PROPOSED BARN CONVERSIONS AT ISLINGTON HALL FARM, ISLINGTON GREEN, TILNEY ALL SAINTS, KINGS LYNN, PE34 4SB.

FLOOD RISK ASSESSMENT

View of Barns

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 the conversion of two barns at Islington Hall Farm, Islington Green, Tilney All Saints. 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.

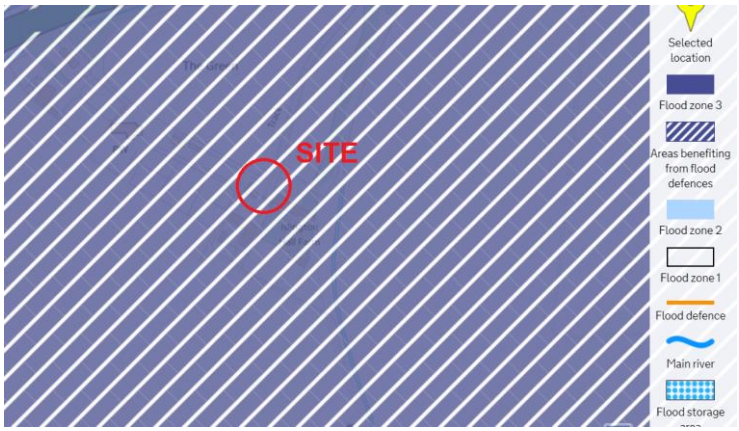
Introduction

A planning application is due to be submitted to the Borough Council of Kings Lynn and West Norfolk for the permission to convert two barns at Islington Hall Farm, Islington Green, Tilney All Saints, Kings Lynn, PE34 4SB into holiday accommodation. The barns are at present used for storage of materials.

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 Kings Lynn and West Norfolk Borough Council's Strategic Flood Risk Assessment (SHDC SFRA) map and is located in the Kings Lynn 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.



This map shows the whole area is within flood zone 3, and benefiting from flood defences.

The immediate area is shown more clearly on the the map in the appendices of the Council's SFRA which is reproduced below.

Application Site

The site is located 2.2 km west of the tidal defences of the River Ouse. The National Grid Reference of the site is 557220, 316800.

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 categorised as 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 refined 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 this application is for the refurbishment of an existing building which will provide additional holiday accommodation which will be managed along with the present

holiday accommodation on the site then it cannot be located at an alternative location in a lower flood zone.

Policy DM5 in the Kings Lynn and West Norfolk Local Plan allows for the replacement of out of date properties and states:

> **Policy DM 5 – Enlargement or Replacement of Dwellings in the Countryside**
>
> Proposals for replacement dwellings or extensions to existing dwellings will be approved where the design is of a high quality and will preserve the character or appearance of the street scene or area in which it sits. Schemes which fail to reflect the scale and character of their surroundings or which would be oppressive or adversely affect the amenity of the area or neighbouring properties will be refused.

The development will satisfy all of the requirements as set out in Policy DM11 (Touring and Permanent Holiday Sites) in the Local Plan.

The safety of the occupants in the future will be achieved by raising the finished floor level of the building above the predicted flood level on this site.

Therefore it can be considered 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 Kings Lynn and West Norfolk Borough Council's planning policies.

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

Strategic Flood Risk Assessments (SFRA)

The Flood Zone maps only provide a guidance to the flood risk if there are no flood defences. Therefore the next stage is to refer to the available SFRA's to ascertain a better indication of the actual flood risk.

The first Strategic Flood Risk Assessment (SFRA) for the Borough of King's Lynn and West Norfolk area was completed by Bullens Consultants in 2005, which was updated by Faber Maunsell in 2008. The updated SFRA applied more sophisticated 2D modelling methodologies and made use of recent LIDAR data (ground levels measured by aircraft), which provided more detailed information on local topography.

The 2008 SFRA was replaced by the November 2018 SFRA, which provides more up to date maps and information on the predicted flood risk.

Kings Lynn and West Norfolk SFRA

The Level 1 SFRA issued in November 2018 gives detailed information about the flood risk in the Tilney Fen End area.

