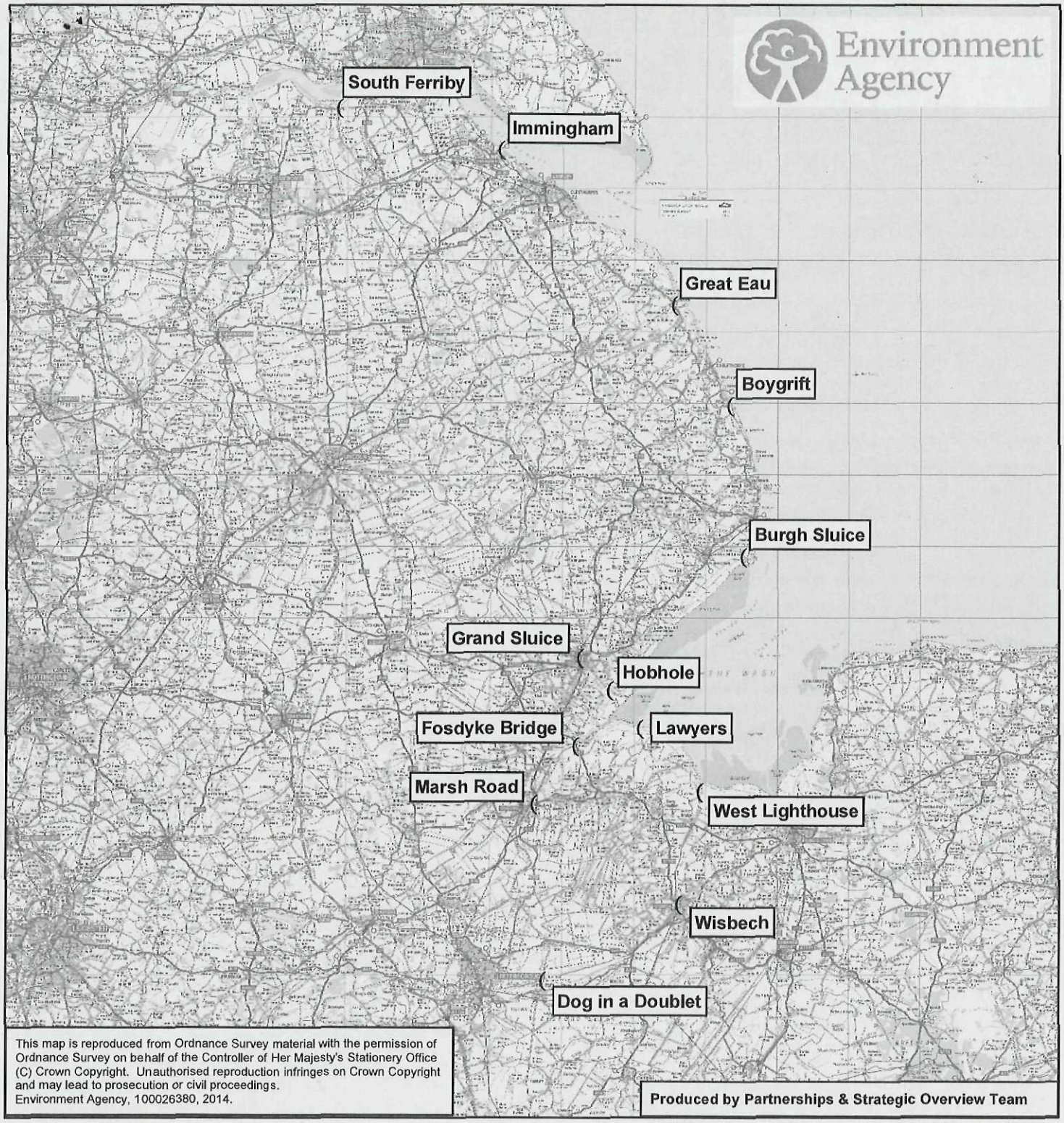
Flood Incident Outline

January 1978 on the Tidal River Nene

Created by the Partnerships and Strategic Overview Team, Lincoln

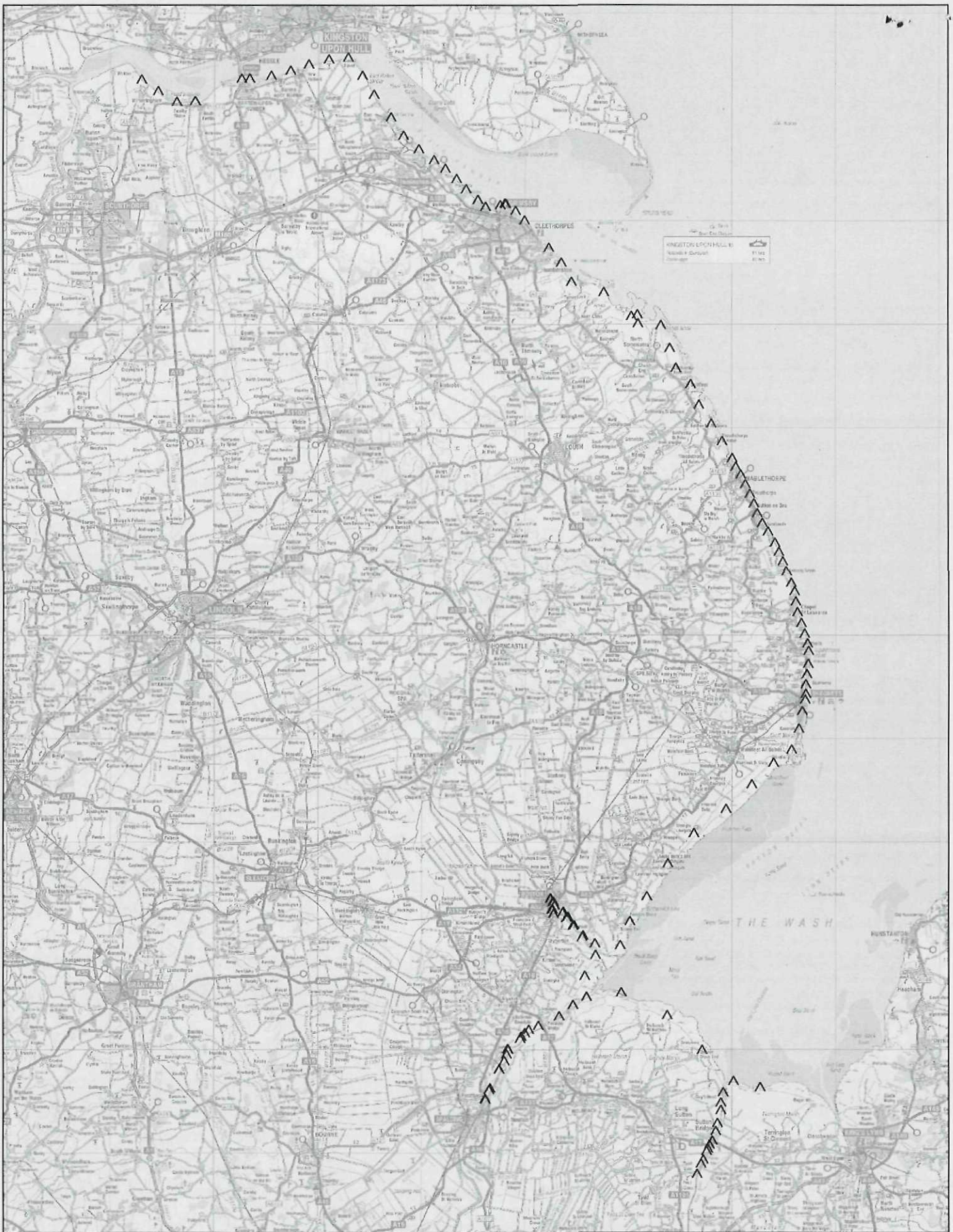
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# Still Water Tidal Levels mODN - Tidal Model Analysis 2006

| Location | Easting | Northing | 100% (1 in 1) | 10% (1 in 10) | 4% (1 in 25) | 2% (1 in 50) | 1% (1 in 100) | 0.5% (1 in 200) | 0.1% (1 in 1000) |
|---|---|---|---|---|---|---|---|---|---|
| South Ferriby | | | | | | | | | |
| Immingham | | | | | | | | | |
| Great Eau | 545500 | 393800 | 3.80 | 4.19 | 4.34 | 4.46 | 4.57 | 4.69 | 4.96 |
| Boygrift | 553300 | 379800 | 3.84 | 4.24 | 4.41 | 4.53 | 4.65 | 4.77 | 5.05 |
