

PROPOSED DEVELOPMENT AT ANGLIA MOTEL, FLEET, HOLBEACH, SPALDING, PE12 8LT. FLOOD RISK ASSESSMENT



View from south side of site

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69 Charlotte Way,
Peterborough,
PE3 9ER.

This flood risk assessment has been prepared solely to support the planning application for the proposed development at the Anglia Motel, Fleet, Holbeach. The author has made every effort to provide an accurate assessment of the flood risk but accepts no liability should the information be found to be incorrect or incomplete, or if it is used for any other purposes other than for which it was originally commissioned.

Introduction

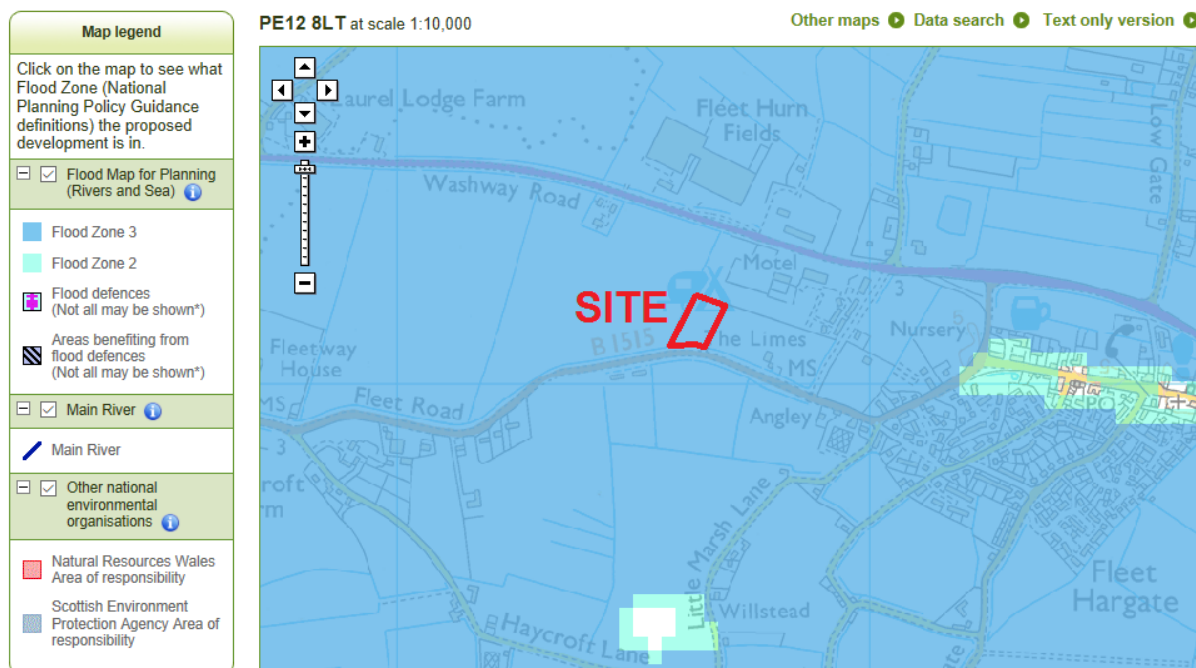
A Planning Application is due to be submitted to South Holland District Council to place 6 additional static caravans on an existing site south of the Anglia Motel on the south side of the A17 road at Fleet, near Spalding.

The site is in Flood Zone 3 as shown on the Environment Agency's Flood Zone map. The flood zone maps do not take into account existing flood defences.

For the Planning Application to be valid a flood risk assessment needs to be carried out to conform with the requirements of the Technical Guidance to the National Planning Policy Framework Development and Flood Risk. The site is within a defended area as specified in the South Holland District Council's Strategic Flood Risk Assessment and is located in the South Holland Internal Drainage Board District.

Environment Agency (EA) Flood Zones

The map below is taken from the Environment Agency website and shows the flood zones in the area.



It can be seen that a greater part of this area of Fleet is within Flood Zone 3. Land to the east in the centre of the village is higher and classed as flood zone 2.

Application Site

The development is located on the west side of the village of Fleet Hargate. The approximate National Grid Reference of the site is 538640 325125.

The location of the site is shown on the plan at the end of this document.

