

**PROPOSED DEVELOPMENT BETWEEN 1 AND 1A NORTHORPE
ROAD, DONINGTON, PE11 4XU**
FLOOD RISK ASSESSMENT



View from Rear of Site

S M Hemmings B Sc C Eng MICE MIWEM,
69 Charlotte Way
Peterborough
PE39ER

This flood risk assessment has been prepared solely to support the planning application for a development at Northorpe Road, Donington. 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

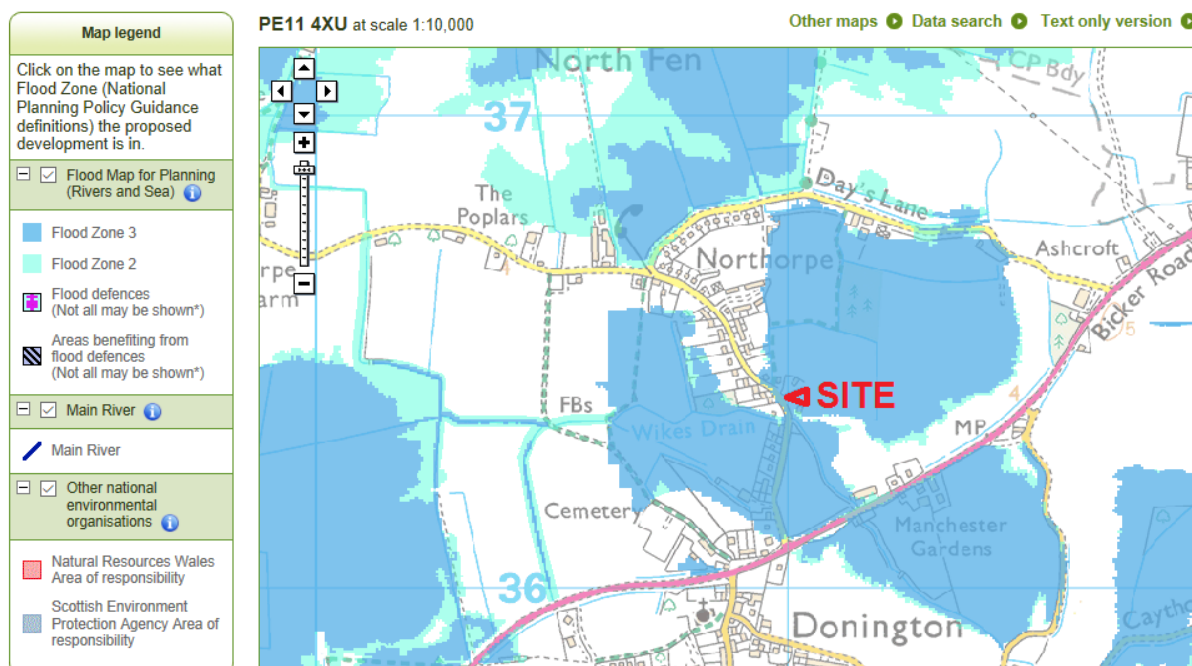
A development of one dwelling is proposed on a site south of the existing bungalow No 1A, Northorpe Road, Donington. The site is 1km north of the centre of Donington. The land is at present part of the garden of this property.

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

The Planning Application requires a flood risk assessment to be carried out as specified in the Practice Guidance to the National Planning Policy Framework Development and Flood Risk. The site is within a defended area as specified on the South Holland District Council's Strategic Flood Risk Assessment (SHDC SFRA) map and is located in the Black Sluice Internal Drainage Board District.

Environment Agency (EA) Flood Zones

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



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

Application Site

The site is located 3.4km east of the South Forty Foot Drain (SFFD) and 10.1 km from the tidal section of the River Welland. The National Grid Reference of the site is 521020 336410.

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 classed within Flood Zone 3(a) as defined in Table 1 of the Technical Guidance.

Applying the flood risk vulnerability classification in Table 2 of the Guidance, a residential development is “more vulnerable”.

Table 3 of the Guidance is shown below:

<u>Flood Zones</u>	<u>Flood Risk Vulnerability Classification</u>				
	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	✓*

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

Sequential Test

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

As can be seen from the map on page 2 of this report the centre of Donington is designated to be within Flood Zone 1. However parts of the area around Northorpe Road are considered to be within Zone 3 and other parts in zone 1, although the relative ground levels along Northorpe Road do not vary very much. There are few alternative sites available for development in Donington.

Taking into account the guidance, it can be seen that it is extremely unlikely that an alternative site with a lower flood risk could be found in the Donington area. The safety of the development will be delivered by ensuring the floor level of the proposed new dwelling is above predicted residual flood levels for this area.

