PROPOSED RESIDENTIAL DEVELOPMENT AT CHAMBERS COURT, SPALDING, PE11 2QP.

FLOOD RISK ASSESSMENT



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This flood risk assessment has been prepared solely to support the planning application for a development at Chambers Court, 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

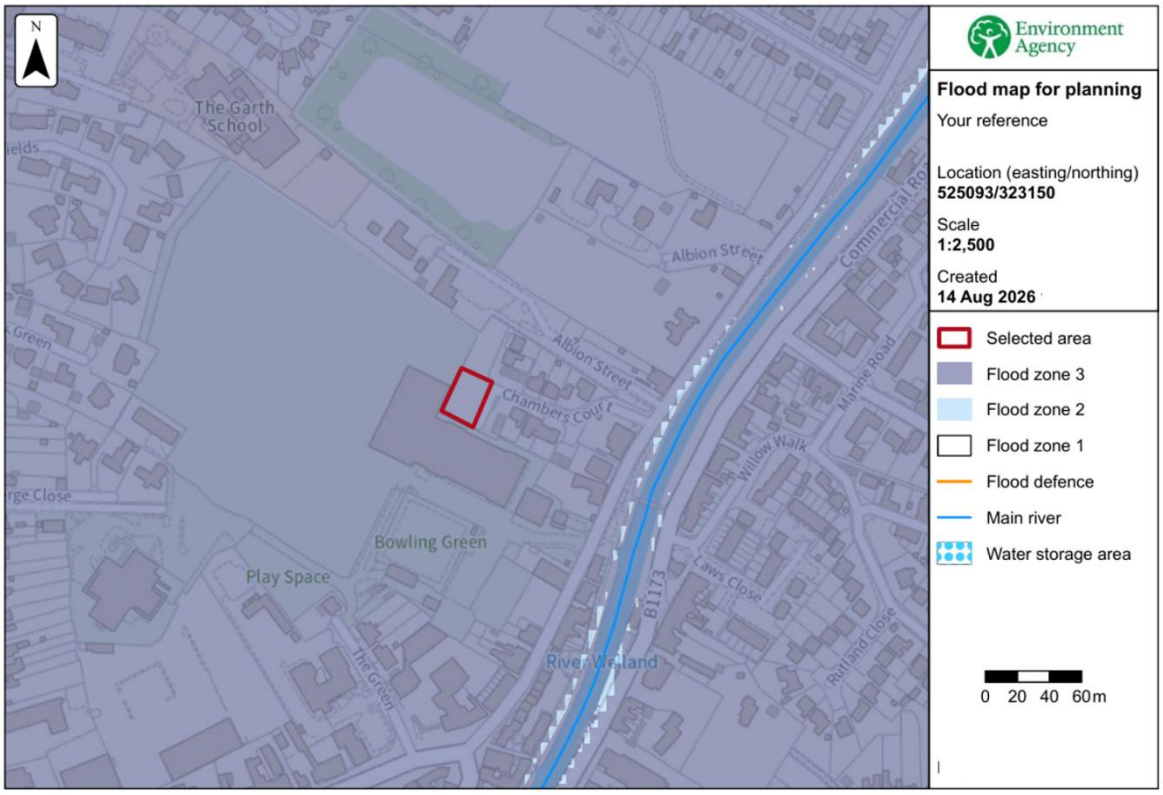
A planning application is due to be submitted to South Holland District Council for permission to carry out a development of one dwelling at the western end of Chambers Court, Spalding, PE11 2QP.

The site of the proposed development is within Flood Zone 3 as shown on the Environment Agency's Flood Zone map.

The Planning Application requires a flood risk assessment to be carried out as specified in the Practice Guidance to the National Planning Policy Framework Development and Flood Risk. The site is within a defended area as specified on 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.



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It can be seen that that all of this area of Spalding is in Flood Zone 3.

Application Site

The National Grid Reference of the site is 525095 323150.

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 a dwelling house 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 *	✗	✗	✗	✓*

From the above table it can be seen that “More Vulnerable” development is only satisfactory within flood zone 3 if the sequential and exception test is passed.

Strategic Flood Risk Assessment

The Strategic Flood Risk Assessment (SFRA) written for the South Holland District Council (SHDC) in 2010 provides details of the actual flood risk in the Council’s area. This information has not been updated and reference to the maps in this document give the following information for the actual flood risk and hazard at the site for the 1% fluvial event and 0.5% tidal event.

