PROPOSED DEVELOPMENT AT
15 DOUBLE STREET, SPALDING PE11 2AA

FLOOD RISK ASSESSMENT

Front view from Double Street

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This flood risk assessment has been prepared solely to support the planning application for the proposed new development at Double Street, 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 to South Holland District Council for Planning Permission to demolish an existing small building behind the main building and replace this with a new maisonette at 15 Double Street, New Road Spalding, PE11 2AA. The application also includes the proposal to convert the main building into two self contained flats.

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 Planning Application requires a Flood Risk Assessment to be carried out as required in Technical Guidance to the National Planning Policy Framework.

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 development is located on the western side of the River Welland. The National Grid Reference of the site is 524975 322770.

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

All of the site is within a defended area and is not in the functional flood plain and therefore can be designated 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 on the next page:

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 †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Therefore it can be seen that as the site is within Flood Zone 3(a), the sequential and the exception test must be 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.

All of the central area of Spalding, as can be seen from the map on page 2 of this report, is in Flood Zone 3, even though the land levels are above 5.00m OD and no flooding is predicted in the 0.1% event in 2115. It is not possible, consistent with wider sustainability objectives, for all new housing within the South Holland area to be delivered within an area of no flood risk.

This development complies with South Holland District Council's policies and as it is within the central part of Spalding where ground levels are higher than all other areas of the town and therefore it has a lower flood risk than any other area in Spalding, as the whole of this town is within Flood Zone 3(a).

Therefore it is considered that the sequential test is 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 at the location of 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

Consultants produced a Strategic Flood Risk Assessment (SFRA) in 2010. The modelling and the maps were updated in February 2017 and the SFRA has been rewritten as the South East Lincolnshire SFRA available on the South East Lincolnshire Planning website. These documents provide details of the flood risk in the Council's area. Reference to the maps in the 2010 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 .. 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 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 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

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

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 is 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.

Site Levels

The level of Double Street in front of 15 Double Street is approximately 5.40m OD. No levels have been measured on the site of the proposed maisonette but a site inspection showed that the rear of the existing main building is at approximately the same level as Double Street.

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 50 metres from the River Welland, which is main river and maintained by the Environment Agency.

This area north west of the River Welland is drained by surface water and combined sewers maintained by Anglian Water, which discharge either into the River Welland. There are no IDB open or piped watercourses in this area of Spalding.

Potential Sources of Flooding

The following sources of flooding will be considered:

1. Failure or overtopping of the tidal defences.
2. Overtopping of the River Welland.
3. From IDB watercourses
4. Surface water flooding

1. Failure or overtopping of tidal defences.

The River Welland is tidal north of Fulney Lock, which is approximately 2km 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 would be overtopped with a 0.5% probability event. However if overtopping or a breach were to occur water would flow westwards from the tidal Welland and lower land to the west of the River Welland would be flooded. The central area of Spalding would remain unaffected, even if a tide of extreme proportions occurred.

It is reasonable to presume that within the next one hundred years works would be undertaken on the section of the bank north of Fulney Lock to ensure that there will be a 1 in 200 year standard of defence continuing into the future.

Therefore it can be concluded that flooding from this source is adequately mitigated.

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. Double Street is at a level of 5.40m OD and would act as the flood defence if required. The maximum predicted water level in the fluvial section of the Welland is 4.67m OD. The level is unlikely to rise above this level as if levels in the river rise above this level a siphon will be activated to spill water onto Cowbit Washes. Also water will begin to flood over lower banks around Crowland, and these measures would prevent the level in the river from rising above this level.

Therefore it can be concluded that flooding from this source is adequately mitigated.

3. Flooding from IDB watercourses

The highest predicted water levels in IDB drainage channels in the area are in Vernatts Drain which are 3.79m OD. As the proposed floor level of the new building is 5.50m OD this source of flooding can be discounted.

4. Surface Water Flooding

The road and path level in Double Street is 5.40m OD, and the proposed ground floor level of the new building 5.60m OD. It is also proposed that the floor level of the existing building should be raised to be 200mm above the pavement level in front of the property. If there is any accumulation of surface water in Double Street after a heavy storm it is unlikely to be greater than 100mm in depth and flood the new building. Any accumulations of surface water would flow over the eastern footpath and through the lower entrances to properties directly into the River Welland behind.