The Design and Access statement will confirm that the proposed development is in accordance with the relevant South Holland District Council Core Strategy policies. Development is required in the Donington area because there is a shortfall of residential housing 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

Consultants have produced a Strategic Flood Risk Assessment (SFRA) for the South Holland District Council (SHDC). This document provides details of the flood risk in the Council's area. Reference to the maps in this document give the following information for the flood risk and hazard at the site for the 1% fluvial event and 0.5% tidal event.

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 flood probability
	Peak Velocity Nil

For year 2115 Depth of flooding ... zero
 Extent of flooding.... Low or medium flood probability
 Peak Velocity Nil

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

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

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

Tables in the SFRA show the following details of the defences on the west side of the tidal section of the River Welland north of River Glen outfall, at chainage 15.5km

	2007	2115
Peak 1 in 200 tidal level	5.99m OD	7.13m OD
Peak 1 in 1,000 tidal level	6.32m OD	7.46m OD

The bank levels on the west side of the River Welland, which are earth banks, at this location vary between 7.51m OD and 7.72m OD.

Tables in the SFRA show the following details of the defences on the east side of the South Forty Foot Drain

1 in 100 year fluvial level in 2007 3.20m OD
 1 in 100 year fluvial level in 2007 3.24m OD

The bank levels on the east side of the South Forty Foot Drain, which are earth banks, at this location are at a level of 3.70m OD.

Figure 16 of the general maps shows that the site is not within the rapid inundation zone.

Existing Ground Levels

The level of the grassed area south of the bungalow varies between 3.35m OD and 3.5m OD. The level of the existing bungalow is 3.67m OD. Northorpe Road is at a level of 3.30m OD approximately.

A plan the levels taken on the site is shown on page 11 of this report.

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 3.4 km from the South Forty Foot Drain (SFFD) which is maintained by the Environment Agency and is the main channel for all of the water in of the Black Sluice IDB area to flow to the outfall at Boston.

The site is located approximately 10.1 km from the tidal section of the River Welland, which has a tidal defence bank which is maintained by the Environment Agency.

The site is located 15 km from the tidal defences on the south side of the Haven which are maintained by the Environment Agency.

There are watercourses in the area that are maintained by Black Sluice IDB.

Potential Sources of Flooding

The potential sources of flooding to the site are:-

1. Failure or overtopping of tidal defences.
2. Overtopping or breach in the South Forty Foot Drain.
3. Flooding from watercourses maintained by Black Sluice IDB.
4. Flooding due to excess surface water run off from the development.

1. Failure or overtopping of tidal defences

As shown above, the east bank of the tidal River Welland, which is approximately 10.1 km south east of the site, has at least a 1 in 200 year standard of protection. However it is extremely unlikely that flood water would reach the development site if a breach occurred in this bank.

The SFRA does not predict any residual flooding in the area of Gosberton in a 1 in 200 year event in 2115.

From the information available in the SFRA the level of risk to this part of Donington from a breach in the tidal defences is remote.

2. Failure or overtopping of the South Forty Foot Drain

The hazard maps in the SFRA indicate that flooding will occur from the SFFD in a 1 in 100 year event in 2115. However the residual flood depth map for this event indicates the flooding will only encroach 200 or 300 metres into Donington North Ing and Middle Fen. The site is 3.4 km from the SFFD.

The SFRA predicts maximum water levels of 3.24m OD in the SFFD in a 1 in 100 year event in 2115. However these predicted levels were taken from a study carried out in 2004 and has been superseded by further computer modelling undertaken for a more recent study.

Following the 2004 studies by the EA Black Sluice IDB undertook a more detailed investigation of bank levels in the southern part of the SFFD and found long lengths with levels of only 3.00m OD. It was concluded from this that the risk of flood levels in the SFFD rising above 3.00m OD were extremely low.

Flows into the SFFD are by gravity from the highland carriers and pumped discharges from fen areas. Black Sluice IDB have an operational plan which states that pumping stations will be switched off when the water level at Black Hole Drove Pumping Station reaches 2.70m OD. This will limit the rate of increase of the water levels in the SFFD and reduce the risk of breaches occurring in the banks in the southern section of the drain.

The water in the SFFD is discharged into the Haven through the two sluices at Black Sluice Pumping Station and a gradient is formed along the drain. As the maximum water level at the upstream end of the SFFD at Black Hole Drove Pumping Station is 3.00m OD then the water level in the SFFD adjacent to the site and at Black Sluice Pumping Station will always be lower than 3.00m OD, and recent studies indicate the maximum level at Black Sluice Pumping Station would be approximately 2.65m OD.