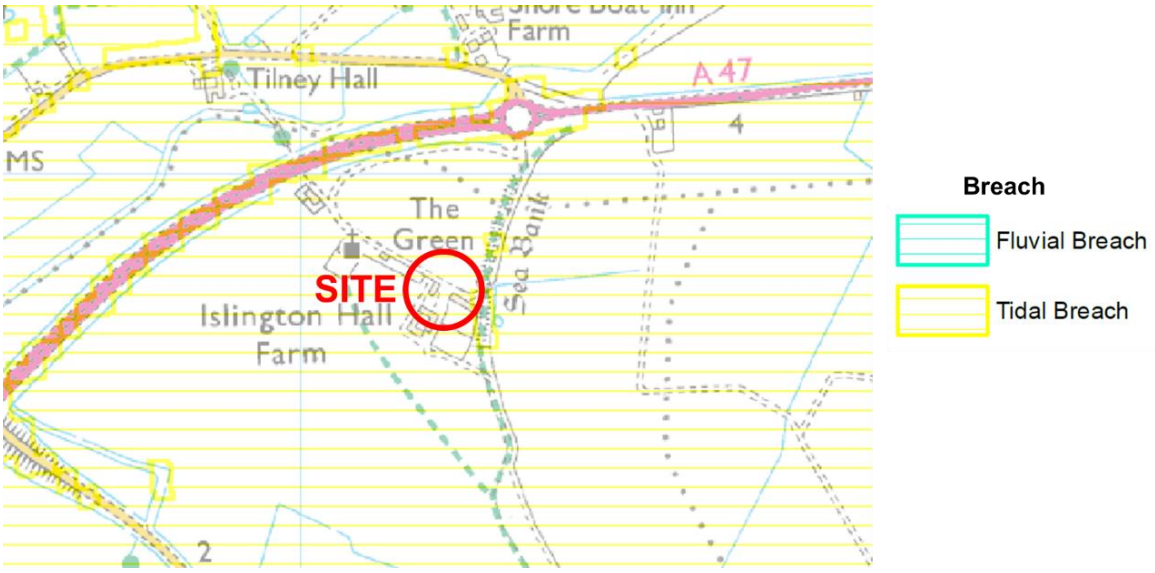
The level 2 SFRA issued in March 2019 will consider the detailed nature of the flood risk within a flood zone, and assess other sources of flooding.

A summary table for this area states:

Highest Flood Risk mechanism …… Tidal Flooding

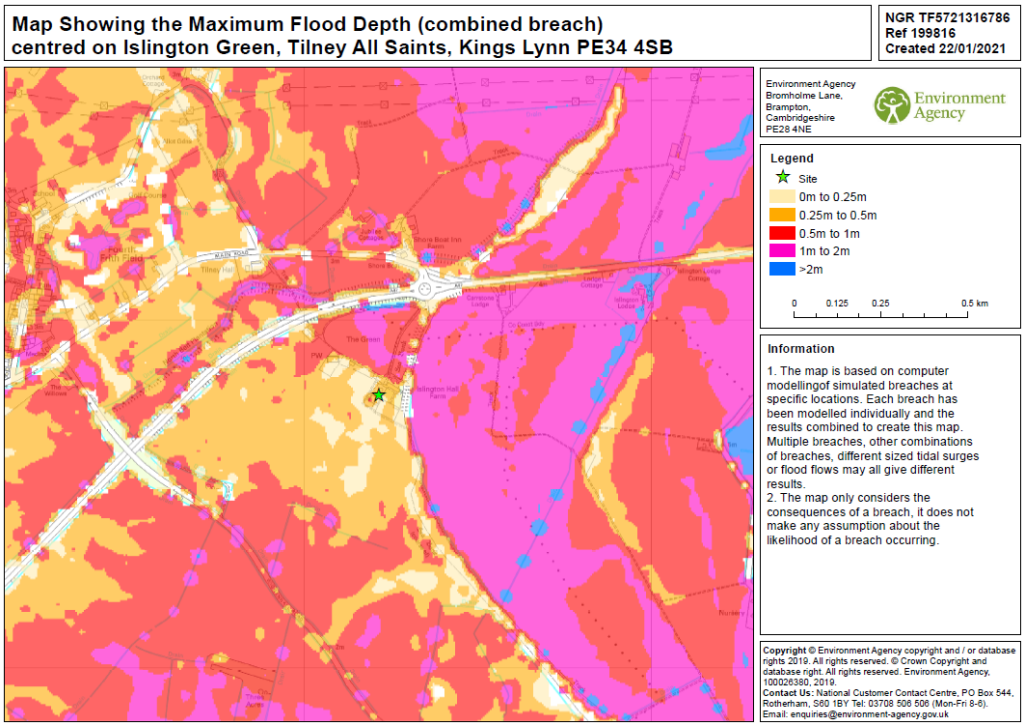
Residual flood risk…… Breach on the tidal Ouse.

