

PROPOSED DEVELOPMENT AT KINGFISHER NURSERIES,
LONG LANE, GEDNEY HILL, SPALDING, PE12 0PP
FLOOD RISK ASSESSMENT



View looking west to the proposed site of building

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Peterborough,
PE3 9ER

This flood risk assessment has been prepared solely to support the planning application for a development at Kingfisher Nurseries, Long Lane, Gedney Hill. 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

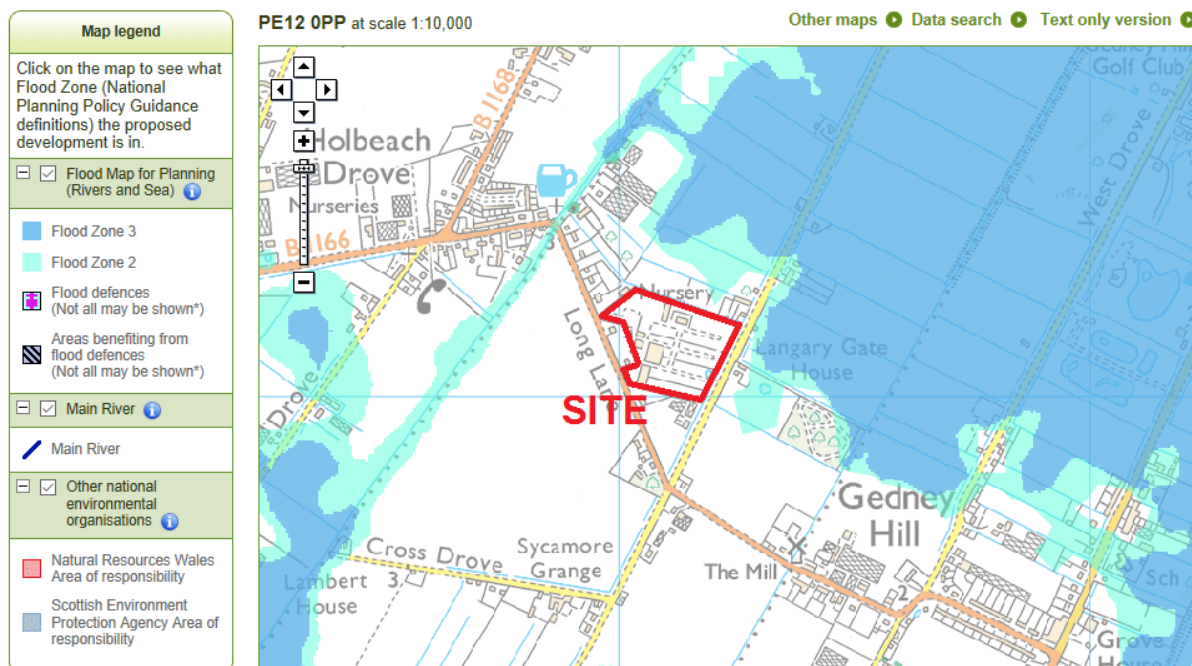
A Planning application is due to be submitted to the South Holland District Council to construct a new industrial building at the Kingfisher Nurseries site at Long Lane, Gedney Hill, Spalding, PE12 0PP.

The site is in Flood Zone 1 as shown on the Environment Agency's Flood Zone map. The flood zone maps do not take into account existing flood defences.

The Planning Application requires a flood risk assessment to be carried out as required in the Technical Guidance to the National Planning Policy Framework Development and Flood Risk. The site is within a defended area as specified in the South Holland District Council's Strategic Flood Risk Assessment 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 this area.



It can be seen that the site is in flood zone 1

Application Site

The site is located 8.3 km from the Barrier Bank, which is the eastern bank of the Cowbit Washes alongside the River Welland) and 12.9km from the tidal defences of the River Nene to the west of the site.

The National Grid Reference of the site is 533113 312109, and the extent of the site is shown on the plan at the end of this document.

Applying the flood risk vulnerability classification in Table 2 of the Guidance, a development consisting of an industrial building is classified as “less vulnerable”.

Table 3 of the Guidance is shown below:

<u>Flood Zones</u>	<u>Flood Risk Vulnerability Classification</u>				
	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 “Less Vulnerable” development is acceptable in Flood zone 1.

Sequential Test

The Planning Practice Guidance advises that development should be guided towards flood zone 1.

The proposed development is located in Flood Zone 1 and therefore can be considered to be a good location for this development, when much of the area around Gedney Hill is within flood zones 2 and 3.

