# FLOOD RISK ASSESSMENT FOR RESIDENTIAL DEVELOPMENT AT 217 BRIDGE ROAD, SUTTON BRIDGE, LINCS.

**FINAL REPORT**

**GEOFF BEEL CONSULTANCY**

**DECEMBER 2014**

**GCB/MERCHANT**

***DISCLAIMER***

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Fig 2 - Site Layout – G R Merchant drg. no. 2436-12-03

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Fig 4 - South Holland District Council Strategic Flood Risk Assessment Depth of Flooding Map

Fig 5 - Environment Agency Tidal Hazard Mapping – Depth, Hazard, Velocity of 1 in 200 year return period event (2115) – CCN/2010/27350

Fig 6 - South Holland Internal Drainage Board District Plan

## 1.0 INTRODUCTION

1.1 A full planning application is to be submitted by G R Merchant Ltd on behalf of Mr S E King for proposed residential development at 217 Bridge Road, Sutton Bridge, Lincs.

1.2 Planning approval requires a Flood Risk Assessment to accompany the planning application for approval by the Environment Agency and to meet the requirements of the National Planning Policy Framework (NPPF).

The site is located within Flood Zone 3 as detailed on the Environment Agency's Flood Zone Maps. The latest Agency Flood Zone Maps have been created as a tool to raise awareness of flood risk with the public and partner organisations, such as Local Authorities, Emergency Services and Drainage Authorities. The Maps do not take into account any flood defences.

However, the site is also shown to be within a Low Risk Category at the present time of the South Holland District Council Strategic Flood Risk Assessment but which increases to extreme risk once the predicted effects of climate change are taken into account to the year 2115.

The site is also located in the South Holland Internal Drainage Board's area.

1.3 Geoff Beel Consultancy was appointed on 25th November 2014 to undertake a Flood Risk Assessment.

## 2.0 LOCATION

2.1 The development site is located at 217 Bridge Road and west of the River Nene tidal defences at Sutton Bridge. The NGR of the central point of the site is TF 46602170.

2.2 The position and extent of the site is shown on Fig 1 – Digital Site Survey at the end of the document.

2.3 The site, located within the South Holland Internal Drainage Board area is shown within Flood Zone 3 as detailed on the Environment Agency Flood Zone Maps but in Low Risk Category of the South Holland District Council Strategic Flood Risk Assessment (2010).

## 3.0 THE SITE AND SEQUENTIAL TEST

3.1 The site is open ground alongside 217 Bridge Road.

3.2 The area of development is approximately 0.10 hectare with proposed access to Bridge Road. Land level at the site is at 3.77m aOD with Bridge Road carriageway at 4.20m aOD.

3.3 The Sequential Test and Exception Test will require to be applied by the local Planning Authority but the development may be permitted as the site is protected against both the 1 in 100 year fluvial and 1 in 200 year tidal events meeting the requirements of NPPF.

## 4.0 EXISTING FLOOD ALLEVIATION MEASURES

4.1 The site is within a defended floodplain, as defined in Appendix 1 of the Environment Agency's 'Policy for the Protection of Floodplains' and is considered to be passive until such time as a flood greater than that for which the defences were designed occurs. The likelihood of flooding due to overtopping or failure of a flood defence embankment is considered to be small.

The South Holland Internal Drainage Board area at Sutton Bridge is protected by the west embankment of the River Nene tidal defences at a level of 6.30m aOD.

4.2 The site and surrounding areas of development drain in a generally northerly direction to discharge into the tidal River Nene as part of the Westmere catchment of the Internal Drainage Board.

4.3 The existing standard of drainage for the South Holland Internal Drainage Board is 1 in 50 years return period, compatible with the Department of the Environment, Food and Rural Affairs target level of service for rural drainage and flood defence works. Freeboard of 900mm is provided to the lowest land levels.

4.4 Current maintenance standards within the South Holland Internal Drainage Board and of the Environment Agency tidal defences are generally very good.

During the operation and maintenance of its pumping stations, associated structures and channel systems, particularly those that could affect property, the Board seeks to maintain a general standard capable of providing flood protection to its district. A routine maintenance programme is in place to ensure that the Boards assets are commensurate with the standard of protection that is sought. However, bank slips, blocked culverts etc may occur from time to time and these matters are usually dealt with promptly.

## 5.0 POTENTIAL SOURCES OF FLOODING

5.1 Four potential sources of flooding have been identified as a result of this assessment:

a) local blockages to existing sewerage
b) local blockages to IDB main drain
c) storm return period of 1 in 50 years being exceeded
d) overtopping of River Nene tidal defences at Sutton Bridge

5.2 The probability of flooding from source a) and b) are low due to the maintenance standards already achieved and managed by Anglian Water Services Ltd and the IDB.

