

**PROPOSED CHANGE OF USE FROM OFFICES TO APARTMENTS
AT 15 HIGH STREET, SPALDING, PE11 1TW
FLOOD RISK ASSESSMENT**



View of existing building

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This flood risk assessment has been prepared solely to support the planning application for the proposed development behind 15, High 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

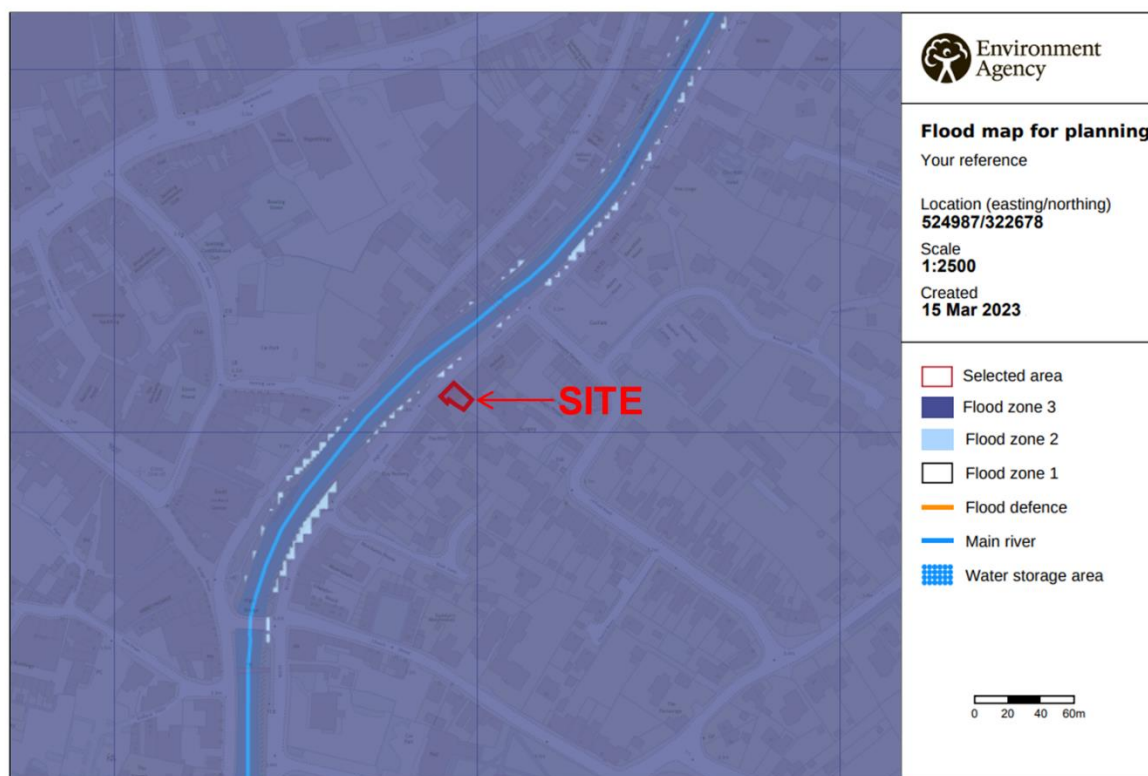
Planning approval was granted by South Holland District Council on 14th November 2022 for the change of use of former offices at 15 High Street, Spalding, to a single residential building. A second planning application is now proposed for a change of use to residential accommodation comprising of 4 self-contained apartments.

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 specified in the Practice Guidance to the National Planning Policy Framework Development and Flood Risk. 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 South Holland 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 located on the eastern side of the River Welland. The National Grid Reference of the site is 524990 322680.

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

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

Applying the flood risk vulnerability classification in Table 2 of the Guidance, the development of residential properties 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 †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

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.

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 the planning application is for a change of use for a Grade II listed building, then the consideration of an alternative location is not possible. The principal of the conversion of the building into residential accommodation has been established with the planning approval that has been granted by South Holland DC.

The safety of the development will be delivered by demonstrating that the floor level of the building is above predicted residual flood levels for this area.

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 Design and Access 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 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 zero
For year 2115	Depth of flooding ... zero
	Extent of flooding.... Low or medium flood probability
	Peak Velocity zero

The maps showing the residual flood hazards 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 rating..... None
Peak Velocity .. zero
For the year 2115 Depth of flooding ... 500mm – 1.0metre
Extent of flooding .. high
Hazard rating..... 1.25 – 2.0 (danger for most)
Peak velocity 0 – 0.3 metres/sec

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

For the year 2115 Depth of flooding ... 500mm – 1.0metre
Extent of flooding .. high
Hazard rating..... 1.25 – 2.0 (danger for most)
Peak velocity 0 – 0.3 metres/sec

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

1. 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 right bank of Spalding Welland is between 5.00m and 5.10m OD