For the present day
Depth of flooding … zero
Extent of flooding .. Low or medium flood probability
Peak Velocity ……. Nil

For year 2115
Depth of flooding … 0 - 500mm, small area 500mm -1.0m.
Extent of flooding….High
Peak Velocity …… 0 – 0.1m/sec

The maps showing the residual flood hazard were revised in the 2016 update of the South Holland District Council Strategic Flood Risk Assessment which can be found on the website of the South East Lincolnshire Joint Planning Committee. The hazards are as follows for the 1% fluvial or 0.5% tidal event probability:

For the present day
Depth of flooding …zero
Extent of flooding .. Low or medium probability
Hazard rating…… zero
Peak Velocity .. zero

For the year 2115
Depth of flooding … 0 – 1.0 metre
Extent of flooding .. High

Hazard rating…… 0.75 – 1.25 (Danger for some)

Peak velocity ……. 0 – 0.3m/sec

The hazards for the 0.1% tidal and fluvial event probability are as follows:

For the year 2115 Depth of flooding …0 – 1.0 metre

Extent of flooding .. High

Hazard rating…… 0.75 – 1.25 (Danger for some)

Peak velocity ……. 0 – 0.3m/sec

Figure 16 of the general maps show that the site is not within the rapid inundation zone for the present day and 2115.

Maximum flood level and bank levels in the River Welland

Tables in the SFRA show the following details of the defence bank on the west side of the tidal section of the River Welland at chainage 22.0km immediately north of Fulney Sluice which is 1.2km north of the development site.

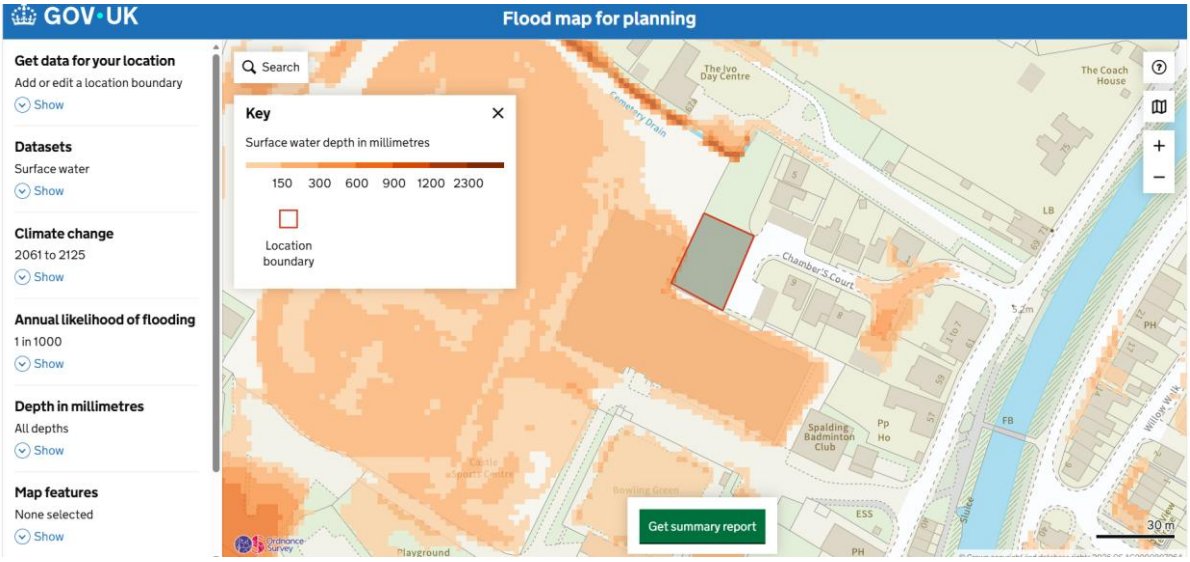
	2007	2055	2115
Peak 1 in 200 year extreme tide level	5.98m OD	6.31m OD	7.12m OD
Peak 1 in 1,000 year extreme tide level	6.32m OD	6.65m OD	7.46m OD

The average defence crest level between chainage 21.3km and 22.0km is between 6.88m and 7.42m OD.

