

PROPOSED DEVELOPMENT OF SEVEN NEW HOUSES BEHIND
114 SPALDING ROAD, HOLBEACH, PE12 7HJ.
FLOOD RISK ASSESSMENT



View of rear of garden

S M Hemmings B Sc C Eng MICE MIWEM,
69 Charlotte Way,
Peterborough,
PE3 9ER.

This flood risk assessment has been prepared solely to support the planning application for a development at Spalding Road, 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.

Introduction

A Planning application is due to be submitted to South Holland District Council to construct seven houses in what is at the present time the rear garden of 114 Spalding Road, Holbeach.

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.

Application Site

The site is located 1 km west of the centre of Holbeach, 8.0 km from the tidal defences of the River Welland north of Spalding, and at least 10km south of the tidal defences of the Wash.

The National Grid Reference of the site is 534800 324875, and the extent of the site is shown on the plan at the end of this document.

The proposed development is within Flood Zone 3(a) "High Probability" as detailed on the Environment Agency's flood zone maps without defences, as defined in Table 1 of the Technical Guidance.

Applying the flood risk vulnerability classification in Table 2 of the Guidance, residential development is classified as "more vulnerable". Table 3 of the Guidance states that more vulnerable development in Flood Zone 3(a) is only permitted after the sequential and exception test is followed.

Sequential Test

As the proposed development is located in Flood Zone 3(a) the NPPF requires the sequential test to be applied to determine if there are any reasonably available and suitable alternative sites in a lower flood risk zone for this type of development. This development can be classed as a windfall site within the town of Holbeach. The development complies with the South Holland District Council's policy on these types of sites. Although the central area of Holbeach is at a slightly higher level, the outskirts of Holbeach are at approximately the same level and therefore it is unlikely to find a residential site with a lower flood risk that has not been developed.

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.

Strategic Flood Risk Assessment

The following information about the flood risk in the location of this development has been sourced from the maps and reports in the South Holland District Council's Strategic Flood Risk Assessment (SHDC 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 this 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

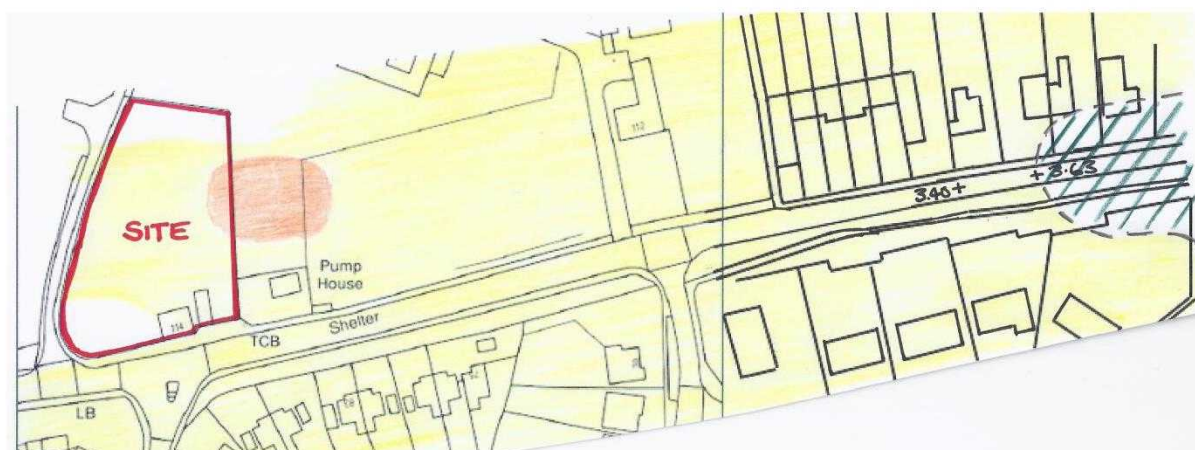
The lowest levels of the east bank of the River Welland around chainage 18km are 7.50m OD, with average levels between 7.60m and 7.70m OD.