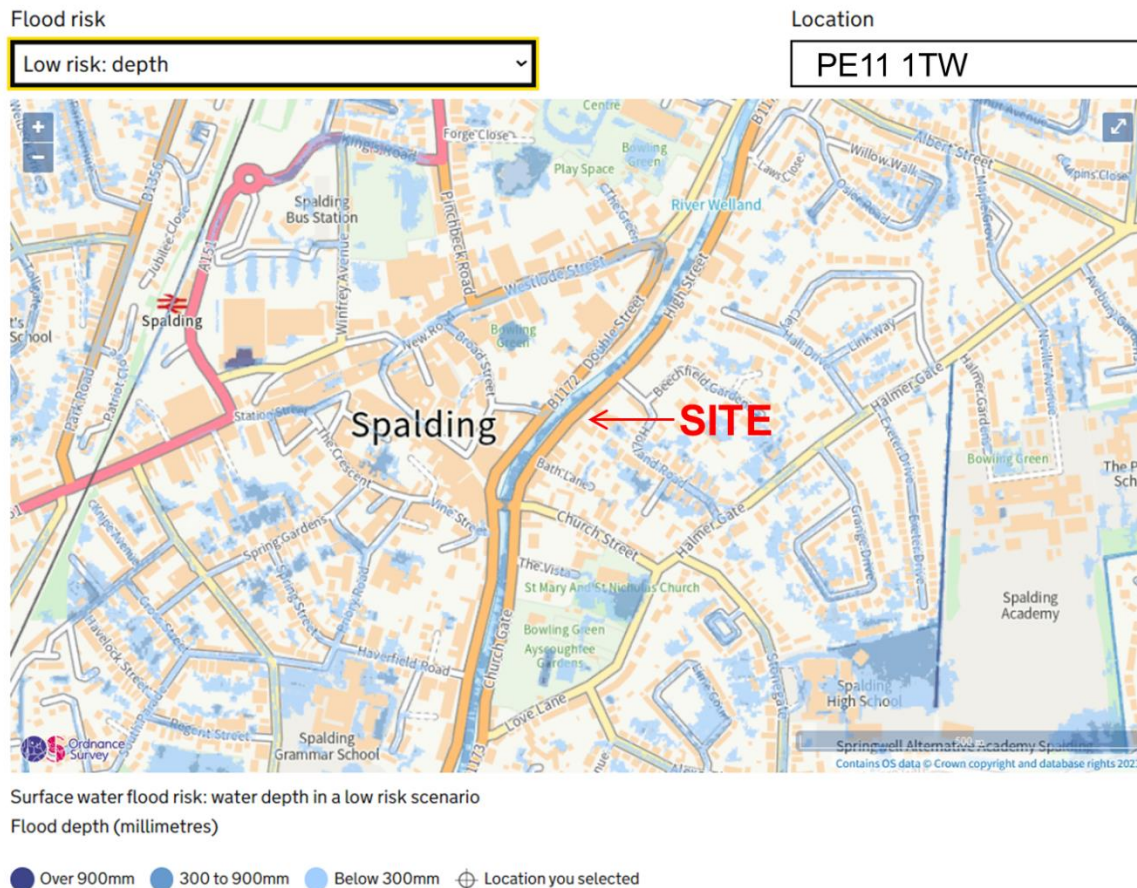
2. The extreme tide levels in the section of the River Welland north of Fulney Lock is shown in the report as follows:

	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.

Information on Surface Water Flooding on Environment Agency Website

The map on the next page shows the predicted depths of surface water flooding in this area of Spalding. The light blue areas indicate the low risk of up to 300mm of surface water flooding, and the darker blue areas indicate that between 300mm and 900mm of surface water flooding could occur.



It can be seen there is no predicted risk of surface water flooding on the site of the building.

Site Levels

The level of High Street is shown on the maps as 4.90m ODN south west of the site and 5.20m ODN at the junction with Clements Terrace north east of the site. Using these levels it can be concluded that the level of High Street in front of 15 High Street is 5.00m ODN.

The property has four floors, a basement, ground floor and first and second floors. There are four steps up to the ground floor of the building which is 750mm above the level of High Street, with the ground floor level of 5.75m ODN. The basement is assumed to have a floor level of approximately 3.20m ODN.

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 building is approximately 15 metres from the fluvial section of the River Welland, which is main river and maintained by the Environment Agency.

The site is approximately 1.4km west of the bank of the Coronation Channel.

The site is approximately 1.75km south of the tidal defences of the River Welland

The area between the River Welland and the Coronation Channel is drained by surface water sewers maintained by Anglian Water, which discharge either into the River Welland or into drainage channels maintained by South Holland Internal Drainage Board. The water levels in the IDB channels are controlled by Clay Lake Pumping Station, which is operated by South Holland IDB, and discharges into the Coronation channel.