The Wash banks are at least 20.0 km north of the site. The tidal defences are earth banks with an average level of 7.80m OD. The maximum predicted 1 in 200 year tide level in the Wash in 2115 shown in the SFRA is 7.11m OD.

Information on Surface Water Flooding on Environment Agency Website

The map below shows the predicted extent of surface water flooding in this area of Spalding between 2040 and 2060.



It can be seen that between 2061 and 2125 there is no predicted risk of surface water flooding to this site.

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 160 metres west of the fluvial section of the River Welland, which is the main river and maintained by the Environment Agency.

The site is approximately 1.2km south of the tidal defences of the River Welland.

The site is approximately 1km south of Vernatts Drain which is maintained by Welland and Deepings IDB.

There are smaller watercourses in this immediate area that are maintained by Welland and Deepings IDB.

Existing Ground Levels

A topographical survey has been produced for the site which will be included with the planning application.

The lowest ground level is on the south western corner of the site which is 3.83m OD. It was not possible to survey the western part of the site but it is assumed levels in this area are between 4.20m OD and 4.30m OD.

The central part of the site slopes up from west to east from the lower levels to between 4.60m and 4.80m OD.

The level of the road east of the site is 4.65m OD.

Potential Sources of Flooding

The following sources of flooding have been identified:

1. Failure or overtopping of the tidal defences.
2. Overtopping of the fluvial section of the River Welland.
3. Flood from overtopping of Vernatts Drain.
4. Flooding from IDB channels and piped drains
5. Blockages in local surface water sewers (highway or Anglian Water)

1. Failure or overtopping of tidal defences.

The extent of the tidal section of the River Welland is Fulney Lock which is 1.2km north of the site. North of the sluice there is an earth bank between West Elloe Road and the river which provides protection against tidal flooding for the land west of the river. The SFRA states that the defences are adequate to withstand a 1 in 200 year (0.5%) probability event for present day but in the future (2115) some of the banks would be overtopped in a 0.5% probability event.

The bank crest levels on the west side of the river taken from the 2010 SHDC SFRA are shown below for the length immediately north of sluice.

Location	Powerstation								Sluice
Chainage	21.4	21.5	21.6	21.7	21.8	21.9	22.0	22.1	22.2
Level (m OD)	7.35	7.04	7.02	6.97	6.98	6.99	7.68	7.30	6.94

These levels range from 6.97m OD to 7.68m 200 metres from Fulney Sluice. It can be seen that a length 300 metres in length will be overtopped in a 1 in 200 year event in 2115 when the level will 7.12m OD as stated in the SFRA.

These banks are well maintained, and it is reasonable to assume that during the next one hundred years, considering the assets that are protected by this bank, further maintenance and capital works will be carried out on the tidal banks to ensure a continuing minimum defence standard of 1 in 200 years.

If a breach occurred in the tidal bank during a 1 in 200 year event in the year 2115 flood water would flow westwards and start to flood the whole area west of the river. The hazards of this will be considered later in the report.

2. Overtopping of the River Welland.

The crest level of the section of the west bank of the River Welland between Willesby Road and Westlode Street varies between 5.20m and 5.5m OD. The levels on this section of the west bank taken from the 2010 SHDC SFRA are shown below.

Location		Willesby Road		Chambers Court					
Chainage	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Level (m OD)	5.20	5.20	5.20	5.30	5.40	5.50	5.20	5.20	5.20

Chambers Court is at chainage 1.2km.

The highest predicted fluvial level for a 1 in 100 year event in the fluvial River Welland in 2115 is 4.69m OD. The lowest level of the east bank of the River Welland between 0.9km and 1.7km can be seen to be 5.20m OD.

There is a risk of flooding on the proposed site from this source if a breach occurred in the west bank of the River Welland in a 1 in 100 year event in 2115. However there is a road located on the top of this bank (Albion Street) which reduces the risk of flooding from this source to a very low level.

3. Overtopping or Breaching of Vernatts Drain

The SFRA states that the maximum predicted flood level in Vernatt's Drain is 3.86m OD for a 1 in 200 year event in 2115. As the crest level of the banks are at a level of 4.31m OD, the risk of overtopping is extremely low.

There is however the risk that the banks could fail when water levels are very high. However as the ground floor level of the proposed dwelling will be above 4.00m OD then there is no risk of flooding occurring from this source.