The probability of flooding from c) is also low due to the South Holland IDB main drain design standard incorporating a minimum 900mm freeboard to the lowest land level which provides adequate storage in events greater than 1 in 50 years.

5.3 Previous historic rainfall events of 1968 and 1978, estimated to be greater than 1 in 100 year events, caused no flooding to any residential properties at the time and the Boards policy is to provide a standard of drainage which satisfies NPPF requirements of a 1 in 100 year return period for fluvial protection inclusive of the effects of climate change and development. The Boards policy regarding the connection of future developments to the arterial system enables a flexible approach to be adopted and meet the criteria for "sustainable urban drainage".

5.4 The possible overtopping and breaching of the tidal River Nene defences at Sutton Bridge is also considered to be low. The Environment Agency has carried out the River Nene Strategic Study Report (1995) and concluded that the defences provide a level of protection against the 1 in 200 years period tidal event.

5.5 More recent hydraulic modelling by the Environment Agency has produced Tidal Hazard Mapping.

The only risk of flooding is as a result of a breach occurring to the Sutton Bridge tidal defences when a potential depth of between 0.50m and 1.00m of floodwaters could affect the site in 2115. The site would not be affected as a result of a breach at the present time.

Floor level of the proposed dwellings will be raised 1.00m above existing ground level at 4.77m aOD with flood resilient construction incorporated up to 300mm above finished floor level to mitigate against the risk of such an event.

## 6.0 EXTENT OF KNOWN FLOODING

6.1 During the preparation of this assessment no evidence was discovered of the site being flooded during the tidal surge event of January 1978 since when tidal defences have been raised and strengthened to a 1 in 200 year standard of protection.

The more recent tidal surge event of 5th December 2013 reached a level of 6.20m aOD and the town and surrounding areas were protected by the improved defences.

## 7.0 PROBABILITIES AND TRENDS OF FLOODING

7.1 The probability of this development flooding from localised drainage systems is low.

7.2 The probability of the site flooding with water from any South Holland main drain is less than 1% because of the standards of the existing flood defence systems, storage within existing drainage channels and the location of the site.

7.3 The probability of the site flooding with tidal waters from the River Nene is less than 0.5% because of the standards of the existing flood defences and the location of the site. If the trend of climate change anticipated to occur continues over the next 100 years, the defences are not considered adequate to sustain the 1 in 200 year standard of protection and overtopping may occur in major tidal events.

7.4 If under very extreme events, levels of floodwater from the South Holland main drains or arterial systems rose to such an extent that the site was affected, the situation would not be sudden. It is very probable that sufficient time would be available to take precautionary actions to limit the extent and potential impact of flooding.

7.5 The water levels in the drainage channels will tend to rise as a result of the impacts of climate change. However the existing systems and defences together with the raising of floor level 1.00m above existing ground level with flood resilient construction will be appropriate for the design life of the development (i.e. 100 years).

## 8.0 IMPACTS OF FLOODING

8.1 No significant impacts of flooding are anticipated due to the existing standards of tidal defence, however a precautionary approach has been adopted to protect against the remote possibility of tidal overtopping to the River Nene tidal defences.

8.2 Floor level of the development will be 1.00m above existing ground level at 4.77m aOD with flood resilient construction offering additional protection against impacts arising from any extreme short duration, localised events.

8.3 The general location of the site within the catchment is such that if flooding occurred from any of the South Holland main drain systems, then probably 2 to 3 days warning time would be available.

8.3 The developer should ensure that the occupiers of the dwellings are sufficiently aware of the risk of flooding, and the standard of the existing defences. The Environment Agency provides a Flood Warning Service which includes Flood Warning Codes and uses direct warning methods where the risks and impacts of flooding are high. Indirect warnings are provided to all flood risk areas, even those at low risk of flooding. The main method is media broadcasts via local radio and also by television.

In addition to direct and indirect flood warnings, the Environment Agency operates a 24 hour a day Floodline Service providing advice and information on flooding, contact tel. no: 0845 988 1188 and the occupiers of the dwellings should register with the Floodline Direct Warnings Service to receive any future flood warnings.

8.5 If any future flood warnings were received, safe access/egress to evacuate the properties within the timescale identified in the SHDC SFRA would be available.

## 9.0 RESIDUAL RISK – EXTREME EVENTS

9.1 The residual risk from extreme events is low on this site, because of its location, existing tidal flood defences and the standard of surface water drainage already provided.