Potential Sources of Flooding

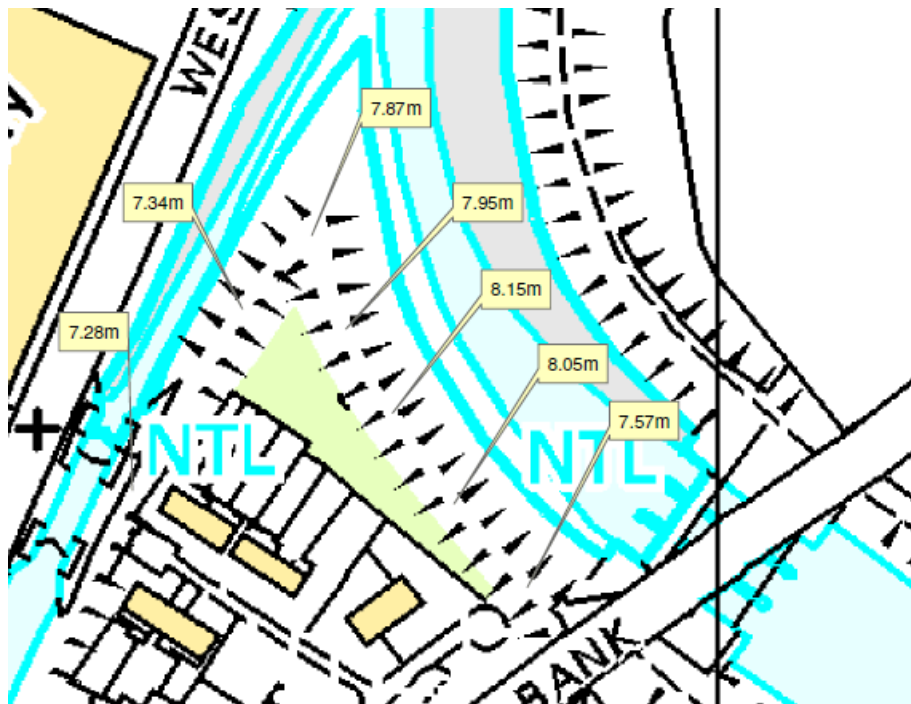
The following sources of flooding have been identified:

1. Failure or overtopping of the tidal defences.
2. Overtopping of the River Welland.
3. Overtopping or breaching of the Coronation Channel.
4. Failures of Clay Lake Pumping Station (IDB)
5. Flooding from IDB channels and piped drains
6. Blockages in local surface water sewers (highway or Anglian Water)

1. Failure or overtopping of tidal defences.

There is a short length of tidal defences on the Coronation Channel west of Marsh Road Sluice and on the River Welland north of Fulney Lock that defends the area between the River Welland and the Coronation Channel from tidal flooding. 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.

Crest levels of this bank have been surveyed and these are shown below.



These levels range from 7.28m OD near Fulney Lock to above 8.00m OD on the main section of bank. The low level of 6.88m OD mentioned in the SFRA was not found. All the surveyed levels are higher than the 1 in 200 year extreme tide level in 2115 of 7.12m OD stated in the SFRA.

These banks are well maintained and have a top width of at least 4.0 metres, 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 1000 year event in the year 2115 flood water would flow southwards and start to flood the whole area between the Coronation Channel and the River Welland. The hazards of this will be considered later in the report.

2. Overtopping of the River Welland.

The lowest level of the east bank of the River Welland between Church Street and Albert Street is approximately 4.90m OD which is approximately 15 metres south west of the development site. The highest predicted fluvial level for a 1 in 100 year and a 1 in 1000 year event in the fluvial River Welland in 2115 is 4.69m OD. The level of the east bank of the River Welland varies between 4.90m and 5.40m OD through the town of Spalding.

The ground levels fall slowly east of High Street but the possibility of the road, which is in effect the fluvial flood defence, failing can be discounted, as can the possibility of the risk of flooding to the proposed site from 1 in 1000 year predicted river levels in 2115.

3. Overtopping or Breaching of the Coronation Channel

The area between the River Welland and the Coronation Channel is protected from flooding by banks on the west side of the channel, which are approximately 2.0m to 3.0m above the land. The top level of these banks are at a level of 5.40m OD, which gives a freeboard of at least 700 mm above the 1 in 1,000 year maximum design level in the channel.

If a breach occurred in the channel the maximum water level in the flooded area could reach between 4.0 m and 4.1 m OD for the present day situation and between 4.3m and 4.4 m OD if climate change is allowed for.

Therefore as the ground floor level of this building is 5.75m ODN the risk of flooding from this source can be considered to be adequately mitigated.

4. Failure of Clay Lake Pumping Station

The South Holland IDB estimate that the Clay Lake Pumping Station provides a 1 in 50 year standard with a freeboard, which in effect provides a 1 in 100 year protection against flooding. The pumping station is maintained in good condition and should a

failure occur the Drainage Board would quickly deploy temporary pumps to alleviate the situation. It is highly unlikely that any flooding from this source would extend as far as this site, as the flood water would need to rise above 4.50m OD, which is higher than the ground levels around the pumping station and east of the building.

