PROPOSED REPLACEMENT DWELLING AT LUCKSBRIDGE FARM HOUSE, SOUTH DROVE, SPALDING, PE11 3ED

FLOOD RISK ASSESSMENT



View of existing house from South Drove

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This flood risk assessment has been prepared solely to support the planning application for the proposed replacement dwelling at Lucksbridge Farm House, South Drove, 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, or if it is used for any purposes other than for which it was originally commissioned.

Introduction

An application (reference No H03-0445-21) has been submitted to South Holland District Council for planning permission to demolish the existing dwelling called Lucksbridge Farm House, which is located on South Drove, Spalding, PE11 3HA and construct a replacement dwelling on the site immediately behind the existing dwelling. This flood risk assessment replaces the document originally submitted with the planning application.

The site is within Flood Zones 3 as shown on the Environment Agency's Flood Zone Map. These maps do not take into account existing flood defences.

The Technical Guidance to the National Planning Policy Framework Development and Flood Risk states that if a development lies within Flood Zone 3 a Flood Risk Assessment should be carried out to accompany any Planning Application.

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.

Environment Agency (EA) Flood Zones

The map below is taken from the Environment Agency website and shows the flood zones in the area.



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It can be seen that all of the site is within flood zone 3.

Application Site

The development is located on South Drove, south of Spalding. The National Grid Reference of the site is 523840 317500.

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

As the site is within a defended area the proposed development can be considered to be within Flood Zone 3(a) as detailed on the Environment Agency's flood zone maps without defences, as defined in Table 1 of the Technical Guidance.

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 most of this area on the south side of Spalding is in Flood Zone 3(a).

It is not possible to locate the development in an alternative location because the application is for the replacement of an existing building.

Referring to the South East Lincolnshire Local Plan 2011-2036 adopted in March 2019, Policy 23 states the rebuilding of outdated dwellings in the countryside will be permitted, subject to conditions on the state of the building and the design of the proposed development.

The safety of the development will be delivered by demonstrating that the ground floor level of the proposed building is above the predicted flood levels in this 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 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 Strategic Flood Risk Assessment (SFRA) written for the South Holland District Council (SHDC) in 2010 provides details of the actual flood risk in the Council's area. This information has not been updated and reference to the maps in this document give the following information for the actual flood risk and hazard at the site for the 1% fluvial event and 0.5% tidal event.

For the present day	Depth of flooding … Zero
	Extent of flooding .. Low or medium flood probability
	Flood Hazard…….Zero
	Peak Velocity ……. Nil
For year 2115	Depth of flooding … Zero
	Extent of flooding…. Low or medium flood probability

Flood Hazard…….Zero

Peak Velocity …… Nil

The maps showing the residual flood hazard were revised in the 2016 update of the South Holland District Council Strategic Flood Risk Assessment which can be found on the website of the South East Lincolnshire Joint Planning Committee. The hazards are as follows for the 1% fluvial or 0.5% tidal event probability:

For the present day
Depth of flooding … 0 – 500mm
Extent of flooding .. High
Flood Hazard…….. 0.75 – 1.25 (danger for some)
Peak Velocity …… 0 – 0.3 metres/second

For the year 2115
Depth of flooding … 250mm – 500mm
Extent of flooding .. High
Flood Hazard…… 0.75 – 1.25 (danger for some)
Peak Velocity …… 0 – 0.3 metres/second.

Figure 16 of the general maps show that the site is just outside the rapid inundation zone for the present day and in 2115, as defined on the map shown in the 2010 SFRA.

1. **The maximum flood levels in the River Welland is shown in the reports as follows:**

	Peak 1 in 100 year		Peak 1 in 1000 year	
Year	2007	2115	2007	2115
Level	4.68	4.76	4.70	4.76

The chainage of the River Welland east of the development site is 7.0km. The bank levels between chainage 6 km and 8 km vary between 5.65m OD and 5.90m OD.

Information from the Environment Agency

The Environment Agency has provided predicted flood levels for a similar location on the River Welland which are taken from the Welland Catchment Strategic Model produced in 2016.

