

**EXISTING STATIC CARAVANS AT THE ROSE AND CROWN, LOW
ROAD, HOLBEACH HURN, HOLBEACH, SPALDING, PE12 8JN**
FLOOD RISK ASSESSMENT



View of southern part 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 assess the flood risk of the static caravans at the Rose and Crown Caravan Park at Low Road, Holbeach Hurn. 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

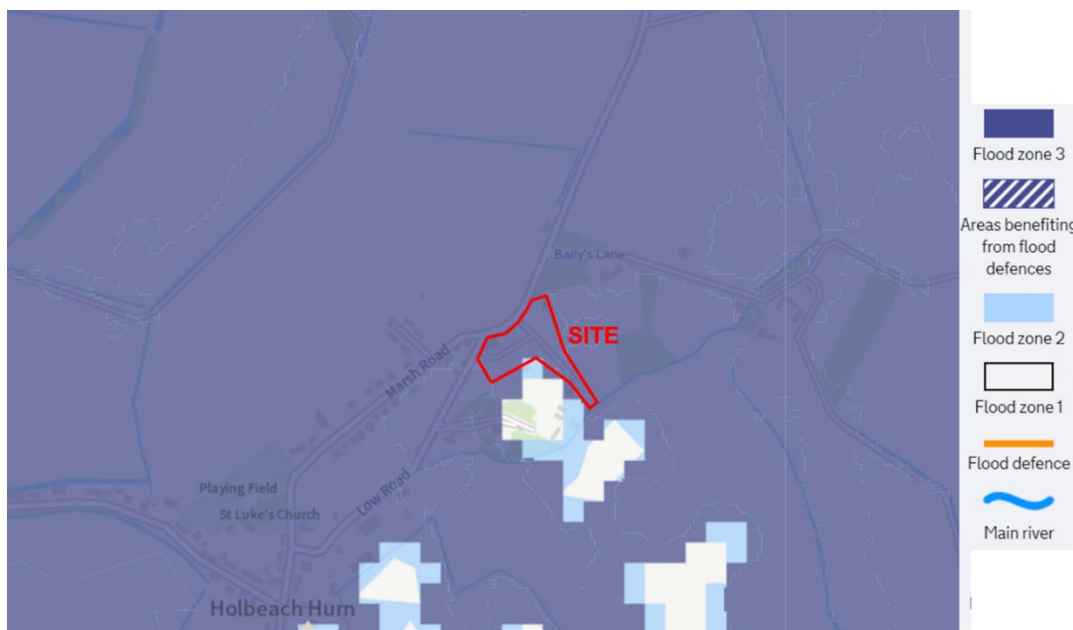
This flood risk assessment has been prepared to assess the flood risk to the existing twelve static caravans at the caravan site east of the Rose and Crown, Low Road, Holbeach Hurn, near Holbeach. The site is on the north side of the village of Holbeach Hurn.

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.

Planning Applications require 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 this area on the north side of Holbeach Hurn is designated on the above map to be in Flood Zone 3.

Application Site

The development is located west of the tidal River Nene, south of the Wash banks and east of the tidal River Welland. The National Grid Reference of the site is 539610 327340.

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

As the site is within a defended area the caravan site can be considered to be 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.

There are two flood risk vulnerability classifications for static caravans in Table 2 of the Guidance.

If the caravans are intended for permanent residential use then they should be classified as “highly vulnerable”.

If the caravans are used for holiday or short term lets then they can be classified as “more vulnerable” subject to a specific warning and evacuation plan.

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 both “more vulnerable” developments are acceptable in flood zone 3(a), subject to the exception test but highly vulnerable development is not considered to be acceptable.

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.

It can be seen that the caravans are already located on the site and the locations cannot be changed.

The guidance gives the following advice where an alternative location is not possible, which can be also applied to developments such as these:

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. For nationally or regionally important infrastructure the area of search to which the Sequential Test could be applied will be wider than the local planning authority boundary.

The proposed development complies with all South Holland District Council's planning policies on encouraging businesses such as these to expand in the rural environment.

Therefore I consider that the sequential test has been 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 Nil
For year 2115	Depth of flooding ... zero
	Extent of flooding .. Low or Medium
	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 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 flooding0 – 250mm
	Extent of flooding ...high
	Hazard 0 – 0.75 (low hazard
	Velocity 0 – 0.3 m/sec

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 River Nene

The maximum levels in this tidal section of the River Nene approximately 9km east of the site are as follows:

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

The defence level (top of left bank) between South Holland Main Drain and the A17 Bridge is 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.

Maximum flood level and bank levels in the River Welland

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

	2007	2115
Peak 1 in 200 year level	5.99m OD	7.13m OD
Peak 1 in 1000 year level	6.32m OD	7.46m OD

The defence level (top of right bank) east of the Fosdyke (A17) Bridge is between 7.50m and 7.70m OD.

