

**PROPOSED RESIDENTIAL DEVELOPMENT AT SPRINGWAY,  
STOCKWELL GATE, WHAPLODE, SPALDING, PE12 6UE**  
**FLOOD RISK ASSESSMENT**



View from Stockwell Gate

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 development at Stockwell Gate, 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**

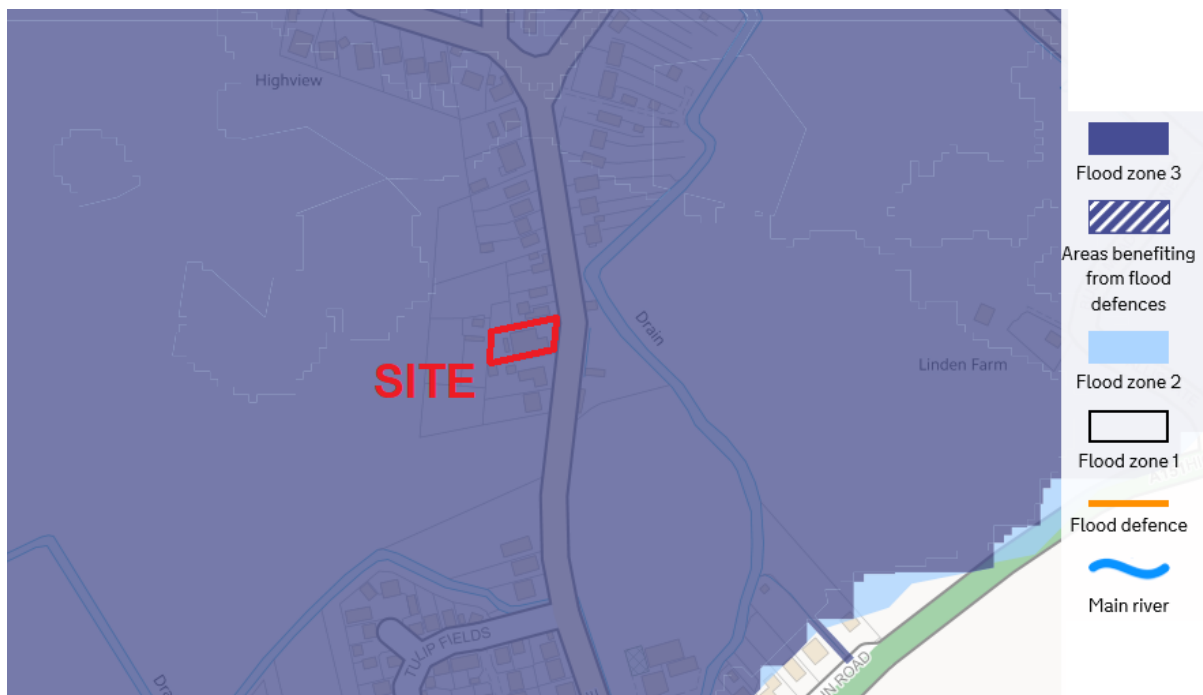
A new residential development is proposed on the site of an existing bungalow at “Springway” at Stockwell Gate, Whaplode, PE12 6UE. The existing bungalow will be demolished and three new dwellings are proposed. The site is on the northern side of Whaplode and is approximately 8½ km from Spalding.

All of this site is within Flood Zone 3 as shown on the Environment Agency’s Flood Zone map.

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 on 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 this area.



It can be seen that all of the site is in Flood Zone 3.

## **Application Site**

The National Grid Reference of the site is 533150 324795.

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 dwelling houses is classified as “more vulnerable”.

Table 3 of the Guidance is shown below:

| Flood Zones | Flood Risk Vulnerability Classification |                         |                         |                 |                  |
|-------------|-----------------------------------------|-------------------------|-------------------------|-----------------|------------------|
|             | Essential infrastructure                | Highly vulnerable       | More vulnerable         | Less vulnerable | Water compatible |
| Zone 1      | ✓                                       | ✓                       | ✓                       | ✓               | ✓                |
| Zone 2      | ✓                                       | Exception Test required | ✓                       | ✓               | ✓                |
| Zone 3a †   | Exception Test required †               | X                       | Exception Test required | ✓               | ✓                |
| Zone 3b *   | Exception Test required *               | X                       | X                       | X               | ✓*               |

Therefore it can be seen that for “More Vulnerable” development the sequential and the exception tests need to be applied to the development.