The map showing the risk of flooding from rivers and the sea is shown below. This shows the site is at risk from tidal flooding.

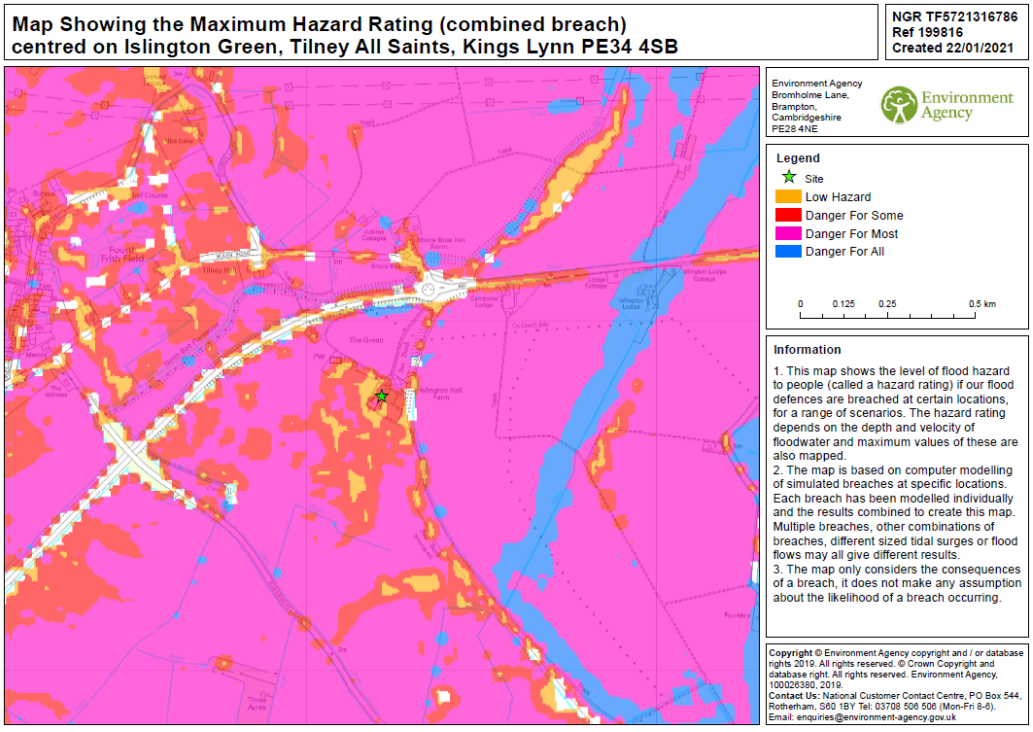


Information from the Environment Agency

The Environment Agency provided a map showing that the predicted flood depth on the site, which is shown below. This predicts between 250mm and 500mm of flooding on the site if a breach were to occur in the west bank of the River Ouse. An enlarged copy of this map is shown later in this report.



The EA also provided the following map of predicted flood hazard on the site, which predicts a hazard of “danger for some” for the barn on the east side and “danger for some” and “low hazard” for the barn on the east side.



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 2.2 km from the tidal section of the River Ouse and the tidal defence banks of this watercourse are maintained by the Environment Agency.

