PROPOSED DWELLING ADJACENT TO 74 BOURNE ROAD, SPALDING, PE11 1JR

FLOOD RISK ASSESSMENT



View from Bourne Road

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 the construction of a new dwelling alongside the existing house at 74, Bourne Road, 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, or if it is used for any other purposes other than for which it was originally commissioned.

Introduction

An application is due to be made for Planning Permission to construct a new dwelling adjacent to the existing house at 74 Bourne Road Spalding, PE11 1RJ.

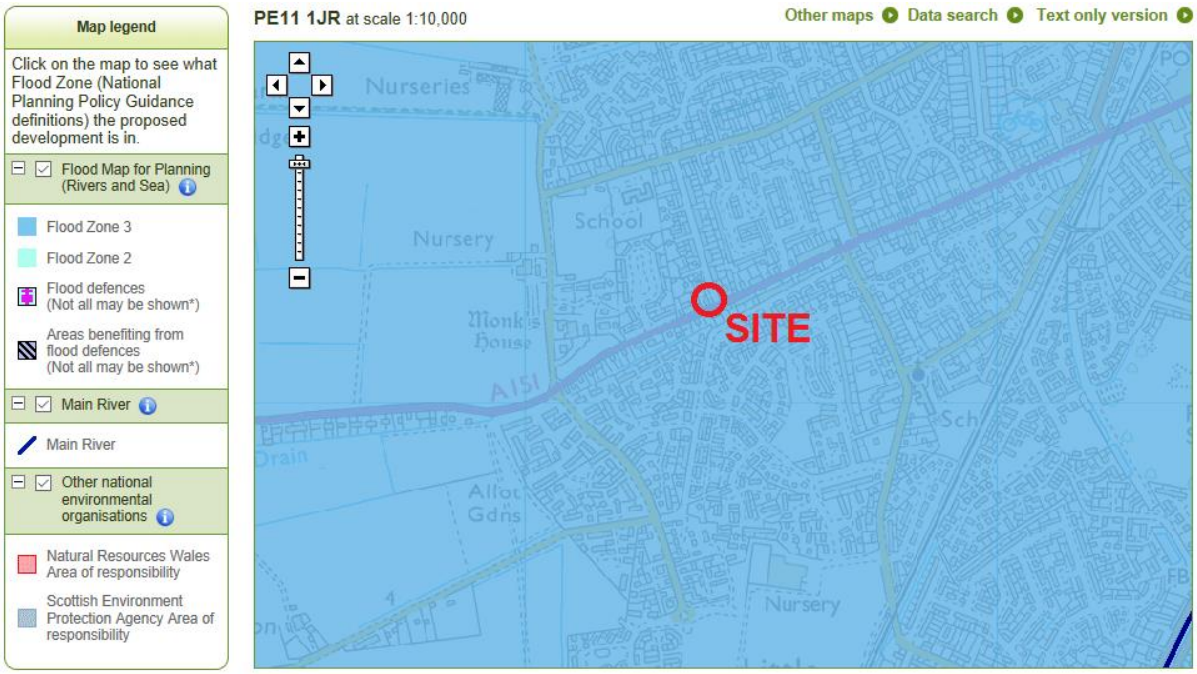
The site is within Flood Zone 3 as shown on the Environment Agency's Flood Zone Map. These maps do not take into account existing flood defences.

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 this area.



It can be seen that all of the site is in Flood Zone 3.

Application Site

The site is located 3.1 km from the tidal section of the River Welland. The National Grid Reference of the site is 523390 322225.

The position and extent of the site is shown on the plan at the end of this document.

As the site is within a defended area the proposed development can be considered to be within Flood Zone 3(a) as defined in Table 1 of the Technical Guidance.

Applying the flood risk vulnerability classification in Table 2 of the Guidance, a development consisting of dwelling houses is classified as “more vulnerable”.

Table 3 of the Guidance is shown below:

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

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.

The greater part of the area around Spalding, as can be seen from the map on page 2 of this report, is in Flood Zone 3. 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 the town of Spalding for this development. 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 outside the town of Spalding available for residential development. Therefore there is a requirement for further land to be brought forward and used for residential development in Spalding. This site is within the town boundary and is suitable 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 …. Nil
	Velocity … Nil
For year 2115	Depth of flooding … zero
	Extent of flooding .. Low or medium flood probability
	Hazard … Nil
	Velocity .. Nil

- 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 left bank of Spalding Welland = 5.20m OD

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

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

The level of Bourne Road in front of the site is 3.61m OD. The average level of the site of the proposed property is between 3.24m and 3.30m OD approximately 300mm lower than the road. The floor level of No 74 Bourne Road is approximately 3.40m OD. It is recommended that the floor level of the proposed development should be 3.65m 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 1.2km from the fluvial River Welland, which is main river and maintained by the Environment Agency.

