

**PROPOSED DEVELOPMENT AT 33 MILESTONE LANE, PINCHBECK,
SPALDING PE11 3XR**

FLOOD RISK ASSESSMENT



Revised 7th January 2013

This flood risk assessment has been prepared solely to support the planning application for a proposed development at Milestone Lane, Pinchbeck, Spalding. 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.

Introduction

An application has been made to South Holland District Council for Planning Permission to construct two pairs of semi detached houses and one bungalow on an area of land at 33 Milestone Lane, Pinchbeck, Spalding. On sheet 9 it is recommended that a bungalow should not be constructed in this area and this dwelling should be replaced with a two story building.

The Planning Application requires a Flood Risk Assessment to be carried out as required in the Technical Guidance to the National Planning Policy Framework.

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 Welland and Deepings Internal Drainage Board district.

Application Site

The development is located on the southern side of the River Glen. The National Grid Reference of the site is 524355 326863.

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

The proposed development is within Flood Zone 3(a) "High Probability" 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, the development is classified as "more vulnerable" in Table 3 of the Guidance, and the statement states that residential use is only permitted after the exception test is followed.

Exception Test

For the Exception Test to be passed:

- a) It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA;
- b) The development should be on developable previously developed land or, if not, it must be demonstrated there is no such alternative land available; and
- c) A FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.

All three 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.

Sections (a) and (b) were in the most part demonstrated by the previous approval granted in 2007, and will be confirmed by the planning authority in their determination of the proposed planning application.

This flood risk assessment will demonstrate that Section (c) is passed.

Strategic Flood Risk Assessment

The following information about the flood risk at the location of the proposed development has been gained from the maps produced for the South Holland District Council Strategic Flood Risk Assessment:

1. Report Maps

- Map 5 indicates the site to be high probability and protected by flood defences.
- Map 6 indicates the peak depth is 0 to 0.5m for the present day 1% / 0.5% tidal event probability.
- Map 7 indicates the peak velocity is 0 to 0.1m/sec for the present day 1% fluvial / 0.5% tidal event probability.
- Map 8 indicates the risk extent is high probability for the present day 1% fluvial / 0.5% tidal event probability.
- Map 10 indicates the actual risk extent for the 0.1% event probability is high, reliant upon protection by flood defences, and flooding starts to occur 1 hour after a breach.
- Map 12 indicates the actual risk extent for the year 2055 for the 1% fluvial / 0.5% tidal event probability is high.
- Map 13 indicates the site is within the high probability band for the year 2115 for the 1% fluvial / 0.5% tidal event probability.
- Map 14 indicates the actual risk extent for the year 2115 for the 0.1% event probability is medium or high, and indicates that this flooding would probably develop approximately ½ hour after any breach occurs.
- Map 16 indicates the site is not within the present day rapid inundation zone, but will be in the rapid inundation zone in 2115.

2. Flood Maps Table D1

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

For the present day	Depth of flooding ... zero
	Extent of flooding .. high
	Hazard low
	Velocity ... 0.0 – 0.1m/sec
For year 2115	Depth of flooding ... 0.5m

Extent of flooding ...High flood probability, occurring ½ hour from the start of the event.

Hazard ... Significant

Velocity .. 0 to 0.1m / sec

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

For the present day

Depth of flooding ... 0.5m

Extent of flooding .. High probability

Hazard ... Low

Velocity .. 0 to 0.1m / sec

For the year 2115

Depth of flooding ...between 0.5m and 1.0m

Extent of flooding .. High probability

Hazard ... Significant

Velocity .. 0 to 0.1m / sec

3. Maximum flood levels:

Maximum flood levels in the River Glen are shown in the reports as follows:

	Present	Present + Climate Change
1 in 100 year	4.32	4.91
1 in 1,000 year	4.47	4.98

The bank level at this location is 4.39m OD

Maximum flood levels in the Vernatt's Drain are shown in the reports as follows:

	Present	Present + Climate Change
1 in 100 year	3.79	3.79
1 in 1,000 year	3.79	3.79

The bank level at this location is 4.25m OD

4. Extreme tide levels

The extreme tide levels in the River Welland between are shown in the report as follows:

	2007	2055	2115
1 in 100 year	5.98	6.31	7.12
1 in 1,000 year	6.32	6.65	7.46

The lowest bank level on the left bank of the tidal River Welland is 7.57m 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" and is considered to be passive until such time that a flood greater than the defences can withstand occurs. The likelihood of flooding due to overtopping or failures of the defences is considered to be very low.