9.2 Although within Flood Zone 3 the site actually has a low risk of flooding due to the current standards of drainage and flood defence and land levels. The site is not located within a Functional Flood Plain of any 'main river' or 'main drain'. The Environment Agency Flood Zone maps have been produced irrespective of existing flood defences and standards of protection.

9.3 South Holland District Council in conjunction with the Environment Agency and the local IDB's within the Council area have completed a Strategic Flood Risk Assessment of the whole District by appointed Consulting Engineers.

The Strategic Flood Risk Assessment has produced more definitive Flood Risk Maps than those published by the Environment Agency and at the same time has analysed flood return periods of all tidal and fluvial defences for 2115 to account for the effects of climate change.

Breach scenarios of embankments failing and/or being overtopped have also been carried out to establish Flood Risk Zones.

9.3 As a result of the Strategic Flood Risk Assessment the South Holland IDB area has been determined as providing protection against a 1 in 100 year return period event whilst the River Nene tidal defences at Sutton Bridge provide protection against a 1 in 200 year return period current day event.

## 10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 As a result of the assessment, the following conclusions have been reached:-

- The proposed development is not in a Functional Floodplain. It is located in the Passive Floodplain protected by tidal defences to a 1 in 200 year return period, (0.5%) and fluvial defences of 1 in 100 year return period (1.0%).

- As a result of the South Holland District Council Strategic Flood Risk Assessment the site is in defended area, actual risk of site flooding from any South Holland IDB main drain system is very low.

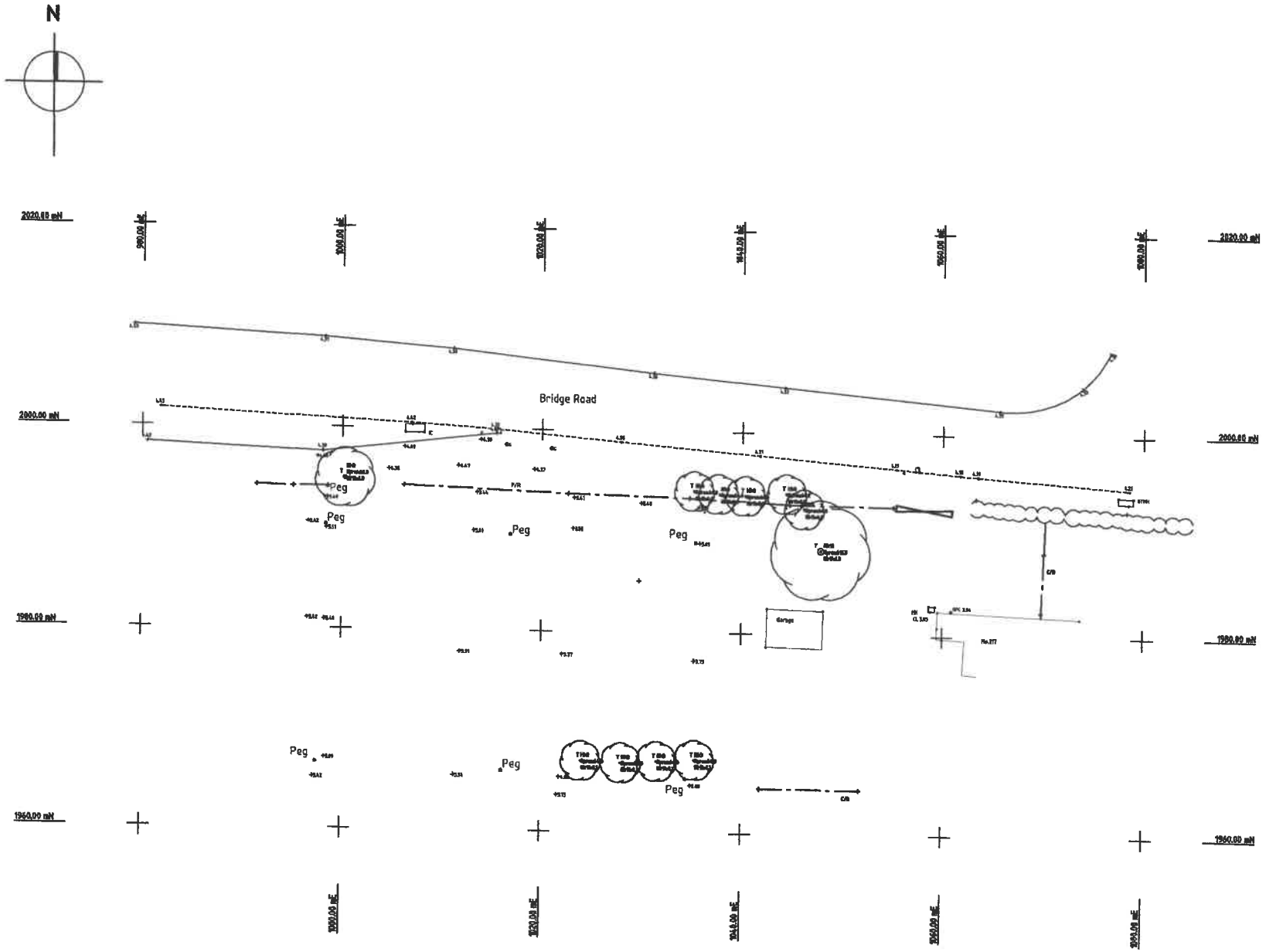
- Although the site is located within an Internal Drainage District with a minimum standard of drainage of 1 in 50 years, this accords with Defra guidelines for rural development. Freeboard to design water level of 900mm to lowest land level is available for events greater than 1 in 50 years providing further storage within the drainage channels. The Boards policy is to continue to provide a standard of drainage of 1 in 100 year return.