### **Sequential Test**

The aim of the Sequential Test, as set out in the Planning Practice Guidance, is to ensure that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The flood zones as defined in the Strategic Flood Risk Assessment for the area provide the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

As can be seen from the map on page 2 of this report the whole of the area north of Whaplode is in flood zone 3. This flood risk assessment will demonstrate that there is no predicted risk of flooding in a 1 in 1000 year tidal or fluvial event in 2115. Therefore it would be difficult to find a similar site for development in the Whaplode area that has a lower flood risk.

As the proposed development is for a three new dwellings on the site of an existing bungalow an alternative location cannot be considered.

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

The South Holland District Council Core Strategy allows for buildings to be replaced when they cannot economically be refurbished to a modern standard.

Therefore I consider that the sequential test has been passed.

### **Exception Test**

The Sequential Test has demonstrated that it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding. Therefore the Exception Test must be applied and for this to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risks, informed by the Strategic Flood Risk Assessment; and
- A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking into account of the vulnerability of its users, without increasing flood risk elsewhere, and where possible will reduce flood risk overall.

Both parts of this test must be satisfied in order for the development to be considered appropriate in terms of flood risk. There must be robust evidence in support of every part of the test.

The first section will be demonstrated by the Supporting Planning Statement and compliance with South Holland District Council's planning policies.

This flood risk assessment will demonstrate that the development will be safe for its lifetime and it will not increase flood risk elsewhere.

### **Strategic Flood Risk Assessment**

Consultants have produced a Strategic Flood Risk Assessment (SFRA) for the South Holland District Council (SHDC). This document provides details of the flood risk in the Council's area. Reference to the maps in this document give the following information for the flood risk and hazard at the site.

The maps illustrate the actual flood hazard for the 1% fluvial event and 0.5% tidal event.

|                     |                                                        |
|---------------------|--------------------------------------------------------|
| For the present day | Depth of flooding ... zero                             |
|                     | Extent of flooding .. Low or medium flood probability  |
|                     | Peak Velocity ..... Nil                                |
| For year 2115       | Depth of flooding ... zero                             |
|                     | Extent of flooding.... Low or medium flood probability |
|                     | Peak Velocity ..... Nil                                |

The maps also illustrate the residual flood hazard which is as follows:-

|                     |                                                       |
|---------------------|-------------------------------------------------------|
| For the present day | Depth of flooding ...zero                             |
|                     | Extent of flooding .. Low or medium flood probability |
|                     | Hazard rating..... None                               |
|                     | Peak Velocity .. zero                                 |
| For the year 2115   | Depth of flooding ... zero                            |
|                     | Extent of flooding .. Low or medium flood probability |
|                     | Hazard rating..... Nil                                |
|                     | Peak Velocity .. zero                                 |

Figure 16 of the general maps show that the site is not within the rapid inundation zone for the present day and 2115.

#### Maximum flood level and bank levels in 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 6.6km 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 |

Tables in the SFRA show the following details for the defence bank on the east side of the Coronation Channel between chainage 0 km and 2.0 km.

|                                  | 2007     | 2115     |
|----------------------------------|----------|----------|
| Peak 1 in 100 year flood level   | 4.32m OD | 4.69m OD |
| Peak 1 in 1,000 year flood level | 4.34m OD | 4.69m OD |

The bank levels on this section vary between 5.35m OD and 6.0m OD. Therefore it can be seen there is a minimum freeboard of 650mm to the predicted design maximum levels in 2115.

The Wash banks are at least 12.0 km north of the site. The tidal defences are earth banks with an average level of 7.80m OD. The maximum predicted 1 in 200 year tide level in 2115 in the SFRA is 7.11m OD.

The tidal section of the River Nene is approximately 15.0km east of the site. The tidal defences are earth banks with an average level of 6.95m OD. The maximum predicted 1 in 200 year tide level in 2115 in the SFRA is 7.00m OD.