The site is approximately 200 metres east of the River Glen, which is main river and maintained by the Environment Agency.

The site is approximately 4.0 km from the tidal defences of the River Welland.

The area is drained by watercourses maintained by the Welland and Deepings IDB, particularly the drain between the plot and Milestone Lane. The water level in this drain is controlled by Pinchbeck Pumping Station.

Levels on the site range from 3.50m OD on the west side of the existing house to approximately 2.80m OD on the east side of the area. A complete survey including levels over the whole site is included with the plans submitted with the planning application.

Proposed Levels of Buildings

The level of Milestone Lane in front of the site varies from 3.43 OD to 3.57m OD. Ground levels on the site vary between 2.80m OD on the east side of the site to 3.50m OD on the west side of the site. It is recommended that the ground floor level of the new properties should be 200mm above the highest level of Milestone Lane at a level of 3.80m OD.

Potential Sources of Flooding

The following sources of flooding have been identified:

1. Failure or overtopping of the tidal defences of the River Welland
2. Flooding due to high water levels in Vernatt's Drain
3. Overtopping or breaching of the River Glen.
4. Failures of Pinchbeck Pumping Station (IDB)
5. Flooding from the IDB drain
6. Blockages in local surface water and foul sewers (highway or Anglian Water)

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

The tidal River Welland is 2.5km east of the site. The predicted levels in this watercourse show that the defences will not be overtopped in a 1 in 1000 year event in 2115. However there is still the risk that the earth bank could breach when the water levels are high. If a breach occurred in the west bank of the tidal Welland water would flow westwards and would flow into Vernatt's Drain. This

will hold up the flow until the water level reaches 4.25m OD then water would flow out of Vernatt's Drain and start to flow westwards towards the development site.

Therefore the risk of flooding from this source is extremely low.

2. Flooding due to high water levels in Vernatt's Drain

The SFRA states that the maximum water level in Vernatt's Drain is 3.79m OD. This is 450mm below the bank levels on the east side of 4.25m OD. Therefore there is a very low likelihood of flooding from this drain. This maximum water level is almost the same as the proposed ground floor level of the new buildings.

Therefore this source of flooding can be discounted.

3. Overtopping or breaching of the River Glen.

The predicted 1 in 100 year water level at the present time is 4.32m OD, compared with the lowest bank level of 4.39m OD. The predicted 1 in 1000 year water level at the present time is 4.47m OD. Therefore if a greater than a 1 in 100 year event occurs at the present time there is likely to be some overtopping of the banks at this location. Predicted levels with climate change are 4.91m OD and 4.98m OD, which is 600mm higher than the banks at this location.

The River Glen has a 1 in 100 year standard of service at the moment, which will decrease in the future unless work is carried out by the EA to raise banks.

Therefore this source of flooding is the greatest risk to the site, and the hazards will be reviewed later in this report.

4. Failures of Pinchbeck Pumping Station (IDB)

The original pumps at Pinchbeck Marsh had a capacity of 1.5 cumecs, the new part of the pumping station built approximately five years ago added a further 1.5 cumecs of capacity. The catchment to the pumps is 850 hectares. Therefore this pumping station provides a good standard of service for the catchment area, and this source of flooding can be considered to be extremely low.

