FLOOD RISK ASSESSMENT

PROPOSED CONSTRUCTION OF A HOUSE ADJACENT TO 68 HAWTHORNE BANK SPALDING PE11 1JQ



View from rear of garden

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PE3 9ER

This flood risk assessment has been prepared solely to support the planning application for the proposed dwelling at Hawthorne Bank, Spalding. 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

An application is due to be made for Planning Permission to construct a new dwelling south of the existing house at 68 Hawthorne Bank, Spalding PE11 1JQ. The site at the moment is part of the large garden of the house at 68 Hawthorne Bank.

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

The Technical Guidance to the National Planning Policy Framework Development and Flood Risk states that if a development lies within Flood Zone 3 a Flood Risk Assessment should be carried out to accompany any Planning Application.

The site is shown within the defended area of the South Holland District Council's Strategic Flood Risk Assessment (SHDC SFRA) map and is located in the Welland and Deepings 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 the whole of the central area of Spalding is in Flood Zone 3.

Application Site

The development is west of the railway and 1 km south west of the centre of Spalding. The National Grid Reference of the site is 523755 321910.

The location 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, the development is classified as “more vulnerable”. Table 3 of the Guidance states that more vulnerable development should only be permitted after the sequential and exception test is applied.

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 of central Spalding is in Flood Zone 3. Therefore it would be difficult to find a similar site for development that is in a lower flood zone.

Taking into account the guidance, it can be seen that it is extremely unlikely that an alternative site with a lower flood risk could be found in Spalding. The safety of the development will be delivered by ensuring the floor level of the proposed new dwelling is above predicted residual flood levels for this area.

The South Holland District Council Core Strategy states that there is a limited number of sites in the South Holland DC area available for residential development. Some further land will need to be identified to enable the Council to meet the RSS and Structure Plan requirement for 2021. Therefore there is a requirement for further land to be brought forward and used for residential development.

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.

Strategic Flood Risk Assessment

The following information about the flood risk to the proposed development has been gained from the maps produced for the South Holland District Council Strategic Flood Risk Assessment:

1. **Report Maps**

- Map 5 indicates the site to be low or medium risk and protected by flood defences.
- Map 6 indicates the peak depth is zero for the present day 1% fluvial / 0.5% tidal event probability.
- Map 7 indicates the peak velocity is zero for the present day 1% fluvial / 0.5% tidal event probability.
- Map 8 indicates the risk extent is zero for the present day 1% fluvial / 0.5% tidal event probability.
- Map 10 indicates the actual risk extent for the 0.1% event probability is zero.
- Map 12 indicates the actual risk extent is zero.
- Map 13 indicates the 1% fluvial / 0.5% tidal event probability for 2115 for the site is zero.
- Map 14 indicates the actual risk extent for the year 2115 for the 0.1% event probability is zero.
- Map 16 indicates the site is not within a rapid inundation zone.

2. Flood Maps Table D1

- The maps illustrate the actual flood hazard which is as follows:

For the present day	Depth of flooding … zero
	Extent of flooding .. zero
	Hazard …. zero
	Velocity … zero
For year 2115	Depth of flooding … zero
	Extent of flooding .. Low or medium flood probability
	Hazard … zero
	Velocity .. zero

- The maps also illustrate the residual flood hazard which is as follows:-

For the present day	Depth of flooding … zero
	Extent of flooding .. Low or medium flood probability
	Hazard … zero
	Velocity .. zero
• For the year 2115	Depth of flooding … zero
	Extent of flooding .. Low or medium flood probability
	Hazard … zero
	Velocity .. zero

3. The maximum flood levels in the fluvial section of the Spalding Welland is shown in the reports as follows:

	Peak 1 in 100		Peak 1 in 1000	
Year	2007	2115	2007	2115
Level	4.43	4.67	4.45	4.68

The defence level of the left bank of Spalding Welland at chainage 2.7km is 5.20m OD. There is no raised defence at this location.

4. The extreme tide levels in the section of the River Welland north of Fulney Lock is shown in the report as follows:

	2007	2055	2115
1 in 100 year	5.98	6.31	7.12
1 in 1,000 year	6.32	6.65	7.46

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The lowest bank level occurs 200 metres north of Fulney Lock, where a section 300 metres long has a minimum level of 6.98m OD.