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

5. Flooding from IDB channels and Piped Drains

There are two main drainage channels in the area between the Coronation Channel and the River Welland. Exeter Drain flows southwards from Albert Street to Clay Lake Pumping Station. There is a northern section of this drain as far as Halmer Gate which is piped. There is also a drain on the western side of the Coronation Channel which flows from Holbeach Road to the Pumping Station. These are shown on the plan on page 15 of this report.

The South Holland IDB has a regular annual maintenance programme and they remove weed growth from channels such as these twice each year. However, any flooding from this channel will not cause any flooding to the development site, as explained in (4) above.

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

6. Surface Water Flooding

The road and path level in this part of High Street is 5.00m OD, and the ground floor level of the building is a minimum of 750mm above this level.

Therefore the flood risk from surface water flooding can be considered to be adequately mitigated.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of any flooding having occurred in this area of Spalding.

Probabilities and Trends of Flooding

The probability of this development flooding from Environment Agency main river is very low.

Residual Risk – Extreme Events

The residual risk from extreme events is very low on this site. The major risk to the site is from a breach or overtopping of the tidal defences

The risk of this happening in this case is low and the hazard from any flooding is also low.

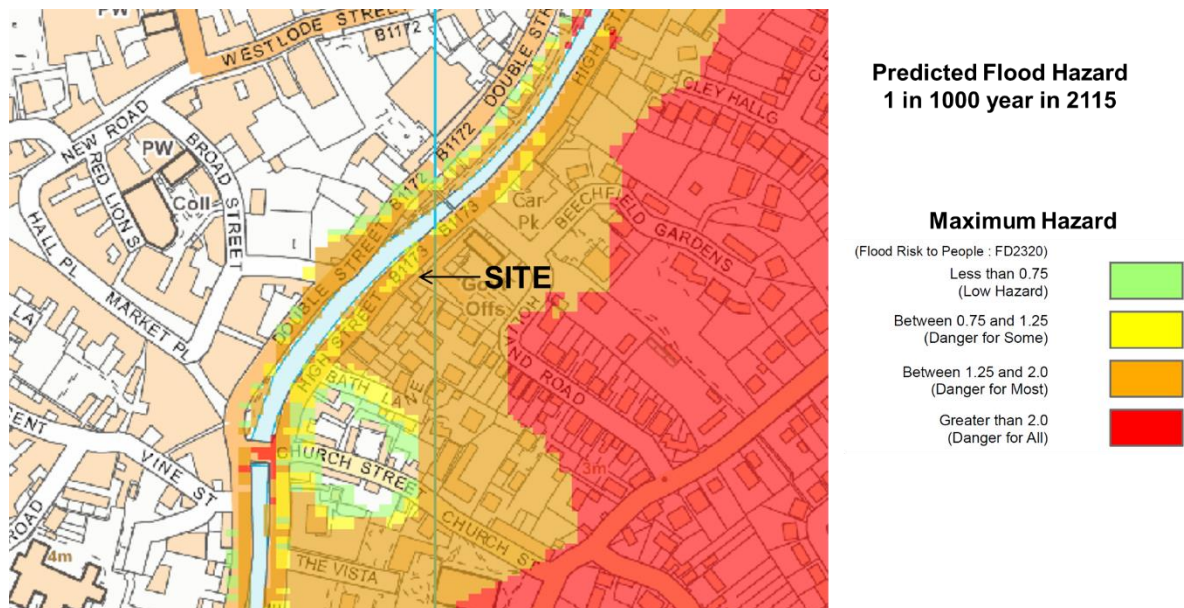
Climate Change

The recommendations for flood depths for this flood risk assessment use information mostly taken from the South Holland DC SFRA which was last updated in 2010. The EA have issued new guidance on recommended contingency allowances for predicted

sea rises, fluvial flows and rainfall intensities which from 19th February 2016 needs to be considered in the FRA. The effects of these new recommendations are considered in Appendix A of this report (pages 16 to 19). It is concluded 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 predicted hazard at the site is shown to be 1.25 – 2.0 (danger for most).



As the development is in flood zone 3 reference should be made to Category D7 which shows the following guidance.

The proposal should be referred to the Environment Agency with a supporting Flood Risk Assessment which demonstrates that the proposal will be safe for its lifetime.

The Environment Agency is likely to object to proposals including ground floor habitable accommodation.

The FRA should aim to identify mitigation measures in line with those required for new build development of the same type, as far as practicable.