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 maps show that the predicted flood depths for the area of the site is between 0 and 250mm (coloured yellow on the map below). There is a small area where the predicted depth is between 250mm and 500mm (coloured orange on the map below) on the eastern side of the site. The hazard for most of the area does not exceed 0.75, considered as a low hazard, and predicted velocities do not exceed 0.1m/sec.

The flood depths are reproduced on the map below.



In the course of taking levels of the site the level of Spalding Road was taken in the green hatched area where the EA map indicates no predicted flooding in a 1 in 200 or a 1 in 1000 year event in 2115. This was found to be 3.63m OD and therefore the

maximum flood level can be assumed to be 3.65m OD. This correlates also with the levels taken on the site which are between 3.30m OD and 3.40m OD and the predicted flood depths across part of the site are 0 – 250mm.

Therefore a proposed minimum floor level of 3.70m OD is recommended for the proposed development.

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 8.0 km from the tidal section of the River Welland and 10.0km from the Wash defences at the nearest point. The tidal defence banks to all of these are maintained by the Environment Agency.

The major watercourses in the area are maintained by South Holland IDB, which has carried out improvement schemes so that IDB watercourses generally provide a standard of 1 in 100 years with a freeboard of 300mm in urban areas.

Existing Ground Levels and Proposed Levels of Buildings

The lowest level found was 3.16m OD near the eastern boundary of the site. The highest level is located at the centre of the rear of the site is 3.42m OD and the average level of the remaining parts of the rear half of the site where the development will be carried out is approximately 3.30m OD. The level of Spalding Road is approximately 3.30m OD south of the site and the level of the existing house is 3.42m OD. A plan showing all the levels is shown on sheet 10 of this report.

Potential Sources of Flooding

The potential sources of flooding to the site are:-

1. Failure or overtopping of tidal defences of the River Welland.
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

As shown above, the east bank of the River Welland, which is approximately 8.0 km from the site, provides at a 1 in 200 year standard of protection in 2115. If the eastern bank of the tidal section of the River Welland breached then the latest EA flood maps indicate that there could be up to 250mm of flood water affecting parts of the site.

The risk of this happening is very low, less than an annual risk of 0.1%. However the proposed ground floor level of 3.70m OD is higher than the predicted 1 in 1000 year flood level predicted by the EA.

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 Spalding Road which is the boundary between the Holbeach River catchment to the north and the Little Holland catchment to the south. Surface water from the site will flow to a watercourse 200 metres north west of the site which is maintained by South Holland IDB. This flows northwards under the A17 By Pass and via the Holbeach River to Holbeach River Sluice located on the south east bank of the tidal River Welland.

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

There is a possibility that surface water from Spalding Road could accumulate in this area. However any large accumulations of surface water would find its way into the local dykes and then into IDB drains and as the proposed floor level is 3.70m OD

compared with the road level of 3.30m OD it is extremely unlikely that any flooding will occur to the proposed dwellings from this source.

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 13 to 17).

Conclusions

The EA state that there is risk of flooding from the tidal section of the River Welland in a 1 in 200 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. If a large breach occurred in the bank the SFRA indicates that the flood water would not reach this area north of Holbeach, but the subsequent EA flood maps indicate there could be flooding with a maximum depth of 250mm.

It is likely that during the next one hundred years the banks of the Tidal Welland will be raised by the EA to further decrease the risk of breaches and flooding.

The risk of flooding to the building from IDB drains can be considered low, especially as the floor level is 2.4 metres higher than the normal water level in the Holbeach

new river behind the site. In this area the discharge of water into the Tidal Welland is controlled by sluices which operate automatically. It is also possible to operate these by hand in an emergency.

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 3.70m OD and enter the proposed buildings.

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 east bank of the River Welland during a 1 in 200 year high tide in 2115. No flooding would be likely to occur if a breach did not occur.

If any flooding were occur it would happen very slowly and residents would have adequate time to prepare themselves for the event.

Recommendations

In any area at risk of flooding it is preferable that new dwellings should be of two story construction with all bedrooms at first floor level. This is to provide a refuge for residents if the building becomes flooded after a major breach of the tidal bank, and ensure there is no danger to residents when they are asleep

The ground floor level of the proposed dwellings should be approximately 300mm above existing ground level at a level of 3.70m OD and all bedrooms should be at first floor level.