If a breach were to occur in Vernatt's Drain with water levels at the maximum predicted level of 3.87m OD Welland and Deepings IDB would be able very quickly to reduce water levels in the Drain by switching off a number of the pumps at Pode Hole Pumping Station. This would reduce the consequence of flooding from this source.

4. Flooding from IDB channels and Piped Drains

There is an open drainage channel north of the site which is called Cemetery Drain which is maintained by Welland and Deepings IDB. This drain flows north then eastwards to a culvert under the railway. It then flows in piped sections eastwards along Wygate Park and these piped drains flow into the Pennygate Drain.

The water levels in this area, are controlled by Pode Hole Pumping Station which is maintained by Welland and Deepings IDB (W & D IDB). 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.

W & D IDB maintain all the pumps at Pode Hole in good condition in readiness to deal with extreme events.

Therefore the risk of flooding to the building following a failure at Pode Hole Pumping Station can be considered to be adequately mitigated

The W & D IDB has a regular annual maintenance programme and they remove weed growth from channels such as these twice each year. However, any flooding from blockages or high water levels in these channels will not cause any flooding to the development site, because the level of the proposed site is higher than all of the land levels west of the site..

Flooding from this source can be considered to be adequately mitigated.

5. Blockages in local surface water sewers

Both Anglian Water and the Highways Authority maintain surface water drainage systems in this area. The floor level of the proposed development will be raised a significant height above the existing ground level which 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 having been flooded in the last 50 years.

Probabilities and Trends of Flooding

The probability of this development being flooded from either the River Welland is very low. The highest risk to the development would be from an extremely high tide event leading to a breach in the tidal defences during that event. In such an event lower land north west of the site where land levels are 3.00m OD and lower would flood to a

depth of greater than 1.0 metre before this area at the western end of Chambers Court would be affected.

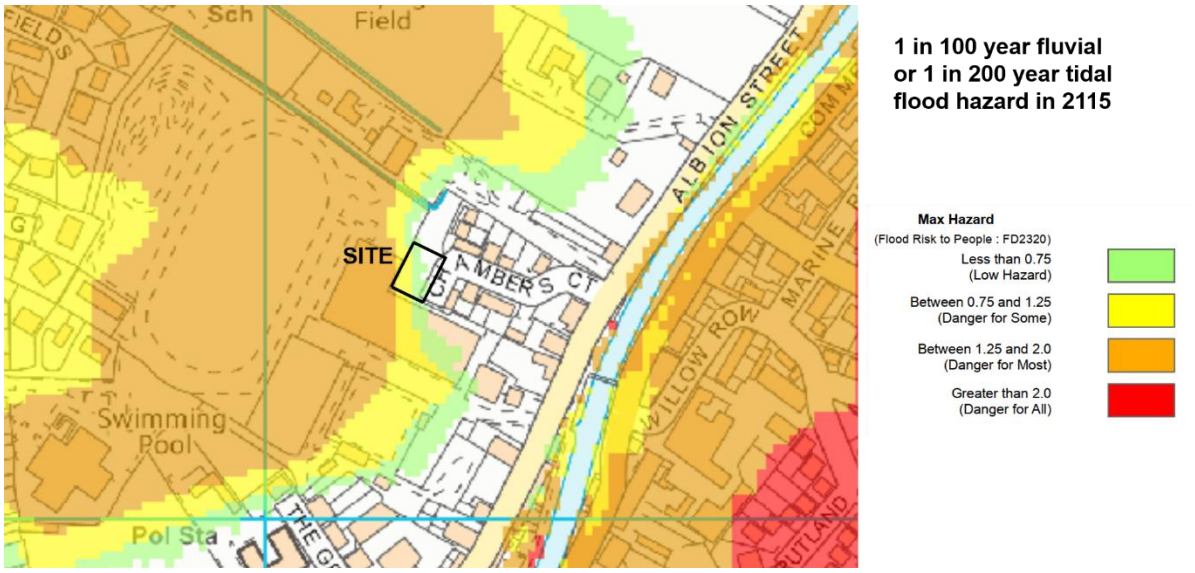
Climate Change

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 the Appendix of this report (pages 14 to 17). The hazard maps can be found on on the South East Lincolnshire Local Plan website. The modelling and mapping note advises that these new maps do not take into account of the new climate change guidance (February 2016) issued by the Environment Agency. The notes in the Appendix conclude that no extra mitigation measures are necessary to comply with the new guidance on climate change.

