

PROPOSED NEW DEVELOPMENT AT TATTERSHALL ROAD,
BOSTON, PE21 9LF
FLOOD RISK ASSESSMENT



View of site from Tattershall Road

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This flood risk assessment has been prepared solely to support the planning application for a new development at Tattershall Road, Boston. 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

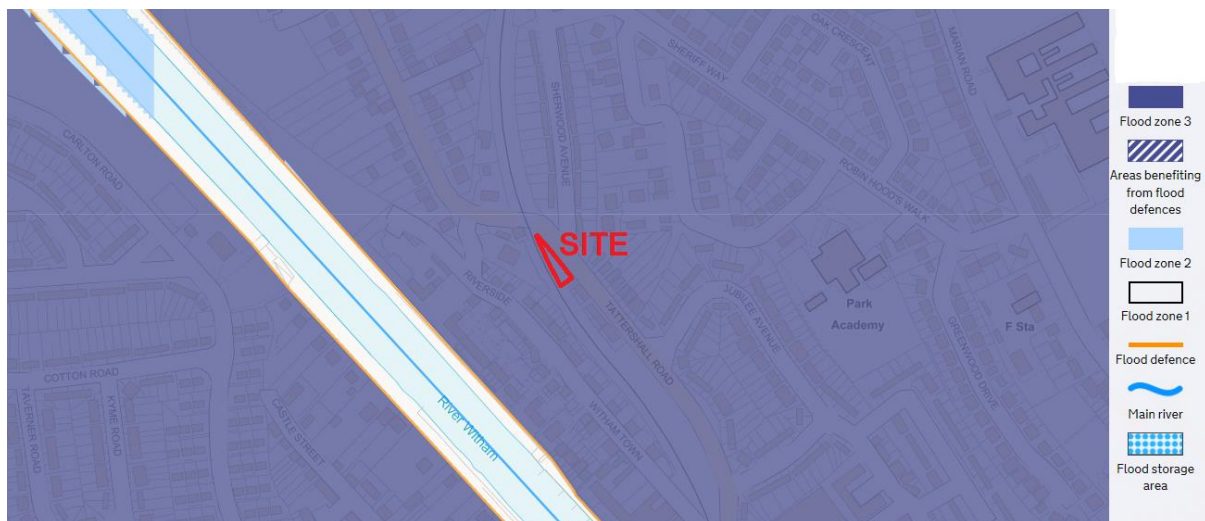
An application is due to be made to Boston Borough Council for planning permission to construct a building on the south west side of Tattershall Road in Boston. The site is situated north of the central area of Boston and is north east of the bank of the Haven, which is tidal as far as the Grand Sluice which is 500 metres south of the site.

The site is within Flood Zone 3 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 specified in the Practice Guidance to the National Planning Policy Framework Development and Flood Risk. The site is within a defended area as specified in the Boston Borough Council's Strategic Flood Risk Assessment (SHDC SFRA) map and is located in the Witham Fourth 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 all of this area of Boston is in Flood Zone 3.

Application Site

The site is located 130 metres from the River Witham. The National Grid Reference of the site is 532170 344950.

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

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

Applying the flood risk vulnerability classification in Table 2 of the Guidance, a development consisting of two apartments 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.

The greater part of the Boston area is in Flood Zone 3. Therefore it would be difficult to find a similar site for this development in a lower flood zone.

The Boston Borough Core Strategy states that there is a limited number of sites in the Boston area available for residential development. The site of this development can be considered as a windfall site within an existing residential area and as such is more sustainable than developing on greenfield land. There is a requirement for further land to be brought forward and used for residential development to enable the Council to meet the RSS and Structure Plan requirement for 2021.

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

The proposed development complies with all Boston Borough Council's planning policies, and there is a requirement for additional accommodation such as is proposed in the Borough 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 Boston Borough 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

Consultants have produced a Strategic Flood Risk Assessment (SFRA) for the Boston Borough Council (SHDC). This document provides details of the flood risk in the Council's area.

The SFRA contains maps showing the predicted hazard from flooding. These maps show that the greatest hazard in this part of Tattershall Road in Boston is from a potential overtopping or a breach in the tidal defences of the Haven.

The SFRA also give more general maps on the relative probability of flooding in this area. As there is now available more detailed mapping from the Environment Agency these will be considered in detail.

Information Supplied by the Environment Agency

The Environment Agency have provided maps showing the maximum hazard, depth of flooding and velocity for the 1 in 200 year and 1 in 1000 year breaching events in 2006 and 2115, and the results of these are shown on the next page:

	Hazard	Flood Depth	Velocity
1 in 200 year event in 2006	none	Zero	Zero
1 in 1000 year event in 2006	none	Zero	Zero
1 in 200 year event in 2115	none	Zero	Zero
1 in 1000 year event in 2115	none	Zero	Zero

The hazard mapping for tidal breaching events supplied by the Environment Agency are reproduced on pages 12 – 15 of this report.

The Environment Agency has provided predicted flood levels for the River Witham which are taken from the Lower Witham Catchment Model produced in 2009. The levels quoted below are maximum predicted water levels in the River Witham directly west of the development.

	2007	2115
Peak 1 in 100 year flood level	4.05m OD	4.35m OD
Peak 1 in 1,000 year flood level	4.09m OD	4.36m 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 130 metres from the bank which is the tidal defence of the Haven which is maintained by the Environment Agency.

There are no IDB watercourses in this area of Boston. There is a 375mm Anglian Water combined sewer under Tattershall Road which flows in a south easterly direction.