There are watercourses in the area that are maintained by Kings Lynn IDB. The Board have carried out improvement schemes so that IDB watercourses generally provide at least a 1 in 50 year standard against flooding of agricultural land with a freeboard which then provides an approximate standard of 1 in 100 years to properties.

Existing Ground Levels and Proposed Levels of Buildings

Levels have been taken at the site, and these are all shown on a plan on page 13 of this report.

The levels are all related to a level of 3.40m ODN on gravel roadway north of the front gate to Islington Hall Farm. The existing levels of the gravel floors of the barns are between 3.390m and 3.45m ODN. The level of the gravel areas between the barns and the house are lower at a level of between 3.10m and 2.20m ODN.

The level of the door cill of the farmhouse was 3.27m ODN and it is presumed this is the approximate level of the farmhouse.

Potential Sources of Flooding

The potential sources of flooding to the site are:-

1) Failure or overtopping of tidal defences of the River Ouse
2) High water levels in IDB drains or culverts
3) Surface Water flooding

1) Failure or overtopping of tidal defences of the River Ouse

As the west bank of the River Great Ouse is approximately 2.2 km from the site this can be considered to be the main flood risk to the site.

The defence levels are generally above the 1 in 200 predicted levels for 2007 but some lengths of the bank could be overtopped in a 1 in 200 high tide in 2115. Therefore there is a risk if the defences are not raised over the next 100 years that the defences could be overtopped in this scenario.

The maps supplied by the EA predict that the existing building could be flooded to a depth of up to 500mm if a breach occurred in the tidal bank of the River Great Ouse.

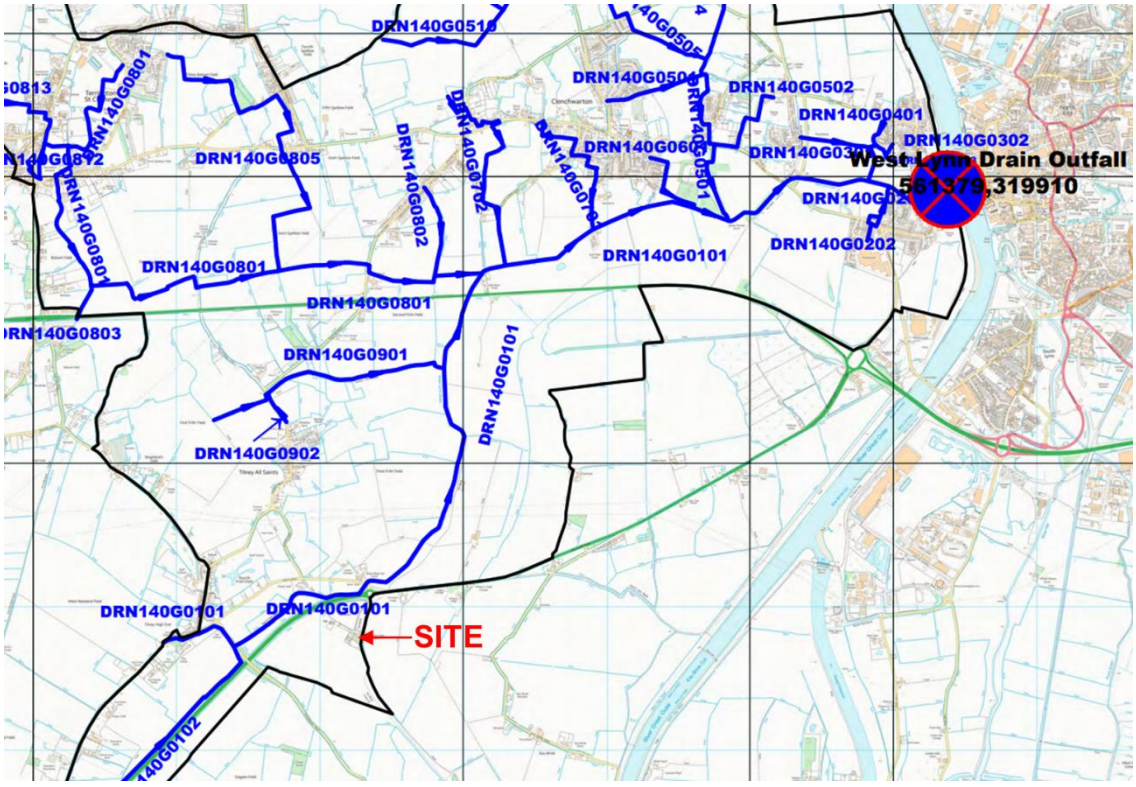
Therefore the risk of flooding from this source will be adequately mitigated by raising the ground floor level of the proposed house above the predicted flood level.