The site is approximately 3.1km from the tidal section of 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.

Potential Sources of Flooding

The following sources of flooding have been identified:

1. Failure or overtopping of the tidal defences.
2. 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 3.1km north 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 this area of Spalding would remain unaffected, unless a high tide of extreme proportions occurred.

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. 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 here. There is a freeboard of at least 500mm above the 1 in 1,000 year maximum design level in the River.

Therefore, as the river is 1.2km from the development, this source of flooding can be discounted.

3. Flooding from Vernatts Drain

Vernatts Drain is 1150 metres 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. In addition there are gravity outfalls from the drainage channels on the west side of Spalding which discharge into Vernatt's Drain.

The SFRA states the maximum design water level in Vernatt's Drain is 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 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 270mm 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 north of Bourne Road is drained by surface water sewers which discharge into the IDB piped drain alongside Pennygate. This flows westwards into an open drain which discharges through a flapped outfall into Vernatt's Drain.

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 drain alongside Pennygate. If a blockage occurs in any highway outfalls or pipes surface water could flow onto the site from Bourne Road. 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 300mm above levels of the site will provide adequate mitigation against flooding from this source.

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.

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 200 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

In an extreme tidal event with multiple breaches occurring in the west bank of the tidal Welland it is just feasible that flooding could start to occur in this area of Spalding. If flooding from this source, or from a major failure in the IDB system, did lead to the level of flood water rising to a level of 3.65m OD then it would do so very slowly, and future residents of the proposed dwelling would have adequate time to be warned and to make plans to evacuate the area along Bourne Road or keep safe on the first floor of the building.

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

- In any area at risk of flooding it is recommended that new dwellings should be of two story construction with all bedrooms at first floor level. This will 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 house should be at a level of 3.65m OD, which is approximately 50mm above the level of the road in front of the property, and 250mm above the level of the adjoining property.
- If any flooding started to occur in an extreme flood event residents could safely escape along Bourne Road before flood water rose to the level of the road, or in an extreme event shelter on the first floor of the building.
- 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.
- If the developer considers it cost effective, considering the level of risk is so low, he could consider designing the new building incorporating flood resistant/resilient techniques to allow it to be refurbished after being flooding to a depth of approximately 300mm. Consideration could be given to the electrics and heating pipes being distributed at ceiling level rather than at floor level.
- On site surface water drainage will be discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.