Existing Ground Levels

The level of Tattershall Road in front of the development site is 3.30m OD. The road is lower 75 metres south eastwards along Tattershall Road where the level is 2.77m OD. The road levels in Sherwood Road north of the site are also lower at 2.65m OD 90 metres north of the junction.

The new properties on the south west side of Tattershall Road south of the proposed development site have been constructed with their finished ground floor raised to a level of 3.67m OD.

At the present time the site is overgrown with bushes and is securely fenced off and therefore it was not possible to gain access to measure the existing site levels. However it can be seen that the site levels are similar to the levels of the footpath with

the site slightly sloping upwards towards the level crossing to the north. The site may also slope upwards towards the railway at the back of the site.

Potential Sources of Flooding

The following sources of flooding have been identified:

- 1) Tidal Flooding due to breaching of the north east bank of the Haven
- 2) Fluvial Flooding from the River Witham
- 3) Flooding from local surface water systems.

1. Tidal Flooding due to overtopping or breaching of the north bank of the Haven

The tidal defences of the Haven are 30 metres east of the site. The Environment Agency have stated that the predicted tide levels at Grand Sluice are as follows:

Event Chance	1 in 1	1 in 10	1 in 50	1 in 100	1 in 200
Predicted Level m OD	4.88	5.34	5.65	5.78	5.93

The maps produced by the Environment Agency do not predict any flooding in either the 1 in 200 year and a 1 in 1000 year event in 2115.

At the present time the defences of the Haven have a less than 1 in 50 year standard of defence. In December 2013 the highest tide for more than 25 years was experienced and many properties in Boston were flooded as water flowed over the top of the defences. However none of the area north of Sluice Bridge has been affected by floods in the past.

The Environment Agency have agreed a one hundred year strategy for the length of the Haven from Tabs Head as far as Grand Sluice. This involves the construction of a Barrier to prevent flooding upstream of Black Sluice Pumping Station. Finance for the Barrier was confirmed by the government soon after 2013 and it is expected that construction will commence in 1 – 2 years time. The Barrier will raise the standard of defence to the central area of Boston, where the flooding occurred, to 1 in 300 years.

The strategy also includes for the raising bank levels along the Haven as predicted tide levels increase with climate change to ensure that there is always a 1 in 200 year standard of defence along both banks of the Haven.

2. Flooding from the River Witham North of Grand Sluice

The predicted maximum 1 in 1000 year level with 20% allowance for climate change in the fluvial River Witham is 4.36m OD. This compares with the minimum level of the site of 3.31 m OD.

The flood defence bank on the north east side of the River Witham north of the site is the now disused railway line alongside the river. Alongside and south of the site there is the existing railway bank. There is a bridge under the bank south of the site but if

flood water flowed through this bridge it would flow into lower areas east of Tattershall Road and would be unlikely to affect the site of the proposed development.

The flood maps provided by the Environment agency do not predict any flooding to the site from this source in a 1 in 1000 year event in 2115.

Therefore the risk from this source can be considered to be adequately mitigated

3. Flooding from Local Drainage Systems

The site of the proposed development is higher than the general levels of Sherwood Avenue and south along Tattershall Road. There is also a 375mm Anglian Water combined sewer beneath Tattershall Road which flows south eastwards towards the centre of Boston. If any flooding occurred in Tattershall Road, either caused by a blockage in the combined sewer or from a failure of the road drainage system, it would flow south eastwards into lower areas of Tattershall Road and would not flood the site of the proposed development.

Extent of known Flooding

It is well known in Boston that at the present time there is a risk of flooding if very high tides, such as the one that occurred in December 2013, are experienced. In 2013 the level of the River rose to nearly 6.00m OD and defences on both sides of the River were overtopped, and brick wall defences failed which made the flooding worse. The central areas of Boston were badly affected with flooding. However the flooding did not extend any further north than the southern end of Tattershall Road, which is 500 metres south west of the site.

A scheme to protect the central part of Boston from flooding had been designed prior to the flood in 2013 and now is being implemented. It involves the construction of a barrier (similar but much smaller than the Thames Barrier) and construction of this structure is due to start soon. The Barrier will provide at least a 1 in 200 year standard of protection for Boston for the next 100 years. The central area of Boston will continue to be at a higher risk for the next 3 to 4 years until the Barrier is completed.

Probabilities and Trends of Flooding

At the present time the areas at greatest risk of flooding in Boston are west of the River Witham and between the River and the Maud Foster Drain near to St Botolph's church. The extent of the areas flooded in December 2013 are shown on the map reproduced on page 11 of this report.