The Planning Practice Guidance advises that when applying the Sequential Test, a pragmatic approach on the availability of alternatives should be taken. For example, in considering planning applications for extensions to existing business premises it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere.

Strategic Flood Risk Assessment

The following information about the flood risk in the location of this development has been sourced from the maps and reports in the South Holland District Council’s Strategic Flood Risk Assessment (SHDC SFRA).

Report Maps

Map 3 shows that site is within flood zone 1.

Map 5 shows that the site is at low or medium risk, but reliant on flood defences for this standard.

Map 6 indicates the peak depth is zero for the present day 1% fluvial and 0.5% tidal event probability.

Map 7 indicates the peak velocity is zero for the present day 1% fluvial and 0.5% tidal event probability.

Map 12 indicates the actual risk is low or medium for the year 2055 1% fluvial and 0.5% tidal event probability.

Map 13 indicates the actual risk is low or medium for the year 2115 1% fluvial and 0.5% tidal event probability.

Map 16 shows that the site is not within a rapid inundation zone.

Flood Maps Table D1

The actual flood hazard for the present day and 2115 is shown as follows:

Depth of flooding..... zero
Extent of flooding..... zero
Velocity nil

The residual flood hazard for the present day and 2115 is shown as follows:

Depth of flooding..... zero
Extent of flooding..... zero
Velocity nil

Maximum flood level and bank levels in the River Nene

The maximum levels in this tidal section of the River Nene 6km east of the site are as follows:

	2007	2115
Peak 1 in 200 year level	5.86	6.20
Peak 1 in 1000 year level	7.00	7.35

The defence level (top of left bank) between South Holland Main Drain and the A17 Bridge are approximately 7.00m OD. However there is a low section adjacent to the bridge itself at a level of 5.95m OD. Levels of the defence north of the A17 bridge are approximately 6.30m OD.

Existing Flood Alleviation Measures

The site is within a defended flood plain, as defined in Appendix 1 of the Environment Agency's "Policy and Practice for the Protection of Flood Plains", which is considered to be passive until such time that a flood greater than the defences can withstand

occurs. The likelihood of flooding occurring due to overtopping or failures of the defences is considered to be very low.

The site is located approximately 12.9 km from the tidal section of the River Nene and 14.5km from the tidal River Welland north of Spalding. The tidal defence banks to both of these are maintained by the Environment Agency.

The major watercourses in the area are maintained by South Holland IDB, which has carried out improvement schemes so that IDB watercourses generally provide at least a 1 in 50 year standard against flooding of agricultural land and aim to provide a 1 in 100 year standard to urban areas.

Existing Ground Levels and Proposed Levels of Buildings

The level in Long Lane just south of the entrance is 2.8m OD and all of the site is level at approximately this level.

Existing Flood Alleviation Measures

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The site is located approximately 12.9 km from the tidal section of the River Nene, which has a tidal defence bank which is maintained by the Environment Agency.

The site is located approximately 14.5 km from the tidal section of the River Welland, which has a tidal defence bank which is maintained by the Environment Agency.

The site is located 8.3 km from the Barrier Bank, which is the eastern bank of the Cowbit Washes alongside the River Welland, and is maintained by the Environment Agency.

There are watercourses in the area that are maintained by South Holland IDB.

Potential Sources of Flooding

The potential sources of flooding to the site are:-

1. Failure or overtopping of tidal defences of the River Welland.
2. Failure or overtopping of tidal defences of the River Nene.
3. Overtopping or breach in the Barrier Bank.
4. Overtopping of the South Holland Main Drain.
5. Overtopping of the North Level New South Eau.
6. Flooding from watercourses maintained by South Holland IDB.
7. Flooding due to excess surface water run off from the development.

1. Failure or overtopping of the tidal defences of the River Welland

The east bank of the tidal River Welland, which is approximately 14.5 km north west of the site, has at least a 1 in 200 year standard of protection. It is not possible even in an extreme event to imagine that flood water from a breach in the River Welland north of the outfall sluice could flow westwards could reach the site in Gedney Hill.

Therefore this source can be discounted.

2. Failure or overtopping of the tidal defences of the River Welland

The west bank of the tidal River Nene, which is approximately 12.9 km east of the site, has at least a 1 in 200 year standard of protection. It is not possible even in an extreme event to imagine that flood water from a breach in the River Nene could flow eastwards and reach the site in Gedney Hill.

