

PROPOSED DETACHED HOUSE
CAPES ENTRY, COWBIT, SPALDING PE12 6AG
FLOOD RISK ASSESSMENT



Site from North of Roadway

S M Hemmings B Sc C Eng MICE MIWEM,
69 Charlotte Way,
Peterborough,
PE3 9ER

This flood risk assessment and surface water plan has been prepared solely to support the planning application for the proposed development at Capes Entry, Cowbit. 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 is due to be submitted to South Holland District Council for planning permission to construct a detached house east of Orchard Cottage at Capes Entry, Cowbit, Spalding PE12 6AG. The site is at present the northern part of a field used as a paddock and is between two existing properties.

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.

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 South Holland Internal Drainage Board district.

Application Site

The development is located north of Cowbit. The National Grid Reference of the site is 525454 319028.

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, which states that residential use is only permitted after the sequential and exception test is followed.

Sequential Test

As the proposed development is located in Flood Zone 3(a) the NPPF requires the sequential test to be applied to determine if there are any reasonably available and suitable alternative sites in a lower flood risk zone for this type of development. This development can be classed as a windfall site outside the village of Cowbit. All of the village of Cowbit and the surrounding area is within flood zone 3. The development complies with the South Holland District Council's policy on these types of sites.

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

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 low or medium risk and protected by flood defences.
- Map 6 indicates the peak depth is zero for the present day 1% / 0.5% tidal event probability.
- Map 7 indicates the peak velocity is zero for the present day 1% fluvial / 0.5% tidal event probability.
- Map 12 indicates the actual risk extent for the year 2055 for the 1% fluvial / 0.5% tidal event probability is low or medium, and protected by flood defences.
- Map 13 indicates the actual risk extent site for the year 2115 for the 1% fluvial / 0.5% tidal event probability is high.
- Map 16 indicates the site is not within the rapid inundation zone.

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 .. low or medium
	Velocity ... Nil
For year 2115	Depth of flooding ... 0 - 500mm
	Extent of flooding ...high

Velocity ... 0 – 0.1m/sec

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

For the present day

Depth of flooding ...0 – 500mm

Extent of flooding .. high

Velocity .. 0 – 0.1m/sec

For the year 2115

Depth of flooding ...0 – 500mm

Extent of flooding .. high

Velocity .. 0 – 0.1m/sec

3. Maximum flood levels:

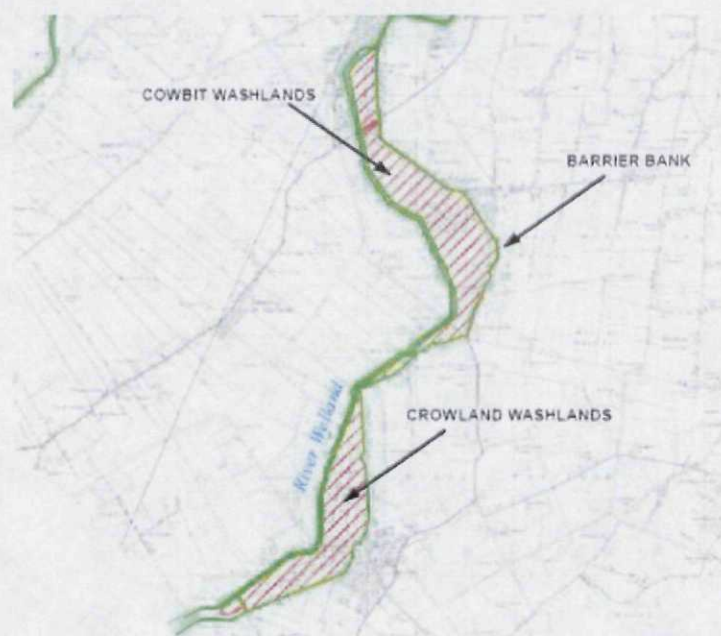
Maximum fluvial flood levels in the River Welland at Crowland at chainages between 3km and 4km are shown in the reports as follows:

	Present	Present + Climate Change
1 in 100 year	4.53	4.67
1 in 1,000 year	4.54	4.67

The lowest level of the Barrier Bank of the River Welland stated in the SFRA is between 5.77m OD and 6.05m OD between chainages 3.0km and 4.0km.