5. The maximum levels in Vernatts Drain

	Peak 1 in 100		Peak 1 in 1000	
Year	2007	2115	2007	2115
Level	3.92	3.92	3.92	3.92

The bank levels on the south side of Vernatt's Drain vary between 4.30m OD and 4.40m OD.

Site Levels

A topographical study of the site has been carried out and a simplified version of this has been produced and shown on page 12 of this report. The existing ground levels in the area where the new property is proposed are between 2.60m and 2.70m OD. Ground levels in the back garden near the western boundary of the site are lower than this at a level of 2.38m OD. The road levels of 3.50m OD on Hawthorne Bank are approximately 1.0 metre above the ground level on the site. The level of The Parkway on the southern boundary is 3.09m OD.

It is recommended that the floor level of any new buildings located south of the existing house should be constructed with a minimum floor level of 3.00m 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" and is considered to be passive until such time that a flood greater than the defences can withstand occurs. The likelihood of flooding due to overtopping or failures of the defences is considered to be very low.

The site is approximately 750 metres from the River Welland, which is main river and maintained by the Environment Agency.

This area west of the centre of Spalding is drained by surface water sewers maintained by Anglian Water, which discharge into drainage channels maintained by Welland and Deepings Internal Drainage Board. The water levels in the IDB channels are controlled by the water level in South Drove Drain Drain which also is operated by Welland and Deepings IDB.

Potential Sources of Flooding

The following sources of flooding have been identified:

1. Failure or overtopping of the tidal defences.
2. A breach in the bank or overtopping of the River Welland.
3. Flooding from Vernatts Drain
4. Flooding from IDB drainage channels
5. Blockages in local surface water sewers (highway or Anglian Water)

1. Failure or overtopping of tidal defences.

The River Welland is tidal north of Fulney Lock, which is approximately 3.2 km north east of the site. The SFRA states that the defences are adequate to withstand a 1 in 200 year (0.5%) probability event for present day. In the future in 2115 some of the banks could be overtopped with a 0.5% probability event. However one would expect that during the next one hundred years defences will be raised to maintain a 1 in 200 year standard of defence. If overtopping or a breach allowed water to flow westwards from the tidal Welland lower land to the west of the River Welland would be flooded and the flood water would only extend to within 1.5km of the site on the eastern side of the railway, unless a high tide of extreme proportions occurred.

The maps in the SFRA indicate that no flooding should occur in a 1 in 1000 year event in 2115 even if a breach develops (residual flooding).

Therefore the risk of flooding from this source can be considered to be remote.

2. Overtopping of the River Welland.

The west bank of the River Welland is at a level of 5.20m O.D. at London Road, which is 750 metres east of the site. This is not a raised defence at this point. The land and the Road are at 5.20m OD and the ground level gradually falls away from the River. Therefore, there is no possibility of failure of the bank. There is a freeboard of at least 500mm above the 1 in 1,000 year maximum design level in the River.

If any floodwater from the River Welland flowed into the area west of the river, which is extremely unlikely, it would be prevented from flowing westwards to the development site by the railway embankment which is higher than the surrounding land.

Therefore this source of flooding can be discounted.