Maximum flood level and bank levels in the Wash

Tables in the SFRA show the following details of the defence bank of the Wash at chainage 12.0km, which is 8.2 km north of the site.

	2007	2055	2115
Peak 1 in 200 year extreme tide level	5.98m OD	6.24m OD	7.05m OD
Peak 1 in 1,000 year extreme tide level	6.32m OD	6.65m OD	7.46m OD

The crest levels of the defences, which are earth banks along this length, vary between 7.68 and 7.88 m OD. With a minimum crest level of 7.68m OD the freeboards are as follows:

	2007	2055	2115
Peak 1 in 200 year freeboard	1700mm	1440mm	630mm
Peak 1 in 1,000 year freeboard	1360mm	1030mm	220mm

Information from Environment Agency

The Environment Agency has produced mapping which shows the maximum hazard, depth and velocity predicted following breaching of any of the tidal defences. The EA have stated that the site would not be affected by overtopping of the defences.

The maps of breaching show the following predictions for hazard, maximum depth and maximum velocity at the development site:

	Maximum Hazard	Maximum Depth	Maximum Velocity
1 in 1000 year in 2006	none	zero	zero
1 in 200 year in 2115	0 – 1.25	0 – 500mm	0 – 0.3m/sec
1 in 1000 year in 2115	0 – 1.25	0 – 500mm	0 – 0.3m/sec

The maps supplied by the Environment Agency are reproduced on pages 13 – 15 of this report.

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 9.0 km from the tidal section of the River Welland to the north west, which is maintained by the Environment Agency.

The site is located approximately 9.0 km from the tidal section of the River Nene at Sutton Bridge, which is maintained by the Environment Agency.

The site is located approximately 8.2 km from the Wash banks north of Holbeach St Matthew, which are maintained by the Environment Agency.

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

Existing Floor Level of Static Caravans and Ground Levels

Caravan	Floor Level (m ODN)	Ground Level (m ODN)
1	5.70	5.04
2	5.40	4.80
3	5.36	4.61
4	5.40	4.83
5	4.23	3.58
6	4.28	3.60
7	4.35	3.60
8	4.06	3.46
9	4.02	3.37
10	4.10	3.53
11	4.20	3.66
12	4.17	4.02

The level of the road outside the entrance from Marsh Road is 4.10m ODN. The site entrance road rises to a level of 4.46m ODN at the intersection with the alternative entrance road to the west, then falls to a level of 3.37m ODN near caravan No 9.

The land level around caravans 1, 2,3 and 4 is higher with levels of between 4.60m and 5.00m ODN.

Potential Sources of Flooding

The potential sources of flooding to the site are:-

1. Failure or overtopping of tidal defences.
2. High water levels in IDB drainage channels.

1. Failure or overtopping of tidal defences.

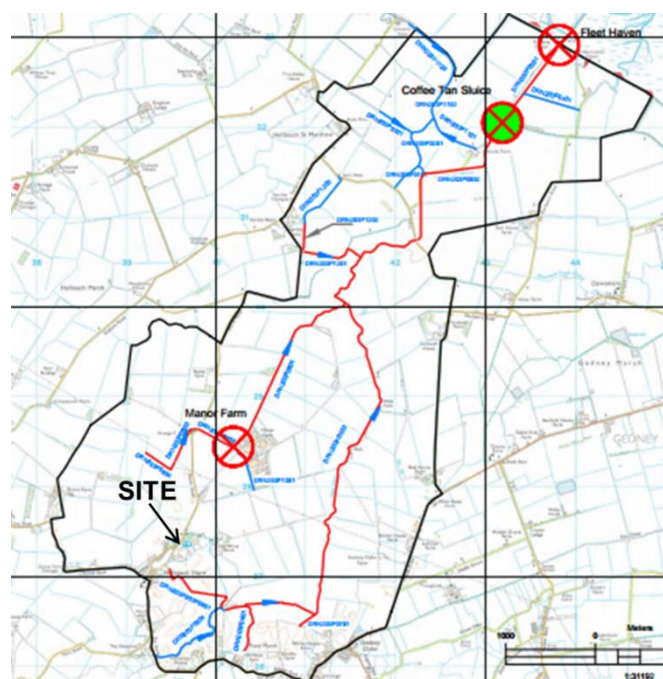
The Wash Bank is approximately 8.2km north of the site, the tidal River Welland is 9.0km west of the site and the River Nene is approximately 9.0 km east of the site of the proposed development. The hazard from a breach of one of these tidal banks will be considered to be the major risk to the site.

The maps in the SFRA and the information provided by the Environment Agency does not predict any flooding in a 1 in 1000 year event in 2115.