	2007	2115
Peak 1 in 100 year flood level	4.56m OD	4.65m OD
Peak 1 in 1,000 year flood level	4.58m OD	4.66m OD

Information on Surface Water Flooding on Environment Agency Website

The map on the next page 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 there no predicted risk of surface water flooding around the proposed building.

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 600 metres from the River Welland, which is main river and maintained by the Environment Agency.

This area south west of Spalding is drained by watercourses maintained by Welland and Deepings Internal Drainage Board. The water levels in the IDB channels are controlled by the water level in North and South Drove Drains which are also operated by Welland and Deepings IDB.

Site Levels

A topographical study of the site has been carried out and the drawing showing the ground levels will be included with the planning application. A sample of these levels have been transferred onto a smaller plan which is shown on page 14 of this report.

The level of South Drove on the western boundary (front) of the site is approximately 2.00m ODN near the entrance and is lower further south where the level is 1.80m ODN.

The floor level of the main part of the existing house is 1.78m ODN and the level of the lean to at the southern end is 1.97m ODN. The levels around the building are between 1.70m and 1.95m ODN. The ground levels are low in the south western corner of the front garden with a lowest level of 1.53m ODN.

The proposed new house will be located to the rear (east) of the existing house and levels in this area are 1.89m, 2.08m, and 2.15m ODN. This area seems to have been made up with gravel and hardcore at some time in the past, as general land levels in the area behind the house seem to be lower at between 1.80m and 1.90m ODN. Further west on the site the ground levels are lower with levels of between 1.25m and 1.50m ODN.

Potential Sources of Flooding

The following sources of flooding have been identified:

1. Failure or overtopping of the west bank of the River Welland.
2. Due to high water levels in the IDB Drainage system
3. Failure or overtopping of the tidal defences of the River Welland.
4. Flooding from accumulation of surface water on the site.

1. Failure or Overtopping of the west bank of the River Welland.

The River Welland is located approximately 600 metres north east of the site.

The maximum predicted 1 in 100 year level in 2115 in the River Welland is 4.58m OD. The minimum level of the west bank of the River Welland at this location is 5.65m OD. Therefore as long as the bank does not fail there is no risk of overtopping of the bank and therefore no risk of flooding to the proposed development.

If the west bank of the River Welland breached at a location north east of the site the flood water would flow towards the site. The map in the South East Lincolnshire SFRA (March 2017) showing the predicted flood level on the site in a 1 in 100 year event in 2115 indicates a predicted flood depth of between 250mm and 500mm on the site. A very basic River Analysis has been carried out with HEC-RAS and this indicates if a 40 metre wide breach occurred in the bank of the river then the depth of flooding would be approximately 500mm on the site.

The flood flow from a breach in the bank of the river would flow into the South Drove Drain which is approximately 20 metres west of South Drove. This IDB Drain is a large drain and this will distribute the flood water northwards and southwards, and will reduce the depth of the flood water below 500mm. Welland & Deepings IDB would operate the pumps at Pode Hole to try to alleviate the situation water but water levels in the drain would inevitably rise flooding could start to taken place onto lower agricultural land in this area.

Adequate mitigation will be provided by raising the ground floor level of the proposed building above the predicted maximum flood level.

2. High Levels in the IDB Drainage System.

The South Drove Drain (shown below) is located on the west side of South Drove.



South Drove Drain is one of two main IDB watercourses in this area and these are maintained by Welland and Deepings IDB (W & D IDB). The water levels in these drains is controlled by the electrically operated and diesel powered pumps at Pode Hole Pumping Station. W & D IDB have stated that the normal water level at Pode Hole Pumping Station is -1.20m OD and the design level in a 1 in 100 year event is 0.18m OD.

W & D IDB have a policy of reviewing standards of protection at regular intervals and would carry out improvements over the next 100 years to ensure that all agricultural land and properties in this catchment would continue to have a satisfactory standard, and therefore it can be assumed that the maximum design level in 2115 will be 0.18m OD.