- On site surface water drainage will be discharged via existing sewerage of Anglian Water Services Ltd and hence to a South Holland IDB main drain.

- Floor level of the development will be raised 1.00m above existing ground level at 4.77m aOD with flood resilient measures incorporated up to 300mm above finished floor level.

- Safe refuge in the event of flooding is available at first floor level.

- A Flood Warning and Evacuation Plan will be agreed with the Local Authority's Emergency Planner.




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Project
NEW DETACHED DWELLING
217 BRIDGE ROAD, SUTTON BRIDGE
SPALDING
LINCS.

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SITE PLAN

Drawing
DIGITAL SURVEY

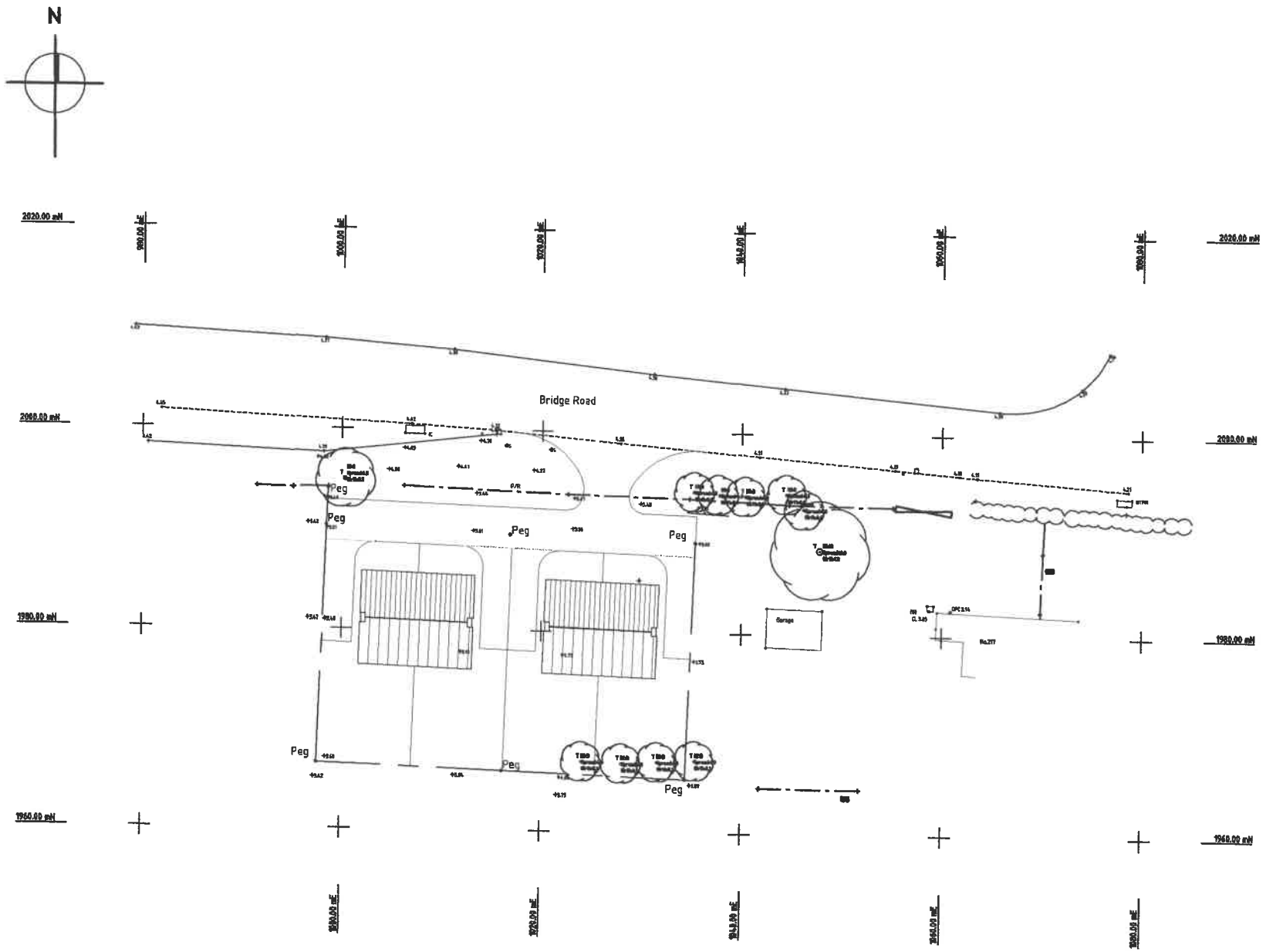
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Date SEPT 2014
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Project
NEW 2-NO DETACHED DWELLINGS
217 BRIDGE ROAD, CHURCH BRIDGE
SPALDING
LINCS.