Occupiers of the property should register with the Environment Agency's Floodline Warnings Direct Service.

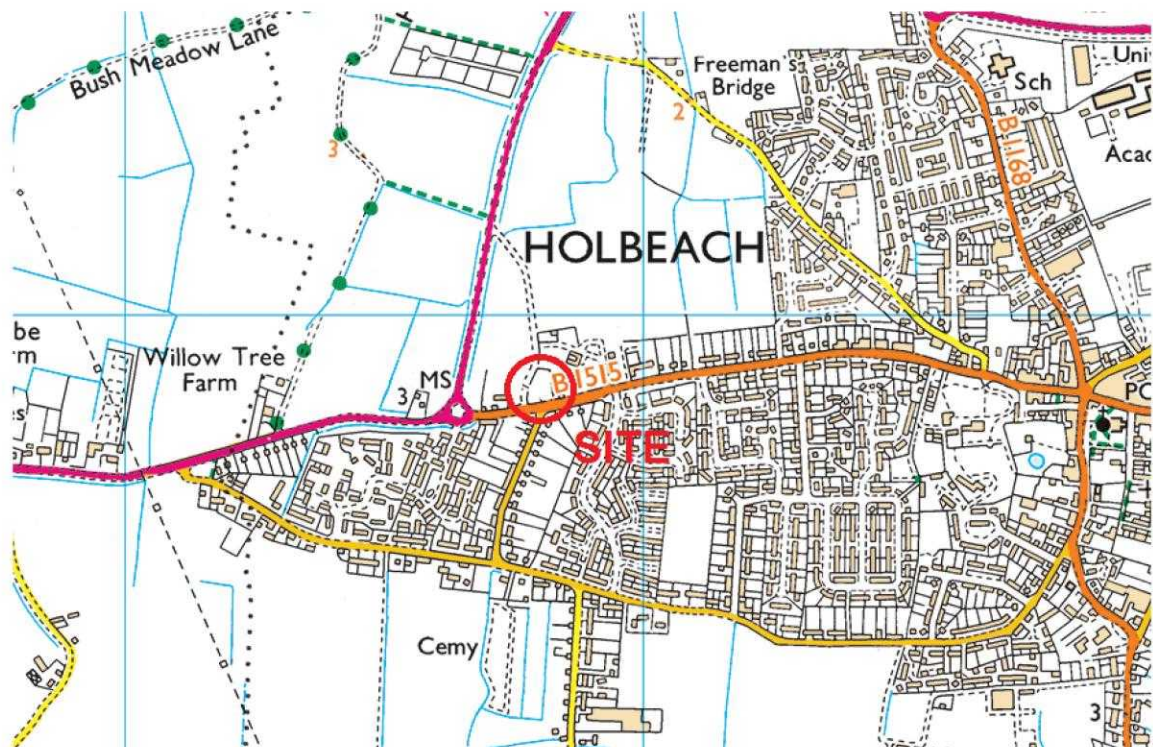
On site surface water drainage should be discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.

