

**PROPOSED DEMOLITION OF EXISTING BUILDING AND SUBSEQUENT
CONSTRUCTION OF RESIDENTIAL APARTMENTS ON THE SITE OF
STATION HOUSE, KINGS ROAD, SPALDING, PE11 1QB
FLOOD RISK ASSESSMENT**



View of development site from Kings Road

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This flood risk assessment has been prepared solely to support the planning application for the proposed development at Kings 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

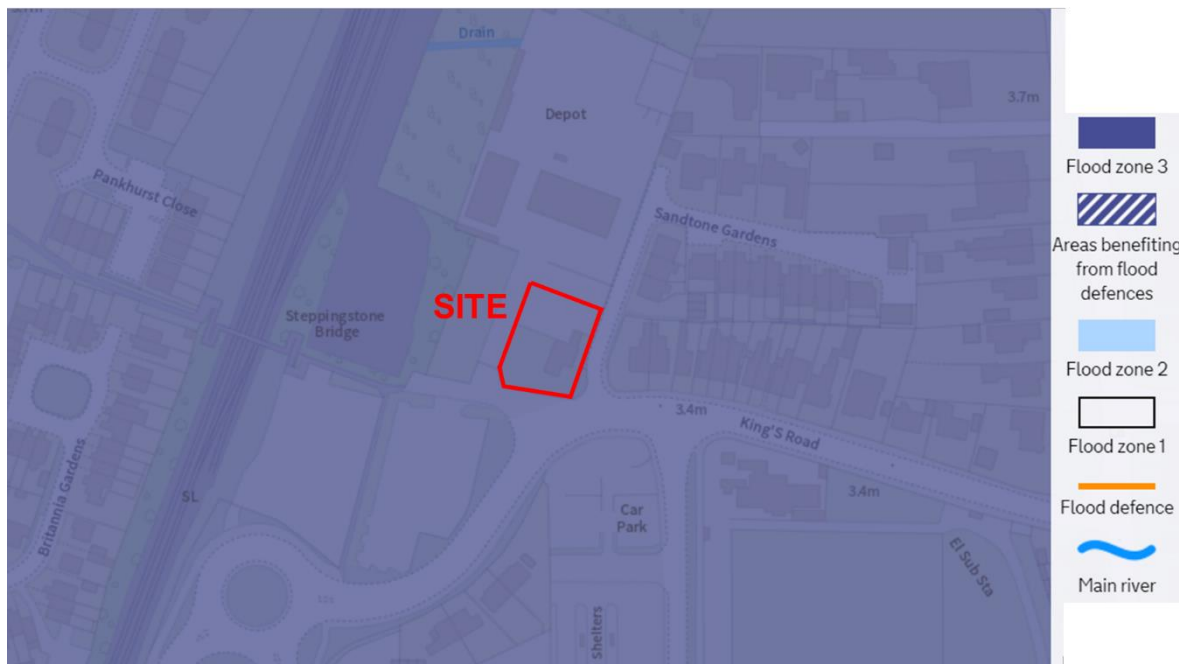
A planning application is due to be submitted to South Holland District Council for permission to demolish the house called Station House on Kings Road, Spalding and construct apartments on the site. The building and the site are at present unoccupied.

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 Welland and Deepings Internal Drainage Board district.

Environment Agency (EA) Flood Zones

The map below is taken from the Environment Agency website and shows the flood zones in the area.



It can be seen that the whole of this area of Spalding 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 524580 323110.

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, a residential development 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	✓*

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.

As can be seen from the map on page 2 of this report the whole of the area of central and north Spalding is in Flood Zone 3. Therefore it would be difficult to find a similar site for this development that is in a lower flood zone.

This report will show that the flood risk at the proposed site is very low and the hazard is lower than the sites allocated in the South East Lincolnshire Local Plan adopted in March 2019. Policy 17 of the Plan (providing a mix of housing) indicates that one bedroomed homes are required to meet the outcomes of the plan.