3. Flooding from Vernatts Drain

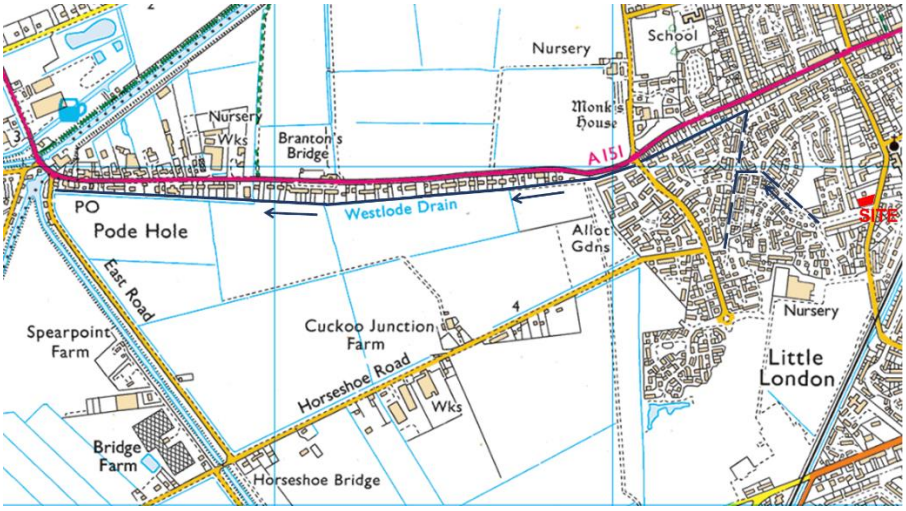
Vernatts Drain is 1.6 km north west of the site. It is an embanked watercourse which mainly conveys water discharged from the pumping station at Pode Hole to the River Glen.

The SFRA states the maximum design water level in Vernatt's Drain to be 3.92m OD which is below the lowest bank level of 4.30m OD. If a breach occurred in Vernatt's Drain Welland and Deepings IDB would be able to reduce the level of water in the Drain by reducing the pumping rate at Pode Hole to prevent extensive flooding and enable a repair of the breach to be undertaken quickly.

Therefore as the proposed level of the building is only 900mm below the maximum design water level of Vernatt's Drain the risk of flooding from this source can be considered to be extremely low.

4. Flooding from IDB watercourses

The area west of Hawthorne Bank is drained by surface water sewers which discharge into piped drainage channels maintained by Welland and Deepings IDB. The location of these drains is shown below. These piped drains discharge into the Westlode Drain which flows westwards and discharges into North Drove Drain near Pode Hole, which is the main pumped outfall for this area west of Spalding. All of these watercourses are maintained by Welland and Deepings IDB.



The water level in North Drove Drain, which is maintained by W & D IDB is controlled by Pode Hole Pumping Station. There are both electrically operated and diesel powered pumps which are operated at this location to control water levels. W & D IDB have stated that the normal pumping level is -1.20m OD and the maximum design water level in a 1 in 100 year event would be 0.18m OD. With climate change this could increase to around 0.7m OD.

Welland and Deepings IDB continue to monitor how climate change will affect the standard of service of drainage channels, especially those protecting urban areas. If these fall below the required level the IDB will carry out improvements to the system to ensure the standard of service remains at 1 in 100 years.

Although the likelihood of water levels rising to 2.00m OD in North Drove Drain is remote, if this happened low land around Deeping St Nicholas would start to flood and so the level in the Drain would be unlikely to increase further.

All of the IDB channels and piped drains are maintained in good condition. Therefore the risk of flooding from this source can be considered to be extremely low.

5. Blockages in local surface water drainage systems

Both Anglian Water and the Highways Authority maintain surface water drainage systems which discharge into the piped IDB drains shown above. Alongside. If a blockage occurs in any highway outfalls or pipes surface water could flow onto the site from Hawthorne Bank or The Parkway. If any flooding occurred from this source the depth of flooding would be only in the region of 100mm and the precaution of raising ground floor levels by approximately 350mm above levels of the site should prevent flooding from this source.

Therefore the risk of flooding from this source is extremely low.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of the site or any of the adjoining properties being flooded in the last fourty years.

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 SFRA maps indicate that if a breach occurred in the sea defences during a 1 in 1000 year event in 2115 the site would not be flooded. Therefore the risk of any flooding occurring at this location is very low.

Therefore although this site is within Flood Zone 3 according to the initial classification because of the current standards of drainage and flood risk in Spalding there is a very low risk of flooding to this site.

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 this FRA. The effects of these new recommendations are considered in Appendix A of this report (pages 13 to 16). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

Summary of Risk of Flooding to the Site

Even in an extreme tidal event with multiple breaches occurring in the west bank of the tidal River Welland it is difficult to foresee that any floodwater would flow as far south as this site on Hawthorne Bank. If any floodwater from this source, or from a major failure in the IDB system, did lead to the level of flood water reaching the site it would do so very slowly, and the precaution of raising the ground floor level to 3.00m OD should prevent any flooding to the building itself.