South East Lincs Advice Matrix

Advice can be found on the recommended mitigation required by referring to a spreadsheet on the South East Lincolnshire website.

The map below shows that the predicted flood hazard for this site is between 0 and 1.25, the western corner is danger for some and the central green strip is low hazard.



As the development is in flood zone 3 and the maximum predicted flood hazard is 0.75 – 1.25 (danger for some) reference should be made to Category E8 which shows the following advice.

The NPPF requires that the proposal is accompanied by a Flood Risk Assessment which contains evidence that appropriate mitigation measures / flood resilience techniques have been incorporated into the development.

The applicant is advised to refer to the following document for information on flood resilience and resistance techniques to be included "Improving Flood Performance of New Buildings – Flood Resilient Construction (DCLG 2007)"

Finished floor levels (FFL) should be informed by the predicted flood depth maps (refer to the relevant 2115 1% fluvial or 0.5% tidal maximum depth map) and set as required below (single storey proposals must use the 0.1% event, 2115 scenario, for setting FFLs).

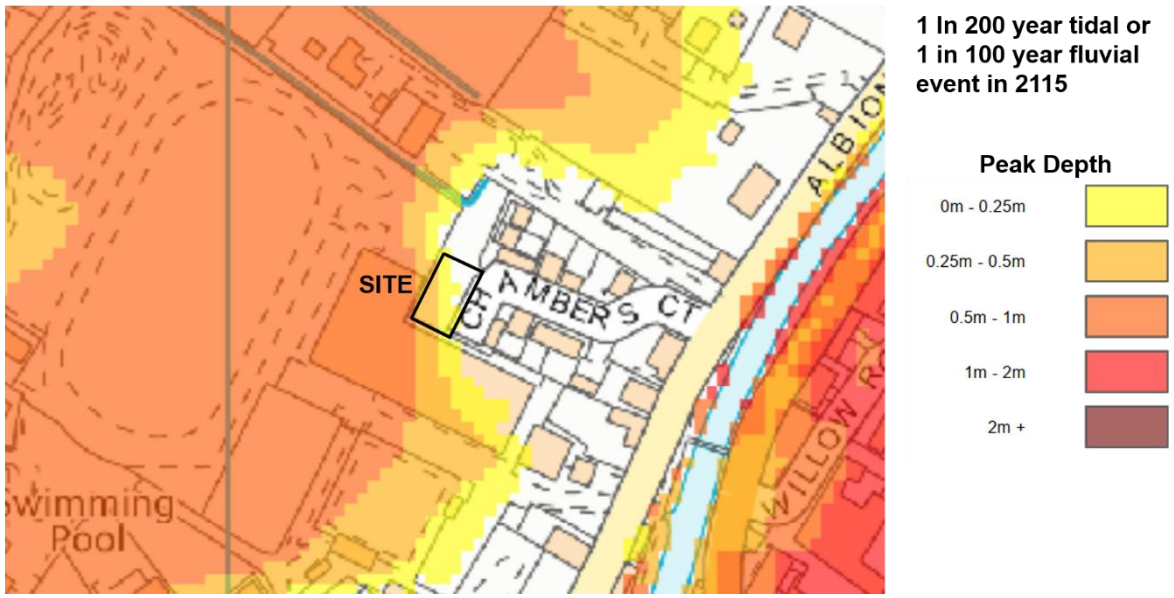
For flood depths of 500mm – 1.0m, FFL should be set 1.0m above ground level with flood resilient construction to a height of 300mm above the predicted flood depth.

For flood depths of 250mm – 500mm, FFL should be set 500mm above ground level with flood resilient construction to a height of 300mm above the predicted flood depth.

For flood depths of 0 – 250mm, FFL must be set 300mm above ground level.

EA Map of Predicted Flood Depths

The Environment Agency plan (shown below) of predicted depths of flooding in a 1 in 200 year fluvial or tidal event in 2115 indicates predicted flood depths of between 0 and 1.0m on the western part of the site. There is no flooding predicted on the eastern 30% of the site.