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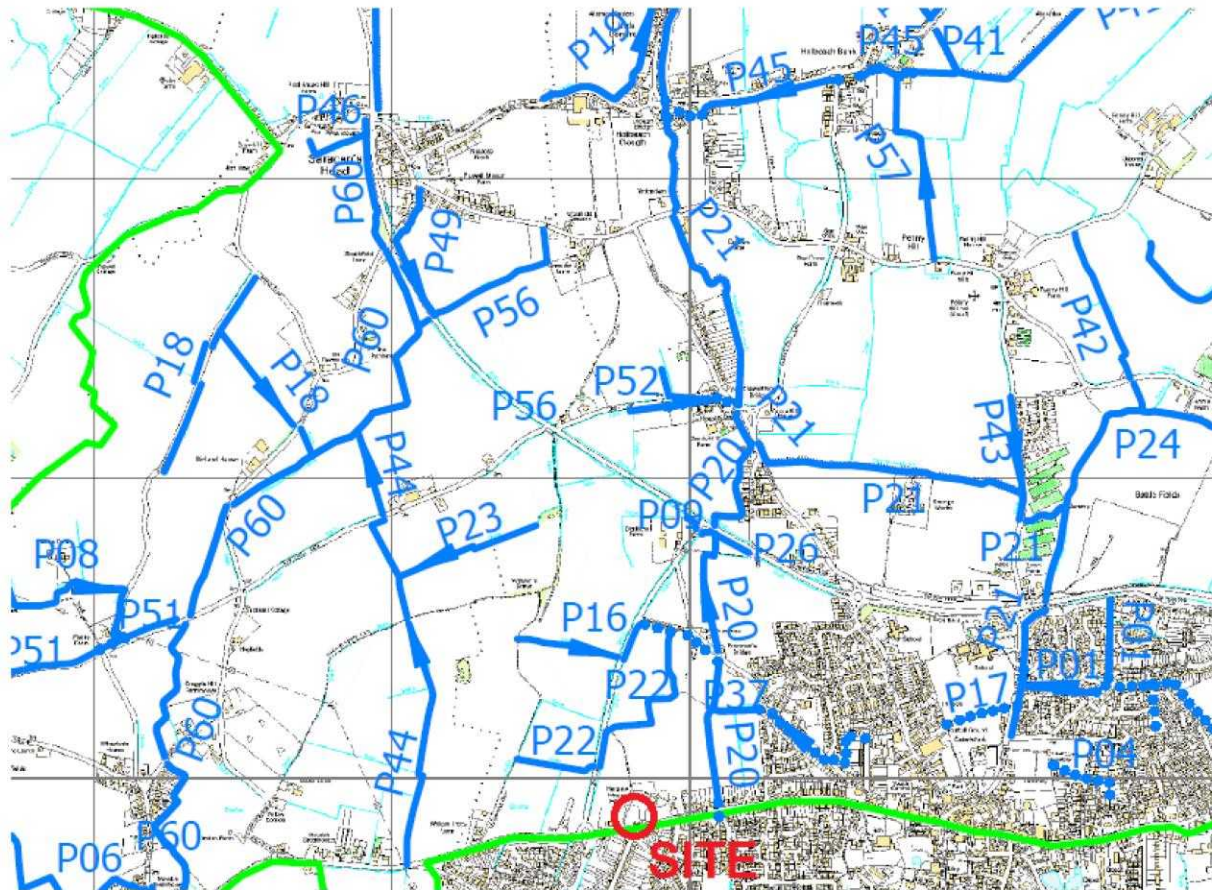
stuart.hemmings@btinternet.com

