

**PROPOSED STABLE BLOCK AT COPELADE LODGE, LITTLE
LANE, WHAPLODE, SPALDING, PE12 6RU**
FLOOD RISK ASSESSMENT



View of site

S M Hemmings B Sc C Eng MICE MIWEM,
13 Lea Gardens,
Peterborough,
PE3 6BY

This flood risk assessment has been prepared solely to support the planning application for a residential development at Copelade Lodge, Little Lane, Whaplode. 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

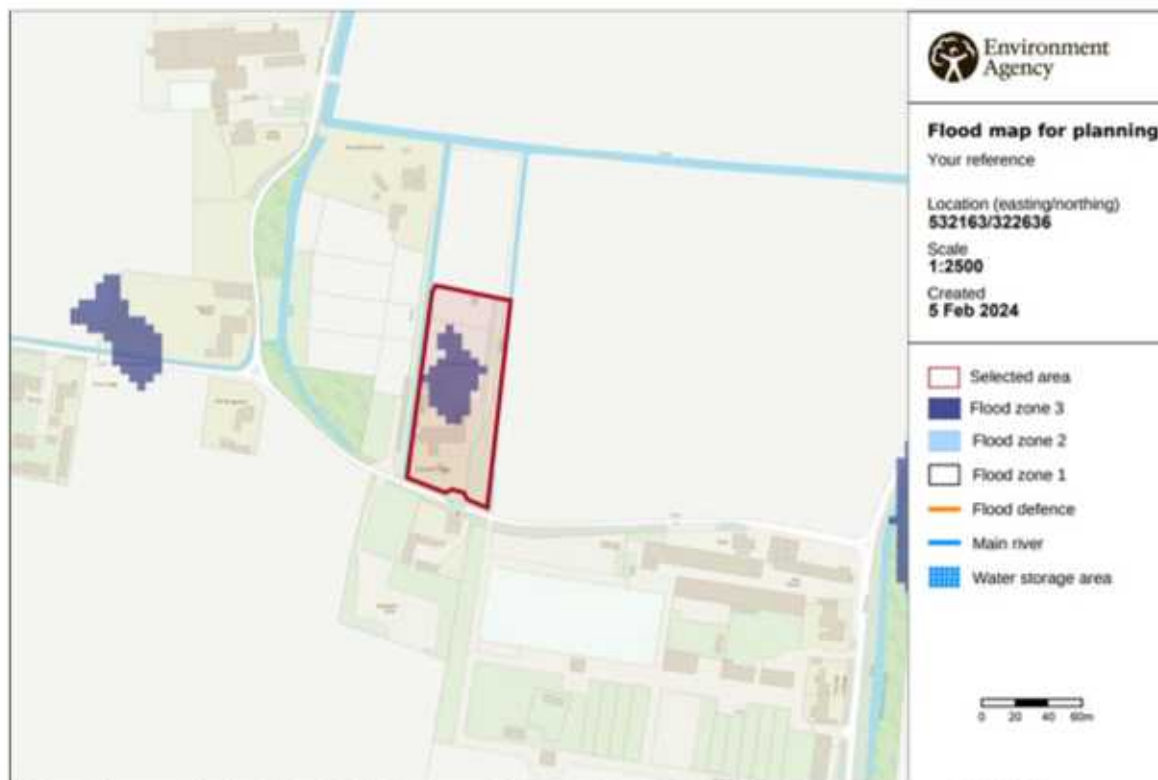
A planning application is due to be submitted to South Holland District Council for permission to construct a stable block north of the property named Copelade Lodge, Little Lane, Whaplode, Spalding, PE12 6RU. The proposed site of the stable is on the north east corner of the grass paddock north of the house.

The site of the stable block is within Flood Zone 1 as shown on the Environment Agency's Flood Zone Map. These maps do not take into account existing flood defences.

The Planning Authority have requested a Flood Risk Assessment should be written to accompany this planning application. 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 central area of this site is shown to be within flood zone 3, and the external areas around the boundary are shown to be within flood zone 1. All of the surrounding area, except for another small area to the west is shown to be within flood zone 1.