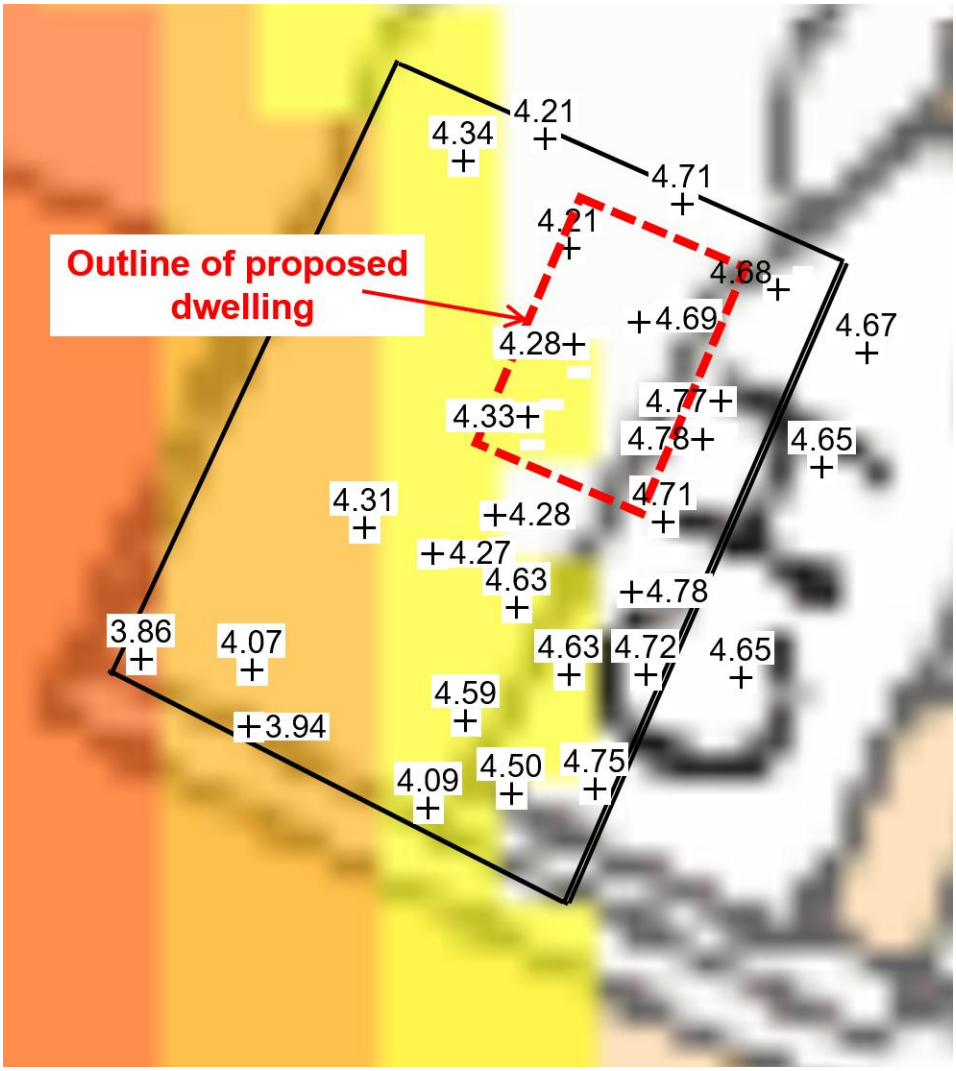


The depths shown in the map will be the result of a breach occurring in the tidal bank north of the site in a 1 in 200 year event in 2115.

Summary of Flood Risk

The above map of predicted flood depths indicates that the depth of flooding on the site would be between 0 and 1.0 metre if the west bank of the tidal section of the River Welland were to breach.

The relevant part of the above map has been enlarged and levels from the topographical survey have been added to this map, which is shown on the next page.



Levels in the south western corner of the site are 3.86m OD where the predicted flood depth is between 500mm and 1.0m and 3.94m and 4.07m where the predicted flood depth is between 250mm and 500mm. This would indicate a maximum flood level in a 1 in 200 year tidal event of between 4.50m and 4.60m OD.

Reviewing levels where no flooding is predicted on the eastern side of the site and on the road east of the site it can be seen that the lowest level is 4.65m OD. Levels in the "yellow area" where the predicted flood depth is between 0 and 250mm are between 4.21m and 4.63m OD, ignoring the 4.09m OD level on the southern boundary.

It is assumed that the area between the road and the proposed house will be at a level of approximately 4.65m OD and therefore the minimum ground floor level of the proposed house should be 4.85m OD, which is 300mm above the estimated predicted maximum flood level on the site of 4.55m OD in a 1 in 200 year event in 2115.