Conclusions

The following conclusions can be made:

- The proposed development is not in a functional flood plain as defined by the Technical Guidance.
- Although the site is in flood zone 3, the actual risk of the site flooding from any Environment Agency watercourse is very low.
- The SFRA indicates that no actual or residual flooding is predicted for the 1% fluvial / 0.5% tidal event probability in 2115, or for the 0.1% event probability in 2115.
- The risk of the site becoming flooded from any source is extremely low.
- In a flood risk area there is always a risk of an event occurring of greater magnitude than has been considered in this flood risk assessment.

Recommendations

- It is recommended that the ground floor level of the proposed building should be 3.00m OD. This is approximately 100mm above the level of the existing property.
- The buildings should have two stories with all of the sleeping accommodation on the first floor.
- If any flooding did occur it would happen extremely slowly over many hours and the Local Authorities and emergency services would have adequate time to warn residents that flooding might occur, and residents would have adequate time to prepare themselves for the event.
- Occupiers of the property should register with the Environment Agency's Floodline Warnings Direct Service.

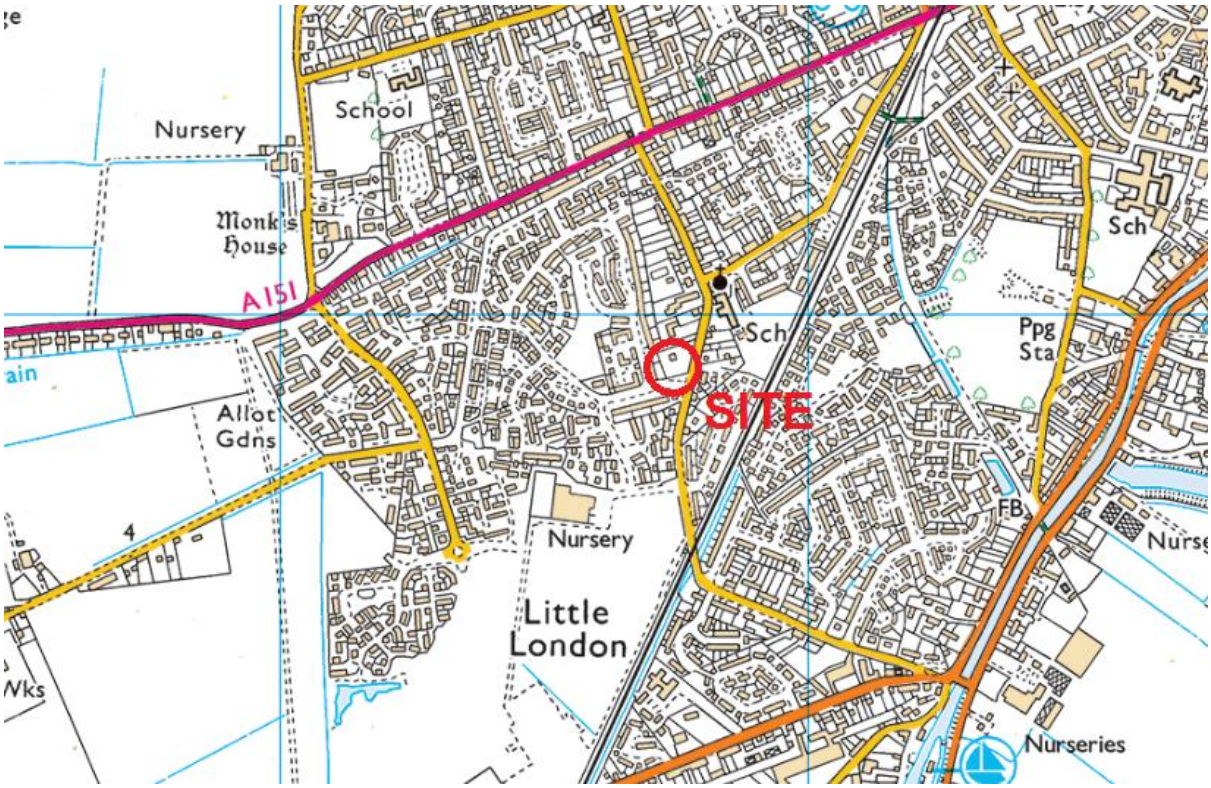
- On site surface water drainage will be discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.