The safety of the development will be delivered by demonstrating that the proposed floor level of this 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 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 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
	Flood Hazard.....	Zero
	Peak Velocity	Nil
For year 2115	Depth of flooding ...	Zero
	Extent of flooding....	Low or medium flood probability
	Flood Hazard.....	Zero
	Peak 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 residual hazards are as follows:-

a) For the 1% fluvial or 0.5% tidal event probability:

For the present day	Depth of flooding.... zero
	Extent of flooding ...Low or Medium
	Hazard None
	Velocity zero
For the year 2115	Depth of floodingzero
	Extent of flooding ...Low or Medium
	Hazard None
	Velocity zero

b) For the 0.1% fluvial or tidal event probability:

For the present day	Depth of flooding.... zero
	Extent of flooding ... Low or Medium
	Hazard None
	Velocity zero
For the year 2115	Depth of flooding zero
	Extent of flooding ... Low or Medium
	Hazard None
	Velocity Zero

Figure 16 of the general maps show that the site is not within the rapid inundation zone for the present day and in 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 left bank of Spalding Welland is 5.20m OD

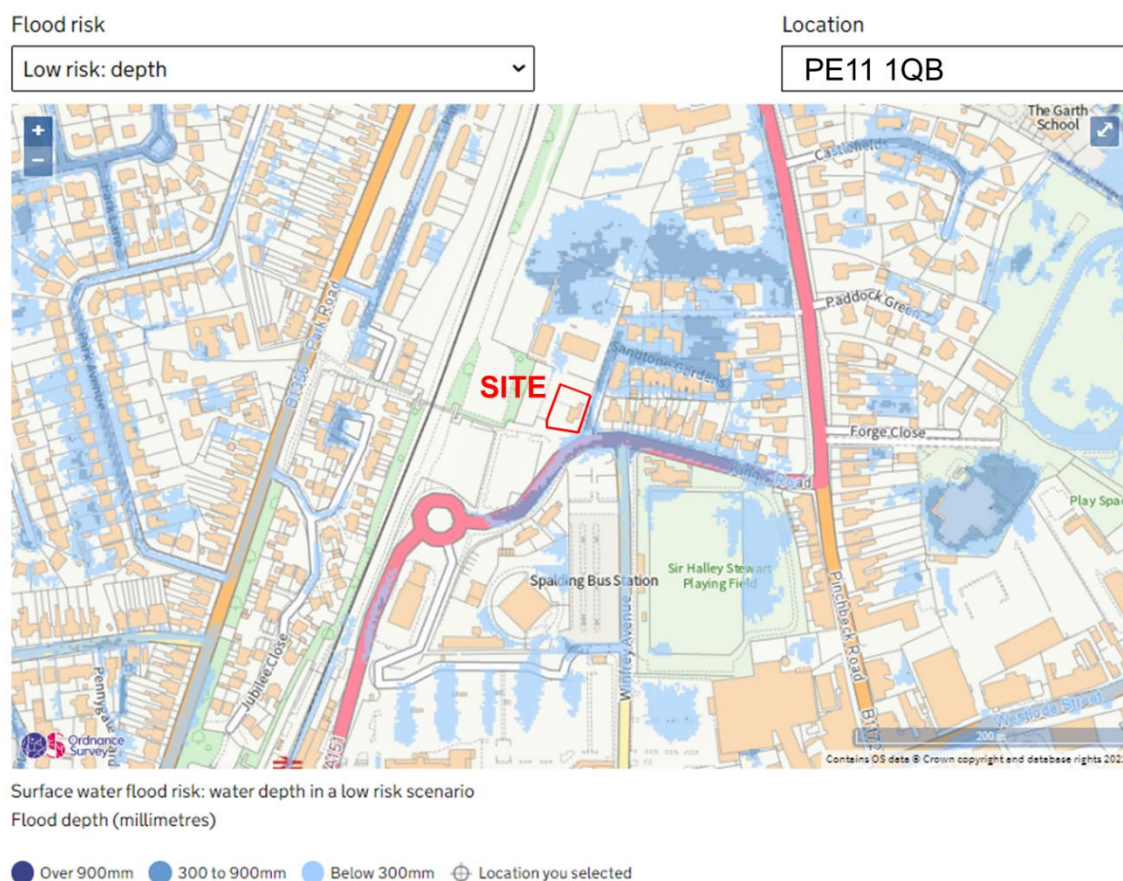
2. The extreme tide levels in the section of the River Welland north of Fulney Lock is shown in the report as follows:

	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 below 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 a no predicted risk of surface water flooding on the 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 1.65 km from the tidal section of the River Welland to the north, which is main river and maintained by the Environment Agency.