Application Site

The development is located on the eastern side of the River Welland. The National Grid Reference of the site is 532163 322635.

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

As the part of the field in which the stable block is to be located is within flood zone 3 is within a defended area this area can be categorised as within Flood Zone 3(a) as detailed on the Environment Agency's flood zone maps without defences, as defined in Table 1 of the Technical Guidance.

Applying the flood risk vulnerability classification in Table 2 of the Guidance, a stable 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 satisfactory in flood zone 1 and flood zone 3(a).

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 stable is to be placed in a field where horses will be kept it is not possible to locate the stable at an alternative location. Although part of the field is designated to be within flood zone 3(a) the stable itself is within flood zone 1.

Therefore it is considered that the sequential test is passed.

Strategic Flood Risk Assessment

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

For the present day	Depth of flooding ... zero
	Extent of flooding .. Low or medium
	Velocity zero
For year 2115	Depth of flooding ... zero
	Extent of flooding .. Low or medium
	Peak Velocity zero

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
	Hazard zero
	Velocity zero
For the year 2115	Depth of flooding .. zero
	Extent of flooding ...low or medium
	Hazard zero
	Velocity zero

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

Maximum flood level and bank levels in the Fluvial Section of the River Welland

The maximum levels in this fluvial section of the River Welland 9.0km west of the site are as follows:

	2007	2115
Peak 1 in 200 year level	4.65m OD	4.74m OD
Peak 1 in 1000 year level	4.67m OD	4.74m OD

The defence level (top of Barrier Bank) at chainage 6.8km is between 5.80m and 6.10m OD.

Maximum flood level and bank levels in the Tidal Section of the River Welland

Tables in the SFRA show the following details of the defence bank on the east side of the tidal section of the River Welland north of the A16 road bridge and 2.7km west of the development site, between chainage 19.8km and 20.8km.

	2007	2055	2115
Peak 1 in 200 year extreme tide level	5.98m OD	6.31m OD	7.12m OD
Peak 1 in 1,000 year extreme tide level	6.27m OD	6.60m OD	7.41m OD

With an average defence crest level between 7.80 and 7.90 m OD the freeboards are as follows:

	2007	2055	2115
Peak 1 in 200 year freeboard	1870mm	1540mm	730mm
Peak 1 in 1,000 year freeboard	1580mm	1250mm	440mm

Maximum flood level and bank levels in the Coronation Channel

Tables in the SFRA show the following details for the defence bank on the east side of the Coronation Channel at chainage 1.5 km which is 2.7km west of the site.

	2007	2115
Peak 1 in 100 year flood level	4.34m OD	4.69m OD
Peak 1 in 1,000 year flood level	4.37m OD	4.69m OD

The bank levels on this section vary between 5.50m OD and 6.0m OD. Therefore it can be seen there is a minimum freeboard of 800mm to the predicted design maximum levels in 2115.

Information on Surface Water Flooding on Environment Agency Website

The map below shows areas around the site where there is a low risk of surface water flooding.



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 the map predicts up to 300mm of flooding on the site of the stable but between 300mm and 900mm in the centre of field.

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 7.8 km from the Barrier Bank on the eastern side of the Cowbit Washes.

The site is located approximately 6.1 km from the nearest tidal section of the River Welland north of Spalding, which is maintained by the Environment Agency.

The site is located approximately 15.1 km from the tidal section of the River Nene, which is maintained by the Environment Agency.

The site is located approximately 6.1 km from the Coronation Channel, which is maintained by the Environment Agency.

The site is located approximately 3.0km north of the South Holland Main Drain, which is maintained by South Holland IDB.

The main watercourses in this area south of Whaplode are maintained by South Holland IDB.

Existing Ground Levels

The level of the field is approximately 3.00m ODN,

The water level in this section of the Little South Holland Drain on the north side of Ravens Bank is normally retained at approximately 0.0m ODN.

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 fluvial defences of the River Welland (Barrier Bank).
3. Failure or overtopping of tidal defences of the River Nene.
4. Failure or overtopping of banks of the Coronation Channel
5. High water levels in IDB drainage channels.
6. Localised surface water flooding.