W & D IDB have a policy of continual maintenance to all the pumps at Pode Hole to ensure that they will operate satisfactorily in a high rainfall event. The Board have contingency plans to operate the pumps if electricity supplies were compromised and have sufficient sources to repair plant and machinery if a breakdown occurred.

Drainage channels maintained by W & D IDB generally have a 1 in 10 year standard with up to 1.0 metre of freeboard, which provides between 1 in 50 year and 1 in 100 year standard against flooding.

Therefore the risk of flooding from this source in a 1 in 1000 year event both now and in 2115 can be considered to be adequately mitigated.

3. Failure or Overtopping of the tidal defences of the River Welland.

The tidal defences are 7.8 km north of the site, to the north of Spalding. The Environment Agency predict that flood water from a breach of these defences would not flow as far as this site in South Drove.

Therefore this source of flooding can be considered to be adequately mitigated.

4. Flooding from accumulation of surface water on the site

Surface water from the roofs of the houses on the development site will if possible be disposed of into soakaways. The hardstandings will be constructed with permeable block paving laid on suitable gravel sub base, or an alternative permeable surfacing. As the ground floor levels will be raised above the level of South Drove and all the ground levels on the site this will adequately mitigate the risk of flooding from this source.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of the site or any of the adjoining properties being flooded.

Probabilities and Trends of Flooding

The probability of this development flooding from Environment Agency main river is very low. However in an extreme event at this location water levels in the River Welland would be very high, and emergency syphons are designed to operate to discharge excess water onto the Washes on the east side of the river.

Residual Risk – Extreme Events

The residual risk from extreme events is very low on this site.

There are no records of this area south of Spalding having been flooded in the last 60 years.

Climate Change

The recommendations for predicted 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 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 18). 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 the flood hazard in a 1 in 100 year fluvial or 1 in 200 year tidal event is 0.75 – 1.25 (danger for some) reference should be made to Category E8 in the matrix which shows the advice for this category is as follows:

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

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

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

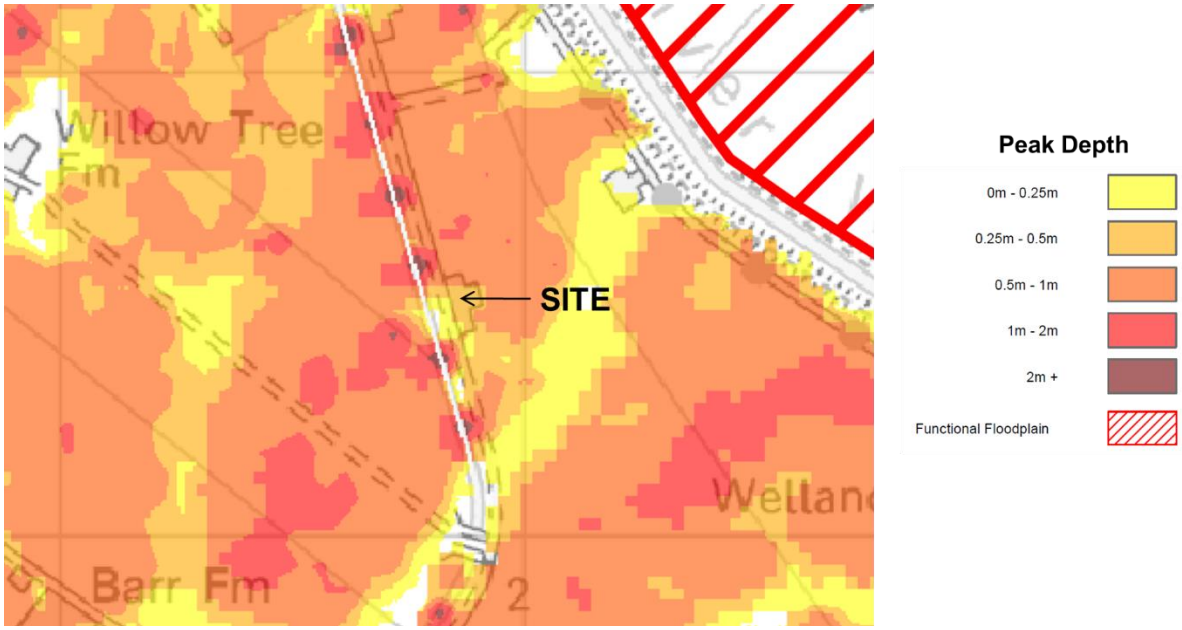
For flood depths of 250mm – 500mm, FFL should be set 500mm above ground level with flood resilient construction to a height of 300mm above the predicted flood depth.