5. Flooding from the IDB Drain

At the present time there is an open watercourse on the southern boundary of the plot alongside the Milestone Lane. Consent has been granted from the Welland and Deepings IDB to allow this section of Board's drain to be piped and filled as part of the development (subject to approval of the technical details). Welland and Deepings have stated that watercourses in this area are expected to have at least a 1 in 50 year standard of protection against flooding. If a more severe event occurs then water will gradually spread across the lower land in this area. The depth of this flooding would be low, in the order of 300mm, and

the proposal to raise the proposed floor levels above the level of Milestone Lane should provide an adequate freeboard to make the risk of flooding from this source extremely low.

6. Blockages in local surface water sewers and highway drains

Any flooding due to surface water sewers or highway drains would flow off the road onto lower land to the north of the road, and therefore would not rise above 3.50m OD.

Therefore this source of flooding can be discounted.

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 last 50 years.

Probabilities and Trends of Flooding

The probability of this development flooding from Environment Agency main river is very low. In an extreme tidal event the 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

There is a residual risk from extreme events on this site. The major risk to the site is from high levels in the River Glen. The lowest level of the banks of the River Glen is noted as 4.28m OD in the SFRA, although an initial inspection indicates that the top level of the bank is probably at least 5.00m OD for 500 metres north of Crossgate Bridge. Therefore there is a risk that overtopping will begin to occur along this length of bank and the likelihood of one single breach occurring at this location is extremely low.

Summary of Risk of Flooding to the Site

The major risk of flooding at this site is from high water levels in the River Glen following heavy rainfall. Water levels in the River Glen are controlled by sluices at Surfleet Reservoir that open to discharge the River Glen into the tidal section of the River Welland. Flow out of the sluice is not possible during the period of high tide in the River Welland and therefore levels in the River Glen will rise during this period. However as soon as discharge is possible into the River Glen levels will immediately fall.

The Environment Agency has indicated that the maximum predicted level in a 1 in 100 year event would be 4.32m OD at the present time.

PPS25 and the Technical Guide to the National Planning Policy Framework indicate that an FRA should consider climate change over the next 100 years. The Guide indicates the following increases should be allowed for:

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%		

Using this guidance the EA has indicated that maximum 1 in 100 year levels in 2115 will be 4.90m OD.

However if we look carefully at the recorded bank levels of the River Glen in SHDC SFRA which are tabulated at every 100 metres along both banks we find in the first 6.0km of the River Glen that there are:

31 instances on the left bank with bank levels less than 4.90m OD.

18 instances on the right bank with bank levels less than 4.90m OD.

3 instances on the left bank with bank levels less than 4.40m OD.

7 instances on the right bank with bank levels less than 4.40m OD.

Therefore there are approximately 4.9km of banks of the Glen below a level of 4.90m OD. and 1.0km of banks below 4.40m OD.

Details of these levels and chainages are shown in Appendix A on page 12.

Therefore it will be impossible for the water level to reach a level of 4.90m OD in the River Glen. At a level of 4.40 m OD water will be flowing over long lengths of banks and this will be limiting the increase of water levels further.

If the water is flowing over banks then it will be distributed widely and it is reasonable to expect this flood water on the development site will not be reach a higher level than 3.80m OD.

The worst case scenario would be for a breach to occur adjacent to the site. It is reasonable to assume that water flowing out of the River would create a draw down near the breach and it is unlikely that the final maximum level will increase above 3.80m OD.

Conclusions

The following conclusions can be made:

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

- Although the site is in flood zone 3, the actual risk of the site flooding from any Environment Agency water course is low.
- There is a very low risk of a rapid inundation of the site caused by high water levels in the River Glen. As water levels rise in the River Glen water will begin to overtop the banks at multiple locations as far west as the A15 road near Bourne. This will alleviate the situation and water levels are unlikely to increase above 4.40m OD. If water levels remain high with continued overtopping at some stage breaches will develop at one or a number of locations, and these are more likely to occur in sections of bank west of Pinchbeck.
- Any flooding from the IDB drain or local sewers or drains will occur very slowly and it is extremely unlikely that flooding from this source would reach a level of 3.80m OD and flood the proposed dwellings.
- There will be an actual risk of flooding in 2115 because a 1 in 100 year event water will overtop the defences. However you would expect that the Environment Agency will increase the levels of these defences sometime in the next 100 years, considering how many properties are protected by this defence.
- It is proposed that the floor level should be raised 200mm above the level of Milestone Lane to a minimum level of 3.80m OD.
- In a flood risk area there is always a risk of an event occurring of greater magnitude than has been considered in this flood risk assessment.