The proposed ground floor level will be above the maximum 1 in 100 year predicted level in the fluvial River Welland east of the site, and above any flood levels that would occur in nearby IDB drainage channels.

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.

Most of the town of Spalding is within flood zone 3(a) and therefore it would be difficult to find a suitable site for this development within a lower flood zone.

The SFRA states that as much of the South Holland DC area is within flood zone 3(a) it is necessary to use the refined flood risk information (hazard and depth maps) for the purpose of the application of the sequential test. The flood hazard on this site is zero on the north eastern part of the site, low hazard in the central part of the site and danger for some (0.75 – 1.25) on the western part of the site. Alternative sites have been accepted in all parts of the South Holland District with similar hazards.

The site of this proposed development is within the town boundary and the South East Lincolnshire Local Plan adopted in March 2019 recognises in paragraph 5.3.5 that infill and speculative applications will come forward within the South Holland District Council area. It states that there will be numerous opportunities for infill developments which it is not practical to identify, and the plan encourages these type of developments provided that the material considerations of the Local Plan and particular sites are met.

The safety of the development will be delivered by ensuring the floor level of the proposed new dwelling is above the predicted residual flood levels for this area in a 1 in 200 year tidal or 1 in 100 year fluvial event in 2115.

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.

Recommendations

In any area at risk of flooding it is recommended that all 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.

As the predicted flood level in a 1 in 200 year event in 2115 is approximately 4.55m OD then it is recommended that the floor level of the proposed dwelling should be raised 300mm above this level, which will be at a level of approximately 4.85m OD.

The building should be designed incorporating flood resistant and resilient techniques to allow it to be refurbished after being flooding to a depth of approximately 300mm above the predicted flood depth.

The developer should advise owners and occupiers of the properties to register with the Environment Agency's Floodline Warnings Direct Service.

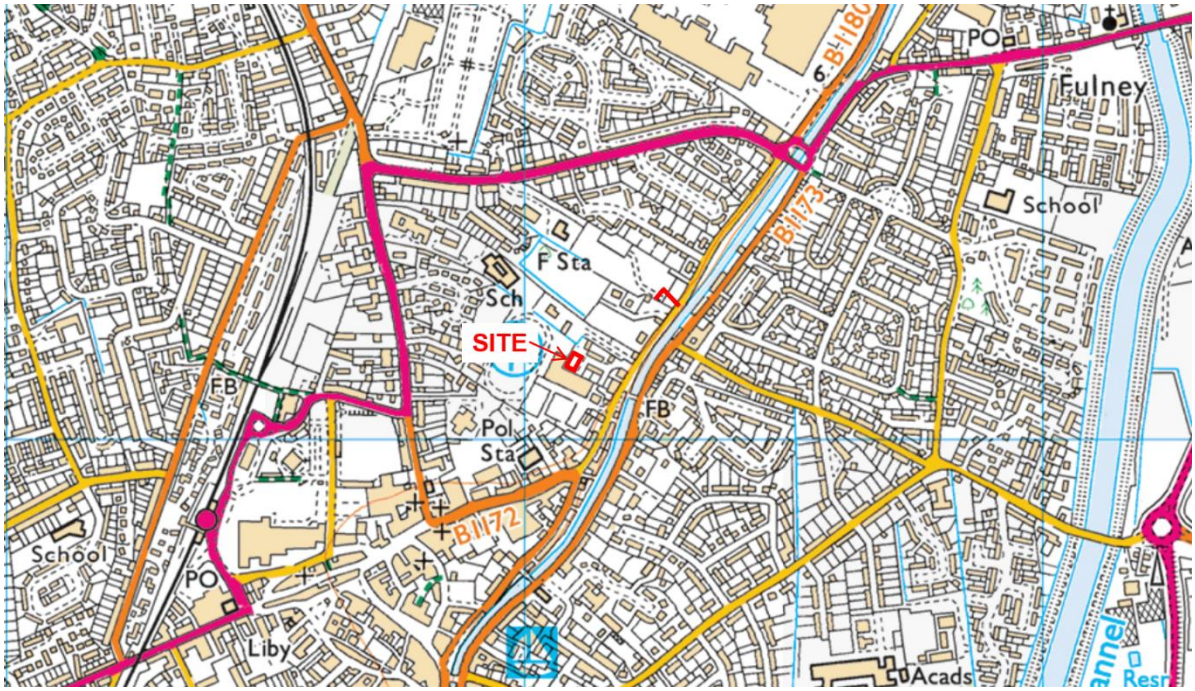
Rainwater from the roof of the building should be discharged if possible into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations. New hardstandings around the building should be constructed with permeable paving.