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

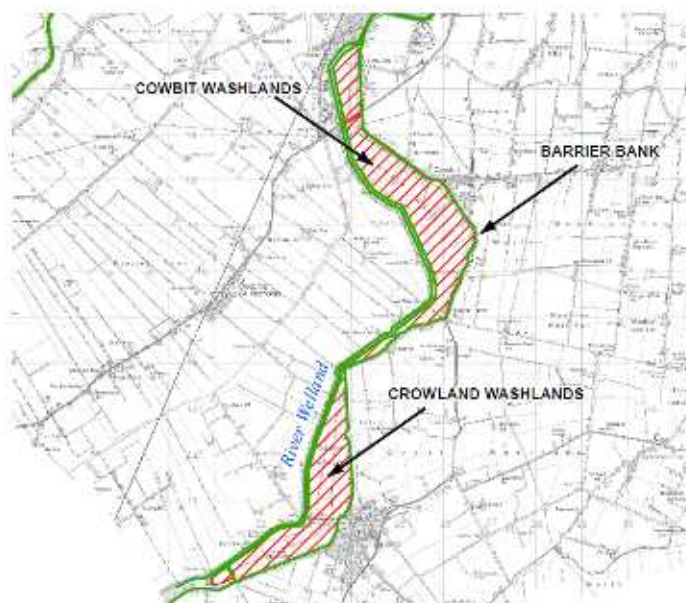
The east bank of the tidal section of the River Welland is approximately 6.1 km north west of the site of the proposed development.

The maps available on the South East Lincolnshire Local Plan website show that there is no predicted risk of flooding in this area south of Whaplode in a 1 in 200 year event in 2115.

Therefore there is adequate mitigation against the risk of flooding from this source.

2. Overtopping of the Barrier Bank.

The section of the River Welland from south of Crowland to the southern outskirts of Spalding has two washlands located on the east side of the River, called Crowland Washlands and Cowbit Washlands. These areas are designed to alleviate very high water levels in the River Welland. When the water level in the River Welland reaches a level of approximately 5.00m OD large syphons are activated which discharge excess water onto the Washes. The Barrier Bank is located on the east side of the Washes to contain the water in the Washlands and is the main flood defence bank on the east side of the river.



The Washes are only flooded in extreme conditions (around 1 in 50 years) and are used the rest of the time as agricultural land. If a breach occurred in the Barrier Bank in this scenario then flood water would flow eastwards towards the proposed development.

The risk of flooding from this source, as the site is 7.8km from the Barrier Bank, can be considered to be very low. The maps available on the South East Lincolnshire Local Plan website show that there is no predicted risk of flooding in this area south of Whaplode in a 1 in 200 year event in 2115.

Therefore there is adequate mitigation against the risk of flooding from this source.

3. Failure or overtopping of tidal defences of the River Nene

The west bank of the River Nene is approximately 15.1 km east of the site of the proposed development.

The maps available on the South East Lincolnshire Local Plan website show that there is no predicted risk of flooding in the area south of Whaplode in a 1 in 200 year event in 2115.

Therefore there is adequate mitigation against the risk of flooding from this source.

4. Failure or overtopping of the banks of the Coronation Channel

The SFRA states that the maximum design level in the Coronation Channel is 4.69m OD. The minimum crest level of the east bank of the Channel is 5.14m OD, which gives a minimum freeboard of 450mm. However, generally there is a freeboard of 600 mm along this bank of the Channel.

If the Channel were to breach water would flow eastwards towards the site. However, it would be retained for a short time by the A16 which is higher than the surrounding land.

With the site being 6.1 km from the Coronation Channel the risk from this source can be considered to be low and therefore there is adequate mitigation against the risk of flooding from this source.

5. High Water Levels in IDB drains

Although the whole of this area is below high tide level in the Wash and the River Welland, the retained water levels in the drainage channels ensure that the risk of flooding is extremely low. South Holland IDB maintains a system of sluices, pumping stations, and drainage channels which convey surface water into the River Welland, the River Nene and the Wash and control water levels throughout the South Holland IDB area.