2. High Water Levels in IDB drains

Although the whole of this area is below high tide level in the Wash and the River Nene, 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 Nene and the wash and control water levels throughout the South Holland IDB area.

A map of the catchment area of Fleet Haven is shown below.



The caravan site is on the southern end of the Fleet Haven Catchment of South Holland IDB and the drainage of this catchment flows northwards to Fleet Haven Pumping Station, which controls the water levels in this area by discharging the flow into the Wash. There are no IDB drains around the boundary of the caravan park, probably because the level of most of the land is around 5.00m OD. The nearest IDB drain is located through lower land south of the site which then flows northwards to the pumping station which is 6.8km north of the site. All of the IDB drains flowing from Holbeach Hurn to the pumping station are designated “high priority” for maintenance.

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, and after this the level of the flood water would need to rise another 1.0 metre before the development site would be affected.

Therefore the risk of flooding from IDB drainage channels can be considered to be extremely low.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of the site or any of the adjoining properties having been flooded in the past.

Probabilities and Trends of Flooding

The probability of this development flooding from a failure in the tidal defences maintained by the Environment Agency can be considered to be remote. Even in an extreme event farm land in the area would be flooded before the campsite area would be affected.

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 remote.

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 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 determine the adequacy of the plan.

As the development is in flood zone 3(a) and there is a predicted flood hazard of 0.75 – 1.25 on parts of the site reference should be made to Category E8 which gives the following recommended mitigation:

The NPPF requires that the proposal is accompanied by a Flood Risk Assessment which contains evidence that appropriate mitigation measures / flood resilience techniques have been incorporated into the development.

The applicant is advised to refer to the following document for information on flood resilience and resistance techniques to be included “Improving Flood Performance of New Buildings – Flood Resilient Construction (DCLG 2007)”

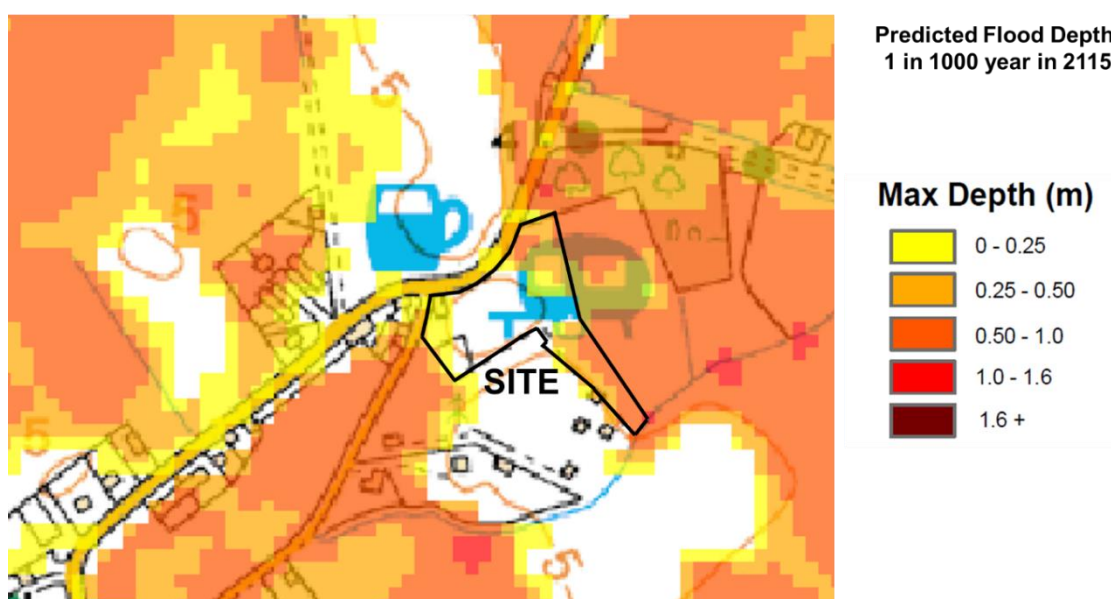
Finished floor levels (FFL) should be informed by the predicted flood depth maps (refer to the relevant 2115 1% fluvial or 0.5% tidal maximum depth map) and set as required below (single storey proposals must use the 0.1% event, 2115 scenario, for setting FFLs).

For flood depths of 250mm – 500mm, FFL should be set 500mm above ground level with flood resilient construction to a height of 300mm above the predicted flood depth.

For flood depths of 0 – 250mm, FFL must be set 300mm above ground level.

Summary of Risk of Flooding to the Site

The relevant part of the Environment Agency map showing the predicted peak depths in this area if a tidal breach in a 0.1% fluvial and tidal event probability is shown below.