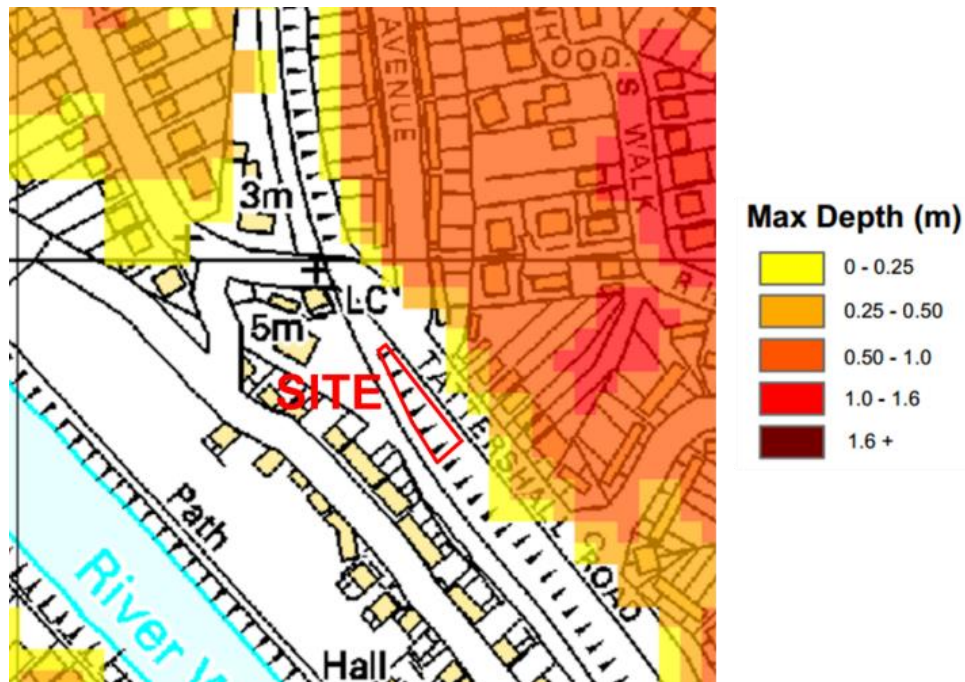
Climate Change

The recommendations for 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 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

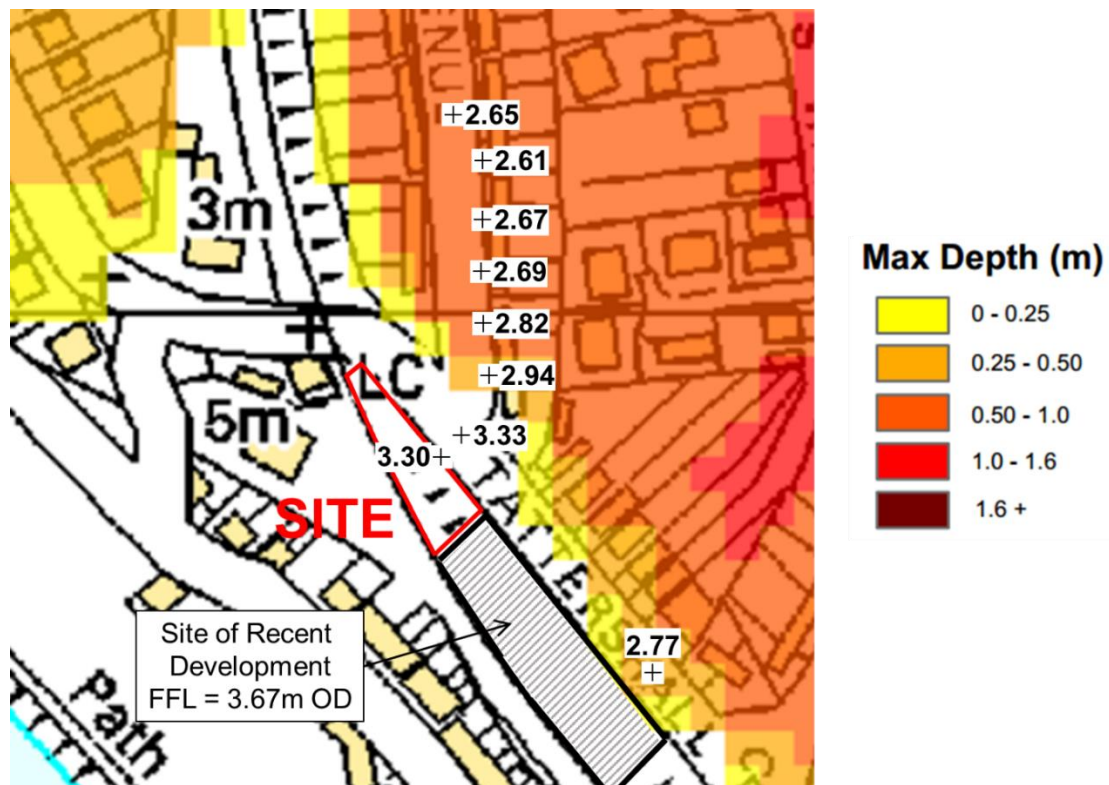
Appendix A of this report (pages 15 to 19). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

Conclusions

The relevant part of the Environment Agency maps showing the 1 in 200 year predicted flood depths in 2115 following a breach is shown on the next page:



The levels taken around the site have been transposed onto a larger version of the 1 in 200 year flood depth map with climate change and this map is shown below.



If you consider the levels along Sherwood Avenue then it can be seen the boundary between the 250mm to 500mm band and the 500mm to 1.0 metre band (dark orange) is at a level of 2.88m OD. From this an estimated value for the maximum flood level is $2.88 + 0.5 = 3.38\text{m OD}$.

The level in Tattershall Road approximately 80 metres south east of the junction with Sherwood Avenue is 2.77m OD, and the predicted flood depth at this location is between 250mm and 500mm (light orange). From this an estimated value for the maximum flood level is $2.77 + 0.5 = 3.27\text{m OD}$.

Therefore it is reasonable to estimate a maximum flood level of between 3.30m OD and 3.35m OD, and to recommend that the finished floor level of the properties should be no lower than 3.40m OD.

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".

Recommendations

In any area at risk of flooding it is recommended that all new dwellings should be of two story construction with all bedrooms at first floor level. This will provide a refuge for residents if the building becomes flooded after a major breach of the tidal bank, and ensure there is no danger to residents when they are asleep.

The ground floor level of the proposed new house should be a minimum of 3.40m OD, which is 100mm above the level of the footpath at the position shown on the plan. As the site probably slopes upwards towards the railway it is likely that the floor level will be higher than the minimum level specified.

All future occupiers of the properties should register with the Environment Agency's Floodline Warnings Direct Service.