## **Environment Agency Tidal Breach Hazard Mapping**

The Environment Agency has published mapping which predicts the depths, velocities and hazard following a breach in the tidal defences for a 1 in 200 and 1 in 1000 year event in 2115. The maps have been produced by modelling breaches along the whole length of the tidal defences and combining these into one map.

Both the 1 in 200 year and the 1 in 1000 year map for 2115 shows that no flooding is predicted to the development site following a breach in the tidal defences. These maps are reproduced on pages 14 and 15 of this report.

## **Information on Surface Water Flooding on Environment Agency Website**

The following map 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 that the map indicates that there is no predicted risk of surface water flooding to this site for the low risk scenario.

## **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 6.6 km east of the tidal section of the River Welland, which has a tidal defence bank which is maintained by the Environment Agency.

The site is located approximately 6.6 km from the west bank of the Coronation Channel which is maintained by the Environment Agency.

The major watercourses in the area are maintained by South Holland IDB.

### **Existing Ground Levels**

The level of Stockwell Gate along the front of the site is at a level of 3.05m OD. The ground level in front of the existing building is approximately 400mm above this level.

### **Potential Sources of Flooding**

The potential sources of flooding to the site are:-

1. Failure or overtopping of tidal defences of the River Welland or the Wash
2. Failure or Overtopping of the Coronation Channel
3. High water levels in IDB drainage channels.
4. Localised flooding in the area.

#### **1. Failure or overtopping of tidal defences of the River Welland or the Wash**

As shown above, the east bank of the River Welland, which is approximately 6.6 km from the site, provides at a 1 in 200 year standard of protection in 2115. The latest EA maps indicate that if there is a breach in the tidal defences no flooding would occur at the site in a 1 in 1000 year event in 2115.

Therefore it can be concluded that no flooding is predicted to the site in a 1 in 1000 year event with 20% allowance for climate change.

#### **2. Failure or Overtopping 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. The SFRA indicates that with a serious breach water would not reach the site in a 1 in 100 year event.

With the site being 6.6 km the risk of flooding from the Coronation Channel will be adequately mitigated by raising floor levels by 300mm above the existing ground level.

#### **3. High Water Levels in IDB drains**

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

The area west of Stockwell Gate is drained by an IDB watercourse 150 metres south of the site which flows eastwards through a culvert under Stockwell Gate and discharges into the drain east of Stockwell Gate. This flows northwards to meet the Whaplode River which is located alongside the A17 road. This watercourse flows northwards and joins the Holbeach River which discharges through a sluice into the tidal River Welland which is 4km west of Fosdyke Bridge and 9.7km north of the development site. The Whaplode River, the Holbeach River and the outfall sluice are all maintained by the South Holland IDB.

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. South Holland IDB watercourses generally state that their watercourses provide a standard of 1 in 100 years with a freeboard of 300mm in urban areas. 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.

The channels maintained by South Holland IDB in urban areas are classified as high priority watercourses and as such receive a higher maintenance priority.

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.

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

#### **4. Localised Flooding in the area**

A suitable surface water disposal system will be designed for the houses on the development site which will dispose of the water into soakaways. The raising of the ground floor levels approximately 300mm above ground level and the surface level of the road will mitigate any risk of flooding from this source.

#### **Extent of known Flooding**

During the preparation of this assessment, no evidence was discovered of this area of Whaplode having been flooded in the past.

#### **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 19<sup>th</sup> 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.