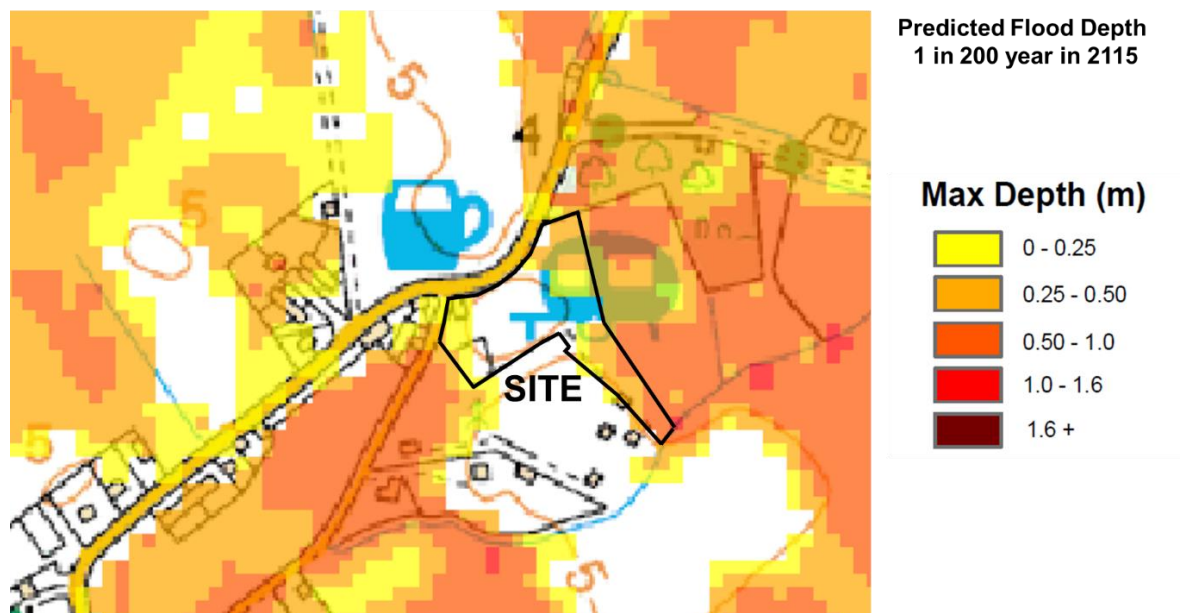


The main risk of flooding to the site is if a breach were to occur in a tidal bank. The risk of this can be considered to be low.

It can be seen that flooding is not predicted to the central part of the site but some flooding up to 250mm deep is predicted on the western side and greater depths of flooding mostly up to 500mm deep on the eastern side of the site. It can be seen that there is no flooding predicted in the part of Marsh Road where the known level is 4.10m ODN. Therefore it can be concluded that the maximum predicted 1 in 1000 year flood level in 2115 is 4.10m ODN.

There is no flood risk to the site in the present day 1 in 1000 year event.

The relevant part of the Environment Agency map showing the predicted peak depths in this area if a tidal breach in a 1.0% fluvial and 0.5% tidal event probability is shown below.



It can be seen that this is similar to the 1 in 1000 year map however the whole length of Marsh Road adjacent to the site is not predicted to flood. Therefore the maximum predicted 1 in 200 year flood level in 2115 can be estimated to be slightly lower at approximately 3.90m ODN.