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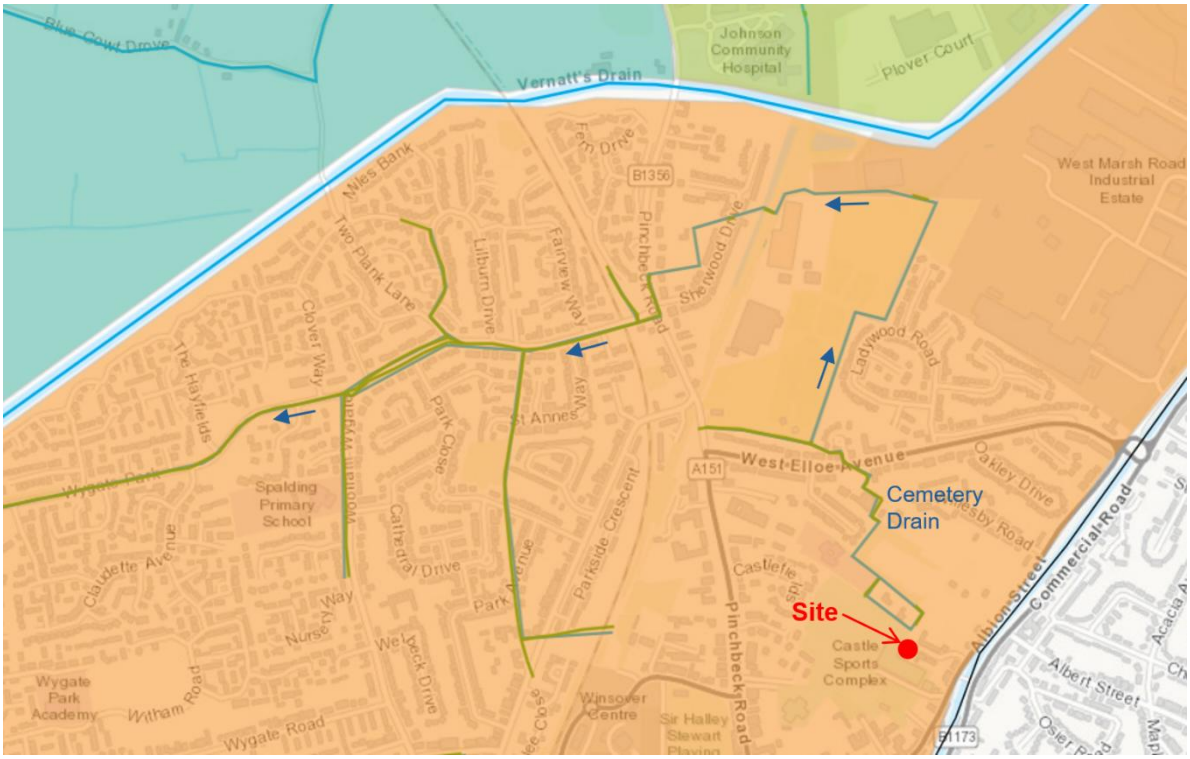
stuart.hemmings@btinternet.com

27th August 2026

LOCATION PLAN



PLAN OF IDB DRAINS



APPENDIX 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

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 the fluvial section of the River Welland, the Coronation Channel or IDB drainage system

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

Therefore it can be seen that the revised guidance increases the maximum allowance for sea rise in 2115 by 100mm. This may slightly increase the risk of a breach occurring in the tidal bank north of the site. It may also slightly increase the flow of water into the area between the Coronation Channel and the River Welland. However it will not change the conclusions and recommendations in this report.

Fluvial Flooding.

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 and the Coronation Channel 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.

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 as the major flood risk to this site is from tidal flooding then any increases in flow from fluvial sources do not need to be considered further.

Therefore it is considered that the mitigation proposed for the development, with the recommendation that the ground floor level should be 4.85m OD, is satisfactory.