2) <u>High Water Levels in IDB drains or Culverts</u>

Kings Lynn IDB have provided a statement about the standard of service provided by the IDB system:

"Hydraulic modelling undertaken by the Kings Lynn IDB in 2010 indicated that flood alleviation measures such as pumping stations and the construction of a storage pond to the east of the SFRA study area helped to ensure that water levels remain predominantly within channel in this area up to a 1% (1 in 100) AEP event".

Islington Green is within the West Lynn Catchment which outfalls through a sluice into the tidal River Ouse at West Lynn approximately 1km north of the A17 bridge. A plan of the IDB watercourses is shown below.



The IDB system was originally designed to provide a 1 in 10 year standard of service with a 900mm freeboard to agricultural land. This provides a standard of service to urban areas of at least 1 in 50 years and in most cases 1 in 100 years.

Kings Lynn IDB have now undertaken computer modelling of the catchment and the results have indicated that most urban areas have a 1 in 100 year standard of service, although there are areas of lower agricultural land which may flood in a 1 in 100 year event. The Board have constructed two storage reservoirs which has improved the standard of service. Climate change will lead to reducing standards but the Board have plans to make improvements over the next ten to twenty years to retain the present day standard of service.

It is conceivable that the site could suffer flooding from the IDB system in one of two ways:

a) From a failure of West Lynn Drain Outfall leading to high water in the drainage channels west of West Lynn. Kings Lynn IDB have a routine maintenance system which should ensure that the outfalls and drains are in good condition and the Board have plans to deal with any emergency breakdown that might occur.

b) From failure of assets in drainage channels near to the site. If a culvert or a drainage channel were to become blocked there could be localised flooding to the drain. However as the proposed ground floor levels will be significantly above all the drainage channels across the lower land north of the site then it is extremely unlikely that such an event could cause flooding to the site.

Therefore it can be concluded that flooding from the IDB system or local dykes is adequately mitigated.

3) Surface Water Flooding

The ground levels on the fields north of Islington Hall Farm are approximately 500mm lower than the ground levels around the building. Therefore it is unlikely that any significant depth of surface water flooding and the risk of surface water flooding can be considered to be adequately mitigated.

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 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 greater risk to the site would be from a breach or overtopping of the tidal defences. However the risk of this actually happening is low and the hazard from any flooding is also low.