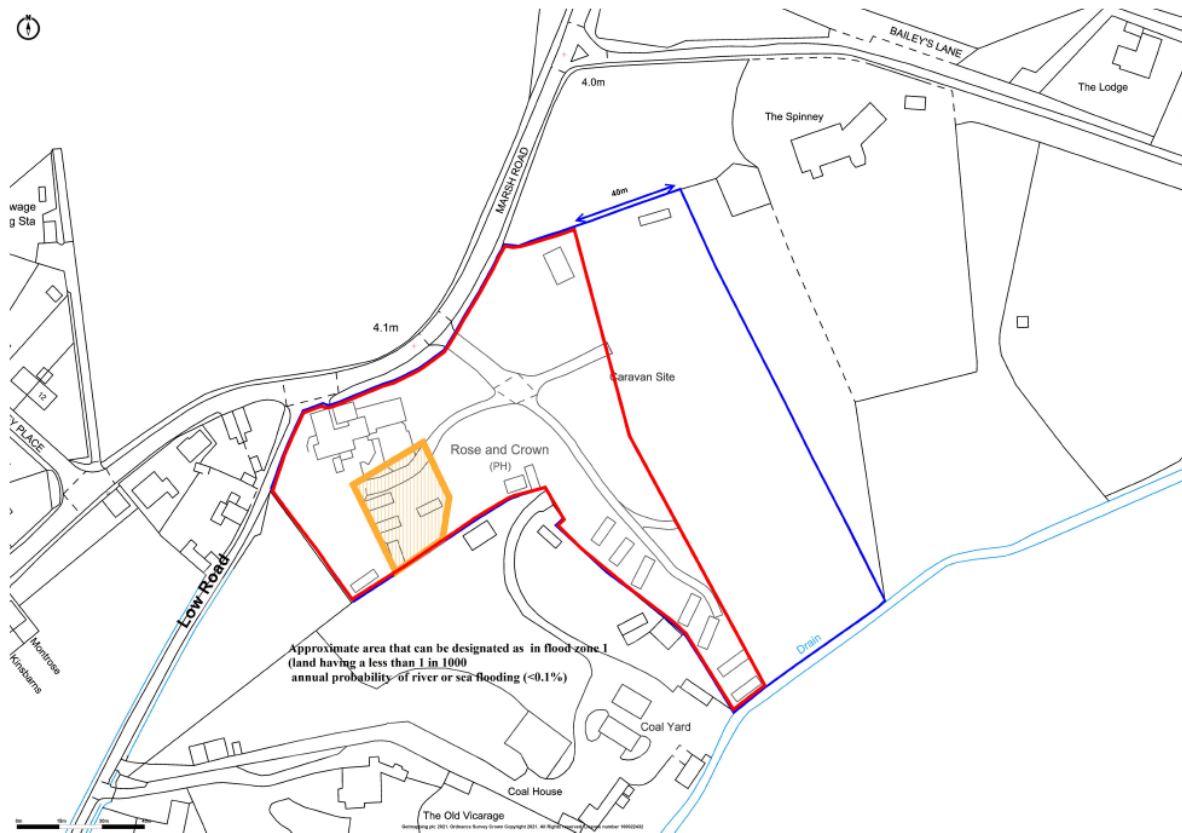
Conclusions and Recommendations

Caravans on plots 8, 9 and 10 could suffer flooding approximately 100mm in depth if a 1 in 1000 year event in 2115 were to occur.

Caravans 1, 2 3 and 4 are a minimum of 1.25 metres above the predicted 1 in 1000 year flood level in 2115.

As the ground levels in the area around caravans 1, 2,3 and 4 is between 4.60 ODN and 5.00m ODN and there is no predicted flooding in a 1 in 1000 year event then an application could be made to the Environment Agency to change the flood zone mapping and classify this area in flood zone 1. Then the use of these caravans would be satisfactory as highly vulnerable development is satisfactory in flood zone 1. The

minimum extent of the area that could be designated as flood zone 1 is shown on the map below.



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

Although the velocities of any flood water that could extend as far as the caravans would be very low, and would be unlikely to cause any damage to the caravans, it is recommended that suitable chains should be fitted to the chassis of caravans in the lower areas that are susceptible to flooding and fixed to secure anchors in the ground. This is to prevent the caravans from moving during a flood.

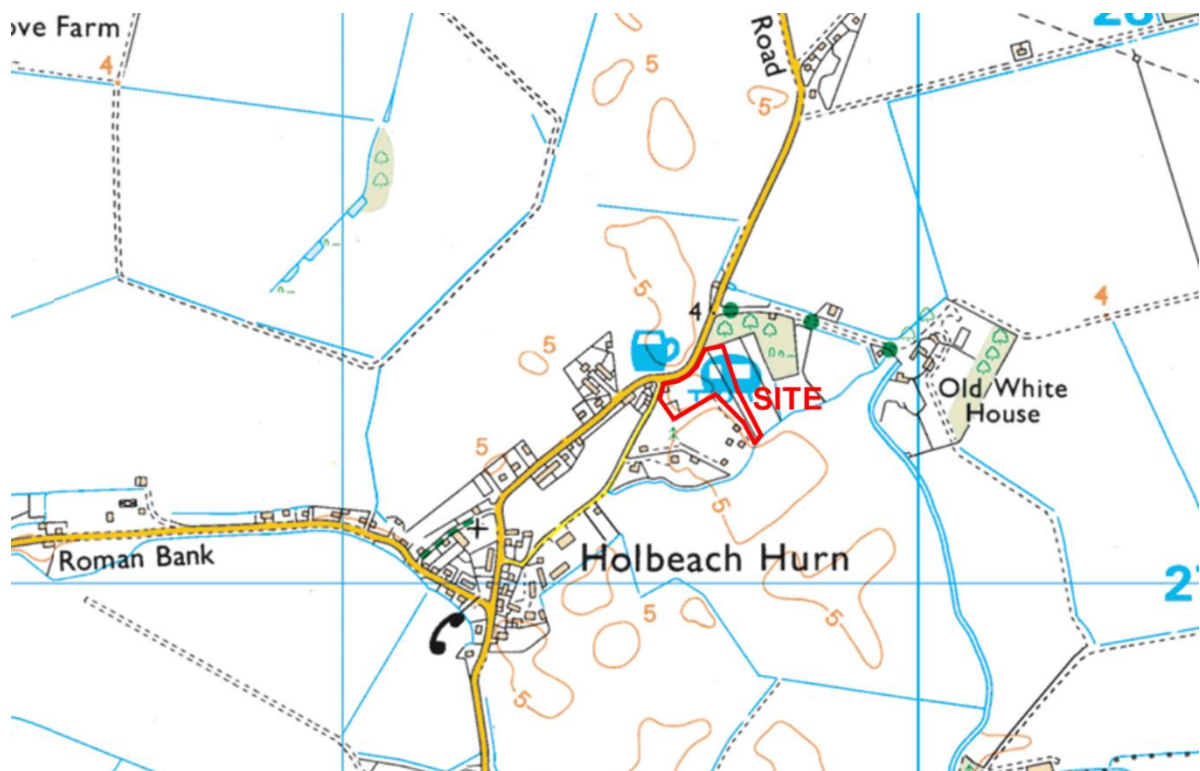
The main risk of flooding to this site is the risk of flooding to the ground floor of the public house and the vehicle entrance south of the public house to the camp site. It is recommended that the operators of the site should produce a flood plan which would detail the precautions and actions to be taken if a flood warning were to be received from the Environment Agency.