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

Summary of flood risk to the Site.

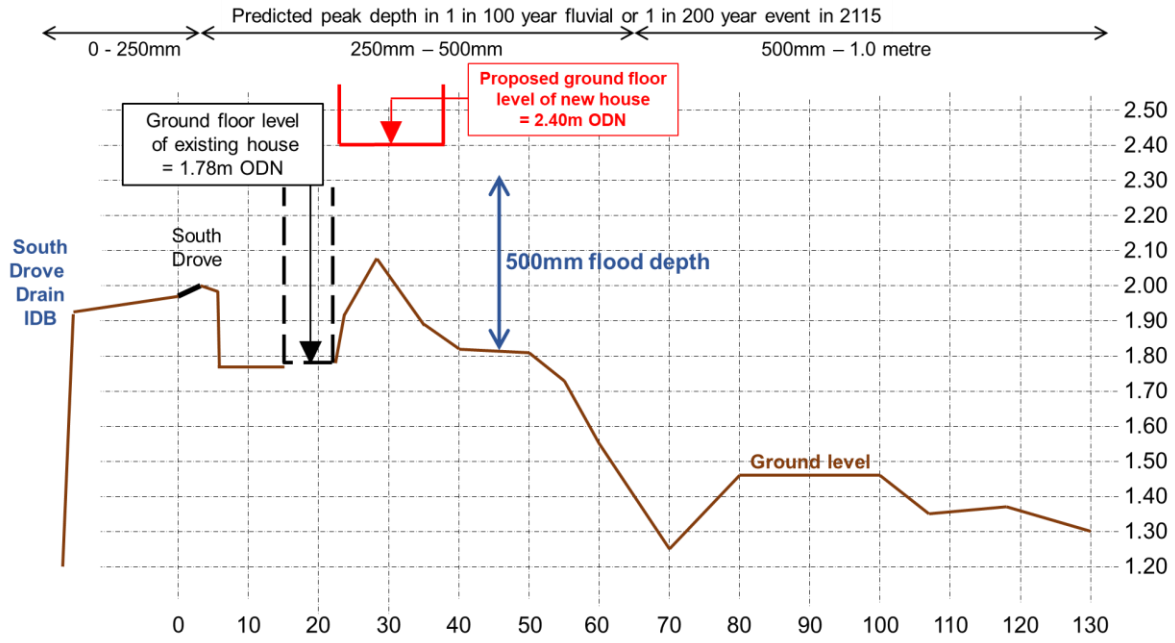
The major flood risk to the site is if a breach were to occur in the south western bank of the River Welland, which is 600 metres from the site.

Part of the most recent map in the 2017 SFRA showing peak residual flood depths in 2115 for the 1% fluvial and 0.5% tidal event probability is reproduced below.



This predicts between 250mm and 500mm depth of flooding on the site.

A section west to east has been drawn using the levels from the topographical study and this is shown below.



The average level of the ground around the house and the site of the replacement building is 1.80m ODN. Therefore it is proposed that the level of the new house should be 2.40m ODN, which is between 400mm and 600mm above the level of South Drove west of the existing house, and 600mm above the average level of the ground where the map above predicts flood depths of between 250mm and 500mm.

Conclusions

The proposed development is not in a functional flood plain as defined by the Technical Guidance.