Therefore flooding from this source can be considered to be adequately mitigated.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of any surface water flooding having occurred in this area of Spalding. This is not surprising as the land levels are some of the highest in the area.

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.

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 12 to 15). Updated SFRA maps were issued on the South East Lincolnshire Local Plan website in March 2017. The modelling and mapping note advises that the new maps do not take into account of the new climate change guidance (February 2016) issued by the Environment Agency. The notes in Appendix A 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. As the development is in flood zone 3 and there is no flood hazard reference should be made to Category G8 which states “No comment”.

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.

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

The flood zones were designated a number of years ago by the EA when little modelling had been carried out. Since then much work has been carried out by the EA which gives much better predictions of flood levels. If the designations were revisited this area would be at least designated in flood zone 2.

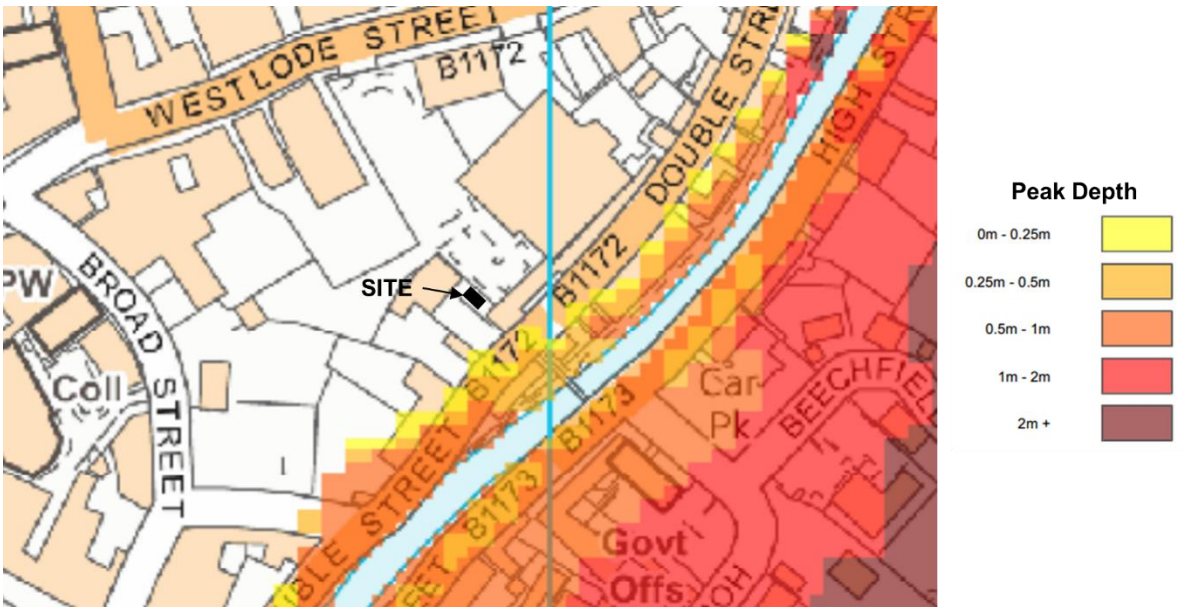
Summary of Risk of Flooding to the Site

The major flood risk at this location is from a very high tide level in the Wash caused by circumstances that lead to the flooding that occurred in 1953.

If a breach occurred in the tidal bank with the tide levels predicted for a 1 in 200 year event, the scenarios indicated on the flood maps in the SFRA would occur.

The SFRA has calculated the consequences arising from a possible breach occurring at any point along the raised defences. Also considered were scenarios in which gates or other assets fail to operate allowing water to flow inland and cause flooding.

Updated maps showing predicted flood depths were issued on the South East Lincolnshire Local Plan website in March 2017. An extract of the map showing predicted residual flood depths for the 0.5% tidal and 1% fluvial event probability on the development site is shown below.



The map predicts that there would be no flooding in this event on the north west side of Double Street.

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 extremely low.

The SFRA indicates that no actual or residual flooding is predicted in the area for the 0.1% event possibility in 2015, as shown on the map reproduced on page 9 taken from the South East Lincolnshire Planning website.

The risk of the site becoming flooded from any source is extremely low.

The flood risk to the proposed building is extremely low and it is considered acceptable to convert the existing building into two self contained flats with sleeping accommodation in the ground floor flat.