There is an IDB watercourse to the north of the site which flows eastwards into the watercourse called "Whaplode River". This flows southwards to the Little South Holland Drain, which is the main drainage channel in the catchment. The level in this watercourse is controlled by Little Holland Pumping Station which pumps the water into the South Holland Main Drain. The water level in this drain is controlled by a sluice alongside Nene Way 1.5km south of Sutton Bridge, where the water discharges into the tidal River Nene at low tide.

There are possibilities of failure of outfall sluices, but these are mitigated by the high level of maintenance given to these structures by the IDB. If a failure did occur the IDB would immediately be warned of the problem by their telemetry system and take action to repair the fault or to bring in temporary pumps to reduce the risk of any flooding in the area. Similarly any failures of culverts or other blockages would be dealt with immediately.

IDB systems are designed to provide a freeboard of between 600mm and 1000mm to all land in a 1 in 10 year return period rainfall event. This normally provides a standard of service of between 1 in 50 years and 1 in 100 years against flooding. In an extreme event water levels will rise but this will be a slow process and it would be at least 24 hours before levels were high enough to begin to flood low land in the area.

South Holland 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 South Holland IDB have an excellent maintenance regime and monitor all assets with a modern telemetry system.

Therefore there is adequate mitigation against the risk of flooding from this source.

6. Localised Flooding due to failure of local drainage systems

The maps on the Environment Agency website predict up to 300mm of surface water flooding could occur on the proposed site of the stable. After an inspection of the site it can be concluded that the level of the centre of the field is higher than the level around the perimeter of the field. In addition to this there is a dyke on each side of the site and each of these flow northwards into the IDB drain to the north of the site.

The inspection of the site was carried out on 15th February 2024 after a particularly wet few months which has left areas of standing water in many of the fields in the area. There was no sign of any standing water on this paddock.

Therefore the risk of the depths of surface water flooding predicted on the Environment Agency map is very low.

Therefore there is adequate mitigation against the risk of flooding from this source.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of this field or any of the adjoining land having been flooded in the past fifty years.

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 people on the site to make arrangements to protect the dwelling and 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 predictions of flood depths for this flood risk assessment use information provided by the Environment Agency which was produced in 2006. The EA have issued new guidance on recommended contingency allowances for predicted sea level 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

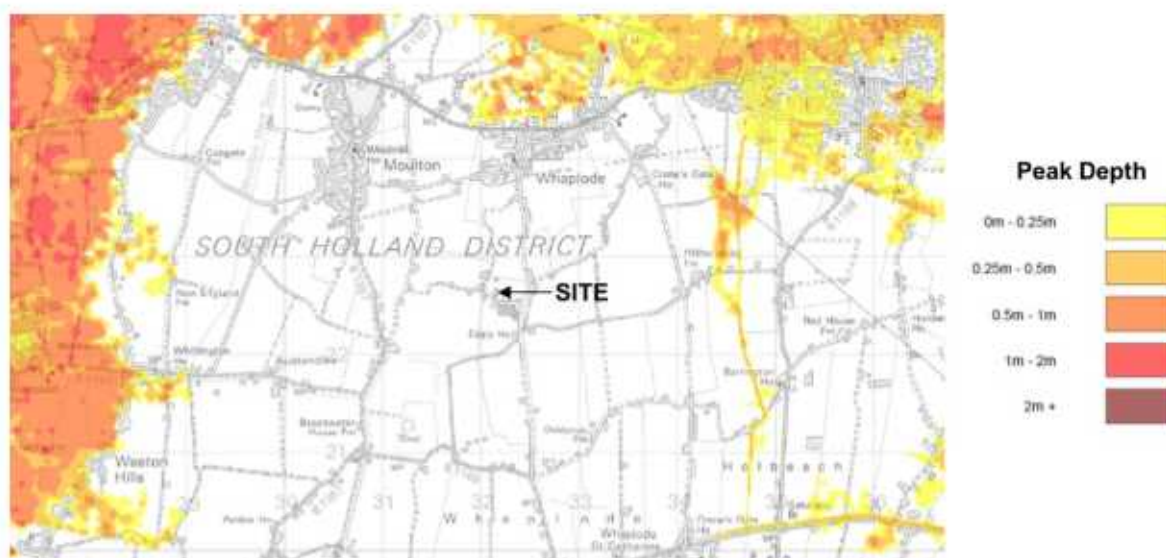
Advice can be found on the recommended mitigation required by referring to a spreadsheet on the South East Lincolnshire website.