Recommendations

- The planning application is for three dwellings, two pairs of semi detached houses and one bungalow. A two story dwelling should be constructed in place of the bungalow, so that all of the sleeping accommodation in all three dwellings is on the first floor.
- It is recommended that the ground floor level of all three dwellings should be 200mm above the road level in front of the site, at a level of 3.80m OD. Ideally to prevent any risk of flooding to the building the floor level should be raised to 1.3 metres above existing ground levels. However this would raise houses unacceptably high compared with surrounding properties, and would not be acceptable to the planning authority
- It is unrealistic to raise the proposed new building nearly 1.3 metres above existing ground level to prevent the very low risk of flooding if the bank of the River Glen fails. Future residents should consider evacuating the building if very high water levels are expected in the River Glen when predicted by the Environment Agency (see below).
- Occupiers of the property should register with the Environment Agency's Floodline Warnings Direct Service. If a Flood Alert is received residents

should stay vigilant and move any high value possessions to the first floor of the building. If a Flood Warning is received then residents should consider evacuating the area and only returning when the danger is over.

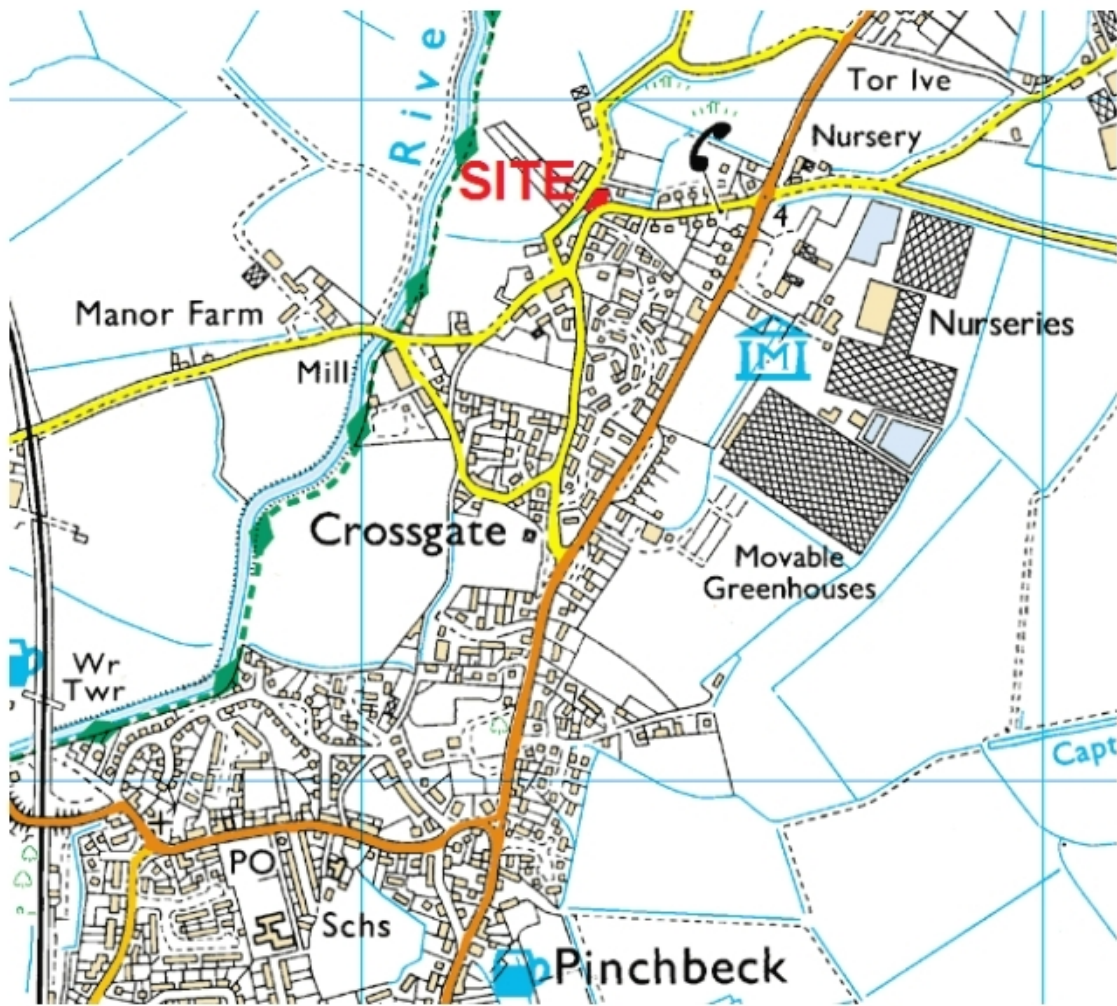
- If residents evacuate the area they should proceed to the central part of Spalding where there is a negligible risk of flooding.
- On site surface water drainage should be discharged into soak aways and these should be designed to BRE Digest 363 and approved under Building regulations.
- The buildings will need to be designed incorporating flood resistant/resilient techniques to allow it to be refurbished after being flooded to a depth of approximately 1.2 metres. Consideration should be given to the electrics and heating pipes being distributed at ceiling level rather than at floor level. Materials used for the floor and walls should be able to withstand flooding for a period of at least a week. Further details are given in Appendix B on page 13.