Table 2 of the Guidance states that "sites used for holiday or short let caravans and camping" are classed as "More Vulnerable" as long as there is a specific warning and evacuation plan.

Table 3 of the Guidance is shown below:

<u>Flood Zones</u>	<u>Flood Risk Vulnerability Classification</u>				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

As the area is not within the functional flood plain it can be designated as being within flood zone 3(a). Therefore it can be seen that for “More vulnerable” development the sequential and the exception tests need to be applied to the development.

Sequential Test

The aim of the Sequential Test, as set out in the Planning Practice Guidance, is to ensure that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The flood zones as defined in the Strategic Flood Risk Assessment for the area provide the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

As can be seen from the map on page 2 of this report the whole of the area around Fleet Hargate with the exception of the small central area of the village is in Flood Zone 3. Therefore it would be difficult to find a similar site for development that is in a lower flood zone.

The advice in the guidance with reference to the application of the sequential test states that when applying the test a pragmatic approach on the availability of alternative available sites should be taken. For example in considering planning applications for extensions to existing business premises it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere. As this is an established business with a location around an existing lake this application can be considered in the same way.

The safety of the proposed additional caravans will be delivered by:-

- a) Ensuring the floor levels are 300mm above the 1 in 1000 year flood level for the proposed life of the caravans
- b) Setting up an adequate flood warning and evacuation plan for the site.

The Design and Access statement will confirm that the proposed development is in accordance with the relevant South Holland District Council Core Strategy policies.

Therefore I consider that the sequential test has been passed.

Exception Test

The Sequential Test has demonstrated that it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding. Therefore the Exception Test must be applied and for this to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risks, informed by the Strategic Flood Risk Assessment; and
- A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking into account of the vulnerability of its users, without increasing flood risk elsewhere, and where possible will reduce flood risk overall.

Both parts of this test must be satisfied in order for the development to be considered appropriate in terms of flood risk. There must be robust evidence in support of every part of the test.

The first section will be demonstrated by the Supporting Planning Statement and compliance with South Holland District Council's planning policies.

This flood risk assessment will demonstrate that the development will be safe for its lifetime and it will not increase flood risk elsewhere.

South Holland DC SFRA

Report Maps

Map 3 shows that the site is within flood zone 3.

Map 5 shows that the site is at low or medium risk, but reliant on flood defences for this standard.

Map 6 indicates the peak depth is zero for the present day 1% fluvial and 0.5% tidal event probability.

Map 7 indicates the peak velocity is zero for the present day 1% fluvial and 0.5% tidal event probability.

Map 12 indicates the actual risk is low or medium for the year 2055 1% fluvial and 0.5% tidal event probability.

Map 13 indicates the actual risk is low or medium for the year 2115 1% fluvial and 0.5% tidal event probability.

Map 16 shows that the site is not within a rapid inundation zone.

Flood Maps Table D1

The actual flood hazard for the present day and 2115 is as follows:

Depth of flooding..... zero
 Extent of flooding..... low or medium, reliant on flood defences
 Velocity nil

The residual flood hazard for the present day and 2115 is as follows:

Depth of flooding..... zero
 Extent of flooding..... low or medium, reliant on flood defences
 Velocity nil

Maximum flood level and bank levels in the River Welland

The maximum levels in the tidal section of the River Welland 8 km west of the site are as follows:

	2007	2115
Peak 1 in 200 year level	5.98	7.12
Peak 1 in 1000 year level	6.27	7.41

The lowest levels of the east bank of the River Welland around chainage 18km are 7.50m OD, with average levels between 7.60m and 7.70m OD.

Tables in the SFRA show the following details of the defence bank on the west side of the tidal section of the River Nene south of the A17 road bridge, at chainage 5.2km.