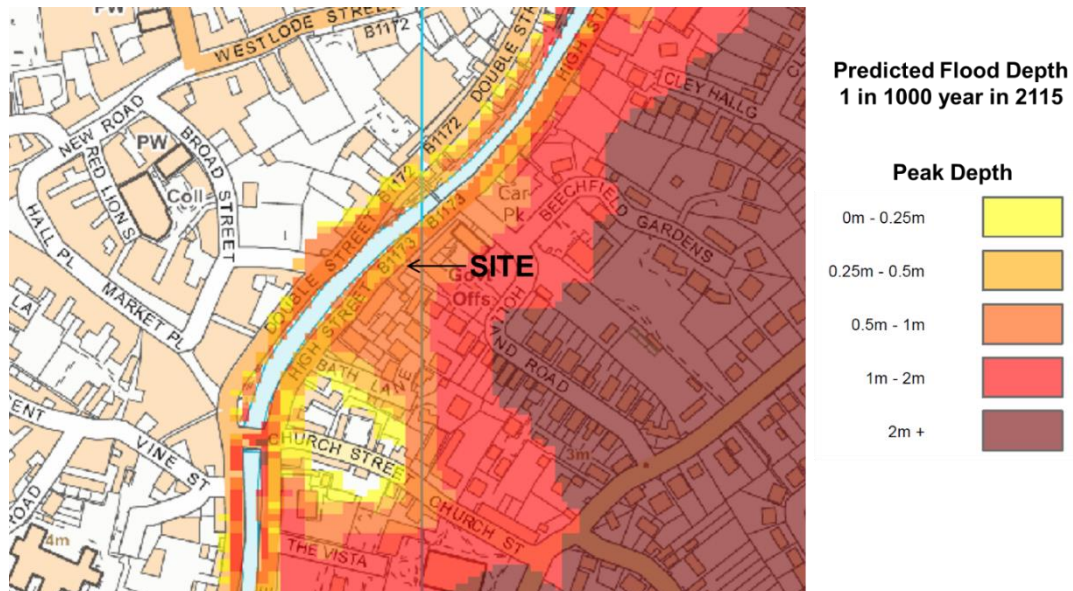
The standing advice for a new build development with sleeping accommodation on the ground floor is found under D8 on the South East Lincolnshire Standing Advice Matrix.

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 – 1.0 metre, FFL must be set 1.0 metre above existing ground level with flood resilient construction to a height of 300mm above the predicted flood depth.

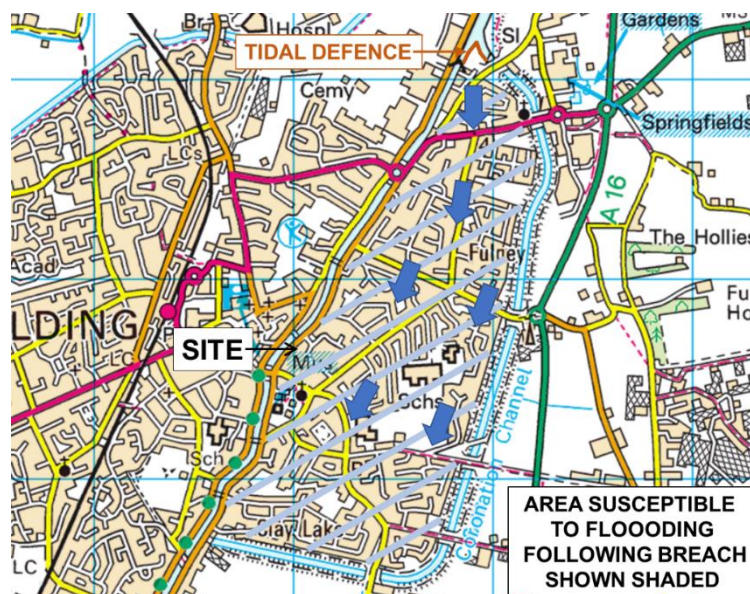
Summary of Risk of Flooding to the Site

The extract from the map in the SFRA (shown below) showing the predicted residual peak depth in 2115 for the 0.1% (1 in 1000 year) event probability in 2115 shows the predicted flood levels in this area, which is presumed to be as a result of a breach in the tidal defences.



This map predicts flood depths of between 500mm and 1.0 metre to the High Street.

By reviewing the various sources of flooding it can be concluded that the major flood risk to the site in a 1 in 1000 year event in 2115 is from tidal flooding. If a breach occurred in the tidal bank of the River Welland or the Coronation Channel between Fulney Lock and Marsh Road Sluice flood water would flow into the area between the Coronation Channel and the River Welland, and if this breach remained unrepaired the whole area north and west of the Coronation Channel and east of the Spalding Welland could be flooded. The map below shows how flood water would flow across the area and the extent of the area that could be flooded in this scenario.



As there are ground levels less than 3.00m ODN flood depths of greater than 2.0 metres could occur after many hours in some parts of the area. The residents of 15 High Street would see Holland Road begin to flood and then the rising flood water would flood onto High Street. The flood water would flow across High Street into the River Welland and the level in the river would slowly rise to a high level. It is possible that the level of the flooded area could reach a level of 5.20m OD, but it is unlikely to rise above this level as flood water would start to flow into the River Welland as soon as the flood level increased above 5.00m OD.