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 section of the River Welland from south of Crowland to the southern outskirts of Spalding has two washlands located on the east side of the River, called Crowland Washlands and Cowbit Washlands. These areas are designed to alleviate very high flows in the River Welland. When the water level in the River Welland reaches a level of approximately 5.10m OD large syphons are activated which discharge excess water onto the Washes. The Barrier Bank is located on the east side of the Washes to contain the water in the Washlands and is the main flood defence bank on the east side of the river.

The site of the proposed house is approximately 650m from the Barrier Bank, the south bank of the River Welland.

Existing Ground Levels

The level of the site of the proposed house varies between 2.30m and 2.43m OD. The field to the south is slightly lower with a level of 2.13m OD and the field to the north is a similar level to the site itself. The floor level of Orchard Cottage is approximately 2.75m OD and the proposed level of the new house is 2.90m OD.

Potential Sources of Flooding

The following sources of flooding have been identified:

1. Failure or overtopping of the Barrier Bank (River Welland)
2. Failure or overtopping of Coronation Channel
3. Failure or overtopping of tidal section of the River Welland
4. Flooding from IDB Drain

1. Overtopping of the Barrier Bank.

The Barrier bank is the eastern bank of the Cowbit Washes. The Washes are only flooded in extreme conditions (around 1 in 50 years) and are used the rest of the time as agricultural land. There are two syphons which operate automatically to allow water to flood on to the Washes and alleviate high water levels in the River Welland. When this occurs the level of water in the washes will quickly rise to around 5.00m OD.

If a breach occurred in the Barrier Bank north of Cowbit in this scenario then flood water would flow eastwards towards the development site. The SFRA does not seem to consider this scenario. Therefore in Appendix 1 (pages 11 and 12) there are predictions of the hazard and water depths that could occur at the development site if a breach occurred. These indicate the hazard is mainly in the "Danger for Some" category with flood depths probably between 400mm and 500mm. However these predictions can be considered to be in excess of the true hazard because a large breach would result in a rapid reduction in the levels in the River Welland which would reduce the computed flow through the breach.

Therefore taking a precautionary approach it is recommended that the ground floor level of the proposed house should be 600mm above the average ground level in the area.

2. Flooding from Coronation Channel

The SFRA states that the maximum design level in the Coronation Channel is 4.69m OD. The minimum crest level of the south bank of the Channel on is 5.70m OD, which gives a minimum freeboard of 1.0 m. The coronation Channel is 2.5 km north of the development site.

If the Channel were to breach water would flow southward towards the site. However, it would be retained for a short time by the A16 which is higher than the surrounding land. The flooding of 0 – 500mm predicted in the SFRA could be from this source. However the flooding would be less severe than the predictions from a breach of the Barrier Bank and therefore as the proposed level of the ground floor of the building is 600mm above average ground level then the risk of flooding to the house in a 1 in 100 year event can be considered extremely low.

3. Flooding from Tidal Section of River Welland

The tidal section of the River Welland starts north of the sluices near the confluence of the Coronation Channel and the River Welland on the northern side of Spalding, which is approximately 6.5km north of the development site. Flood water would tend to flow eastwards towards Weston rather than southwards towards Cowbit.

The SFRA states that flood depths of up to 500mm in depth could occur at the site and this could be the result of a failure of the tidal banks.

The raising of the floor levels by approximately 600mm above ground level should mean that the risk of flooding to the house is extremely low and the risk of flooding in a 1 in 200 year event in 2115 would not be predicted.

4. Flooding from IDB Drain

South Holland IDB maintain drainage channels in this area. The watercourse at the southern boundary of the field where the development is located is Clowacre Drain (B11), which is an IDB drain. This flows into Wheatmere Drain (B35) which flows southwards into the South Holland Main Drain (B30). The water level in the South Holland Main Drain is controlled by Wisemans Pumping Station.

IDB drains were designed to provide at least a 1 in 10 year standard of service with a freeboard of at least 900mm. This normally provides at least a 1 in 50 year standard of service against overtopping and in many cases a 1 in 100 year standard at the present time.

South Holland IDB have a policy of monitoring standards of protection in all their catchments and will carry out improvements to pumping stations, sluices and

drainage channels to ensure they do not fail due to higher run-offs predicted with climate change.

It is unlikely that any failure of assets such as pumping stations, sluices or drainage channels would lead to overtopping of the watercourse because South Holland IDB have an excellent maintenance regime and monitor all assets with a modern telemetry system.