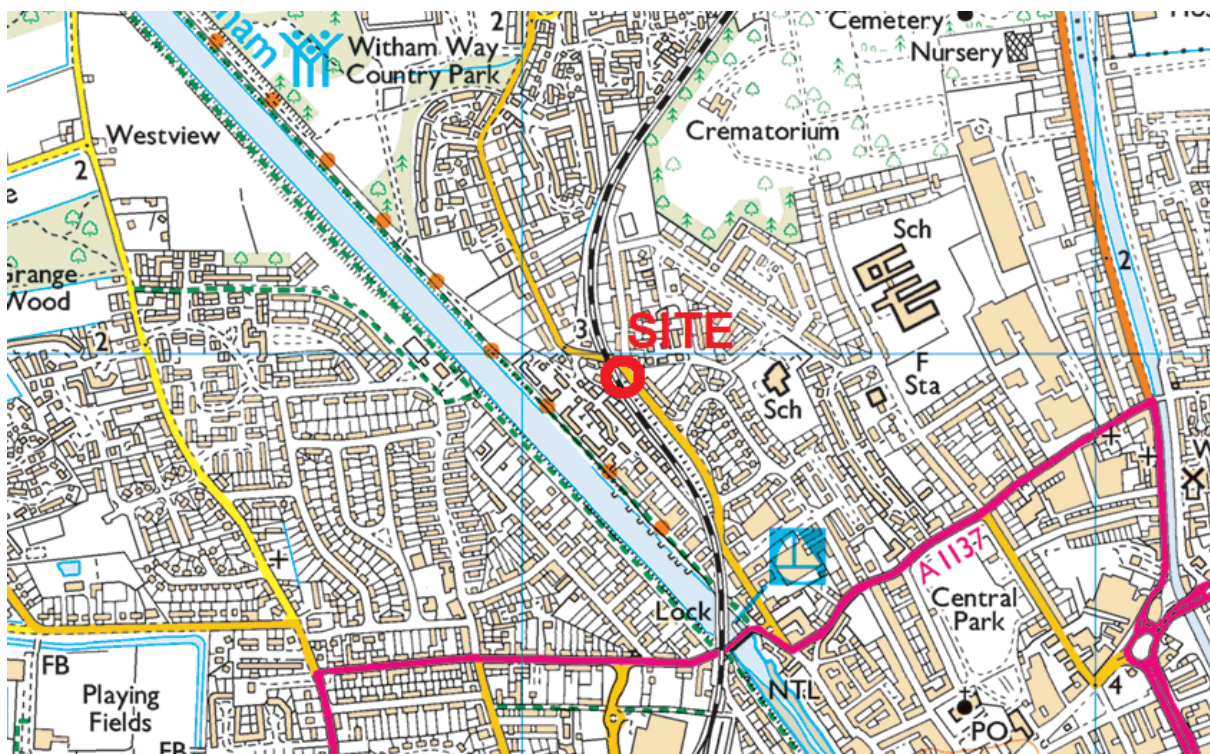
On site surface water drainage from the proposed new building should be discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations. Hardstandings around the buildings should be constructed with permeable paving.

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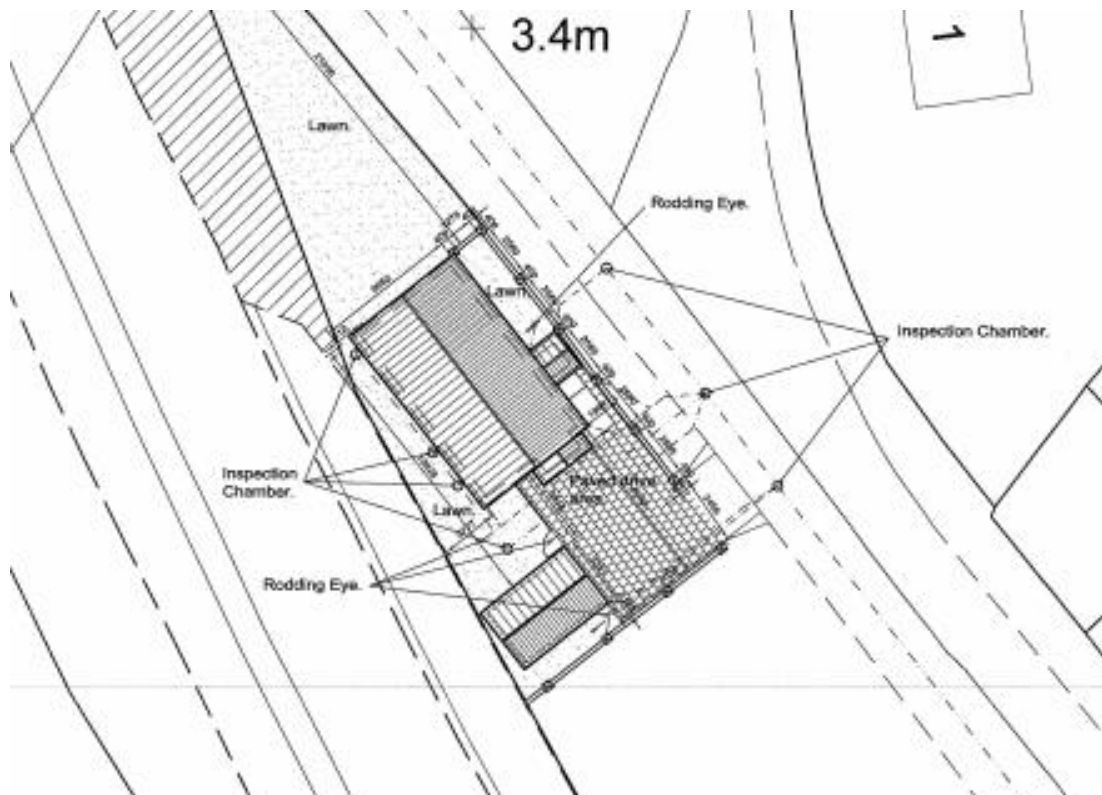
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12th November 2018