Conclusions

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 risk of the site flooding from any Environment Agency watercourse is extremely low.

The map in the SFRA of the predicted flood levels over estimates the depth of flood water at this location in the High Street. The maximum flood level of 5.20m ODN will be 550mm below the ground floor level of the building. However in this scenario there is a risk that the basement could become flooded.

There is no predicted risk of flooding in a 1 in 1000 year event to the ground floor of the building from the fluvial section of the River Welland, the Coronation Channel, or IDB watercourses or from surface water.

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

The owner and the letting agents should ensure that all future occupiers of the flats should register with the Environment Agency's Floodline Warnings Direct Service. The owner should also register so that he can ensure that tenants fully understand the situation.

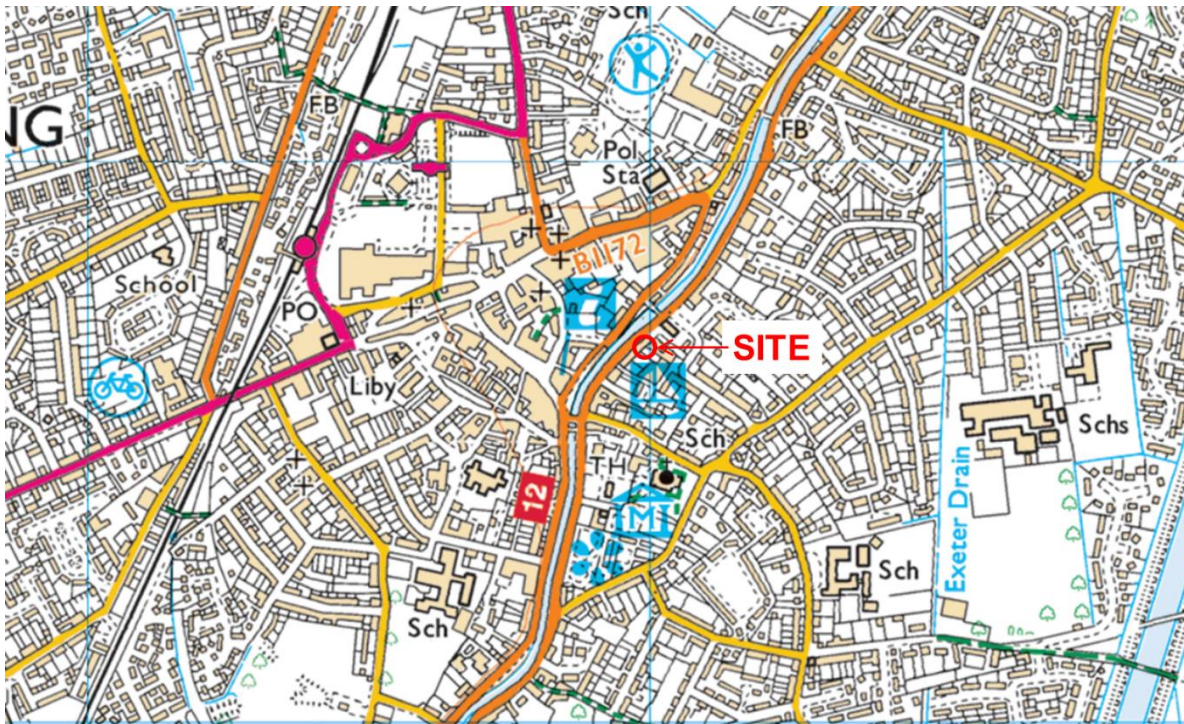
There should be no habitable occupation of the basement of the building. The proposal to use the basement as storage and a laundry facility is considered satisfactory. Future occupiers of the apartments should be warned that there is a risk of flooding to the basement.