Therefore this source can be discounted.

3. Failure or overtopping of the Barrier Bank

The site of the development is 8.3km east of the Barrier Bank, which is the eastern bank of the flood storage area alongside the River Welland. The level of the bank at 7.0km is between 5.80m and 6.10m OD compared with a maximum flood level in the River of 4.75m OD in a 1 in 1000 year event in 2115.

Therefore the risk from this source can be considered to be remote.

4. Overtopping of the South Holland Main Drain

The South Holland Main Drain is 5.6km north of the development site. The normal water level in this watercourse is 0.0m OD and the maximum water level in this watercourse in a 1 in 100 year event is approximately 1.50m OD. Therefore as the proposed floor level of the building is at least 1.3 metres above this than flooding from this source can be considered to be remote.

5. Overtopping of the North Level New South Eau

The site is 3.3km from the North Level New South Eau, which is the main drainage channel in the North Level IDB district that conveys water to Tydd Gote Pumping Station. All of this drainage system, including the New South Eau, is maintained by North Level IDB.

Although the whole of this area is below high tide level and the levels in the rivers, the retained water levels in the drainage channels ensure that the risk of flooding is extremely low. North Level IDB control the water levels in the Main Drain with a large pumping station at Tydd Gote where there are both electrically and diesel driven pumps.

North Level IDB has provided the following information on maximum design levels and 1 in 100 year levels for the Main Drain and the New South Eau:

Maximum Design Water Levels:

Tydd Pumping Station	-1.65m OD
Clough Cross	-1.0m OD
French Drove Old Pumping Station	-0.75m OD

Predicted Present Day Maximum 1 in 100 Year Water Levels:

Clough Cross	-0.05m OD
French Drove Old Pumping Station	0.25m OD
Nene Terrace	0.28m OD

Predicted Maximum 1 in 100 Year Water Levels with 20% increase in flows for climate change:

Clough Cross	0.08m OD
French Drove Old Pumping Station	0.39m OD
Nene Terrace	0.42m OD

As long as funding arrangements continue as present North Level IDB will continue to model trends in climate change and if required install additional pumping capacity, or provide storage solutions over the next 100 years to ensure the standard of service is kept at the same level as present.

North Level IDB have a policy of monitoring standards of protection in all their catchments and will carry out improvements to pumping stations, sluices and drainage channels to ensure they continue to provide satisfactory standards of protection with higher run-offs predicted with climate change.

It is unlikely that any failure of assets such as pumping stations, sluices or drainage channels would lead to overtopping of the watercourse because North Level IDB have an excellent maintenance regime and monitor all assets with a modern telemetry system.

It can be seen that the maximum predicted water level at Nene Terrace with 20% increase in flows for climate change is 2.4 metres below the proposed floor level of the new building and therefore the risk of flooding from this source can be considered to be remote.

6. Flooding from IDB watercourses

The drain, called E13 Drury's Drain – South, alongside Langary Gate Road on the eastern boundary of the development site flows in a northerly direction and discharges into larger drains where the water level is controlled by Fleet Fen Pumping station which is approximately 5km north of the site.

The South Holland IDB drains have been designed to a 1 in 10 year standard with a freeboard of between 800mm and 1.0 metres. This generally provides a standard of at least 1 in 50 years for flooding of the lowest land. Much of the land in the catchment is approximately 2.00m OD and therefore even if the pumps fail to operate for a

considerable time during a significant rainfall event the development site in Gedney Hill would be most unlikely to flood.

Therefore the risk of flooding from the main IDB system can be considered to be remote.

7. Flooding due to excess surface water run off from the development

As most of the site is set out in plots growing nursery plants any excess surface water on the site is likely to soak away into the soil. If any significant volume of water accumulated on the site it would flow into the IDB drain alongside Langary Gate Road.

Therefore the risk from this source can be considered to be remote.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of the site or any of the adjoining properties being flooded.

Probabilities and Trends of Flooding

The probability of this development flooding from Environment Agency main river is very low. In an extreme event any effect on this location would not be sudden and there would be time for residents to take precautionary measures to limit the impact of any flooding that may occur.

Residual Risk – Extreme Events

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

The 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 this FRA. The effects of these new recommendations are considered in Appendix A of this report (pages 12 to 15). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

Conclusions

The maps in the SFRA do not predict any flooding to any part of the area around Gedney Hill in a 1 in 100 year fluvial event or a 1 in 200 year tidal event in 2115.