	2007	2055	2115
Peak 1 in 200 year extreme tide level	5.86m OD	6.19m OD	7.00m OD
Peak 1 in 1,000 year extreme tide level	6.20m OD	6.53m OD	7.34m OD

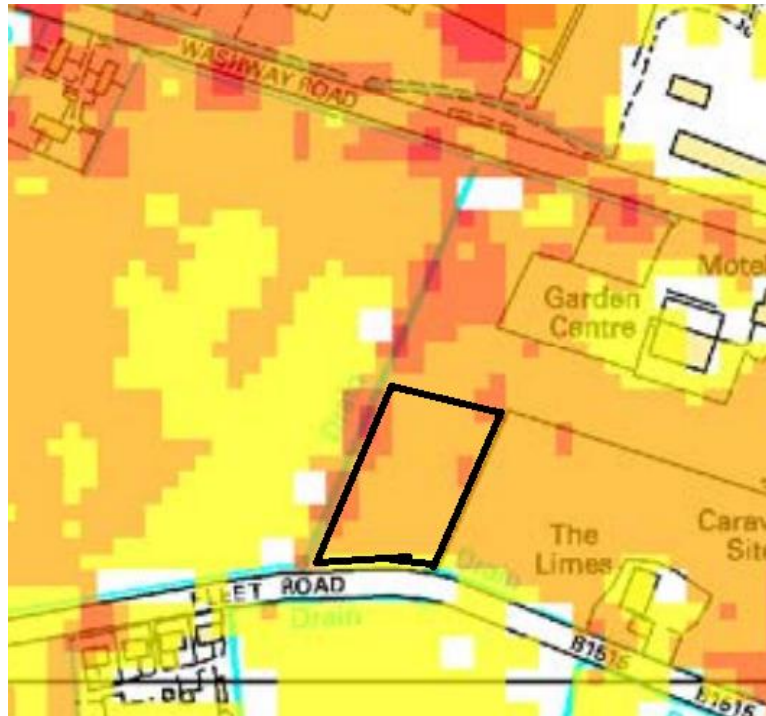
The SFRA states the defence type at this point is “No raised Defence” with a defence crest level of 6.95 m OD and the freeboards are as follows:

	2007	2055	2115
Peak 1 in 200 year freeboard	1870mm	1540mm	730mm
Peak 1 in 1,000 year freeboard	1580mm	1250mm	440mm

Further south the defence is an earth bank with crest levels between 5.3km and 5.7km (the outfall of the South Holland Main Drain) of 7.07, 7.1, 7.04, 7.15 and 7.07m OD. However there is a low section adjacent to the bridge itself at a level of 5.95m OD. Levels of the defence north of the A17 bridge are approximately 6.30m OD.

Environment Agency Tidal Breach Hazard Mapping

The Environment Agency has published mapping which predicts the depths, velocities and hazard following a breach in the tidal defences for a 1 in 200 and 1 in 1000 year event in 2115. The maps have been produced by modelling breaches along the whole length of the tidal defences and combining these into one map. The guidance from the Environment Agency is that for a 100 year life of a development floor levels should be at least 300mm above the 1 in 1000 year predicted flood depths in 2115, and the map showing these depths is shown below.



The map predicts flooding of between 250mm and 500mm depth in a 1 in 1000 year event in 2115 on the site.

This application is for the siting of static caravans with a life of only 20 to 30 years and therefore the range of flood depths in thirty years time will be lower than indicated on the map for 2115.

Site levels

The site of the proposed caravans is all at a level of approximately 3.15m OD, which is 650mm lower than the level of Fleet Road which is at a level of 3.80m OD.

Existing Flood Alleviation Measures

The site is within a defended flood plain, as defined in Appendix 1 of the Environment Agency's "Policy and Practice for the Protection of Flood Plains", which is considered to be passive until such time that a flood greater than the defences can withstand occurs. The likelihood of flooding occurring due to overtopping or failures of the defences is considered to be very low.

The site is located approximately 10 km from the tidal section of the River Welland near Fosdyke, which has a tidal defence bank which is maintained by the Environment Agency.

The site is located 10.3km west of the tidal River Nene north of Sutton Bridge which also has a tidal defence bank which is maintained by the Environment Agency.

The site is located 10.km south of the Wash tidal defences north of Holbeach St Matthew which are maintained by the Environment Agency.

There are watercourses in the area that are maintained by South Holland IDB.

Potential Sources of Flooding

The potential sources of flooding to the site are:-

1. Failure or overtopping of tidal defences of the River Nene or the Wash
2. High water levels in IDB drainage channels.
3. Localised flooding in the area.

1. Failure or overtopping of tidal defences of the River Nene, River Welland or the Wash

The site is approximately 10.0 km from the tidal defences of the River Nene, River Welland and the Wash.