In the recent studies carried out by the EA and published in the Black Sluice Catchment Consultation no flooding will occur to the site in a 1 in 100 year flood event.

To conclude the risk of flood water from the SFFD reaching the site and rising to a level of 3.75m OD and causing flooding to the proposed development is remote and the above predictions indicate it will not occur in a 1 in 100 year event in 2115.

3. Flooding from IDB watercourses

This area on the northern side of Donington is drained by the Wykes Drain which runs under Northorpe Road immediately south of No 1 Northorpe Road. This watercourse drains a large area between Wykes Lane and Washdyke Lane west of Donington.

Prior to the 1990's this area of land was poorly drained and suffered flooding of lower land after heavy rainfall. In 1989 a new booster pumping station was completed which improved the drainage of this area. Works were also undertaken to deepen and widen the section of Wykes Drain from the pumping station as far as the Old Hammond beck, which reduced the flood risk to the area around Northorpe Road.

The water in the Old Hammond Beck flows southwards and westwards alongside the railway to Donington North Ing Pumping station, where there are three pumps and a gravity outfall which discharge the water into the South Forty Foot Drain.

Normal water levels in the Old Hammond Beck are approximately 0.00m OD but in times of heavy rainfall levels can increase to 1.00m OD.

The Black Sluice IDB drains have been designed to a 1 in 10 year standard with a freeboard of between 800mm and 1.0 metres. This generally provides a standard of at least 1 in 50 years for flooding of the lowest land. Much of the land in the catchment is below 3.00m OD and therefore even if the pumps fail to operate for a considerable time during a rainfall event the proposed bungalow at the site in Northorpe Road would be unlikely to flood.

Therefore the risk of flooding from the main IDB system can be considered to be remote.

4. Flooding due to excess surface water run off from the development

There is a risk that following very heavy rainfall excess surface water from the immediate area could flood the site. The precaution of raising the ground floor level of the proposed building to 3.70m OD, which is 400mm above the level of Northorpe Road, will ensure this risk will 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 being flooded.

Probabilities and Trends of Flooding

The probability of this development flooding from Environment Agency main river is very low. In an extreme event any effect on this location would not be sudden and there would be time for residents to take precautionary measures to limit the impact of any flooding that may occur.

Residual Risk – Extreme Events

The residual risk from extreme events is very low on this site. The major risk to the site is from a breach or overtopping of the tidal defences

The risk of this happening in this case is low and the hazard from any flooding is also low.

Climate Change

The recommendations for flood depths in 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 this FRA. The effects of these new recommendations are considered in Appendix A of this report (pages 13 to 16). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

Conclusions

The maps in the SFRA do not predict any flooding to any part of the area around Donington in a 1 in 100 year fluvial event or a 1 in 200 year tidal event in 2115. The extract from the residual flood depth map shown below for the 1 in 100 year fluvial event or a 1 in 200 year tidal event in 2115 shows flood water from the South Forty Foot Drain spreading as far as the Old Hammond Beck in a 1 in 100 year event.



The site is 10.1 km from the tidal defences of the River Welland and therefore the risk of flooding if a bank breached in a 1 in 100 year event in 2115 is extremely low.

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

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

Recommendations

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

In this case the developer has stated that for other planning requirements the building needs to be a bungalow and this is considered satisfactory if the finished ground floor level is raised to 3.75m OD which is 300mm above the average level of the plot of land, and 100mm above the finished floor level of the bungalow (1A Northorpe Road).