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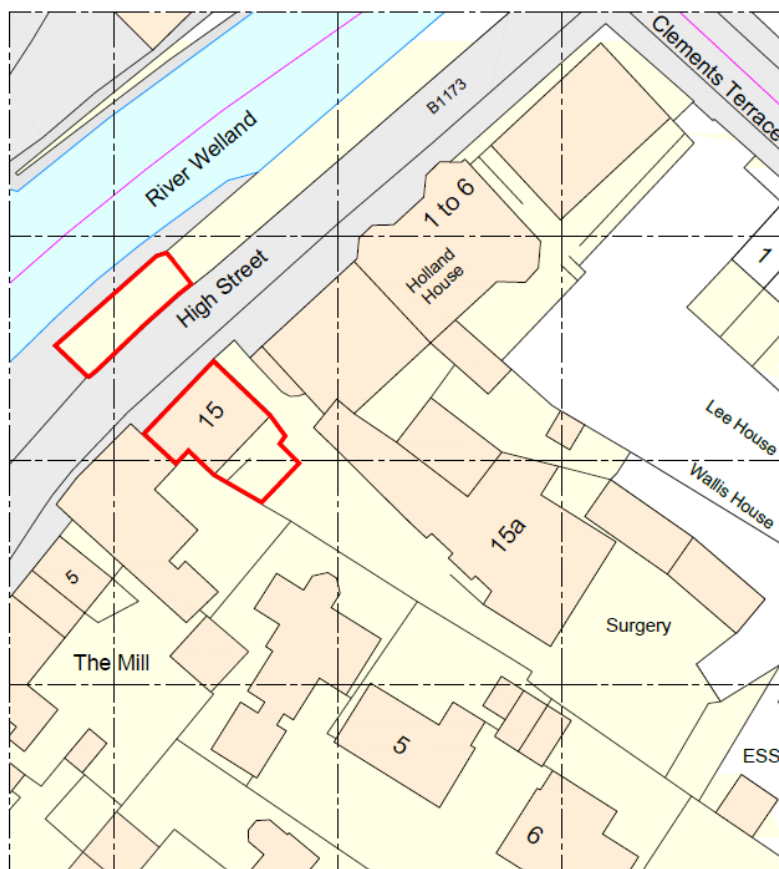
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20th March 2023