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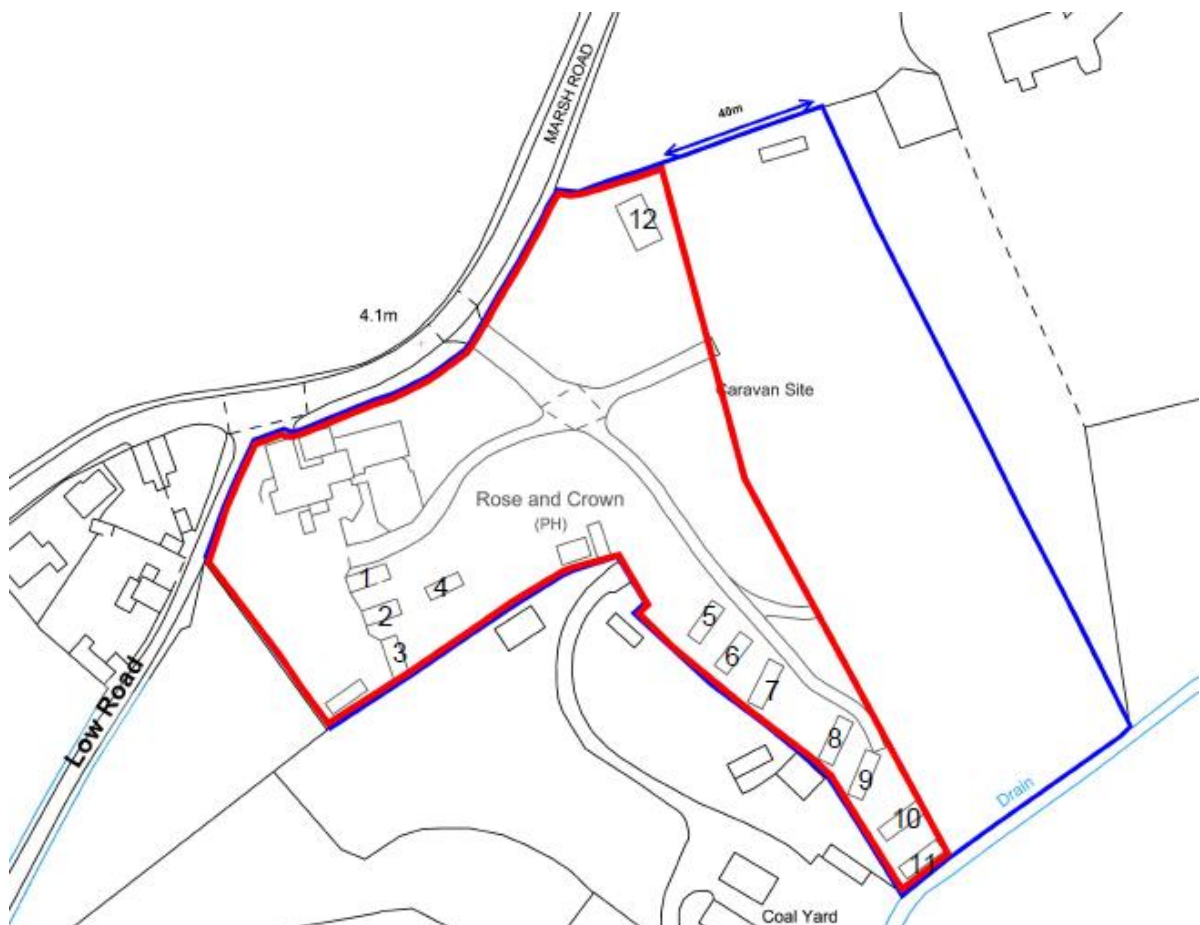
stuart.hemmings@btinternet.com