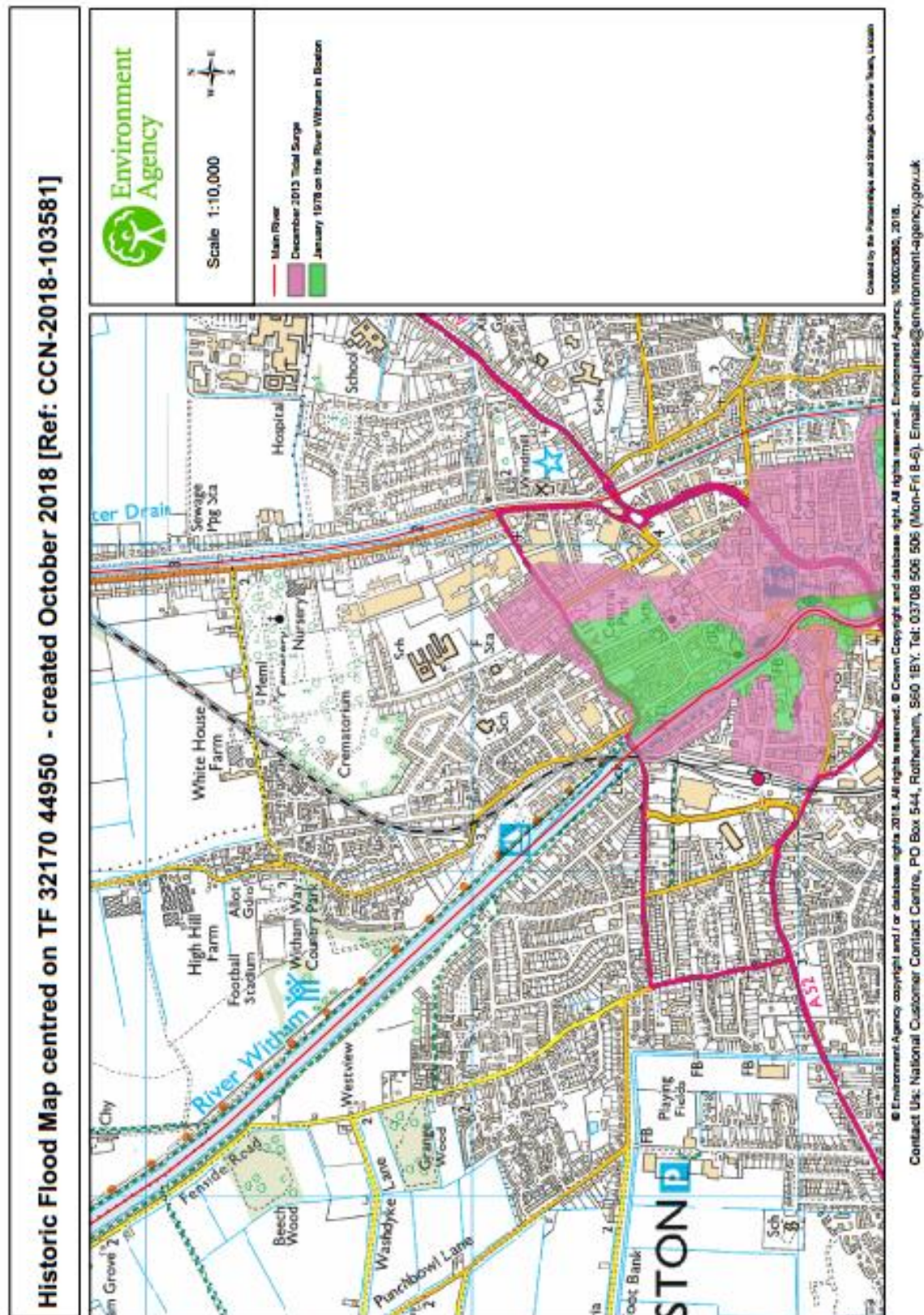
Location Plan



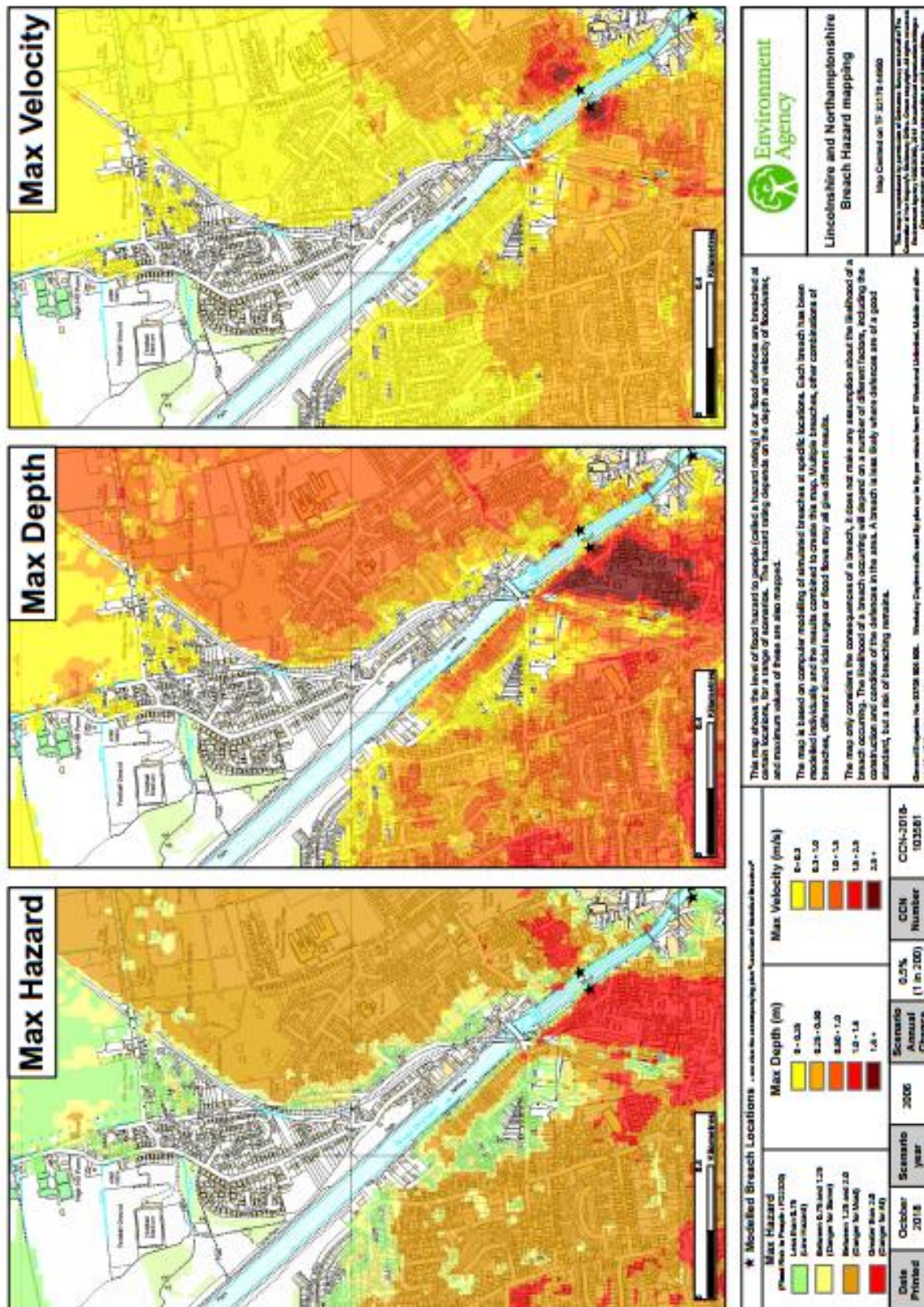