27th April 2016

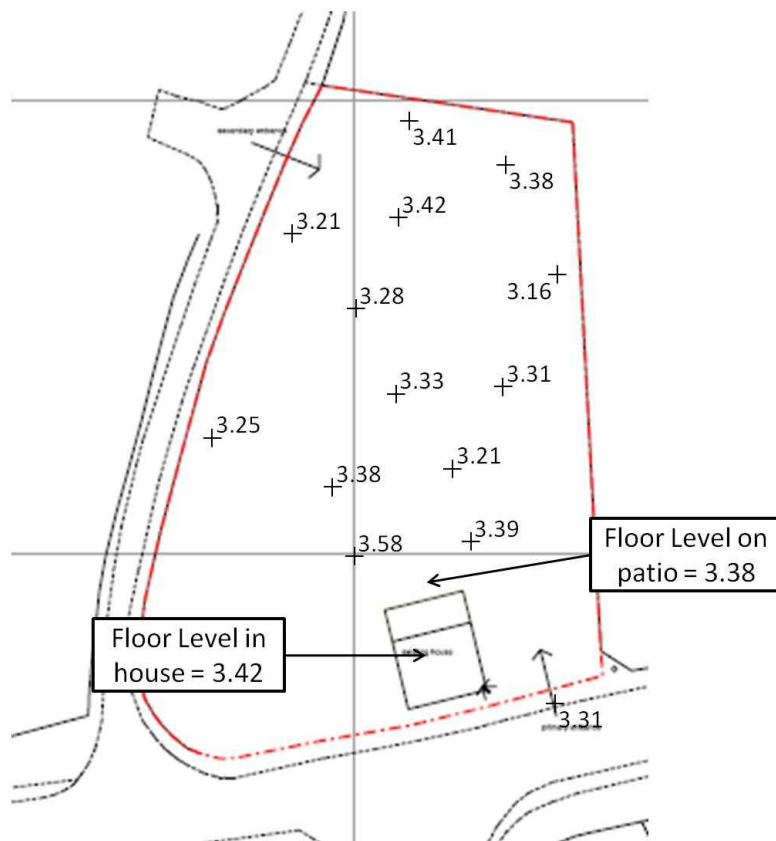
LOCATION PLAN



PLAN OF AREA SHOWING IDB WATERCOURSES



PLAN OF SITE SHOWING LEVELS



PLAN OF PROPOSED DEVELOPMENT



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 the main source of flooding to be from the tidal River Welland or the Wash. The new climate change recommendations could affect the predictions of flood levels in 2115 at the development site:

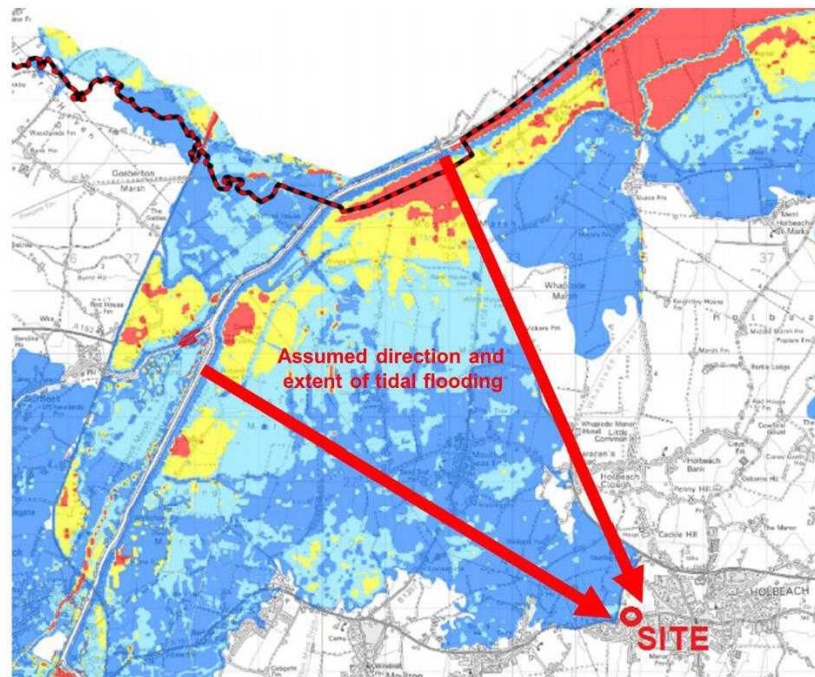
The contingency allowance in metres for the years 2055 and 2115 using 1990 as a baseline in the SFRA compared with the guidelines is as follows

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

Therefore the new guidance increases the maximum predicted sea level in 2115 by 100mm compared with the allowance made in the SFRA, and presumably in the subsequent maps produced by the Environment Agency.

Conclusions

Part of the residual 1 in 200 year (tidal) flood depth map for 2115 from the SFRA is shown below:



It can be seen that the maps in the SFRA do not predict any flooding to the site but the later maps issued by the Environment Agency predict flood depths of between 0 and 250mm.

A 100mm increase of maximum tide levels is unlikely to increase flood depths by as much as 100mm. When the flood maps are revised it is unlikely that flood depths are likely to significantly change.

As has been stated above flood water from the tidal River Welland may now just encroach onto the site of the development but the raising of floor levels to 3.70m OD should still ensure properties do not flood in this scenario.

The increase contingencies for peak river flows will effect modelling carried out by IDB's but predicted water levels in the area are not likely to 3.70m OD and cause flooding to the proposed development.