The hazard from the River Nene east of the development site if a breach occurred in the length of bank between the South Holland Main Drain Outfall and the A17 bridge will be considered to be the major risk to the site. If the banks north of the A17 bridge or the Wash banks breached the flood water could reach the site but the resulting flood depths should not be as high as if a breach occurred in the banks directly east of the site.

The predicted levels in the SFRA indicate that the west bank of the River Nene between the A17 road bridge and the South Holland Main Drain Outfall Sluice will not be overtopped unless there is an event greater than 1 in 1000 years at the present time. However in 2115 although it will not be overtopped in a 1 in 200 year event, it will be overtopped in a 1 in 1000 year event.

The maps in the SFRA indicate do not predict any flooding on the proposed site in a 1 in 200 year event in 2115. The maps produced later by the Environment Agency predict flood depths of up to 500mm in depth in a 1 in 200 year event in 2115 on the proposed site of the development

The EA breach mapping assumes no attempt is made to immediately repair the breach. It is also likely that the EA will undertake further bank raising within the next 100 years to ensure that there is a continuing 1 in 200 year defence to the areas west of the River Nene.

2. High Water Levels in IDB drains

Although the whole of this area is below high tide level and levels in the rivers, the retained water levels in the drainage channels ensure that the risk of flooding is extremely low. South Holland IDB maintains a system of sluices, pumping stations, and drainage channels which convey surface water into the River Nene, the Wash and the River Welland and control water levels throughout the South Holland IDB area.

The development site is located on the north side of Fleet Road which is in the Lutton Leam catchment. The watercourse on the southern side of the A17 is an IDB maintained drain, and excess surface water from the Anglia Motel site, including the areas of the campsites, will flow into this watercourse, which is piped for part of its length in front of the Motel. This then flows into the Priestfields Drain north of the A17 road. The water then flows eastwards through the Gedney Drain and into Lutton Leam, and the water then discharges through a sluice into the tidal River Nene north of Sutton Bridge.

The channels maintained by South Holland IDB in urban areas are classified as high priority watercourses and as such receive a higher maintenance priority.

There are possibilities of failure of outfall sluices, but these are mitigated by the high level of maintenance given to these structures by the IDB. If a failure did occur the IDB would immediately be warned of the problem by their telemetry system and take action to repair the fault or to bring in temporary pumps to reduce the risk of any flooding in the area. Similarly any failures of culverts or other blockages would be dealt with immediately.

IDB systems are designed to provide a freeboard of between 600mm and 1000mm to all land in a 1 in 10 year return period rainfall event. South Holland IDB watercourses generally state that their watercourses provide a standard of 1 in 100 years with a freeboard of 300mm in urban areas. In an extreme event water levels will rise but this will be a slow process and it would be at least 24 hours before levels were high enough to begin to flood low land in the area, and after this the level of the flood water would need to rise another 1.0 metre before the development site would be affected.

Therefore the risk of flooding from IDB drainage channels can be considered to be extremely low.

3. Localised Flooding in the area

Although there is a possibility that surface water could accumulate on Fleet Road it would not reach any depths before it drained onto lower land both north and south of the road. As the floors of the proposed caravans will be at least 500mm above ground level this will provide adequate mitigation against the risk of flooding.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of the existing house or garden or any of the adjoining properties having been flooded in the past.

Probabilities and Trends of Flooding

The probability of this development flooding from Environment Agency main river is very low. In an extreme event any effect on this location would not be sudden and there would be time for residents to take precautionary measures to limit the impact of any flooding that may occur.

Residual Risk – Extreme Events

The residual risk from extreme events is very low on this site. The major risk to the site is from a breach or overtopping of the tidal defences

The risk of this happening in this case is low and the hazard from any flooding is also low.

Climate Change

The recommendations for flood depths for this flood risk assessment use information mostly taken from the South Holland DC SFRA which was last updated in 2010. The EA have issued new guidance on recommended contingency allowances for predicted sea rises, fluvial flows and rainfall intensities which from 19th February 2016 needs to be considered in the FRA. The effects of these new recommendations are considered in Appendix A of this report (pages 12 to 15).