| Burgh Sluice | 555190 | 358620 | 4.26 | 4.45 | 4.63 | 4.76 | 4.90 | 5.03 | 5.34 |
| Hobhole | 536610 | 339940 | 4.82 | 5.30 | 5.49 | 5.64 | 5.78 | 5.93 | 6.27 |
| Lawyers | 540750 | 334550 | 4.84 | 5.32 | 5.51 | 5.66 | 5.80 | 5.95 | 6.29 |
| West Lighthouse | 549150 | 325750 | 4.88 | 5.37 | 5.57 | 5.71 | 5.86 | 6.01 | 6.35 |
| Grand Sluice | 532400 | 344500 | 4.88 | 5.33 | 5.51 | 5.65 | 5.78 | 5.93 | ~ |
| Fosdyke Bridge | 531700 | 332200 | 4.91 | 5.38 | 5.56 | 5.71 | 5.85 | 5.99 | ~ |
| Marsh Road | 526000 | 324000 | 5.04 | 5.44 | 5.60 | 5.73 | 5.85 | 5.98 | ~ |
| Wisbech | 546100 | 310000 | 4.83 | 5.25 | 5.41 | 5.53 | 5.66 | 5.78 | ~ |
| Dog in a Doublet | 527300 | 299300 | 3.67 | 4.00 | 4.13 | 4.22 | 4.32 | 4.42 | ~ |