Client
S E KING

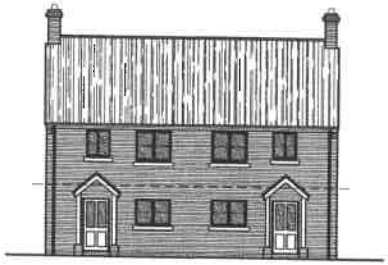
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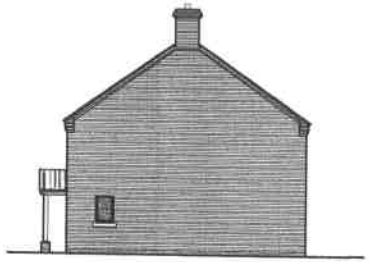
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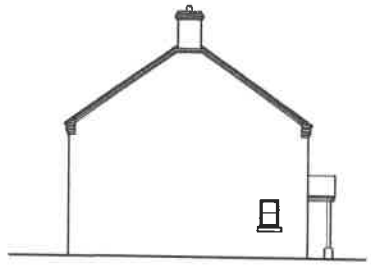
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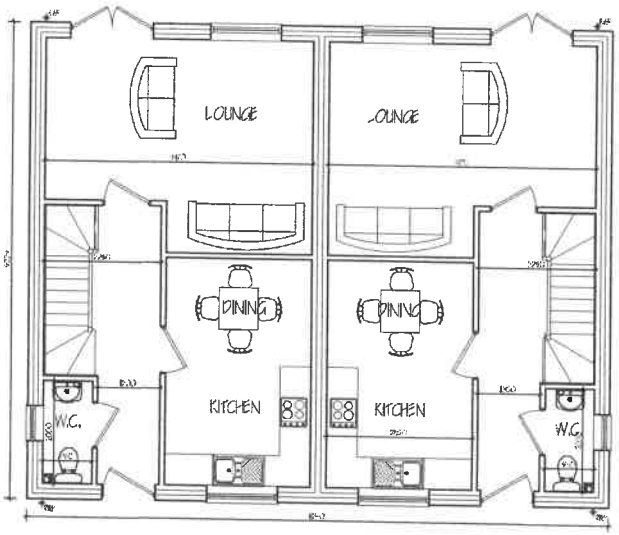
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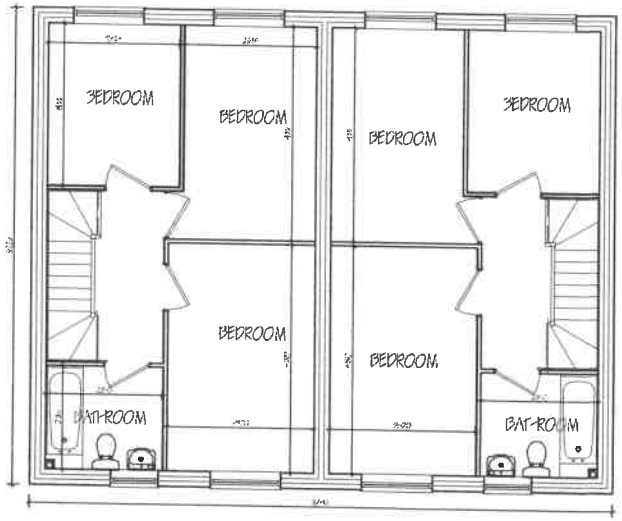
REAR ELEVATION