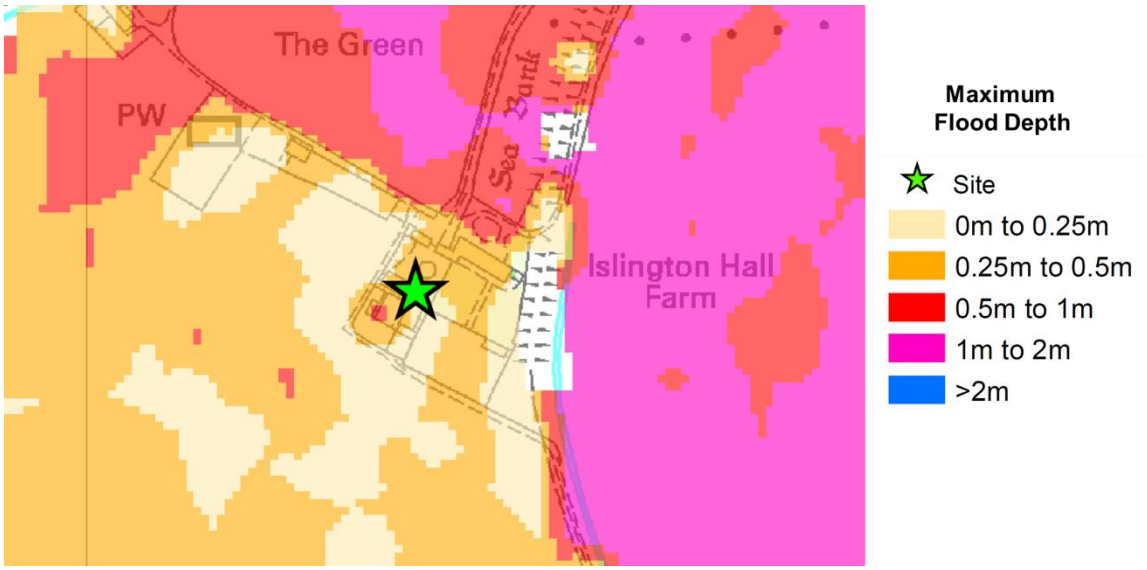
Climate Change

The recommendations for flood depths for this flood risk assessment use information from the 2009 and the 2018 Kings Lynn and West Norfolk BC SFRA's. The EA 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 17). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

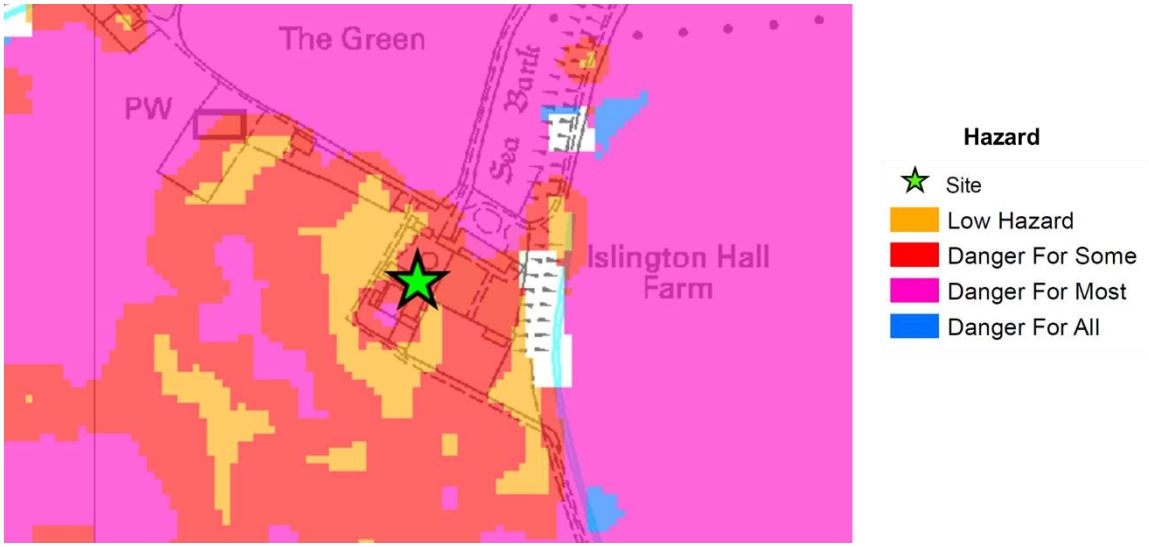
Summary of Predicted Flood Depths

The map of predicted flood depth supplied by the Environment Agency advises that the predicted flood depth across the whole area of the house and gardens of Islington House Farm is between 250mm and 500mm.

An extract from this map supplied by the Environment Agency for the predicted flood depths is shown below:



The predicted flood hazard for most of the house and gardens is “Danger for Some” as shown on the plan below.



Using the map showing predicted flood depths and the land levels taken on the site the following range of ground levels range from 3.08m to 3.40m ODN. Therefore the maximum flood level can be estimated as follows:

Ground level	Flood depth	Flood level
3.08m ODN	500mm	3.58m ODN
3.40m ODN	250mm	3.65m ODN

Therefore the flood level can be estimated to be 3.61m ODN and the recommended floor level should be 3.65m ODN, which is approximately 250mm above the existing ground level around the barns.