The risk of flooding from IDB drains can be considered low, because the ground levels on the site are 2.8 metres above the normal level of the major IDB drains in the area.

The proposed development is not in a functional flood plain as defined by PPS 25.

As most of the site is in flood zone 1, the risk of the site flooding from any Environment Agency or IDB watercourse is extremely low.

Recommendations

The ground floor level of the building should be raised if possible slightly above the existing ground level on the site. However it is recognised that the developer needs to cater for fork lift trucks entering and leaving the building for loading vehicles.

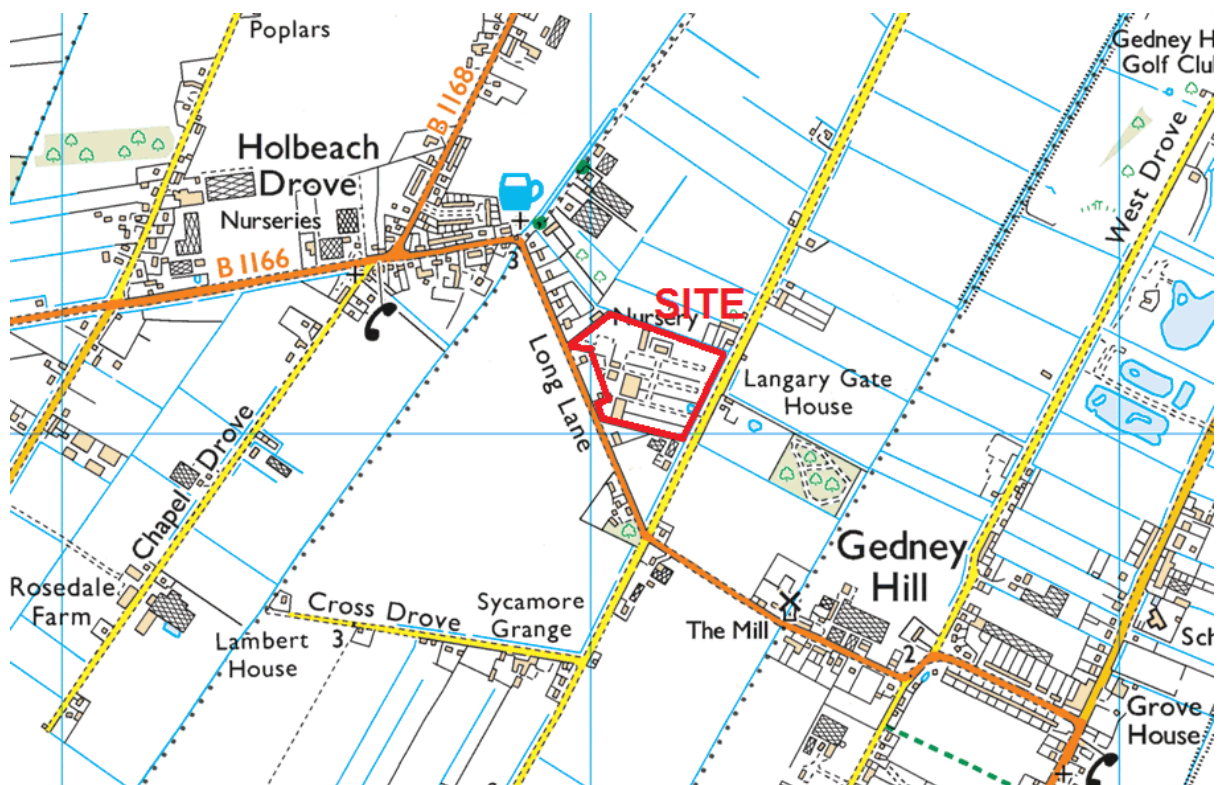
The surface water drainage from the new building will be discharged into a new storage lagoon which will be located in the north eastern corner of the site. Excess surface water will be discharged at a low rate into the South Holland IDB drain on the eastern boundary subject to the agreement of the South Holland IDB.