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. The last time that a breach occurred in the River Welland was 1947, and since that date considerable investment has been made to raise banks and provide a banks which are above the 1 in 100 year flood level.

Probabilities and Trends of Flooding

The probability of this site 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

There is a residual flood risk to the site if the Barrier Bank west of the site breached when the Cowbit Washland is full. Water would flood eastwards towards the proposed development site.

Conclusions

The following conclusions can be made:

- The proposed development is not in a functional flood plain as defined by the Guidance.
- Although the site is in flood zone 3, the actual risk of the site flooding from any Environment Agency water course is very low.
- The SFRA states for the 1.0% fluvial and 0.5% tidal event there is no actual risk of flooding at the present time but in 2115 flooding up to a depth of 500mm could occur.
- The SFRA states for the 1.0% fluvial and 0.5% tidal event there is a residual risk of flooding at the present time and in 2115 flooding up to a depth of 500mm could occur.
- There is a residual risk that the site could flood if a breach occurs in the Barrier Bank after the Cowbit Washes have been flooded. It is likely that flood water from this source would substantially increase the flow in Wheatmere Drain which could overflow onto the adjoining fields south of the site, which would limit the increase in flood depth in around the site of the development.

As the risk of flooding the Crowland Washes is between 1 in 20 years and 1 in 50 years, the risk that the Barrier bank would fail is considerably less than this, and must be less than 1 in 1000.

- 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

- In any area at risk of flooding it is preferable that any new dwelling should be of two story construction with all bedrooms at first floor level. This is to provide a refuge for residents if the building becomes flooded after a major breach of the tidal or fluvial bank, and ensure there is no danger to residents when they are asleep
- The ground floor level of the proposed house should be approximately 600mm above existing ground level at a level of 2.90m OD and all bedrooms should be at first floor level.
- Occupiers of the property should register with the Environment Agency's Floodline Warnings Direct Service.
- If occupiers of the building are warned of possible very high levels in the fluvial River Welland they should monitor the situation and if necessary be prepared to evacuate the area during the period when the Washes are at the maximum level.
- On site surface water drainage should be discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.
- All future owners and occupiers of the building should be given a copy of the Flood Risk Assessment so that they are fully aware of the risk of flooding in this area.
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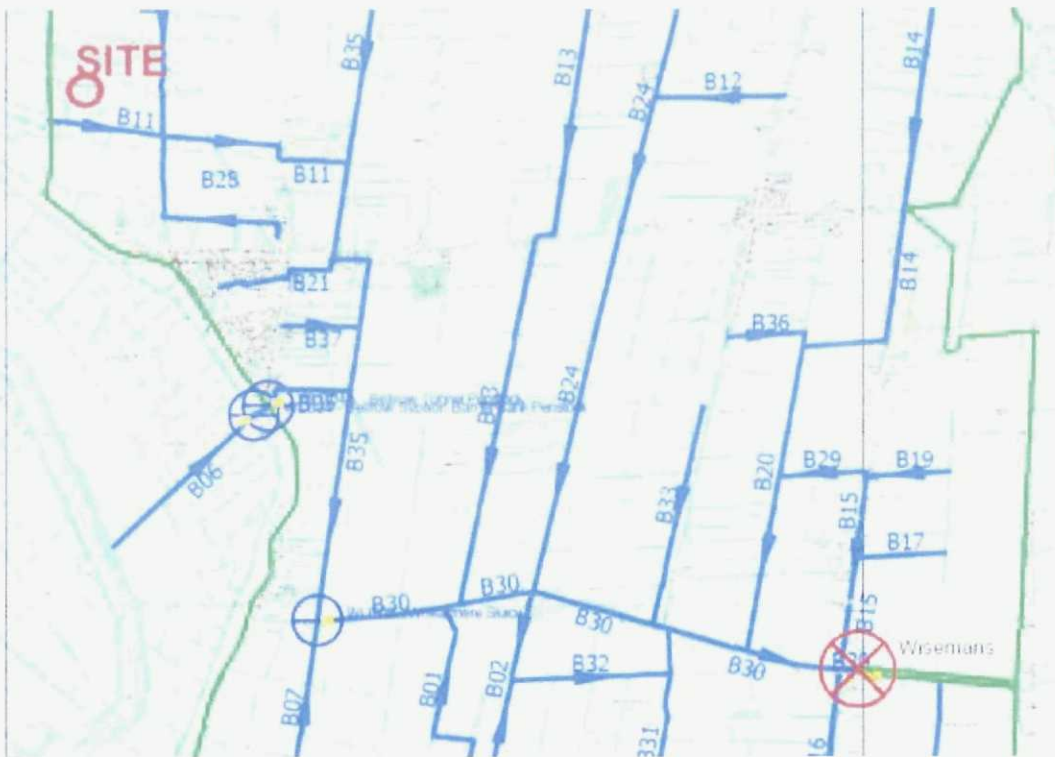
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16th September 2015