SIDE ELEVATION




GROUND FLOOR PLAN




FIRST FLOOR PLAN

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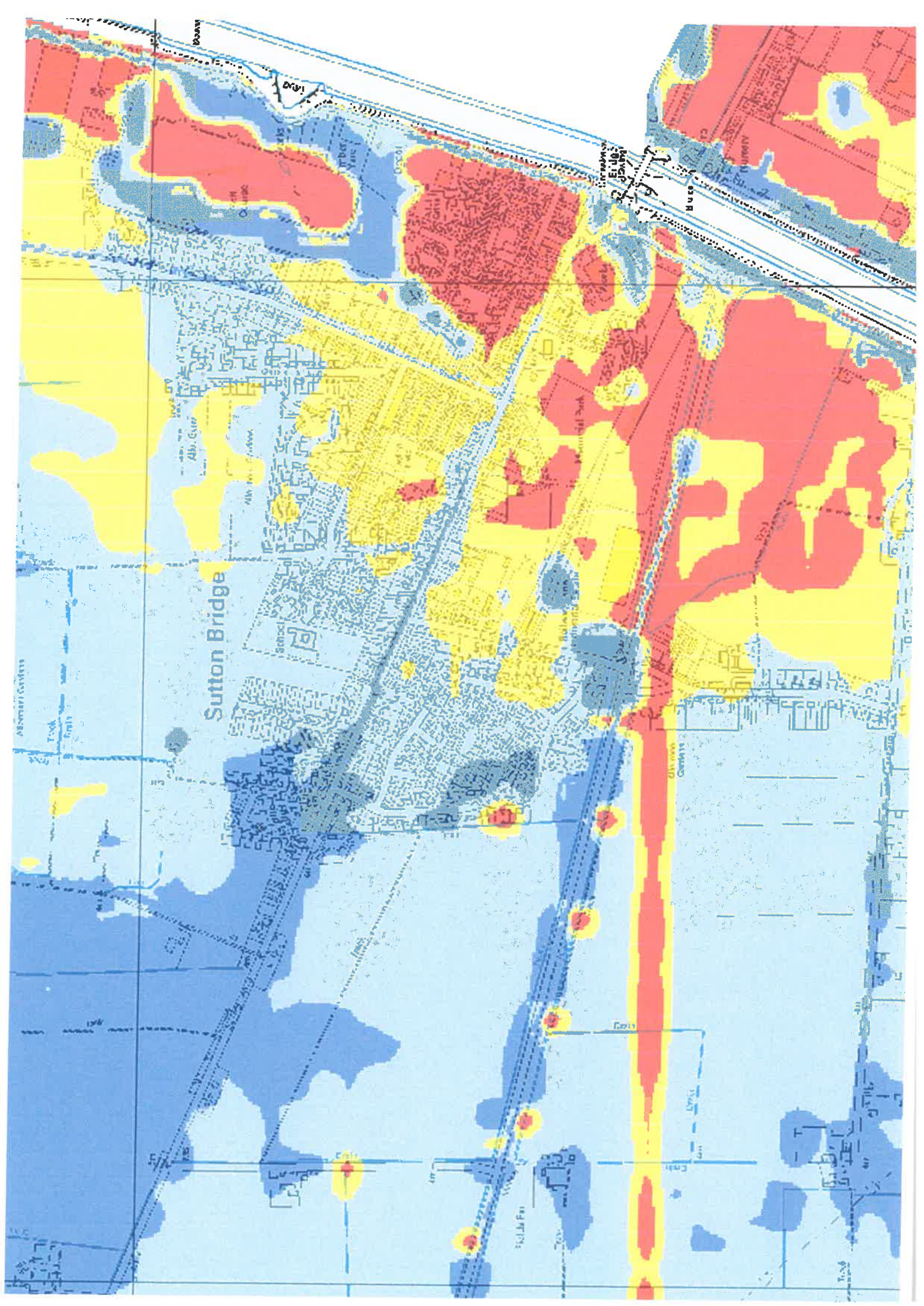
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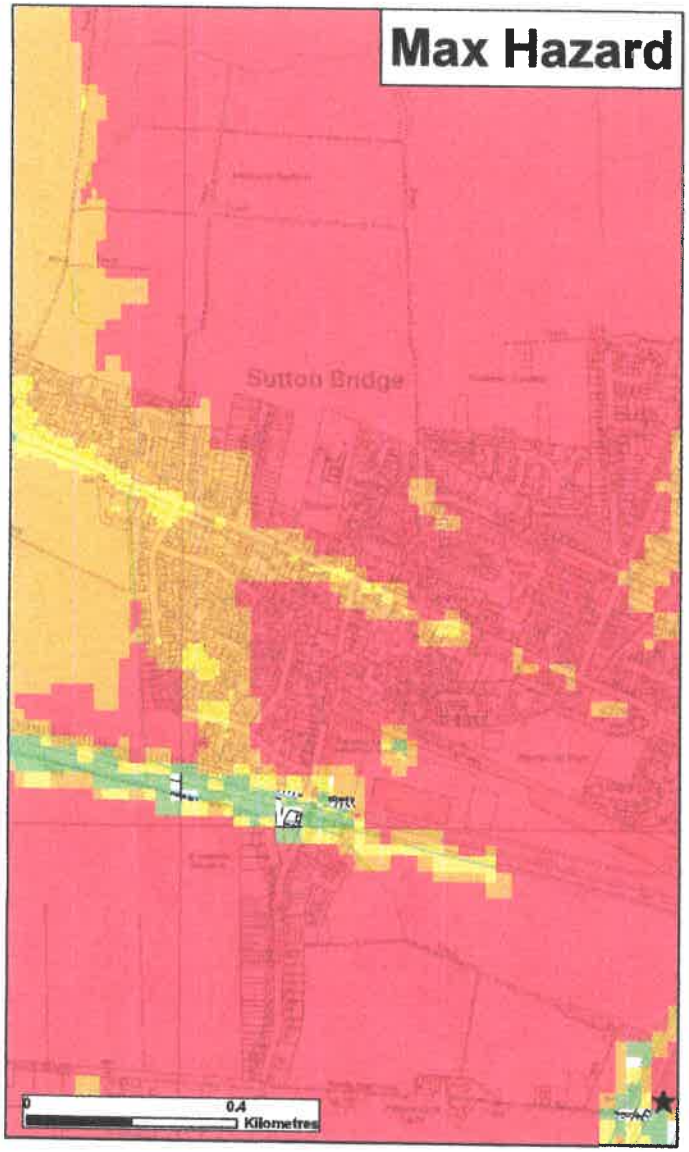