Conclusions

The EA state that there is risk of tidal flooding if a breach occurs in the tidal flood banks in a 1 in 200 year and a 1 in 1000 year event in 2115. The EA have modelled breaches in banks of all of the tidal rivers and along the frontage of the Wash. The banks are high enough at the present time to prevent overtopping in a 1 in 1000 year event in 2115. If a breach occurred in a tidal bank the SFRA indicates that the flood water would not reach the Fleet Hargate area but the subsequent EA flood maps indicate there could be flooding with a maximum depth of 500mm in 2115.

Comparing ground levels and predicted flood depths for a flood risk assessment carried out for a development 350 metres east of this site concluded that the maximum flood level in a 1 in 1000 year event in 2115 would be 3.40m OD. Reference was also made to a site on Little Marsh Lane 400 metres south east of the development site where the flood level was estimated at 3.30m OD.

This would indicate that the estimated flood level in a 1 in 1000 year event in 2115 would be no higher than 3.45m OD which is 300mm above ground level on the development site. However the life of the caravans is only likely to be between 25 and 30 years, and within this time flood levels are unlikely to be higher than 200mm above ground level. Therefore the provision of caravans with floor levels 500mm above ground level will be adequate to satisfy the guidelines that state that accommodation with sleeping accommodation on the ground floor should be at least 300mm above the predicted flood level for the life of the development.

The risk will be additionally mitigated by the fact that the caravans are not occupied in the winter months when the flood risk is higher.

The Environment Agency have stated that their policy is to continue to maintain tidal banks in the future with at least a 1 in 200 year standard of service.

The risk of flooding to the caravans from IDB drains can be considered to be adequately mitigated with the raising of floor levels 500mm above ground level.

The IDB have adequate arrangements to bring in contractors and use their own staff if a failure of any part of the sluices occurred. If drains become full any flooding that occurs would happen very slowly and affect land at levels between 2.50m OD and 3.0m OD before the development site. It would be very unlikely to reach a level of 3.15m OD and flood the site of the proposed development.

The proposed development is not in a functional flood plain as defined by PPS 25.

Although the site is in flood zone 3, and the actual risk of the site flooding from any Environment Agency or IDB watercourse is very low. The site is only likely to flood if a breach occurs in the tidal defences during a 1 in 200 year high tide in 2115. No flooding would be likely to occur if a breach did not occur.

Any flooding would happen very slowly and the occupiers of the caravans would have adequate time to prepare themselves for the event.

Recommendations

The floor level of the proposed new static caravans will be 500mm above ground level.

The site owner should register with the Environment Agency's Floodline Warnings Direct Service.

The site owner should prepare a plan so that all site managers are aware how to warn occupants of the caravans of the danger and advise of evacuation procedures if these are required.

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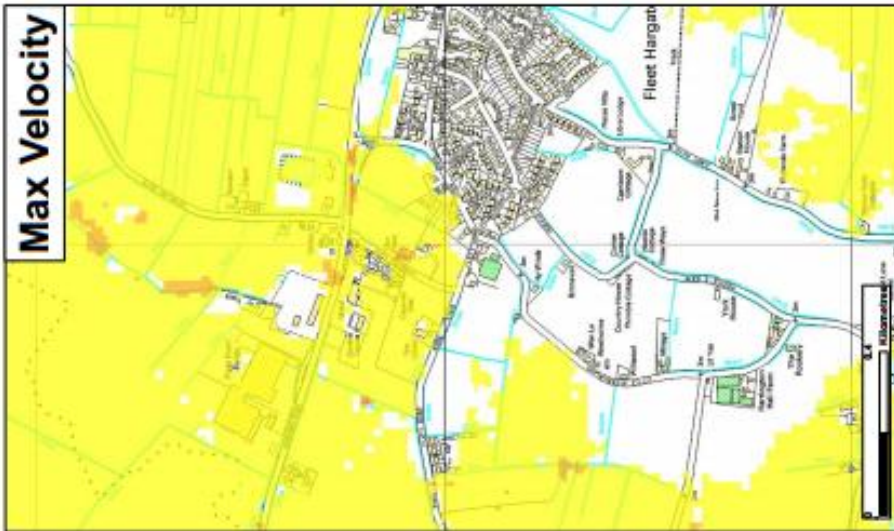
9th January 2017