S M Hemmings B Sc C Eng MICE CMIWEM

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LOCATION PLAN



SITE PLAN



APPENDIX A

RIVER GLEN DEFENCE CREST LEVELS BELOW 5.00m OD

Left Bank		Right Bank	
Chainage	Level	Chainage	Level
0.4	4.83	2.3	4.92
0.7	4.67	2.4	4.63
0.8	4.40	3.3	4.89
1.5	4.95	3.4	4.25
1.9	4.89	3.9	4.97
2.0	4.90	4.0	4.90
2.1	4.65	4.1	4.95
2.2	4.80	4.2	4.72
2.3	4.57	4.3	4.64
2.4	4.72	4.4	4.61
2.5	4.65	4.5	4.54
2.7	4.97	4.6	4.82
3.0	4.87	4.7	4.42
3.1	4.79	4.8	4.59
3.2	4.60	4.9	4.43
3.3	4.48	5.0	4.35
3.5	4.71	5.1	4.37
3.6	4.40	5.2	4.39
3.7	4.89	5.3	4.96
3.8	4.33	5.4	4.28
3.9	4.59	5.5	4.28
4.3	4.79	5.6	4.70
4.4	4.65	5.7	4.38
4.5	4.59		
4.6	4.70		
4.7	4.89		
4.8	4.92		
4.9	4.80		
5.0	4.76		
5.1	4.83		
5.2	4.86		
5.3	4.71		
5.6	4.84		
5.7	4.79		
6.0	4.82		

Chainage is distance measured from Surfleet Sluice in kilometres

Levels are bank levels taken from SHDC SFRA.

APPENDIX B

RECOMMENDATIONS ON LIMITING FLOOD DAMAGE TO BUILDING

- Walls: Construction to first floor level should be carried out with good quality brickwork. Specification for blockwork should be checked and only blockwork that does not absorb water should be used. If possible brickwork should be used instead of blockwork to first floor level. Construction below DPC should be carried out with engineering brickwork.
- Ground Floor: Either precast concrete beams with concrete infill, or concrete above made up ground should be used. Dense concrete screeds should be used.
- Doors: Doors should be solid construction, or plastic should be considered. Butt hinges should be fitted to allow doors to be removed and placed in a dry area prior to any flooding.
- Kitchens: Install plastic base feet and if possible other plastic items to reduce damage from low level flooding. Raise fitted ovens as high as possible.
- Electrical Services: Place all of electrical wiring at first floor level and drop wiring down to sockets at least 1.0 metre above ground level.