Conclusions

The area around Tilney All Saints is mostly within flood zone 3 and is classified as being within an area benefitting from flood defences, and therefore the risk of flooding is low.

The proposal is to create additional holiday accommodation at this location by converting the existing buildings which will be used as the daytime living accommodation and constructing new extensions to form the sleeping accommodation. The height between the ground floor and the roof construction in the existing part of the building will restrict how high the floor level can be raised. Therefore it is recommended that the floor level should be raised 150mm above the existing ground level in this part of the building.

The new extension to the building where all the sleeping accommodation will be located will be raised 600mm above the existing ground level which will provide adequate mitigation against the predicted flood depth on this site.

The proposed levels of both parts of the building are above any predicted flood level that would be caused by a failure of the IDB drainage system.

Recommendations

In any area at risk of flooding, even though in this case the risk is low, it is preferable that proposed buildings in a defended area should be of two storey construction with all bedrooms at first floor level. This will provide a refuge for residents if the building were to become flooded and ensure there is no danger to residents when they are asleep.

The proposed development is the conversion of an existing building which will be used as a holiday cottage and therefore the following floor levels are proposed:

a) The floor level in the converted part of the building should be raised by 150mm above the existing ground level to a level of 3.55m ODN.
b) The floor level in the new extension where all sleeping accommodation should be located should be raised by 600mm above the existing ground level to a level of 4.00m ODN.

Flood resilient construction should be incorporated to a minimum height of 300mm above the predicted flood level, and all of the electrical installation should be a similar height above finished floor level.

The Environment Agency operates a 24 hour a day Floodline service providing advice and information on flooding. The management of the holiday lettings should register to receive automatic telephone flood warnings from the Environment Agency's Floodline Warnings Direct Service.

The management of the holiday lettings should ensure that their information brochure gives details of the flood risk to the property so that visitors are sufficiently aware of the flood risk. If a flood warning is received from the Environment Agency the people staying in the properties should be informed of the situation by the operators. This should all be set out in a flood plan which should be drawn up by the operators of the holiday lettings and agreed with the District Council.