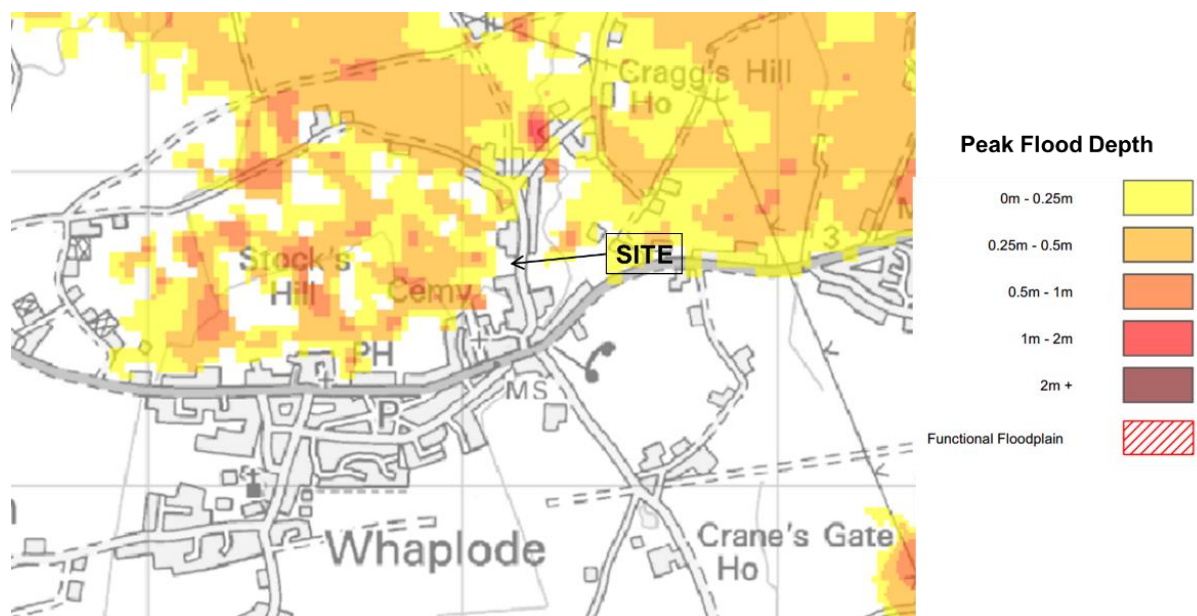
### **South East Lincs Advice Matrix**

Advice can be found on the recommended mitigation required by referring to a 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 states “No comment”.

### **Conclusions**

All of the land in this area of Whaplode is in flood zone 3.

The plan (shown below) of predicted depths of flooding in the recently updated SFRA does not show any flooding in a 1 in 100 year fluvial or 1 in 200 year tidal event in 2115.



The plans of predicted areas of flooding in the maps supplied by the EA and reproduced on pages 13 and 14 of this report does not show any flooding in a 1 in 1000 year fluvial or tidal event in 2115. The relevant part of this map is shown below.



The Environment Agency have stated that their policy is to continue to maintain tidal banks in the future with at least a 1 in 200 year standard of service.

The risk of flooding to the building from IDB drains can be considered low, especially as the floor levels will be raised by approximately 300mm.

The IDB have adequate arrangements to bring in contractors and use their own staff if a failure of any part of the sluices occurred. If drains become full any flooding that would occur would happen very slowly and affect land at levels between 2.50m OD and 3.00m OD before the development site. It would be very unlikely to reach a level above 3.00m OD and flood the proposed development.

As the development is in flood zone 3 and there is no flood hazard the proposed development falls within the category “G8” as shown on the Standing Advice Matrix on the South East Lincolnshire website and no extra mitigation is recommended for this category.

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

### **Recommendations**

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

However as there is no predicted risk of flooding to the site in a 1 in 1000 year event in 2115 it is considered that the proposed dwelling on plot 3 with bedrooms both on the ground floor and the first floor will be satisfactory on this site.

The ground floor level of the proposed dwellings should be 300mm above the average existing ground levels, which will be approximately 600mm above the level of Stockwell Gate.

The developer should advise owners and occupiers of the properties to register with the Environment Agency's Floodline Warnings Direct Service.

Rainwater from the roofs of the buildings should be discharged if possible 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.