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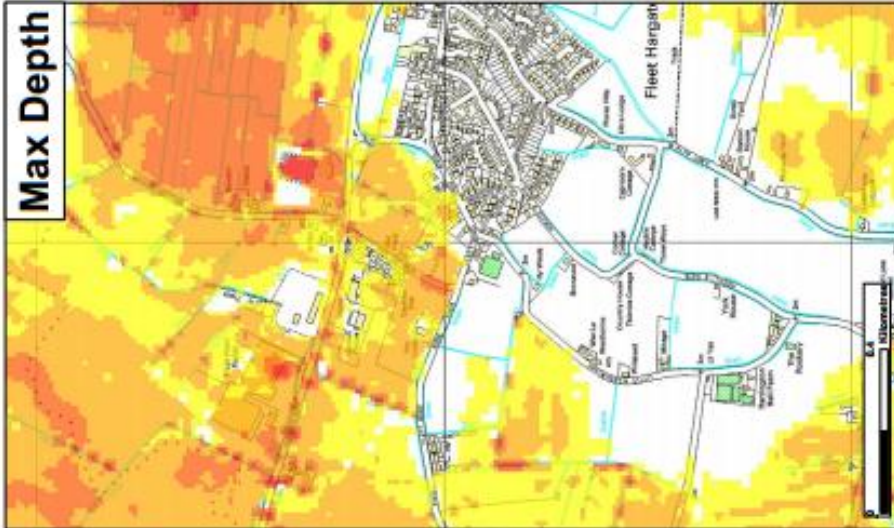
PROPOSED PLAN OF SITE



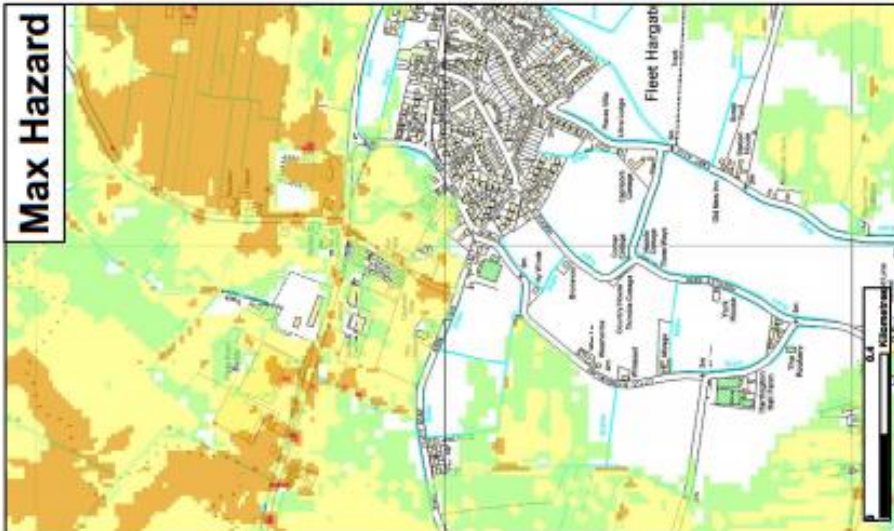
Max Velocity



Max Depth



Max Hazard



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: 03 0784 506 506. **Weekday Daytime calls cost 5p plus up to 1p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary.**