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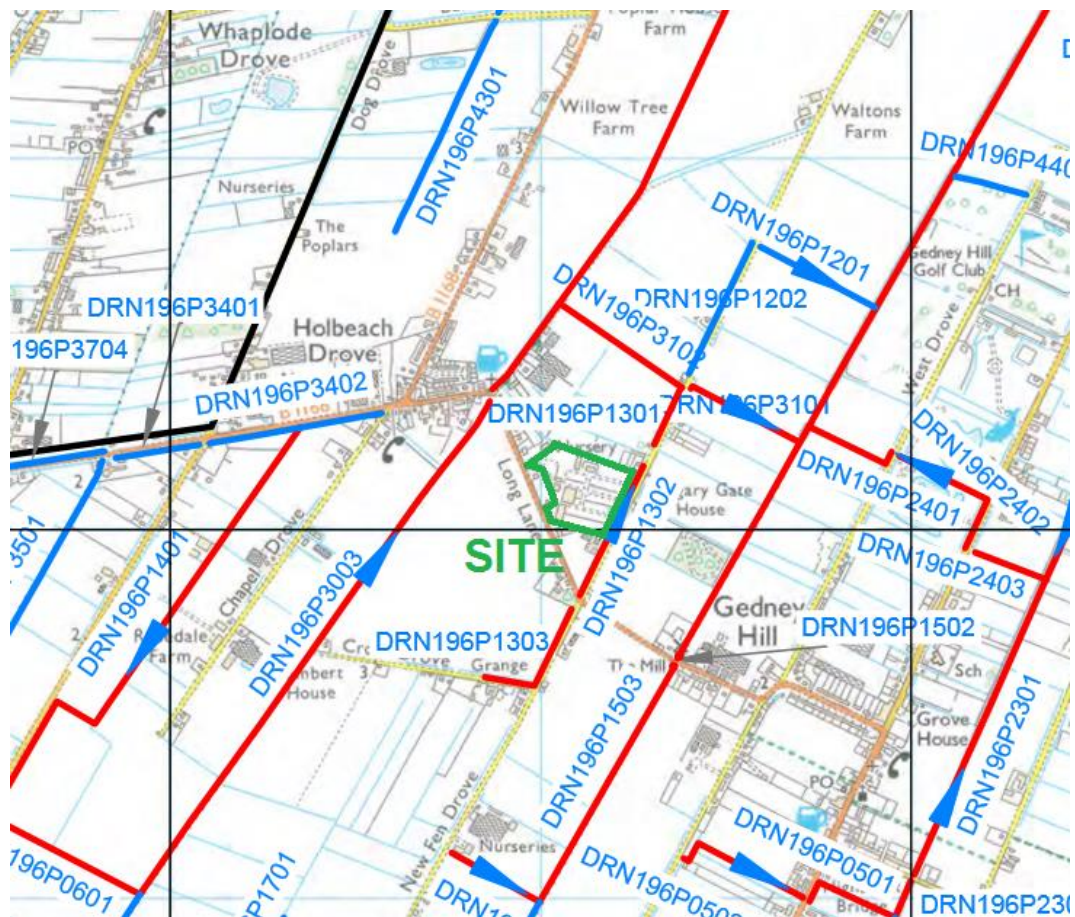
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10th April 2017

LOCATION PLAN



PLAN OF IDB DRAINS



LOCATION OF PROPOSED BUILDING



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)

<u>Area of England</u>	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 SFRA does not predict any flooding in a 1 in 200 year tidal event or a 1 in 100 year fluvial event in 2115 in this area of Gedney Hill. The risk of flooding from tidal watercourses has been discounted and a small increase of approximately 100mm in the allowance for peak tidal levels will not make any difference to this conclusion. It has been established that if the Barrier Bank were to breach when the flood level was the same maximum water level as the River Welland then there is a remote risk of the development site being subject to flooding. There is a minor risk of flooding to the site from the IDB drainage system. The two sources of fluvial flooding will be considered below to establish whether the new climate change guidelines will affect the conclusions in the main part of the report.

1) Fluvial Flooding from the River Welland.

As the development is in flood zone 3 and is classed as less vulnerable, the advice from the Environment Agency is that the central climate change allowance, which is 25%, should be considered. After considering the effects of this increase the higher central allowance, which is 35%, 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 guidance. If flows increase by between 25% and 35% in this river systems it will have the effect of increased flooding over the long sections of bank between Market Deeping and Spalding and the maximum levels in the River downstream of Crowland will not increase significantly, and the maximum level in the Cowbit Washes are not likely to increase above 5.05m OD.

2) Flooding from the IDB drainage system.

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 and North Level 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 and North Level IDB will continue to review the modelling they have already carried out and when these Boards consider these refurbishments adequate arrangements will be made to incorporate the latest climate change projections in order that the Boards continue 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 levels should be raised if possible by least 150mm above the existing ground level is satisfactory.