The site is approximately 550 metres from the fluvial section of the River Welland, which is main river and maintained by the Environment Agency.

This area west of the River Welland is drained by surface water sewers maintained by Anglian Water, which discharge either into the River Welland or into drainage channels maintained by Welland and Deepings Internal Drainage Board. The water levels in the

IDB channels are controlled by the water level in South Drove Drain which also is operated by Welland and Deepings IDB.

Site Levels

A topographical survey of the site has been carried out and part of this is reproduced on page 11 of this report.

The floor level of the existing house on the site is 4.52m ODN. This is 500mm higher than the average ground level around the house which is approximately 4.00m ODN.

Ground levels slope away from the house and the ground level around the southern and western sides of the site is between 3.60m and 3.70m ODN, and on the northern boundary the level varies between 3.70m and 4.00m ODN. There is a brick wall on the eastern boundary which is approximately 1.8 metres high.

The level of Sandtone Gardens is approximately 3.50m ODN and the tarmac access on the southern boundary rises from 3.50m to 3.70m on the south western corner of the site.

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 1.65 km north east of the site. The SFRA states that the defences are adequate to withstand a 1 in 200 year (0.5%) probability event for present day. In the future in 2115 some of the banks would be overtopped with a 0.5% probability event. However if overtopping or a breach occurred 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 and the Kings Road area would remain unaffected, even if a tide of extreme proportions occurred.

It is reasonable to presume that within the next one hundred years works will be undertaken on this section of the bank to ensure that there will be a 1 in 200 year standard of defence continuing into the future, especially considering the value of the industrial and residential properties protected by these defences.

2. Overtopping of the River Welland.

London Road and Double Street are located on the west bank of the fluvial section of the River Welland. The bank at this location is not a raised defence as land levels west of Double Street and Albion Street fall over 550 metres from a level of approximately 5.20m OD to the level of Kings Road of approximately 3.50m OD.

The predicted level in the fluvial River Welland in a 1 in 1000 year event in 2115 is 4.68m OD. If this level increases siphons are activated to spill water onto Cowbit and Crowland Washes. Also water will begin to flood over lower banks around Crowland. Therefore, the risk of any flooding from this source reaching the area of Kings Road is extremely low.

Therefore, this source of flooding can be considered to be adequately mitigated.

3. Flooding from IDB watercourses

The highest predicted water level in Vernatts Drain which is located 1.1km north of the site is 3.79m ODN, which is 210mm below the proposed ground floor level for the new buildings of 4.00m ODN.

Maximum predicted water levels in the IDB catchment controlled by Pode Hole Pumping Station in a 1 in 100 year event in 2115 are below 1.00m OD which is at least 3.0 metres below the proposed ground floor level for the new buildings of 4.00m ODN.

There is a piped IDB drain called “Edward Road Dyke” which provides surface water drainage to the Kings Road area. This drain conveys the surface water westwards to discharge into open channels west of Monks House Lane. In the unlikely event that this drain were to become blocked some sections of Kings Road could suffer flooding but it is highly unlikely that flood water would reach a depth to affect the development site.

Therefore the risk of flooding from IDB channels can be considered to be adequately mitigated.

4. Surface Water Flooding

The road and path level in Kings Road is 3.50m OD. As the recommended finished floor level of the proposed buildings is 500mm above the existing road level then the risk of flooding from surface water 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.

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

Although this site is within Flood Zone 3 according to the initial classification because of the current standards of drainage and flood risk in this part of 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 the 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.