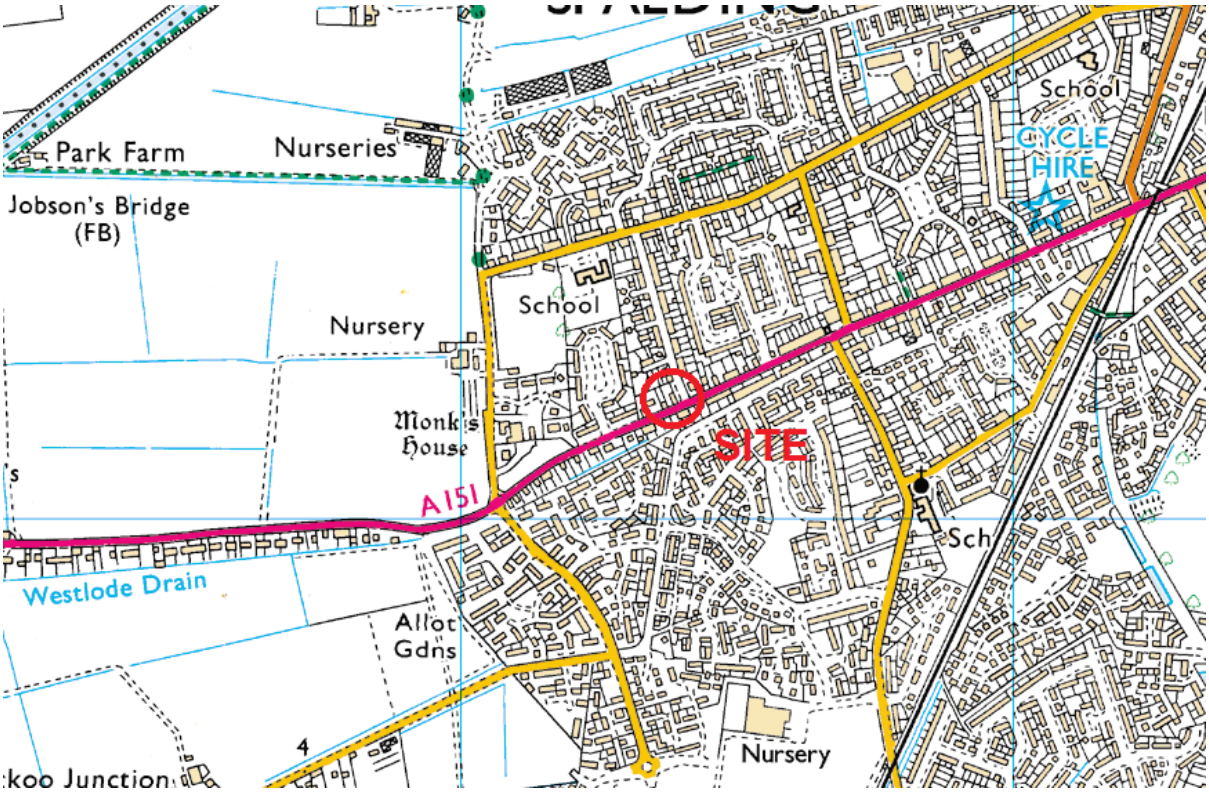
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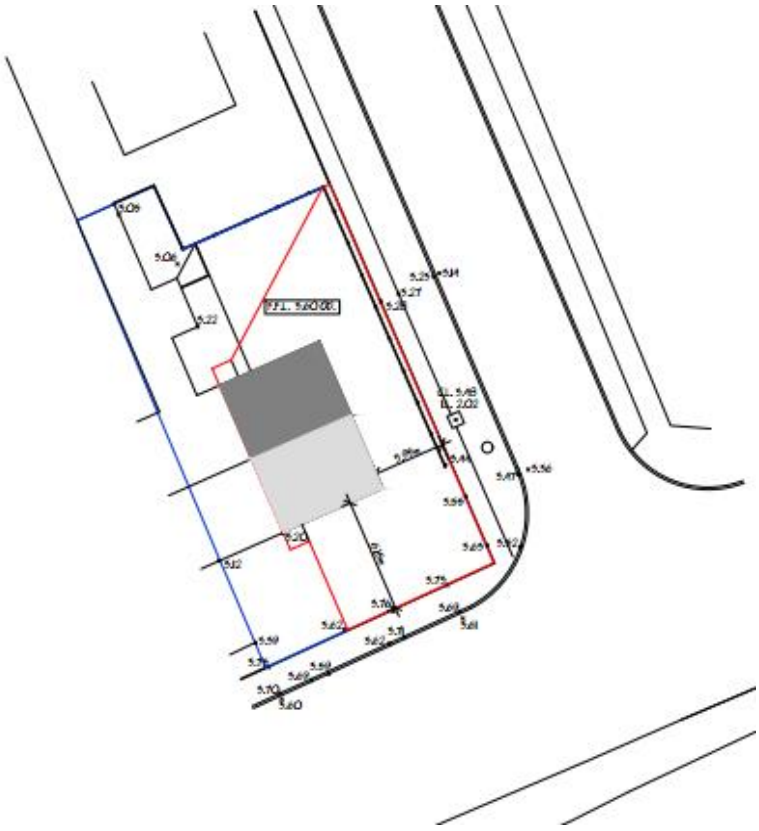
stuart.hemmings@btinternet.com

10th March 2017.