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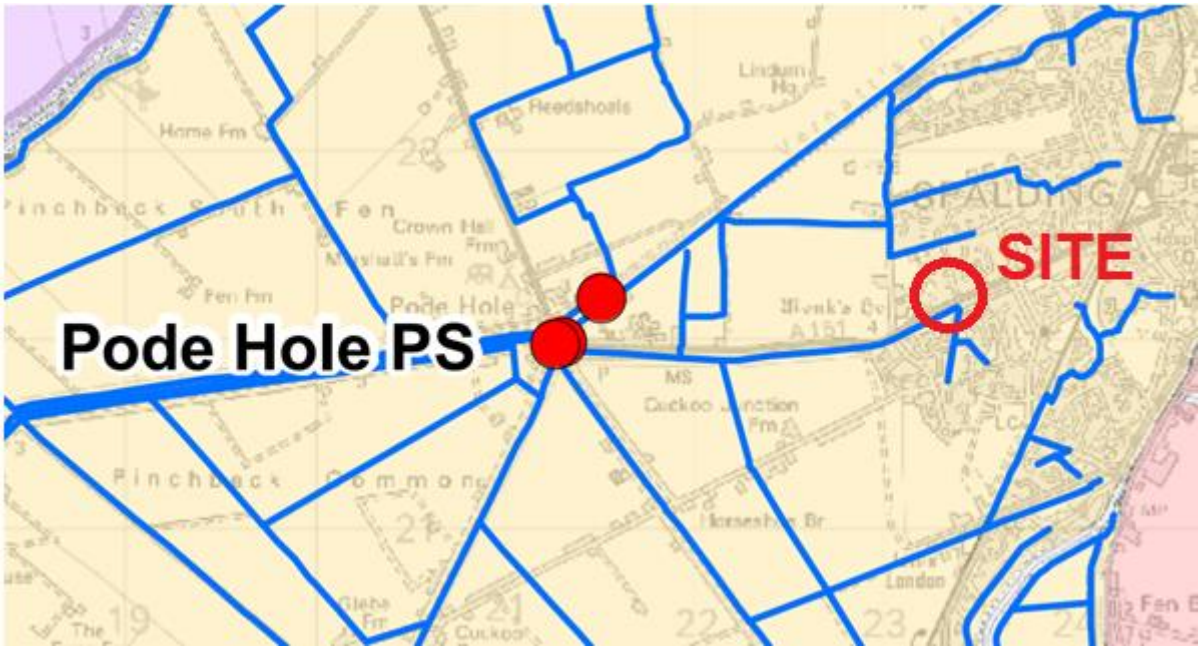
stuart.hemmings@btinternet.com