Plan of Proposed Development



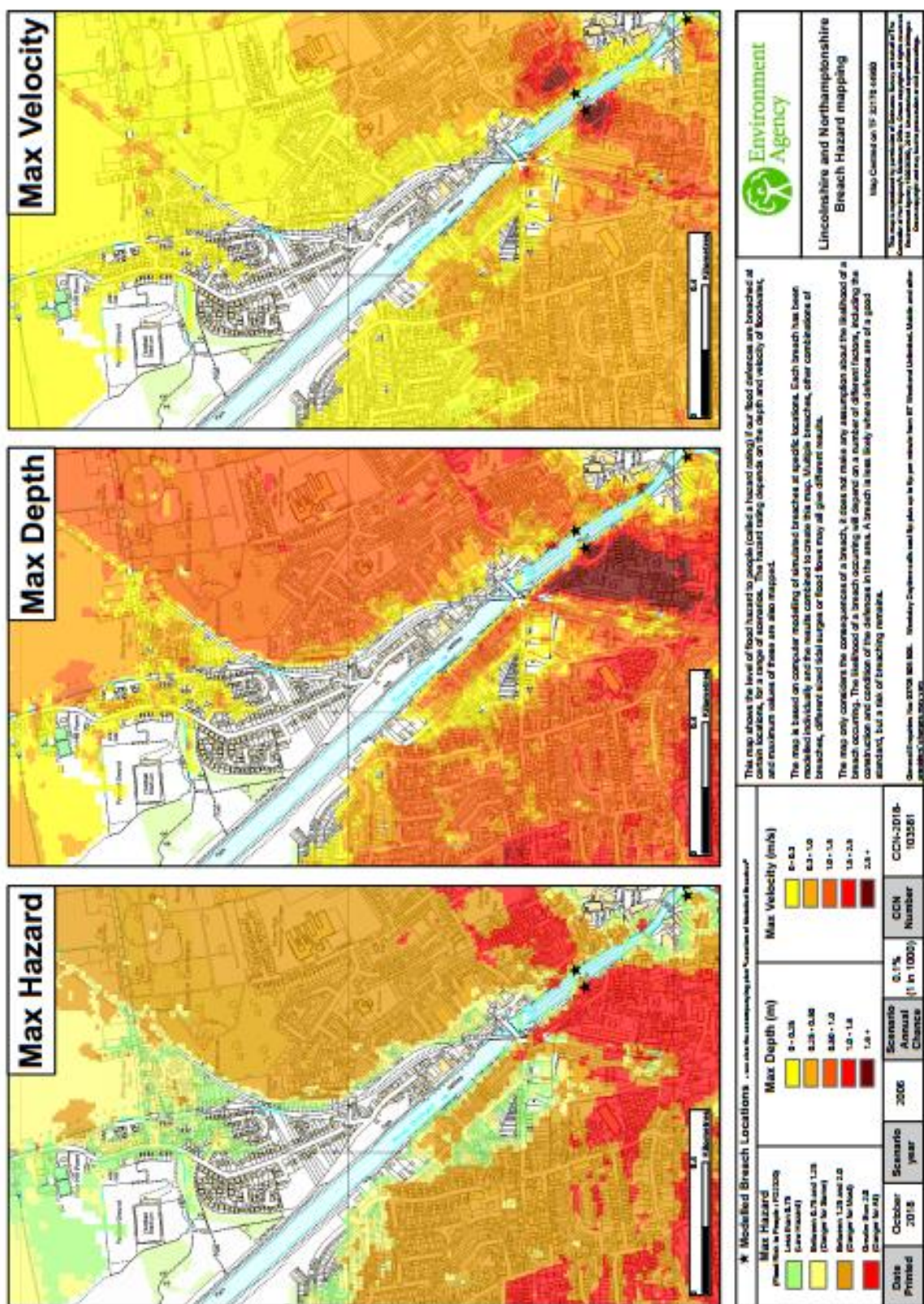
EA MAP OF HISTORIC FLOODING