As the proposed development is in flood zone 1 and there is no flood hazard reference should be made to Category H4 which states "No Comment"

Summary of Risk of Flooding to the Site

The main risk of flooding to the site is if a breach were to occur in the east bank of the tidal River Welland. The risk of this happening along this section of bank can be considered to be low. The bank has a wide top and bank slopes are not steep.

The relevant part of the map showing the predicted peak depths in this area if a breach occurred in either the east bank of the River Welland in 2115 in a 0.5% tidal event probability or a breach occurred in the Barrier Bank of the River Welland in a 1.0% fluvial event is shown below.



It can be seen that there is no predicted flooding in a large area south of Whaplode in a 1 in 100 year fluvial event or a 1 in 200 year tidal event in 2115. Detailed maps available for the Whaplode and Holbeach area show that there is only a small increase in the extent and predicted depth of flooding in a 1 in 1000 year event in 2115 when compared with the map above. Therefore it can be concluded that there is no predicted risk of flooding in a 1 in 1000 year event on this site.

The risk of flooding from high water levels in the IDB system is extremely low.

Although the Environment Agency map of surface water flooding predicts that there could be flooding on this site an inspection has shown that the level of the centre of the field is higher than the level around the perimeter of the field. There is a dyke on

each side of the site and each of these flow northwards into the IDB site to the north of the site.

The inspection of the site was carried out on 15th February 2024 after a particularly wet few months which has left areas of standing water in many of the fields in the area. Therefore it is concluded that the risk of surface water is extremely low.

Recommendations

As there is no predicted fluvial or tidal flood risk in this area and the equestrian centre is classed as less vulnerable it is recommended that the floor of the stable block should be raised a minimum of 100mm above the existing ground level and the proposed level of the any proposed hardstandings outside to reduce the risk of flooding from surface water standing on the site.

The owners of the site should register with the Environment Agency's Floodline Warnings Direct Service.

Surface water from the roofs of the proposed stable block should be discharged into a soakaway.

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19th February 2024

LOCATION PLAN



PLAN OF IDB DRAINS



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 less vulnerable development in flood zone 3(a) the central and the higher central allowances should be used to assess the risk.

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

1) Flooding from Tidal River Welland

The FRA has identified the first source of flooding where the new climate change recommendations could affect the predictions of flood levels in 2115 at the development site is flooding from the tidal River Welland or River Nene.

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 will not have the effect of increasing the predicted flood level at the site in a 1 in 200 year breach event in 2115 by the maximum of 100mm, but it will probably be only between 10mm and 50mm. It is unlikely that this

increase will significantly change the maps of flood risk at present issued by the Environment Agency that are available on the South East Lincolnshire website.

2) Flooding from Coronation Channel, Barrier Bank and the IDB drainage system

As the development is in flood zone 1 and is classed as less vulnerable, the central climate change allowance, which is 25%, should firstly be considered. After considering the effects of this increase the higher central, which is 35%, 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 25% and 35% will not significantly change the conclusion in the SFRA of what might happen if a breach occurred in the bank of the Coronation Channel. If there are additional flows along the Coronation Channel and 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.

South Holland IDB, and all IDB's, are aware that climate change will affect the operations of pumping stations, sluices and drainage channels. Pumping stations and sluices only have a 30 year life and will need to be refurbished or rebuilt within this timespan. It is assumed that South Holland IDB will continue to review the modelling they have already carried out and when the Board consider these refurbishments adequate arrangements will be made to incorporate the latest climate change projections in order that the Board continues to provide the same standard of service as the present day.

Therefore it is considered that the mitigation proposed for the development, with the recommendation that the floor level of the proposed stable should be raised a minimum of 100mm above the existing ground level, is satisfactory.