Although the site is in flood zone 3, the actual risk of the site flooding from any Environment Agency watercourse is very low.

In the area west of South Drove indicated yellow (flood depths 0mm – 250mm) on the map showing predicted levels above the maximum ground level is 2.00m ODN.

In the area indicated light orange (flood depths 250mm – 500mm) on the map showing predicted levels above the ground levels vary between 1.53m and 2.15m ODN. Ignoring the upper and lower levels gives a range of between 1.70m and 2.00m ODN.

Further east on the site indicated darker orange (flood depths 500mm - 1.0metre) on the map ground levels vary between 1.28m and 1.64m ODN.

By referring to the above levels and the section west to east above it is concluded that the estimated maximum flood level in a 1 in 100 year event in 2115 would be between 2.25m and 2.30m ODN. Therefore it is recommended that the minimum finished ground floor level of the proposed house should be 2.40m ODN.

There is always a risk of an event occurring of greater magnitude than a 1 in 100 year event in 2115 which could increase the risk of flooding at the site.

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 building becomes flooded after a major breach of the River Welland, and ensure there is no danger to residents when they are asleep.

The proposed ground floor level of the new building should be 2.40m ODN which is 600mm above the general ground levels immediately east of the existing building and between 400mm and 600mm above the level of South Drove west of the existing building.

Flood resilient construction should be included to a height of 300mm above the predicted flood depth.

Occupiers of the property should register with the Environment Agency's Floodline Warnings Direct Service.

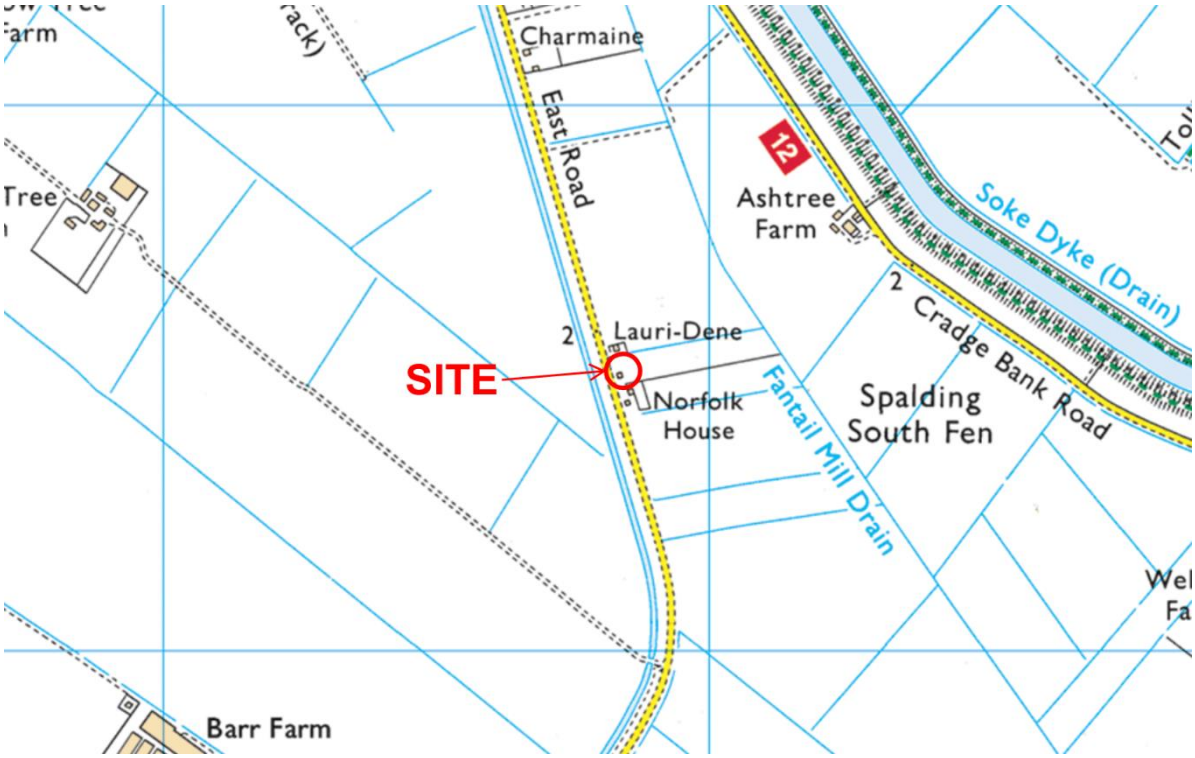
Surface water from the roof of the proposed property should be discharged into a soakaway and this should be designed to BRE Digest 365 and approved under Building regulations.