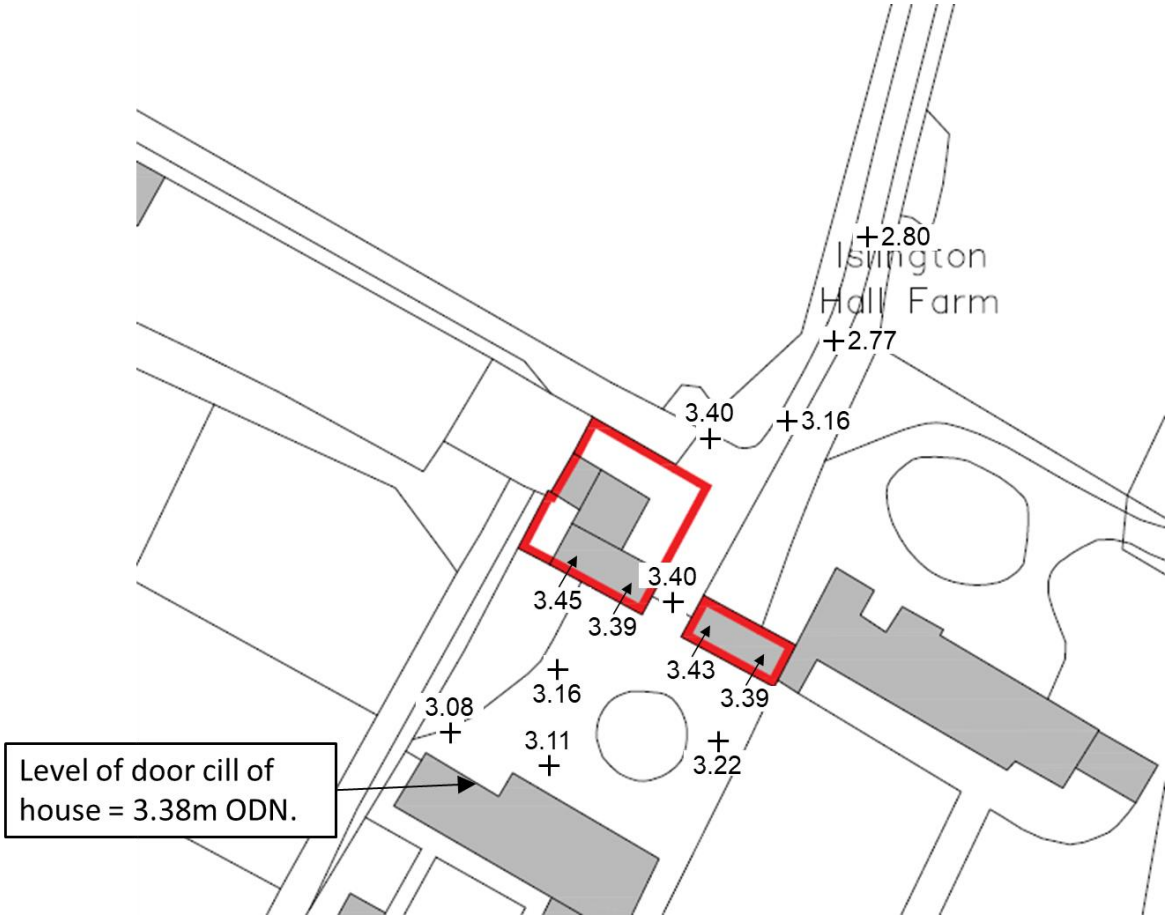
S M HEMMINGS B Sc C Eng MICE MIWEM

stuart.hemmings@btinternet.com

10th February 2021

LOCATION PLAN

SITE LEVELS



BLOCK PLAN OF PROPOSED DWELLING

APPENDIX A CLIMATE CHANGE

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

The most recent Kings Lynn and West Norfolk Strategic Flood Risk Assessment was issued in November 2018. Although this document refers to the most recent guidance from the Environment Agency much of the modelling refered to in the report was carried out prior to this date. Before 2016 the 2013 Environment Agency guidance to planners was used. The information provided is summarised in Tables 1 and 2 reproduced below:

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 the higher central and the upper end should be used to assess the range of allowances.

Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Table 3 sea level allowance for each epoch in millimetres (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)

Area of England	1990 to 2025	2026 to 2050	2051 to 2080	2081 to 2115	Cumulative rise 1990 to 2115 / metres (m)
East, east midlands, London, south east	4 (140 mm)	8.5 (212.5 mm)	12 (360 mm)	15 (525 mm)	1.24 m

Table 4 offshore wind speed and extreme wave height allowance (use 1990 baseline)

Applies around all the English coast	1990 to 2050	2051 to 2115
Offshore wind speed allowance	+5%	+10%
Offshore wind speed sensitivity test	+10%	+10%
Extreme wave height allowance	+5%	+10%
Extreme wave height sensitivity test	+10%	+10%

Effects on Predictions of Flood Risk in FRA

It has been concluded that the major flood risk to the site is from overtopping or a breach in the east bank of the tidal River Ouse.

The FRA has identified two sources of flooding where the new climate change recommendations could affect the predictions of flood levels in 2115 at the development site:

1) Flooding following a breach in the banks of the River Ouse.
2) Flooding from IDB watercourses.

1) Flooding following a breach in the banks of the tidal River Ouse.

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

It can be seen that the revised guidance increases the maximum allowance for sea rise in 2115 by 100mm. This should only have the effect of increasing flood levels by between 25mm and 50mm at the site of the development. This allowance has been incorporated in the recommendations for the finished floor level of the building.

2) Effect on IDB Systems

Kings Lynn 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 Kings Lynn 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.

It is considered that the mitigation proposed for the development, with the recommendation that the ground floor level of the proposed converted barn should be raised to a level of 3.55m ODN and the new extension where the sleeping accommodation will be located should be raised to a level of 4.00m ODN is satisfactory when taking into account the above revised climate change guidance.