Environment
Agency

Lincolnshire and Northamptonshire
Tidal Breaching Hazard
Mapping

Map Control on TF 30040 24275

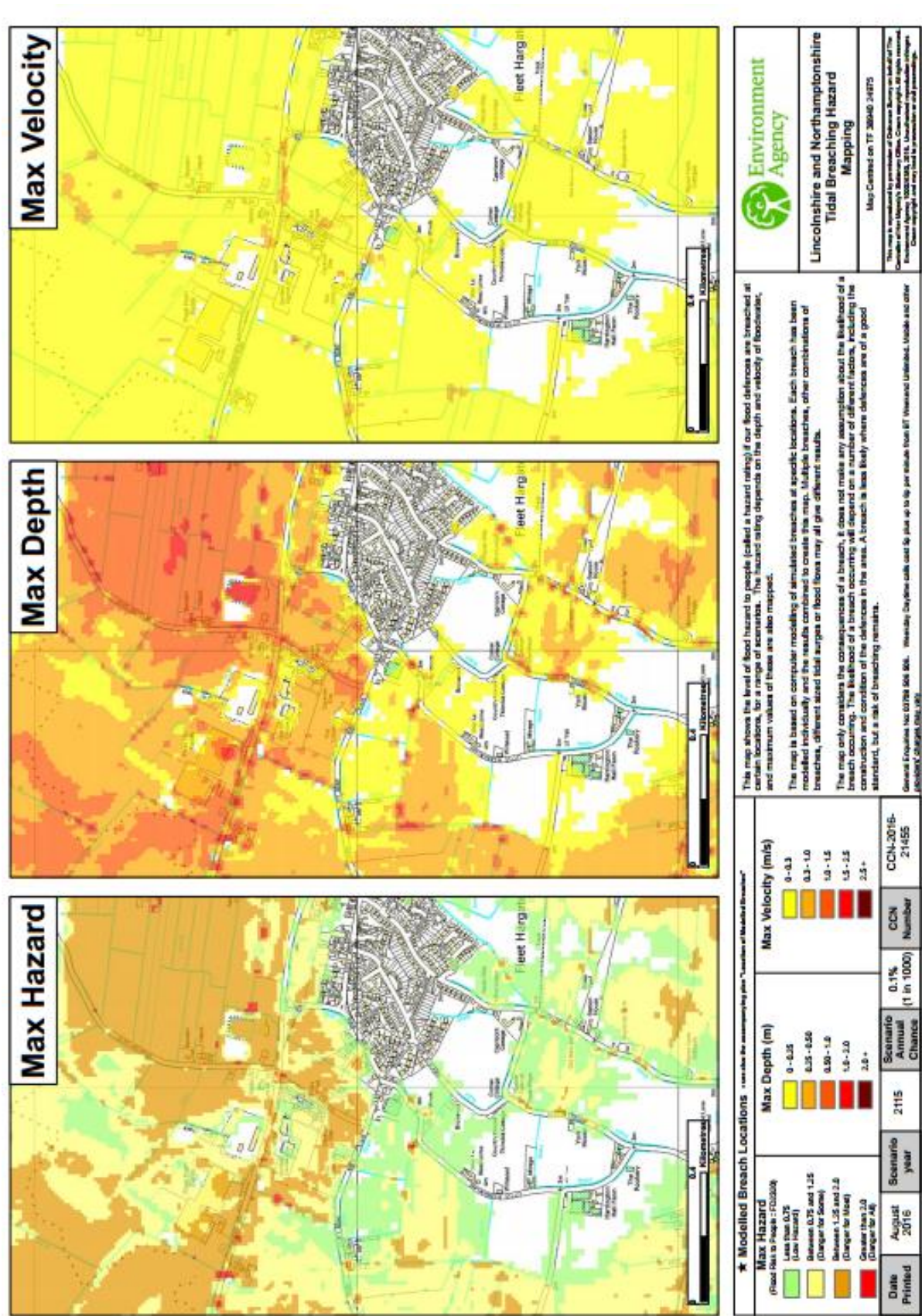
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★ Modelled Breach Locations

100m after the accompanying plot "Location of Modelled Breaches"

Date Printed	August 2016	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2016-21455
Max Hazard (Road loss is Peak - F02208) Less than 0.25 (Low Hazard) Between 0.25 and 1.25 (Danger for Family) Between 1.25 and 2.0 (Danger for Motor) Greater than 2.0 (Danger for All)							
Max Depth (m) 0 - 0.25 0.25 - 0.50 0.50 - 1.0 1.0 - 1.5 1.5 - 2.0 2.0 +							
Max Velocity (m/s) 0 - 0.3 0.3 - 1.0 1.0 - 1.5 1.5 - 2.5 2.5 +							

1 in 1000 year in 2115 Breach Hazard Map



APPENDIX A CLIMATE CHANGE

The Environment Agency has issued revised guidance on climate change and have now stated that the new predictions should be considered and incorporated into all flood risk assessments produced after 19th February 2016.

Listed below are the climate change allowances in three documents:

- South Holland SFRA
- EA guidance (2013)
- Revised EA guidance

The recommendations in each document are shown below.