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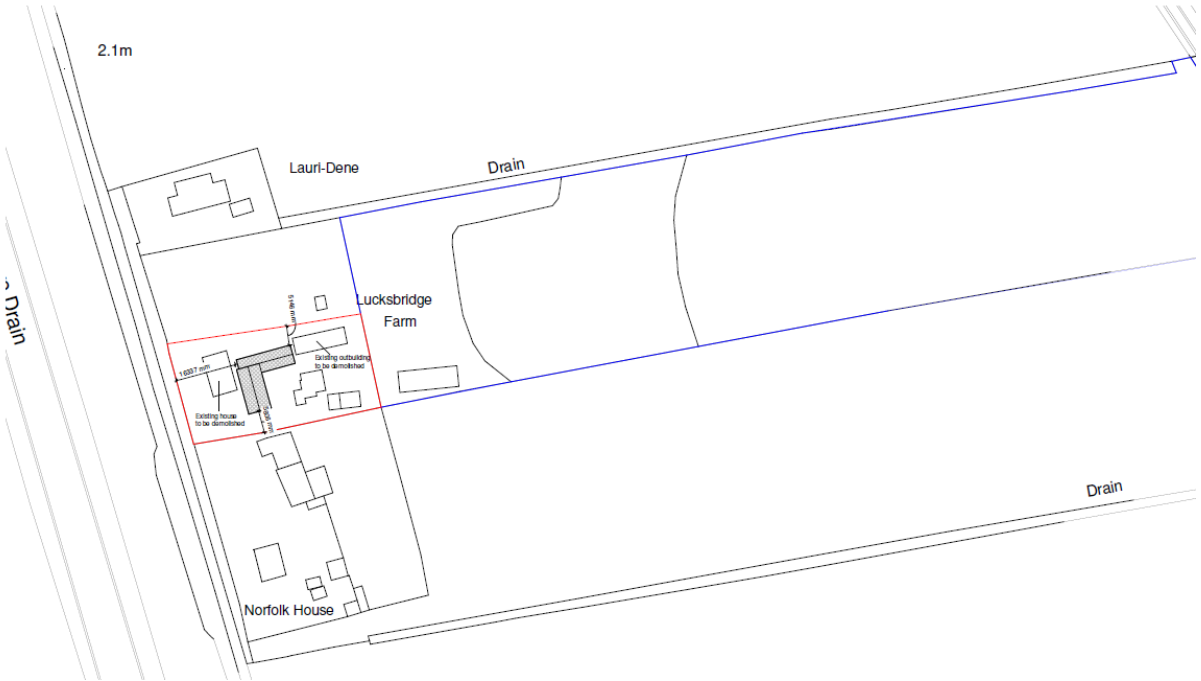
stuart.hemmings@btinternet.com