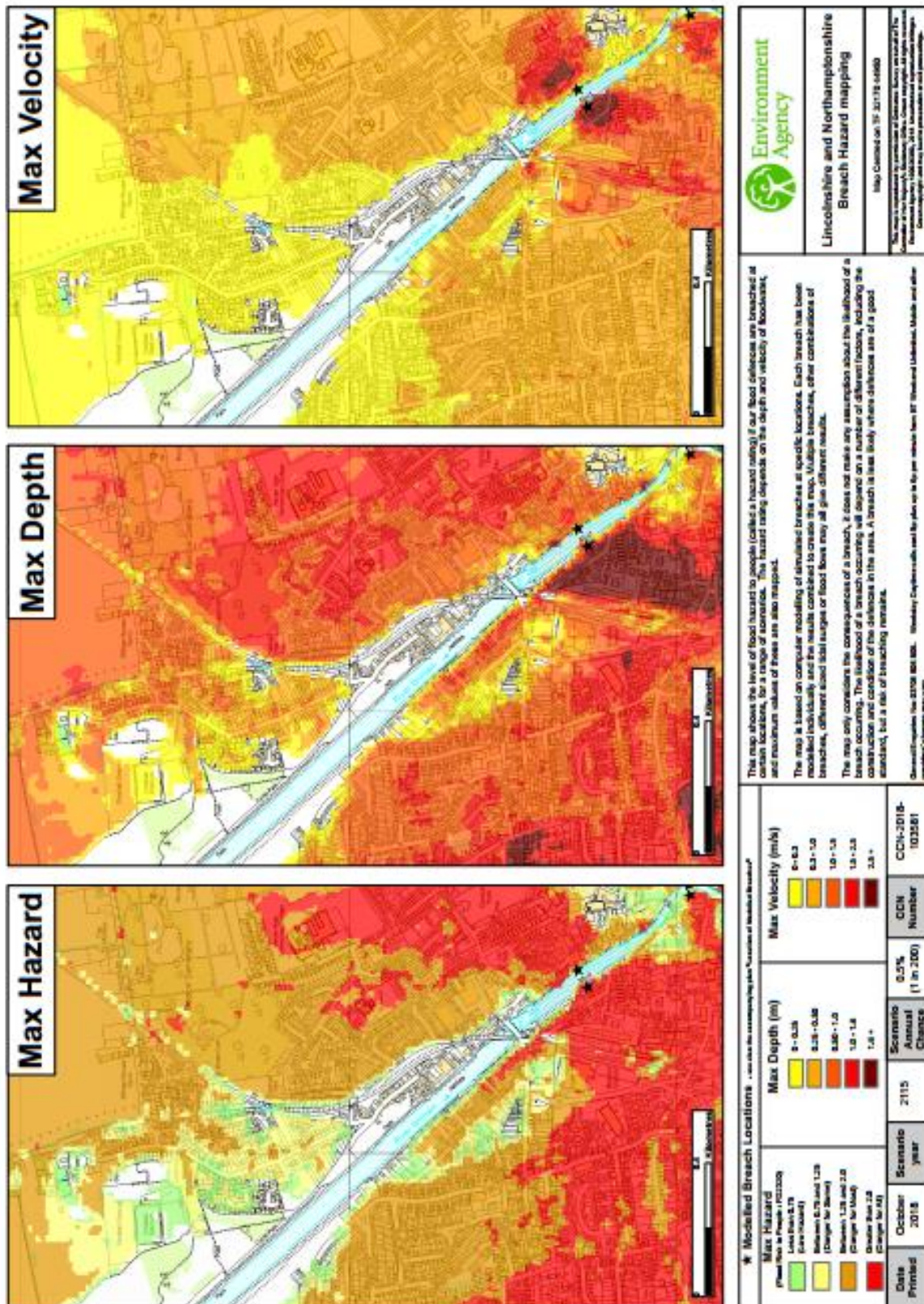
1 in 200 year Flood Risk from Breaching in 2006