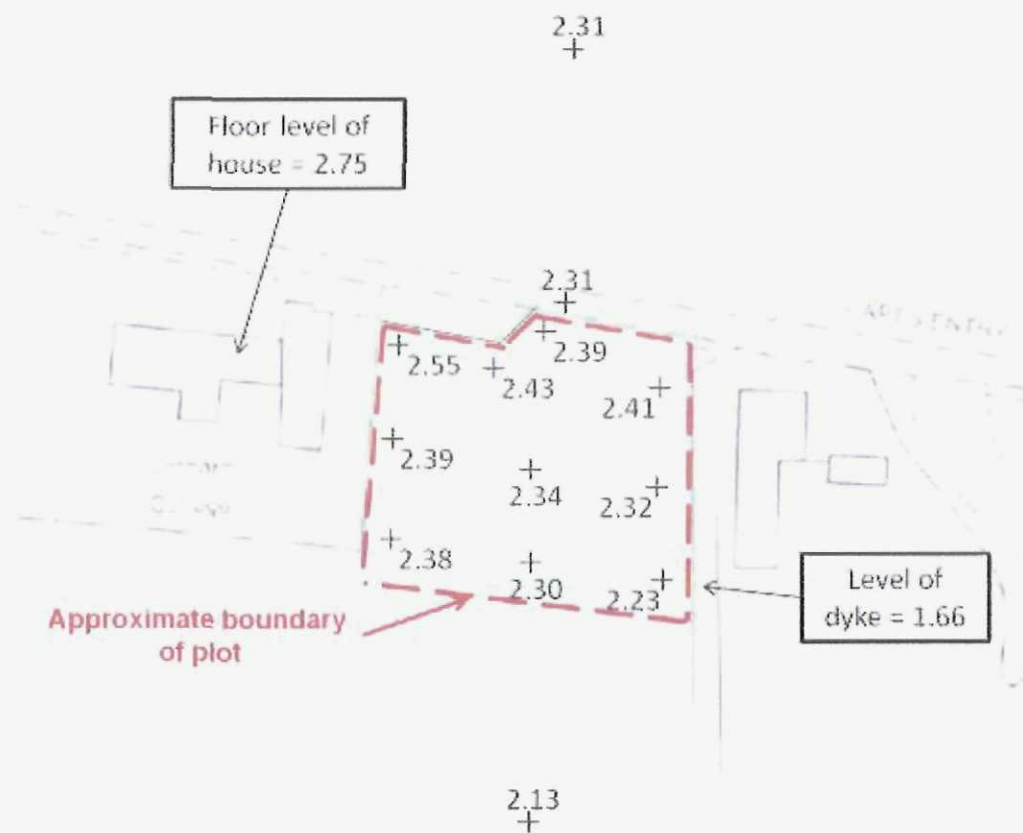
LOCATION PLAN



PLAN OF SOUTH HOLLAND IDB WATERCOURSES



PLAN SHOWING LEVELS OF THE SITE



APPENDIX 1

BREACH CALCULATIONS FOR BARRIER BANK

This calculation will work out an assumed volume that will flow through a 40 metre wide breach of the Barrier Bank when the water level in the flood storage area is the maximum 1 in 100 year level in 2115.

A calculation of this volume will then be carried out at the development site to work out probable water depths, velocities and hazard rating for the site in this situation.