9th December 2021

LOCATION PLAN



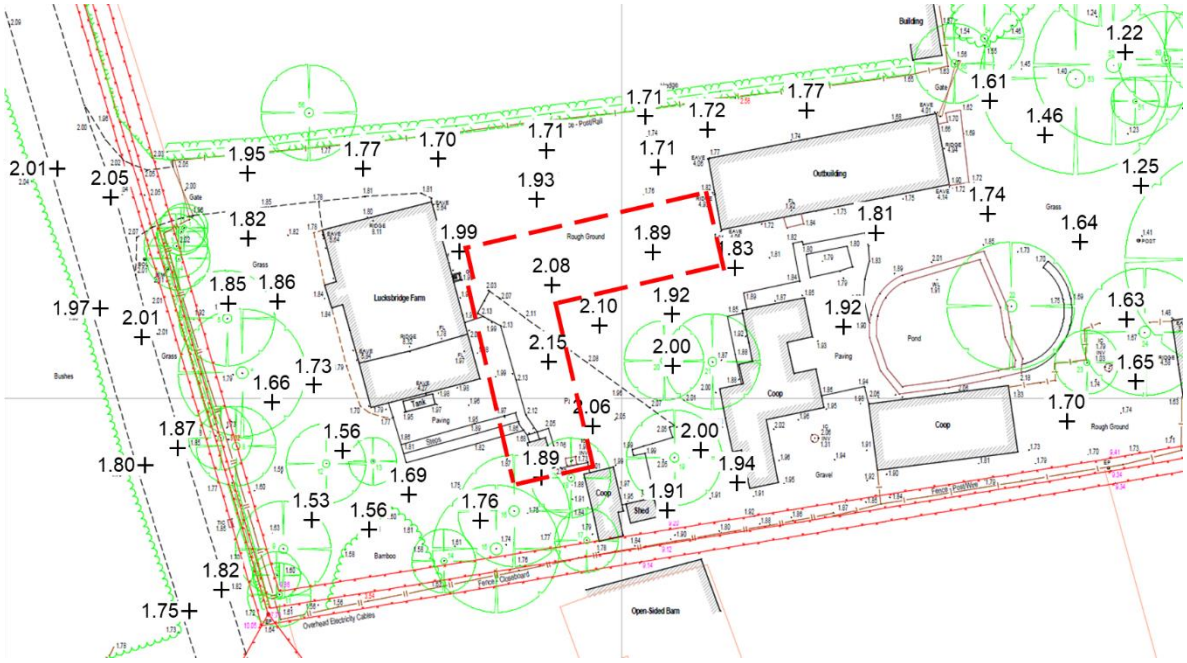
BLOCK PLAN



PLAN OF IDB DRAINS



PLAN OF SITE LEVELS



APPENDIX A CLIMATE CHANGE

The Environment Agency has issued revised guidance on climate change and have now stated that the new predictions should be considered and incorporated into all flood risk assessments produced after 19th February 2016.

Listed below are the climate change allowances in three documents:

- South Holland SFRA
- EA guidance (2013)
- Revised EA guidance

The recommendations in each document are shown below.

2010 South Holland DC SFRA

The SHDC SFRA states that the the following allowances have been made for climate change:

4.4 Climate Change

Scenarios for the years 2055 and 2115 include for climate change contingency allowances to the amount suggested by PPS25[1]. 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

document is out of date'a

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%	

s been withdrawn (19

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 2 the central and higher central category 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

Fluvial Flooding from River Welland.

As the development is in flood zone 3 and is classed as more vulnerable, the central climate change allowance, which is 35%, should first be considered. After considering the effects of this increase the higher central allowance, 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 increase to 35% will not significantly change the conclusion in the SFRA of what might happen if a breach occurred in the bank of the River Welland. If there are additional flows along this part of the 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.

The higher central allowance predicting a 65% increase in flows above the 1 in 100 year predicted flows now needs to be considered. The River Welland is an embanked watercourse between Spalding and Market Deeping. There are flood reservoirs on the east side of the River called the Cowbit and the Crowland Washes. Excess water

would flow into these Washes through two large syphons. In this scenario the Washes would fill up and also water would be flooding over lower banks of the River. The increases in rainfall leading to this would also lead to significant flooding in the upper part of the River Welland Catchment. It is unlikely that there will be any significant increase in the water level in the River. Therefore the consequence will not be significantly different to the maps produced in the SFRA.

Effect on IDB Systems

Welland and Deepings 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 Welland and Deepings 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 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 ground floor level should be a minimum level of 2.40m ODN is satisfactory.