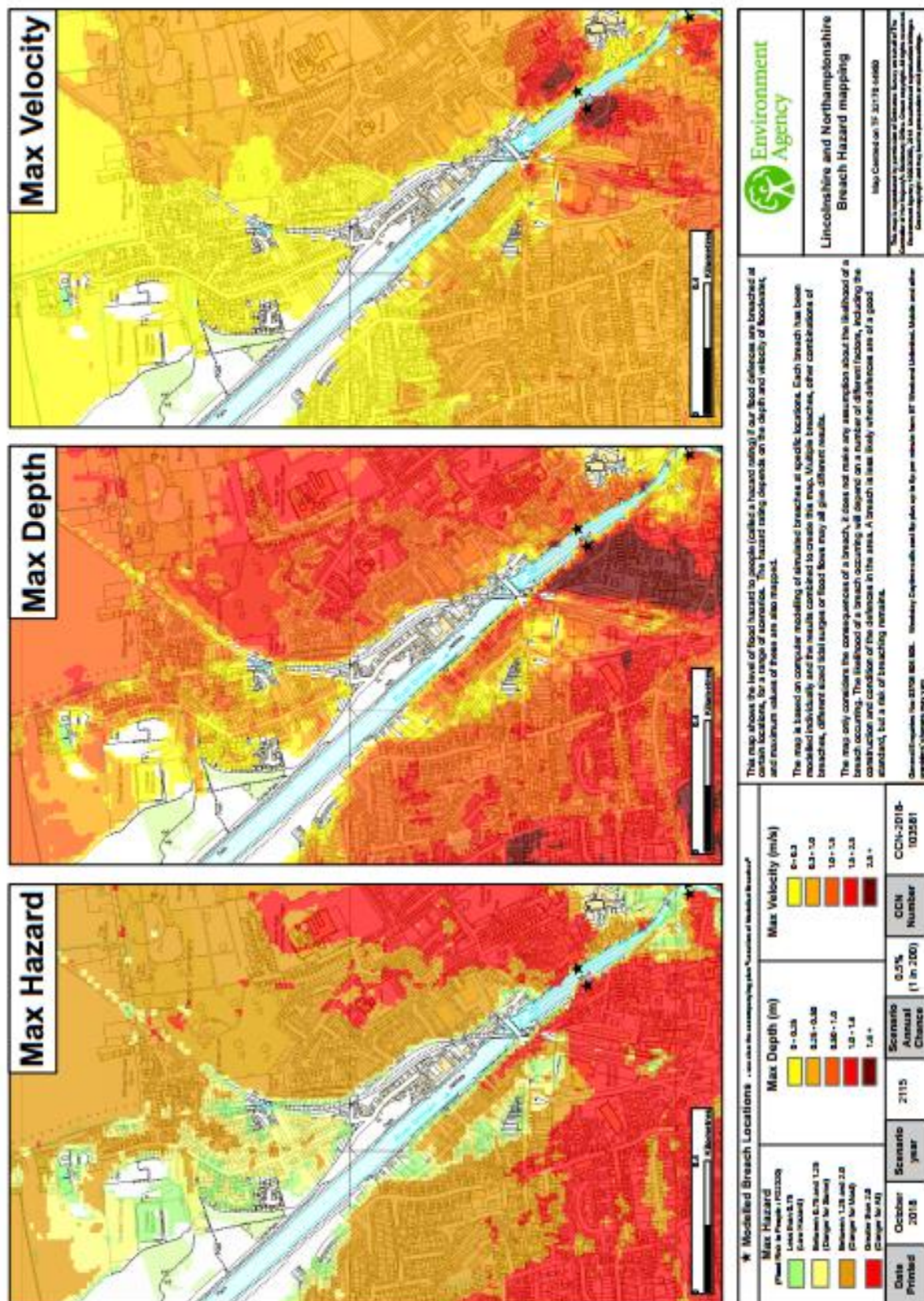
1 in 1000 year Flood Risk from Breaching in 2006



1 in 200 year Flood Risk from Breaching in 2115



1 in 1000 year Flood Risk from Breaching in 2115



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.

The maps issued by the EA were produced in 2006 and used the climate change impacts published by Defra in October 2006 which are reproduced below.

Table 1: Regional net sea level rise allowances

<i>Administrative or Devolved Region</i>	<i>Assumed Vertical Land Movement (mm/yr)</i>	<i>Net Sea-Level Rise (mm/yr)</i>				<i>Previous allowances</i>
		<i>1990-2025</i>	<i>2025-2055</i>	<i>2055-2085</i>	<i>2085-2115</i>	
East of England, East Midlands, London, SE England (south of Flamborough Head)	-0.8	4.0	8.5	12.0	15.0	6mm/yr* constant

Table 2: Indicative Sensitivity Ranges

<i>Parameter</i>	<i>1990-2025</i>	<i>2025-2055</i>	<i>2055-2085</i>	<i>2085-2115</i>
Peak rainfall intensity (preferably for small catchments)	+5%	+10%	+20%	+30%
Peak river flow (preferably for larger catchments)	+10%	+20%		
Offshore wind speed	+5%		+10%	+10%
Extreme wave height	+5%		+10%	+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 Haven (Tidal)
- 2) Flooding from River Witham (Fluvial flooding).

1) Flooding from the Haven

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	2006 guidance	Revised 2016 guidance
2055	0.395	0.412
2115	1.205	1.24

It is unlikely that an increase of 35mm in maximum levels in the Wash will have a significant impact on the predicted flood levels for the development site. The range of predicted flood depth on the site is 1.25 metres, and a very small increase in the maximum flood level in the Wash is not going to change this prediction significantly.

2) Flooding from River Witham

As the development is in flood zone 3 and is classed as more vulnerable, the central climate change allowance, which is 35%, should firstly be considered. After considering the effects of this increase the higher central, which is 65%, 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 SFRA also has used this figure of 20%. The increase to 35% and 65% will not significantly change the conclusion in the SFRA of what might happen if a breach occurred in the bank of the fluvial section of the River Witham. If there are additional flows in the catchment area

it will lead to the storage systems north and south of Lincoln operating and additional overtopping over lower banks rather than any significant increase in levels in the river.

Therefore it is considered that the mitigation proposed for the development, with the recommendation that the finished floor level of the proposed buildings should have a minimum finished ground floor level of 3.40m OD, is satisfactory.