Recommendations

In any area at risk of flooding it is preferable that buildings 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, and ensure there is no danger to residents when they are asleep. However as the risk of any flooding occurring is very low and is not predicted in a 1 in 1000 year event in 2115 then accommodation with bedrooms on the ground floor is considered satisfactory.

The ground floor level of the new building should be 5.60m OD.

The ground floor level of the existing building which will have sleeping accommodation on the ground floor should if necessary be raised so that the floor level inside the building is a minimum of 200mm above the level of the pavement outside.

If any flooding were to occur, which is extremely unlikely at this location, it would happen extremely slowly over many hours and occupants of the flats would have adequate time to prepare themselves for the event.

The owner of the building should advise all tenants that they should register with the Environment Agency's Floodline Warnings Direct Service.

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.

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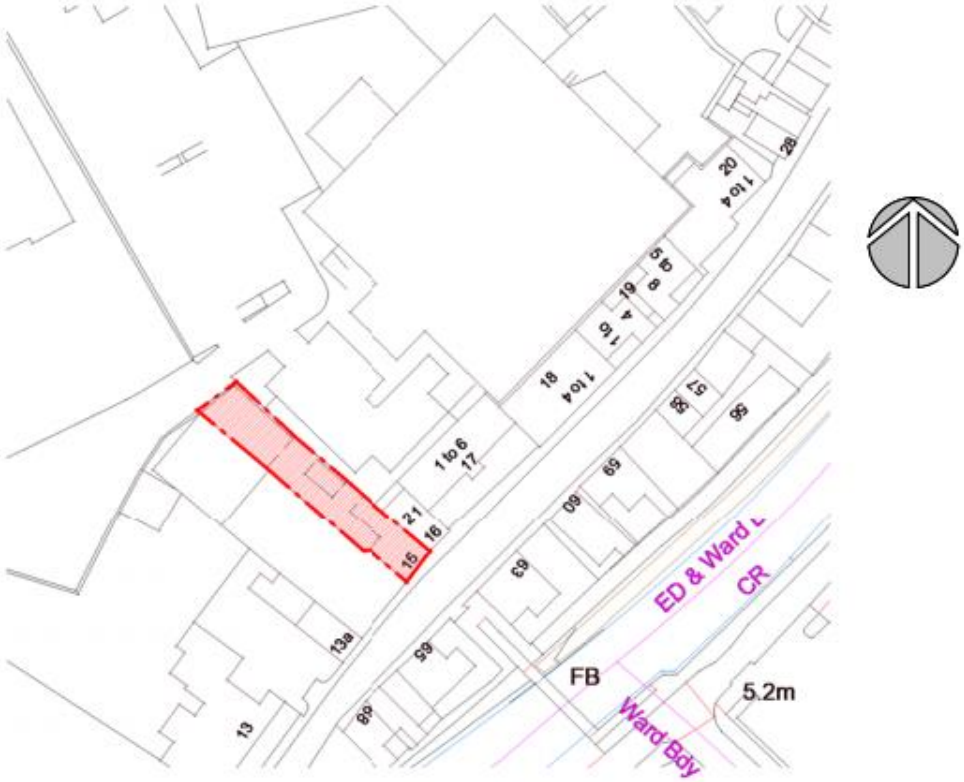
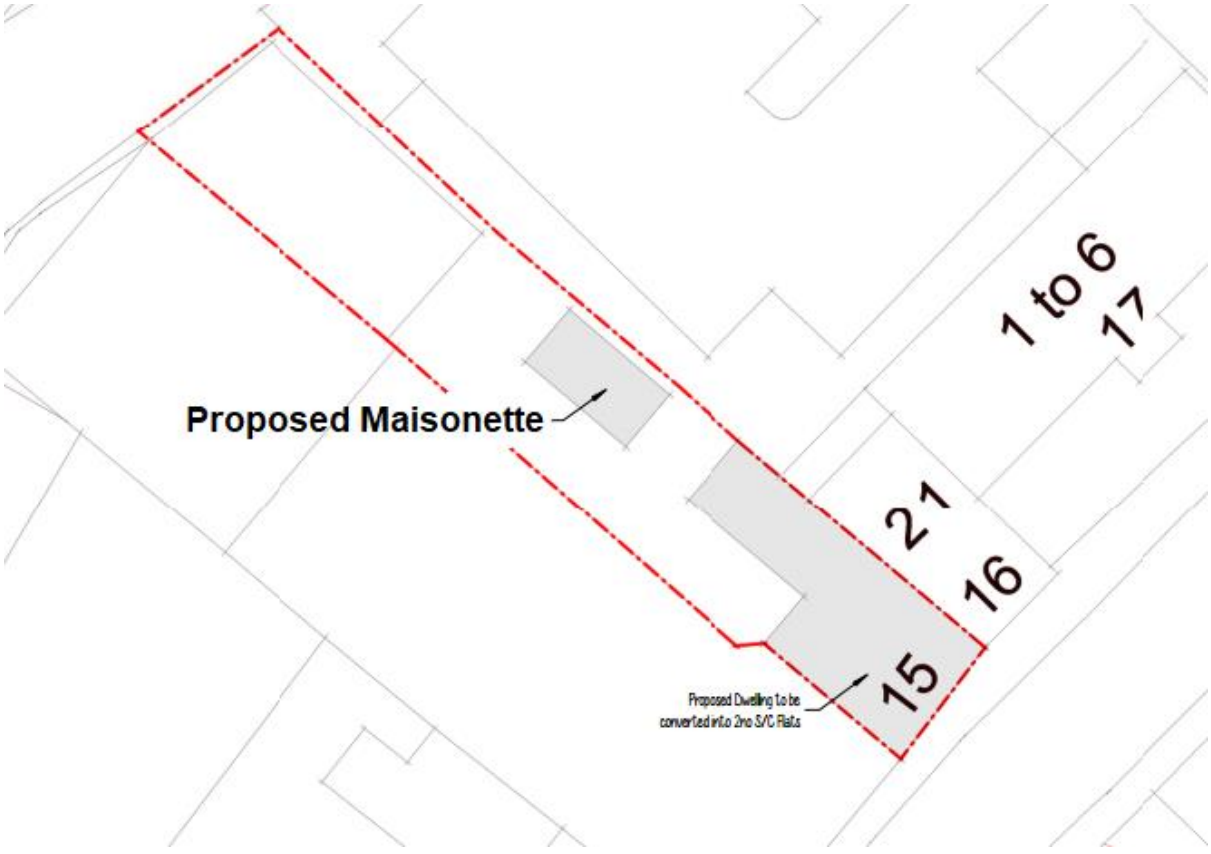
17th February 2020