^ **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 6ppm 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**

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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 | June 2015 | Scenario year | 2006 | Scenario Annual Chance | 0.5% (1 in 200) |

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

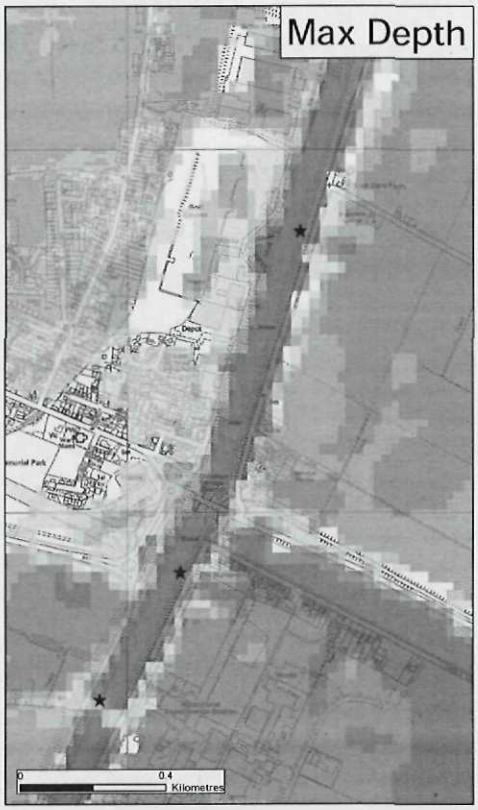
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# Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 48310 21295

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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 | June 2015 | Scenario year | 2006 | Scenario Annual Chance | 0.1% (1 in 1000) |
|---|---|---|---|---|---|

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.

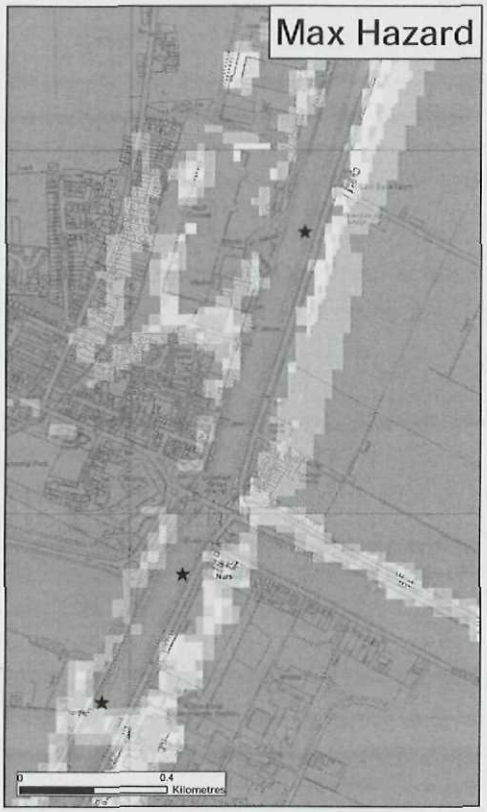
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary.

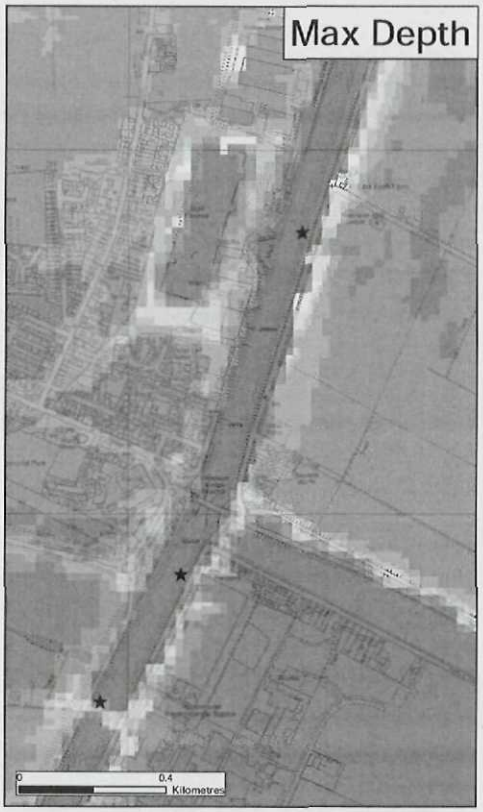
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**Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping**

Map Centred on TF 48310 21295

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| 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 | June 2015 | Scenario year | 2115 | Scenario Annual Chance | 0.5% (1 in 200) |
|---|---|---|---|---|---|

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.

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Environment Agency

# Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

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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 | June 2015 | Scenario year | 2115 | Scenario Annual Chance | 0.1% (1 in 1000) |
|---|---|---|---|---|---|

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.

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Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

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