LOCATION PLAN

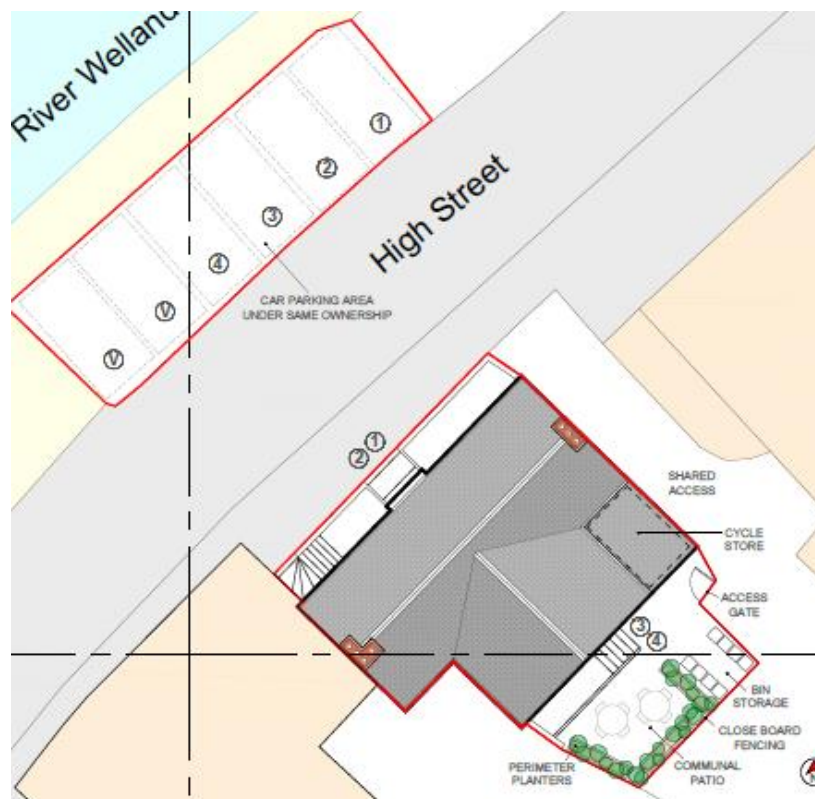


SITE LOCATION PLAN



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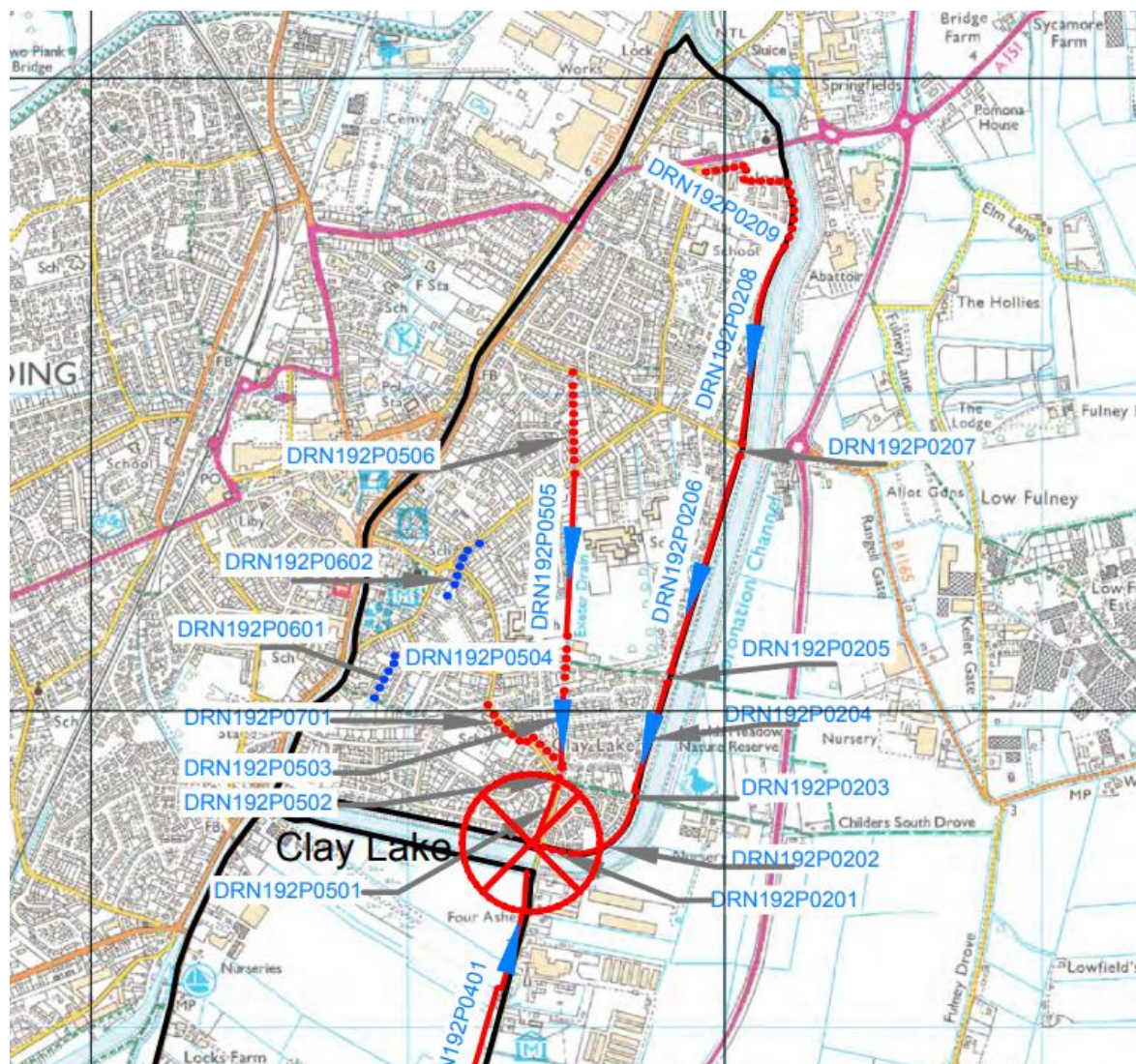
PROPOSED BLOCK PLAN



PROPOSED GROUND FLOOR PLAN



PLAN OF SOUTH HOLLAND IDB DRAINAGE



APPENDIX A CLIMATE CHANGE

The Environment Agency has issued revised guidance on climate change and have now stated that the new predictions should be considered and incorporated into all flood risk assessments produced after 19th February 2016.

Listed below are the climate change allowances in three documents:

- South Holland SFRA
- EA guidance (2013)
- Revised EA guidance

The recommendations in each document are shown below.

2010 South Holland DC SFRA

The SHDC SFRA states that the the following allowances have been made for climate change:

4.4 Climate Change

Scenarios for the years 2055 and 2115 include for climate change contingency allowances to the amount suggested by PPS25¹. These allowances are expressed in Table 2. Percentage increases are relative to the present-day.

Table 2 – Adopted Climate change contingency allowances

Parameter	Year 2055	Year 2115
Sea level rise (m)	+ 0.33	+ 1.14
Extreme wave height	+ 10%	+ 10%
Peak river flow and volume	+ 20%	+ 20%
Peak rainfall intensity	+ 20%	+30%

Where flows arise from pumping rather than natural run-off, notably in the Vernatt's Drain and for the Fenland subcatchments of the South Forty Foot Drain, peak flow rates for future eras have been taken as equal to current rates since this SFRA assumes all flood risk management measures will remain in their current state.

2013 Guidance to Planners

Guidance to planners was issued by EA in September 2013

Table 1: Recommended contingency allowances for net sea level rises (Net sea level rise (mm per year) relative to 1990)

	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

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

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

Revised 2016 EA Guidance

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

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

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

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

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

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

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

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

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

Effects on Predictions of Flood Risk in FRA

The FRA has identified that there is a possibility of flooding from both tidal and fluvial sources where the new climate change recommendations could affect the predictions of flood levels in 2115.

Tidal Flooding.

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 updated SFRA does not predict any residual flooding on any part of the site in a 1 in 1000 year event in 2115. The lowest land level on the site is approximately 5.20m OD.

The increase of 100mm in maximum levels in the tidal River Welland will not have the effect of changing the flood risk to the site.

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 fluvial section of the River Welland will not be raised by the increase in flows projected in the new climate change allowances. If flows increase by 65% in the river it will have the effect 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.

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.

Therefore it is considered that the conclusions and recommendations in this report will not be affected by the revised guidance on climate change.