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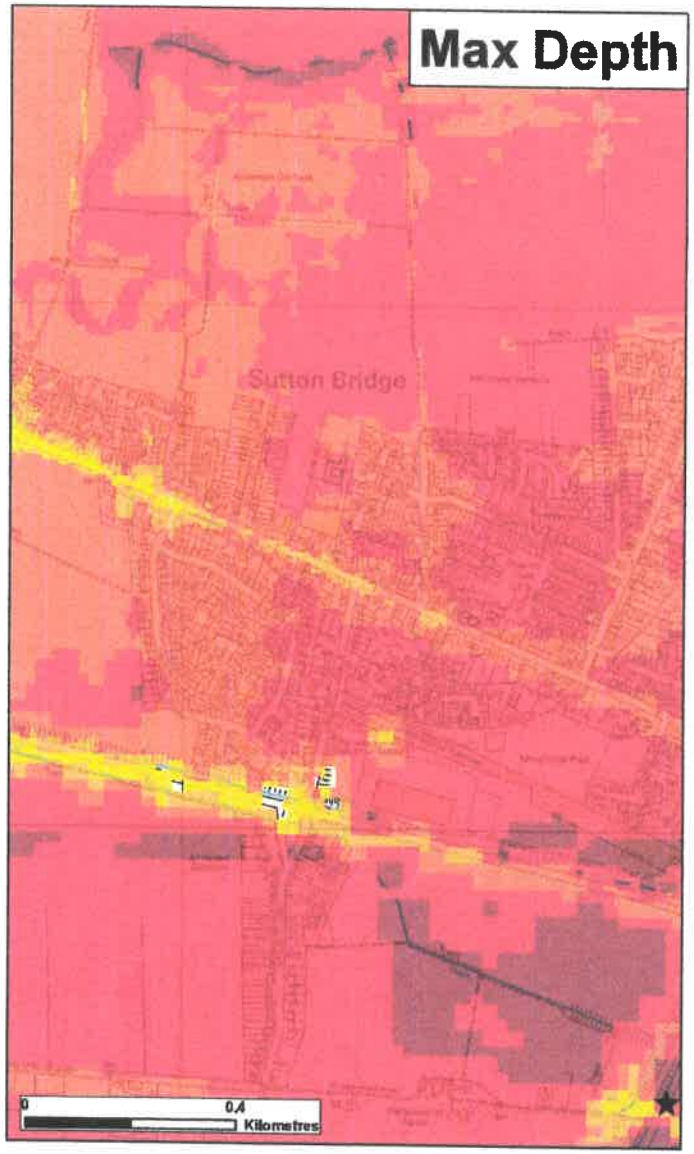
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Sutton Bridge







★ **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** | April 2011 | **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.