2010 South Holland DC SFRA

The SHDC SFRA states that the the following allowances have been made for climate change:

4.4 Climate Change

Scenarios for the years 2055 and 2115 include for climate change contingency allowances to the amount suggested by PPS25¹. These allowances are expressed in Table 2. Percentage increases are relative to the present-day.

Table 2 – Adopted Climate change contingency allowances

Parameter	Year 2055	Year 2115
Sea level rise (m)	+ 0.33	+ 1.14
Extreme wave height	+ 10%	+ 10%
Peak river flow and volume	+ 20%	+ 20%
Peak rainfall intensity	+ 20%	+30%

Where flows arise from pumping rather than natural run-off, notably in the Vernatt's Drain and for the Fenland subcatchments of the South Forty Foot Drain, peak flow rates for future eras have been taken as equal to current rates since this SFRA assumes all flood risk management measures will remain in their current state.

2013 Guidance to Planners

Guidance to planners was issued by EA in September 2013

Table 1: Recommended contingency allowances for net sea level rises (Net sea level rise (mm per year) relative to 1990)

	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

Table 2: Recommended national precautionary sensitivity ranges for peak rainfall intensity, peak river flow, offshore wind speed and wave height

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%		
Offshore wind speed	+5%		+10%	
Extreme wave height	+5%		+10%	

Revised 2016 EA Guidance

Table 1 peak river flow allowances by river basin district (use 1961 to 1990 baseline)

River basin district	Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Anglian	Upper end	25%	35%	65%
	Higher central	15%	20%	35%
	Central	10%	15%	25%

For more vulnerable development in flood zone 3(a) the higher central and upper end should be used to assess the range of allowances.

Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

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

Table 3 sea level allowance for each epoch in millimetres (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)

Area of England	1990 to 2025	2026 to 2050	2051 to 2080	2081 to 2115	Cumulative rise 1990 to 2115 / metres (m)
East, east midlands, London, south east	4 (140 mm)	8.5 (212.5 mm)	12 (360 mm)	15 (525 mm)	1.24 m

Table 4 offshore wind speed and extreme wave height allowance (use 1990 baseline)

Applies around all the English coast	1990 to 2050	2051 to 2115
Offshore wind speed allowance	+5%	+10%
Offshore wind speed sensitivity test	+10%	+10%
Extreme wave height allowance	+5%	+10%
Extreme wave height sensitivity test	+10%	+10%

Effects on Predictions of Flood Risk in FRA

The FRA has identified two sources of flooding where the new climate change recommendations could affect the predictions of flood levels in 2115 at the development site:

- 1) Flooding from the tidal rivers or the Wash.
- 2) Flooding from IDB drainage system

1) Flooding from the tidal River Nene

The contingency allowance in metres for the years 2055 and 2115 using 1990 as a baseline in the SFRA compared with the guidelines is as follows

Year	SFRA	2013 guidance	Revised 2016 guidance
2055	0.33	0.395	0.412
2115	1.14	1.205	1.24

Therefore it can be seen that the revised guidance increases the maximum allowance for sea rise in 2115 by 100mm. This will not have the effect of increasing the maximum

flood level at the site in a 1 in 200 year breach event in 2115 by 100mm. It will probably be between 10mm and 50mm. As the proposed life of the development is thirty years this climate change allowance will not affect the conclusions and recommendations in the report.

2) Fluvial Flooding from IDB watercourses

As the development is in flood zone 3 and is classed as more vulnerable, the advice from the Environment Agency is that the higher central climate change allowance, which is 35%, should be considered. After considering the effects of this increase the upper end allowance, which is 65%, should be considered to assess the effect of this.

IDB's have been using an allowance of 20% for climate change over the past few years in their assessments and modelling of their systems. Generally IDB's are happy that their systems provide a 1 in 100 year standard to most urban areas at the present time.

South Holland IDB, and all IDB's, are aware that climate change will affect the operations of pumping stations, sluices and drainage channels. Pumping stations and sluices only have a 30 year life and will need to be refurbished or rebuilt within this timespan. It is assumed that South Holland IDB will continue to review the modelling they have already carried out and when the Board consider these refurbishments adequate arrangements will be made to incorporate the latest climate change projections in order that the Board continues to provide the same standard of service as the present day.

Therefore it is considered that the mitigation proposed for the development, with the recommendation that the floor levels should be a minimum level of 3.65m OD is satisfactory.