LOCATION PLAN



BLOCK PLAN



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

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

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

Revised 2016 EA Guidance

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

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

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

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

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

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

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

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

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

Effects on Predictions of Flood Risk in FRA

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

1) Flooding from the tidal part of the River Welland.
2) Flooding from the fluvial River Welland

1) Flooding from the tidal part of the 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 east of the site. However it will not change the conclusions and recommendations in this report.

2) Fluvial Flooding from the Coronation Channel or the River Welland

As the development is in flood zone 3 and is classed as more vulnerable, the upper end climate change allowance, which is 35%, should first 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.

The EA have been using an allowance of 20% for climate change over the past few years in their assessments and modelling of their systems. The SHDC SFRA also has used this figure of 20%. The increase to 35% will not significantly change the conclusion in the SFRA of what might happen if a breach occurred in the bank of the River Welland. If there are additional flows along this part of the River Welland it will lead to the storage systems of the Cowbit and Crowland Washes operating and additional overtopping over lower banks rather than any significant increase in levels in the river.

The upper end allowance predicting a 65% increase in flows above the 1 in 100 year predicted flows now needs to be considered. The River Welland is an embanked watercourse between Spalding and Market Deeping. There are flood reservoirs on the east side of the River called the Cowbit and the Crowland Washes. Excess water would flow into these Washes through two large syphons. In this scenario the Washes would fill up and also water would be flooding over lower banks of the River. The increases in rainfall leading to this would also lead to significant flooding in the upper part of the River Welland Catchment. It is unlikely that there will be any significant increase in the water level in the River. Therefore the consequence will not be significantly different to the maps produced in the SFRA.

Therefore it is considered that the mitigation proposed for the development, with the conclusion that the proposed minimum finished floor level of the new building should be 5.60m OD, and the recommendation to raise the finished ground floor level of the existing building, is satisfactory.