**S M HEMMINGS B Sc C Eng MICE MIWEM**

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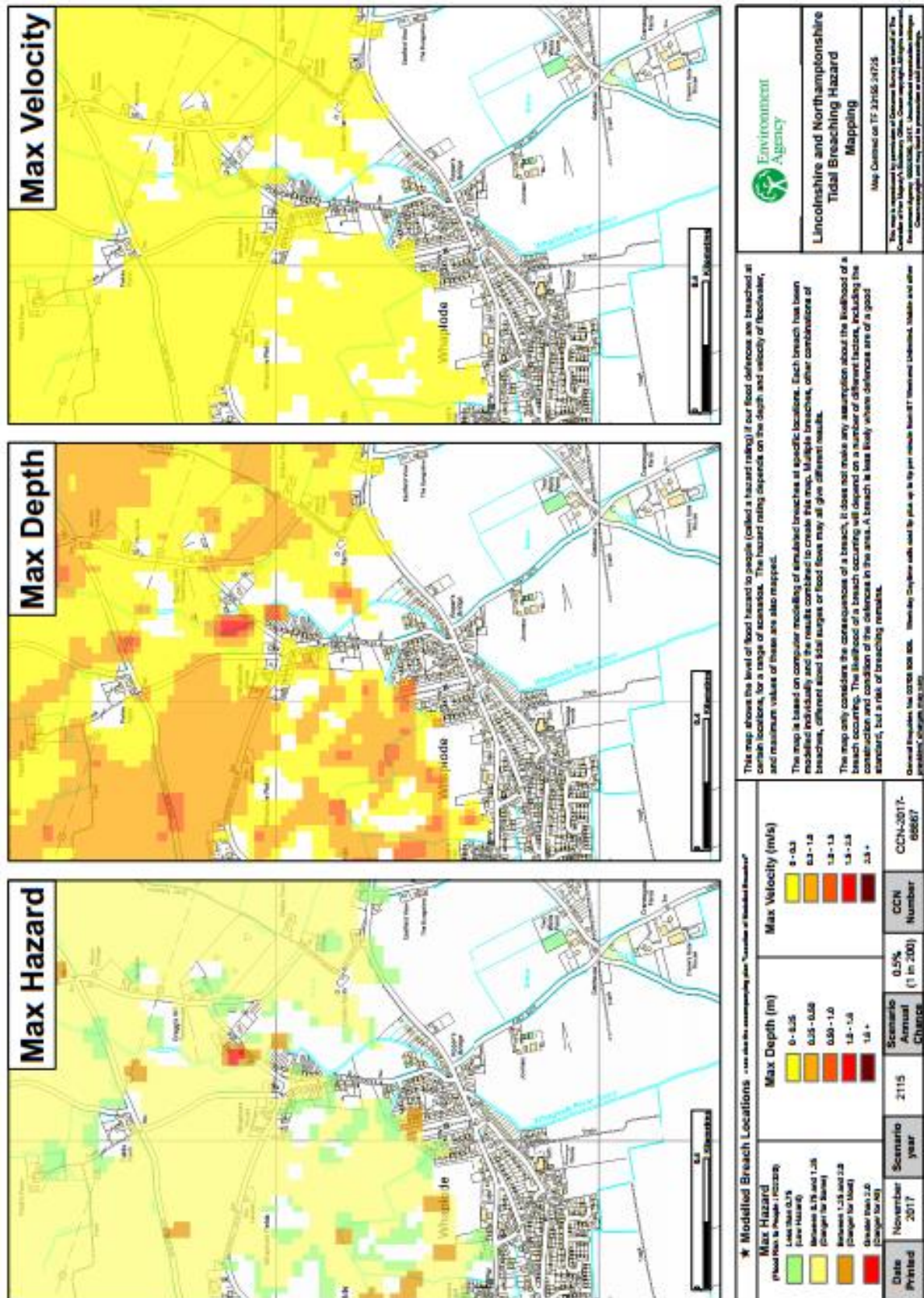
18<sup>th</sup> November 2020