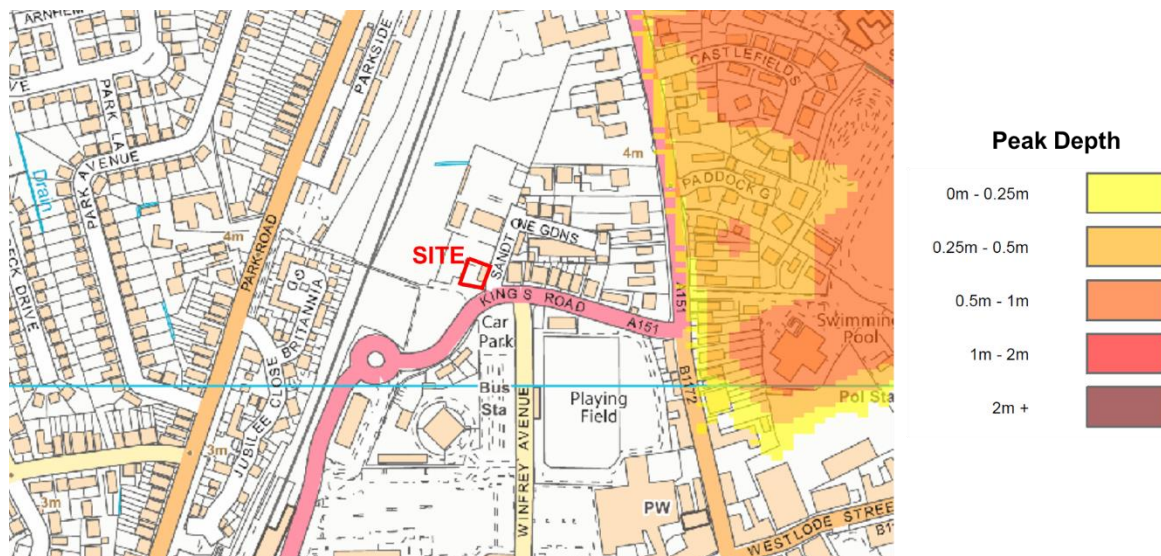
South East Lincs Advice Matrix

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 shows that the matrix reference for this category is “No Comment”.

Summary of Risk of Flooding to the Site

Part of the map in the SFRA of the residual peak depth in 2115 for the 0.1% (1 in 1000 year) event probability in 2115 is shown below and this indicates that there is no predicted flooding in this event in this area on the southern side of the central area of Spalding.



Even in an extreme tidal event with multiple breaches occurring in the west bank of the tidal River Welland it is difficult to foresee flooding occurring at this location, as lower land to the north would flood in preference to the higher central area of Spalding.

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 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 to the area for the 0.1% event possibility in 2015, as shown on the map reproduced above taken from the SHDC SFRA.

The risk of flooding if there is a breach in the tidal defences has been shown to be extremely low.

The risk of flooding from the fluvial section of the River Welland or from any IDB drains has been shown to be adequately mitigated.

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 preferable that a proposed building should be of two storey 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 in this location as the flood risk is low the proposed development of apartments with sleeping accommodation on the ground floor is considered to be satisfactory.

It is assumed that following demolition of the existing building the ground level on the site will be approximately 3.70m ODN. It is recommended that the finished ground floor level of the proposed buildings should be raised approximately 300mm above the existing ground level to a minimum level of 4.00m OD.

All future occupiers of the proposed apartments should register with the Environment Agency's Floodline Warnings Direct Service to receive telephone flood warnings.

Soakaways should be considered initially for the disposal of the surface water from the site. If site investigations indicate that soakaways will not be satisfactory the surface water from the proposed buildings should be discharged into the surface water sewer in Kings Road subject to the agreement of Anglian Water.