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.

Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.

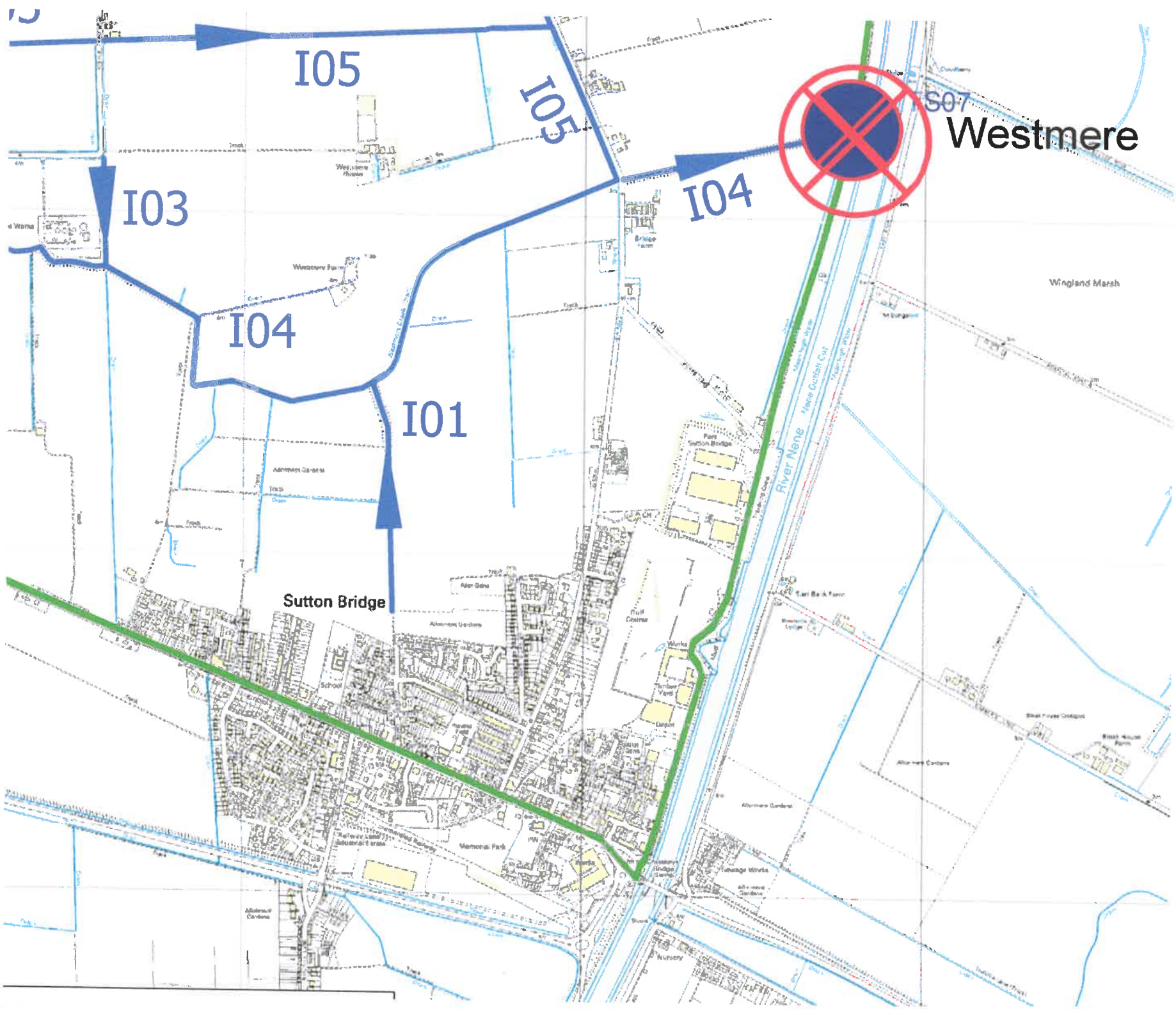
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 6p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

Environment Agency

# Northern Area Tidal Breach Hazard Mapping

Map Centered on TF 4731 2148

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I05
I05
I03
I04
I04
I01
S07
Westmere
Wingland Marsh
River Nene
Sutton Bridge