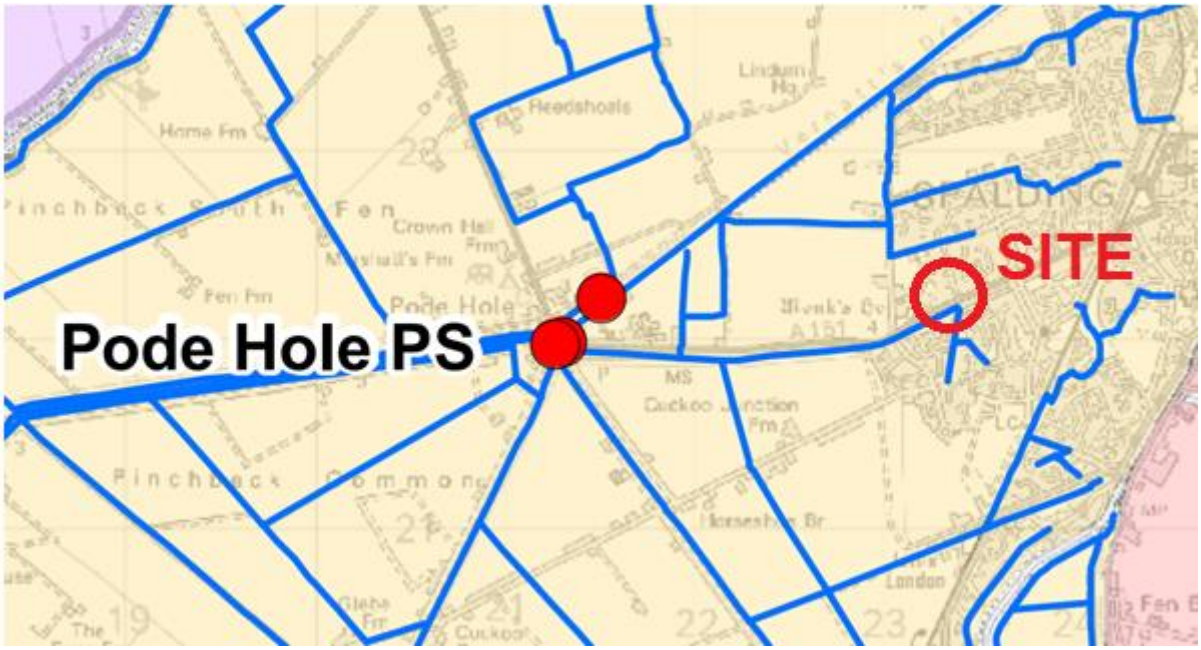
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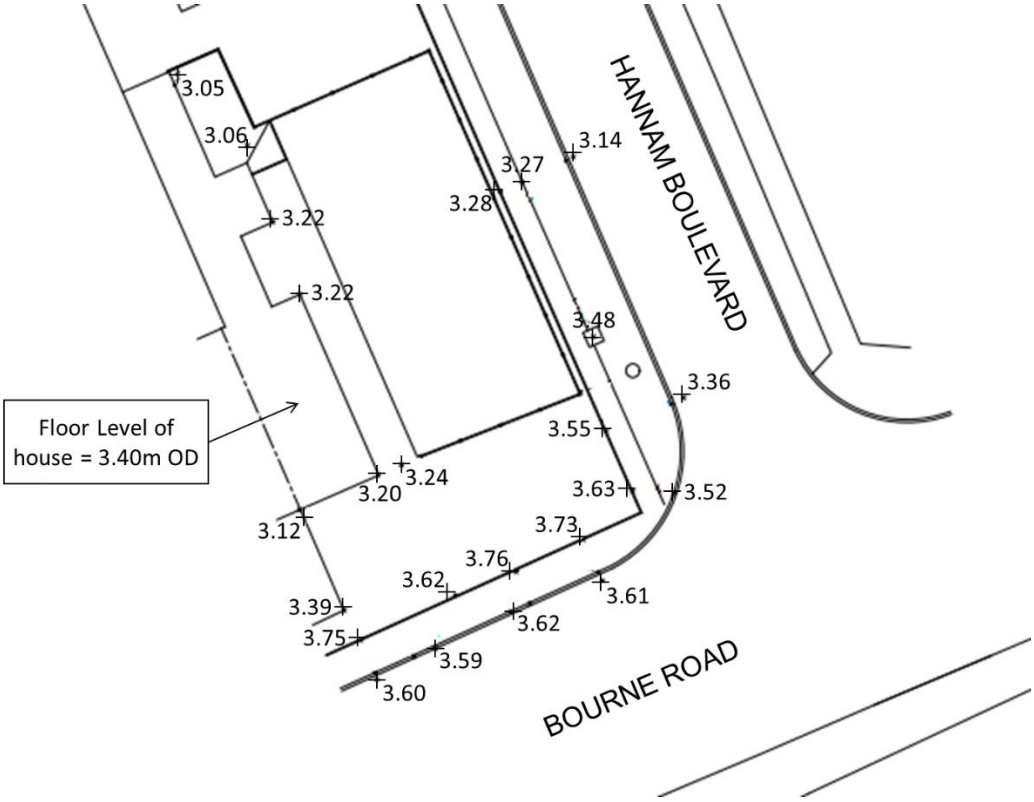
PLAN OF SITE



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 fluvial River Welland
3) Flooding from Vernatts Drain and other IDB drains

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 will occur in this area of Spalding in a 1 in 200 year fluvial or tidal event in 2115. It has been concluded that one of the two possible sources of flood risk to the site is most likely to be tidal flooding from the River Welland.

It can be seen that the revised guidance increases the maximum allowance for sea rise in 2115 by 100mm. However this is only likely to increase flood levels at the extreme edge of the flood water by 10mm and may slightly increase the risk of a breach occurring in the tidal bank north of the site. However it will not change the conclusions and recommendations in this report.

2) Flooding from Fluvial River Welland.

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.

Maximum flood levels in the River Welland will not be increased by the increase in flows projected in the new climate change allowances. If flows increase by 65% in these systems it will have the affect of flooding over the long sections of bank between Spalding and Market Deeping and the maximum levels will not increase significantly.

3) Flooding from IDB Watercourses

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.

Welland and Deepings 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 Welland and Deepings 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.

The report has concluded that as the main flow in Vernatt's Drain is from the discharge from Pode Hole Pumping Station then there will be no increases due to climate change unless the pumping capacity is increased.

Therefore it is considered that the existing floor level of 3.65m OD provides acceptable mitigation of flooding to the proposed development.