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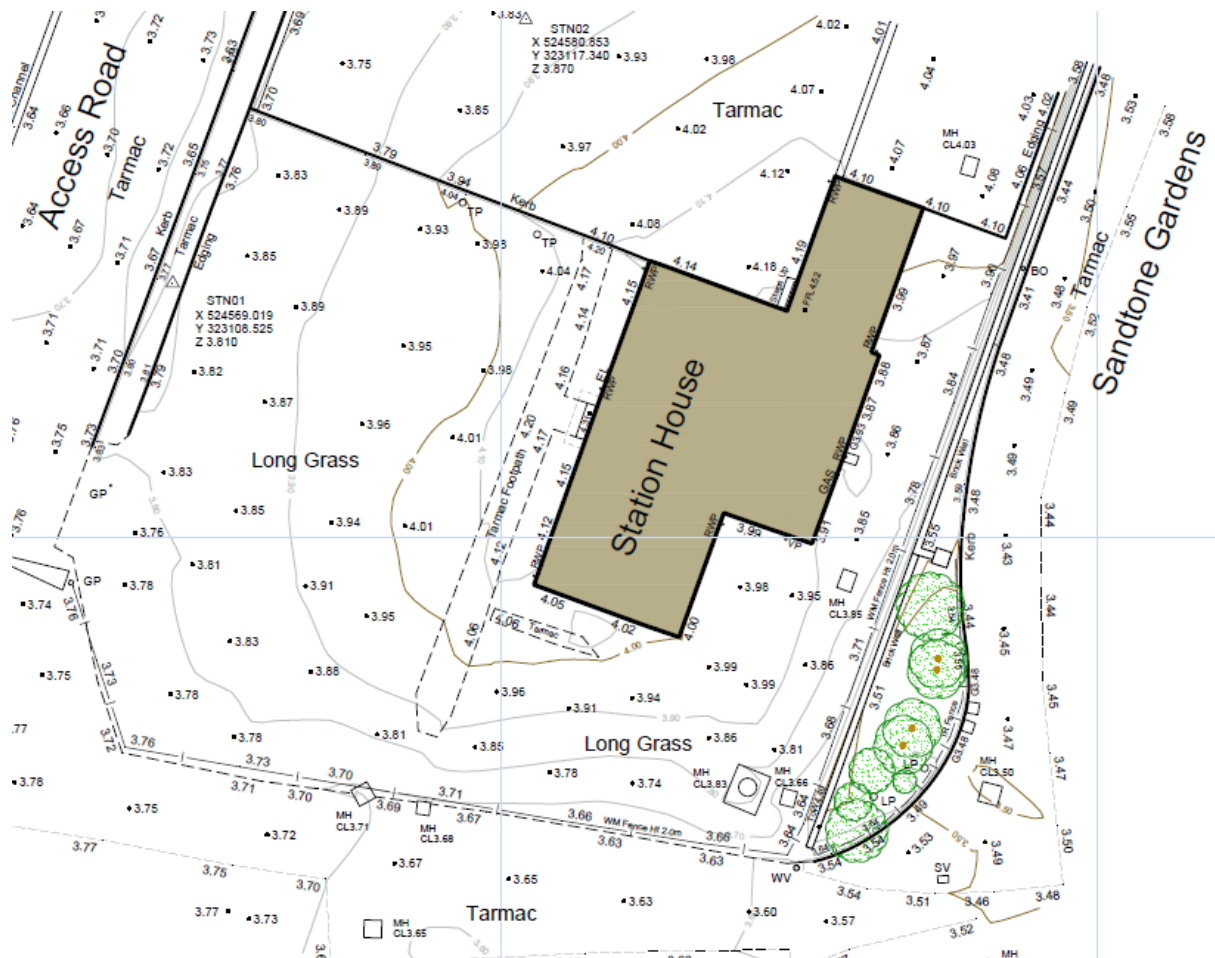
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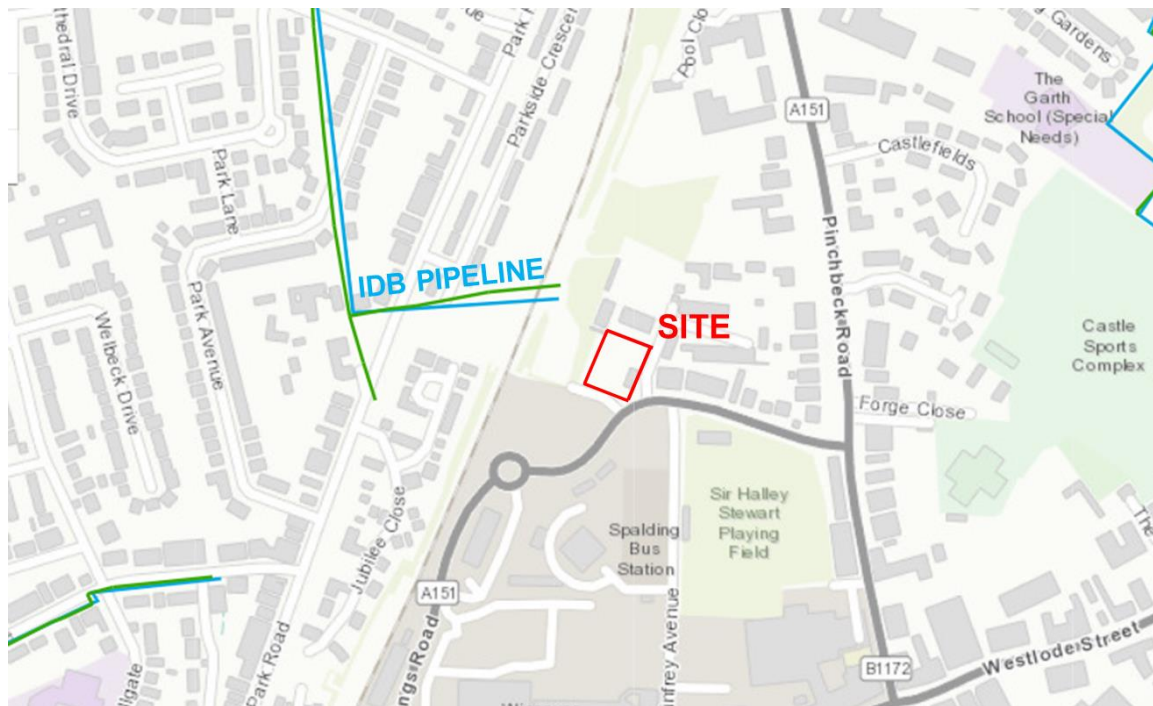
LOCATION PLAN