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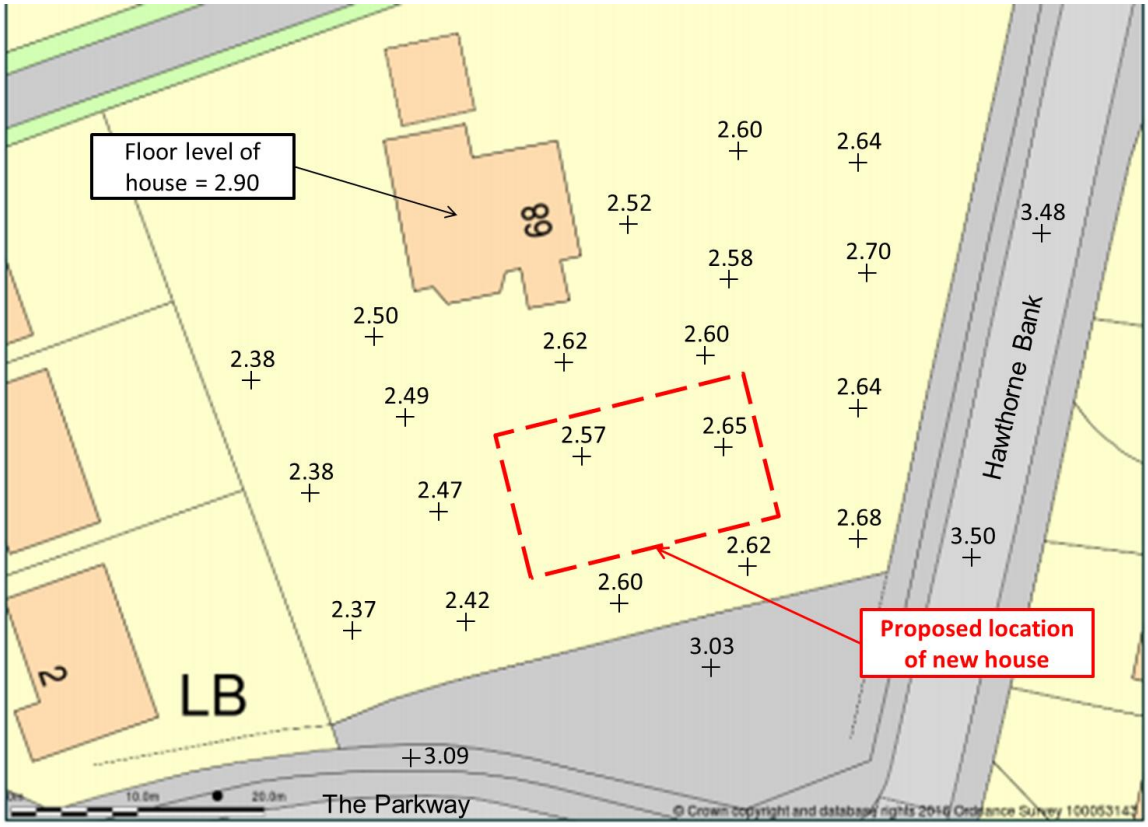
LOCATION PLAN



PLAN OF IDB DRAINS



PLAN OF SITE LEVELS



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 PPS25[1]. 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

document is out of date'a

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%	

s been withdrawn (19

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 River Welland
2) Flooding from Vernatt's drain or the River Welland

1) Flooding from the tidal River Welland

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

The SFRA does not predict any flooding at the site in a 1 in 100 year fluvial or a 1 in 200 year tidal event. Also no flooding is predicted on the site in a 0.1% probability event in 2115. It has been concluded in the report that this flooding is most likely to be tidal flooding from the River Welland.

Therefore with the precaution of recommending that the new building should have a ground floor level of 3.00m OD the small increase in the maximum level of tidal flooding will not change this conclusion.

2) Flooding from Vernatt's Drain

The contingency allowance for fluvial flows in the SFRA compared with the guidances, assuming a river flow of 50 cumecs, is shown below:

Year	SFRA	2013 guidance	Revised 2016 guidance
1990	50	50	50
2055	60	-	63.25
2115	72	66	93 (+86%)

The revised 2016 guidance figures use the higher central allowance band of figures given in the 2016 guidance. However if the upper end allowance is used the 2115 figure increases to 139 cumecs, an increase of 178% over the 1990 figures.

These figures seem to be very high for use in fenland IDB systems which use pumping stations to discharge flows into larger watercourses. In the case of Vernatt's Drain the major discharge is the pumped discharge from Pode Hole Pumping Station, which will not increase unless the pumping capacity at Pode Hole is increased.

If a breach occurred in a bank of Vernatt's Drain then W & D IDB would immediately reduce pumping at Pode Hole Pumping station which would within a few hours reduce the water level in Vernatt's Drain, reduce the flow from the breach and limit the rise in flood water behind the breached bank.

Welland and Deepings IDB, and all IDB's, are aware that climate change will affect the operations of pumping stations and drainage channels. Pumping stations only have a 30 year life and will need to be refurbished or rebuilt within this timespan. When the Board plan for these refurbishments adequate arrangements will be made to incorporate the latest climate change projections.

Therefore it can be concluded that climate change will not increase predicted water levels in Vernatt's Drain.