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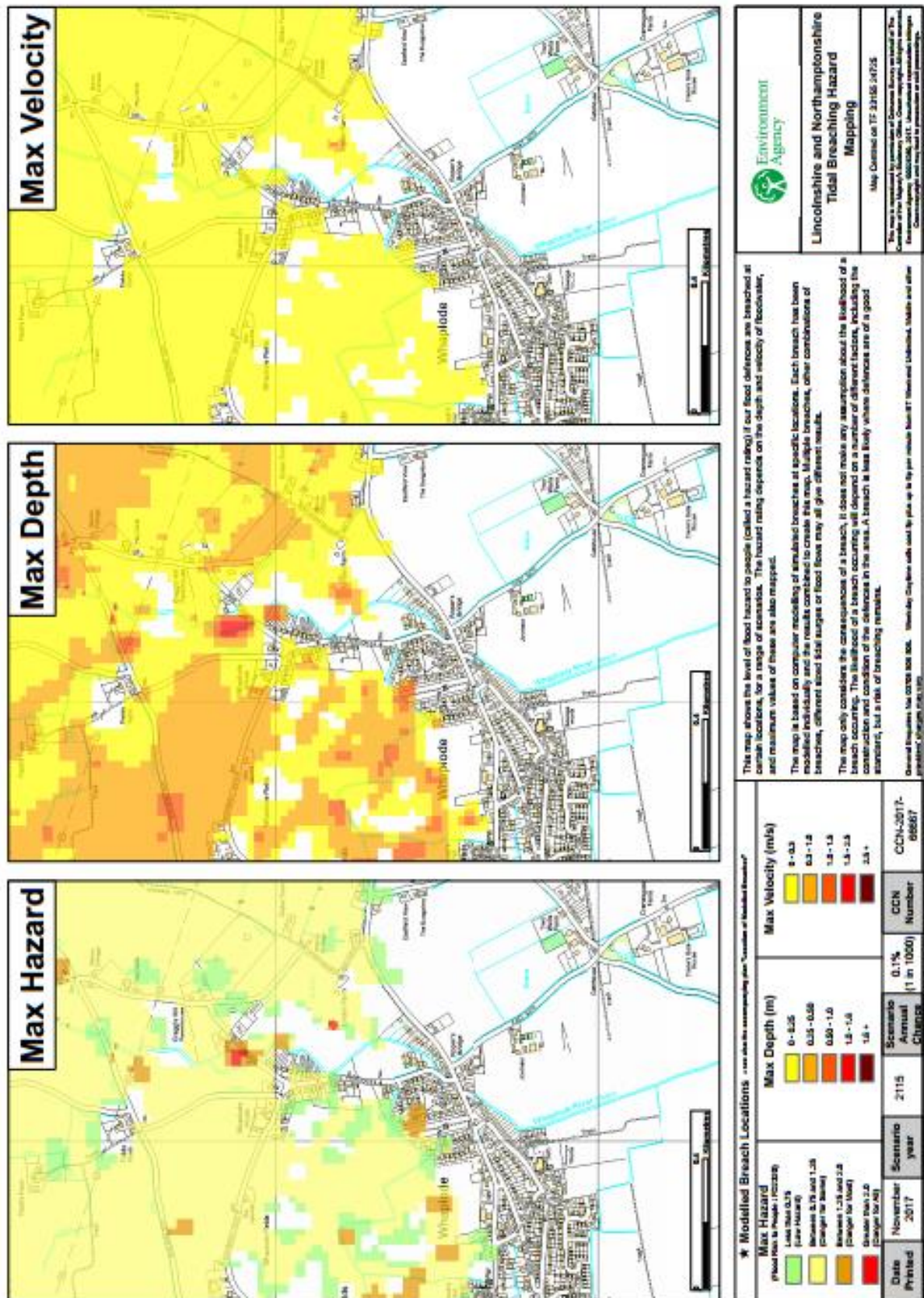
## PLAN OF PROPOSED DEVELOPMENT



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



**EA MAP SHOWING TIDAL BREACHING HAZARDS IN**  
**1 in 1000 YEAR EVENT 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 19<sup>th</sup> 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 PPS25<sup>1</sup>. 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)**

| <a href="#">Area of England</a>         | 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 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 Welland.

The contingency allowance in metres for the years 2055 and 2115 using 1990 as a baseline in the SFRA compared with the guidelines is as follows

| Year | SFRA | 2013 guidance | Revised 2016 guidance |
|------|------|---------------|-----------------------|
| 2055 | 0.33 | 0.395         | 0.412                 |
| 2115 | 1.14 | 1.205         | 1.24                  |

Therefore it can be seen that the revised guidance increases the maximum allowance for sea rise in 2115 by 100mm for the maps in the SFRA and 40mm for maps issued by the Environment Agency. The EA maps indicate that flood water from a breach in the tidal banks in a 1 in 1000 year event in 2115 may reach the western boundary at

the rear of the site. Therefore a small increase will not change this map significantly and cause any flooding on the site in this event.

## 2) Flooding from Coronation Channel and the IDB drainage system

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 SHDC 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 Coronation Channel. If there are additional flows along this part of 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.

It is concluded that the mitigation that is recommended is still adequate for the development.

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 mitigation proposed for the development, with the recommendation that the floor levels should be raised by 300mm above the existing ground level is satisfactory.