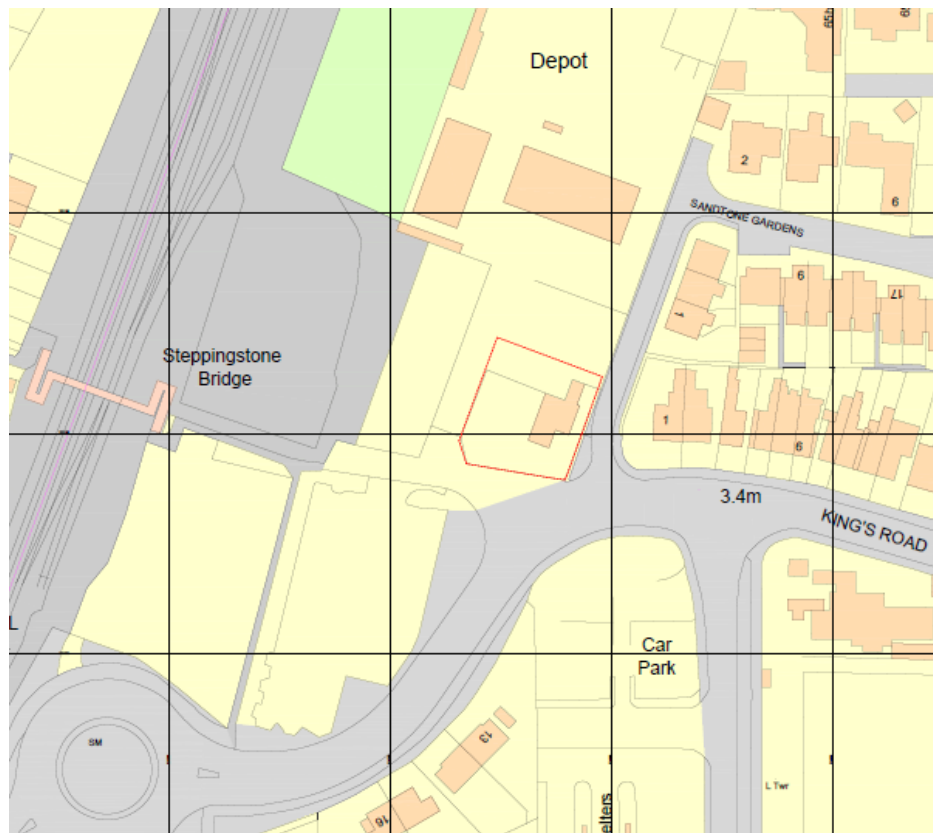
LEVELS ON THE SITE



PLAN OF IDB DRAINAGE CHANNELS AND PIPELINES



SITE 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 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 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 or the 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 west of the tidal 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 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 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 mitigation proposed for the development, with the recommendation that the ground floor level of the proposed buildings should be a minimum level of 4.00m OD is satisfactory.