28th October 2021

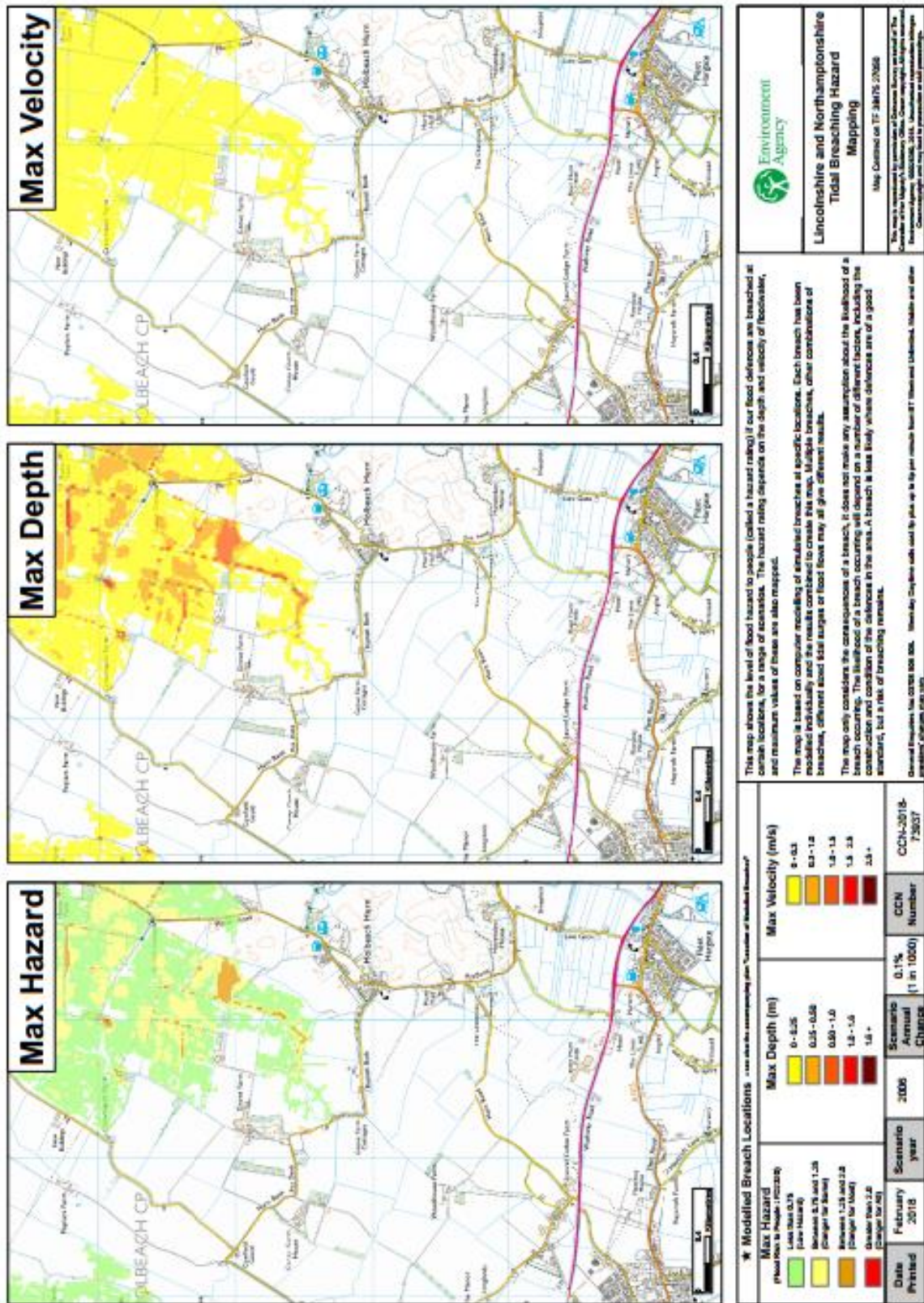
LOCATION PLAN



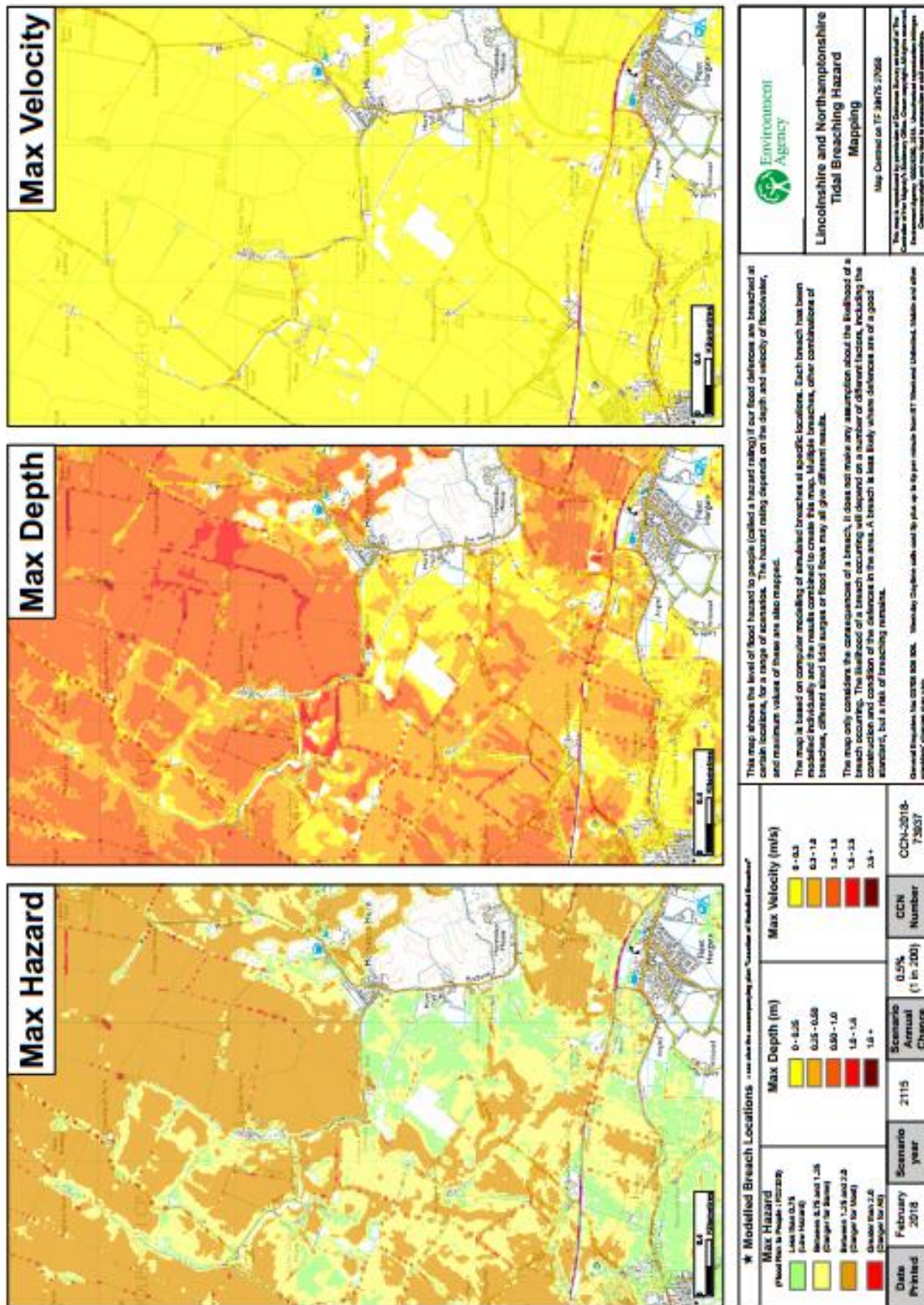
PLAN OF LOCATION OF STATIC CARAVANS



EA MAP SHOWING TIDAL BREACHING HAZARDS IN
1 in 1000 YEAR EVENT IN 2006



EA MAP SHOWING TIDAL BREACHING HAZARDS IN
1 in 200 YEAR EVENT IN 2115



Max Hazard

Max Depth

Max Velocity

Legend

Max Hazard

Max Hazard	Max Depth (m)	Max Velocity (m/s)
0 - 0.25	0 - 0.25	0 - 0.25
0.25 - 0.50	0.25 - 0.50	0.25 - 0.50
0.50 - 1.00	0.50 - 1.00	0.50 - 1.00
1.00 - 1.50	1.00 - 1.50	1.00 - 1.50
1.50 - 2.00	1.50 - 2.00	1.50 - 2.00
2.00 - 2.50	2.00 - 2.50	2.00 - 2.50
2.50 - 3.00	2.50 - 3.00	2.50 - 3.00
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31.00 - 31.50	31.00 - 31.50	31.00 - 31.50
31.50 - 32.00	31.50 - 32.00	31.50 - 32.00

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 higher central 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 the main 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 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.

Flooding from IDB drainage system

As the development is in flood zone 3 and is classed as more 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.

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 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 above additional climate change allowances do not affect the conclusions in the flood risk assessment.