Maximum level of the River Welland = 5.03m OD

Average level of land immediately behind the Barrier Bank = 2.0m OD

Width of breach = 40 metres

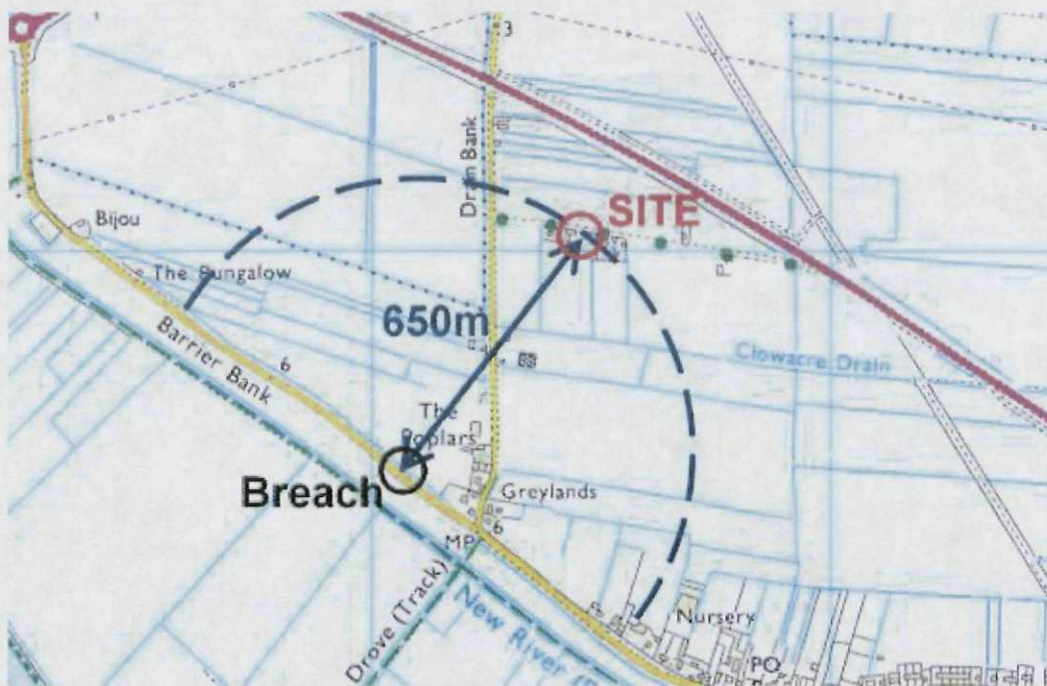
Assume the breach is a broad crested Weir

$$\begin{aligned}\text{Maximum Volume through Breach} &= 1.7 \times b \times H^{3/2} \\ &= 1.7 \times 40 \times 3.03^{3/2} \\ &= \underline{358.4 \text{ cumecs}}\end{aligned}$$

$$\text{Velocity of water through breach} = 358.4 / (40 \times 3.03) = \underline{3.2\text{m/sec}}$$

The site is approximately 650 metres from the nearest breach position.

Assume that water will be flowing away from the breach along the dotted blue line at the same depth and velocity.



The length of the dotted blue line is $0.5 \times 3.142 \times 650 \times 2 = \underline{2042 \text{ metres}}$

Therefore if we assume the same volume (358.4 cumecs) is flowing through the blue line we can work out flood depths for different chosen velocities.

For example choose velocity of 0.2 m/sec, therefore area of flow = 1792 sm

Therefore flood depth = $1792/2042 = \underline{0.878 \text{ metres}}$

This can be repeated for different velocities and the hazard rating worked out for each case, using the formula

$$\text{Hazard Rating} = ((\text{depth of flooding} \times \text{velocity}) + 0.5) + \text{Debris factor}$$

Velocity	Flood depth	Hazard Rating	Hazard
0.2	878mm	$(0.878 \times 0.7) + 0.5 = 1.11$	Danger for some
0.3	584mm	$(0.584 \times 0.8) + 0.5 = 0.97$	Danger for some
0.4	438mm	$(0.438 \times 0.9) + 0.5 = 0.89$	Danger for some
0.5	351mm	$(0.351 \times 1.0) + 0.5 = 0.851$	Danger for some
0.6	293mm	$(0.293 \times 1.1) + 0.5 = 0.89$	Danger for some

The hazard have been worked out following the guidance shown in the Supplementary Note to FD2320 and FD2321 on Flood Hazard Ratings and Thresholds for Development Planning.

There is some discussion in the supplementary note about what value should be taken for the debris factor. One table suggests that for arable land the factor should be zero. However the final table suggests the use of a factor of 0.5. If a factor of zero were to be used it would reduce the hazard rating to below 0.75 in every case and the hazard to "Very low hazard - Caution".

Therefore it is estimated that the deepest flooding that would occur on the site would be between 400mm and 500mm in depth.