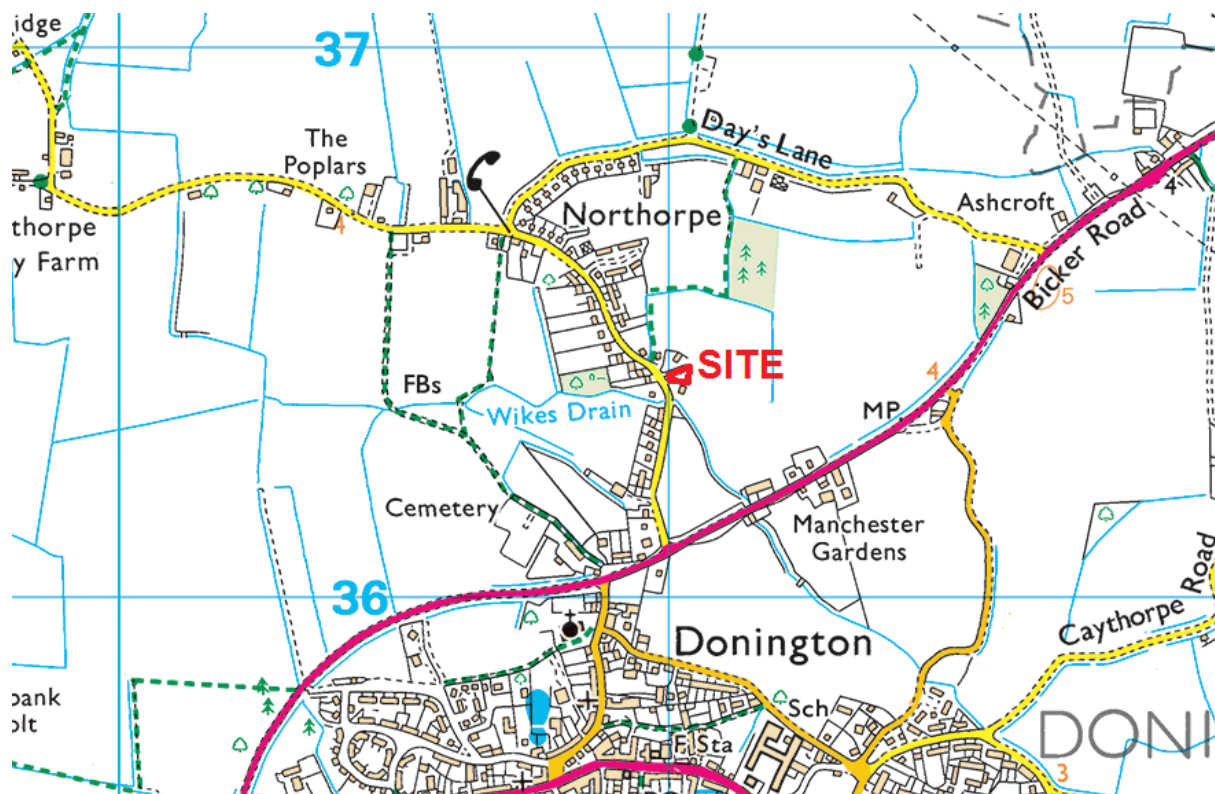
All future owners and occupiers of the dwellings should register with the Environment Agency's Floodline Warnings Direct Service.

S M HEMMINGS B Sc C Eng MICE MIWEM

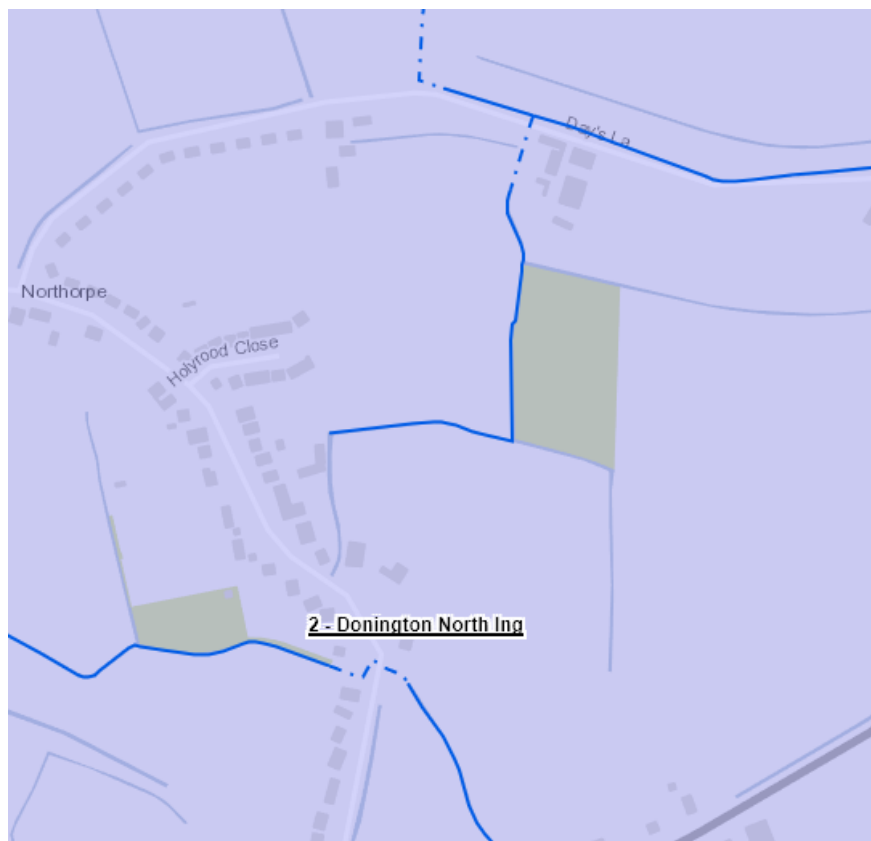
stuart.hemmings@btinternet.com

18th November 2016.

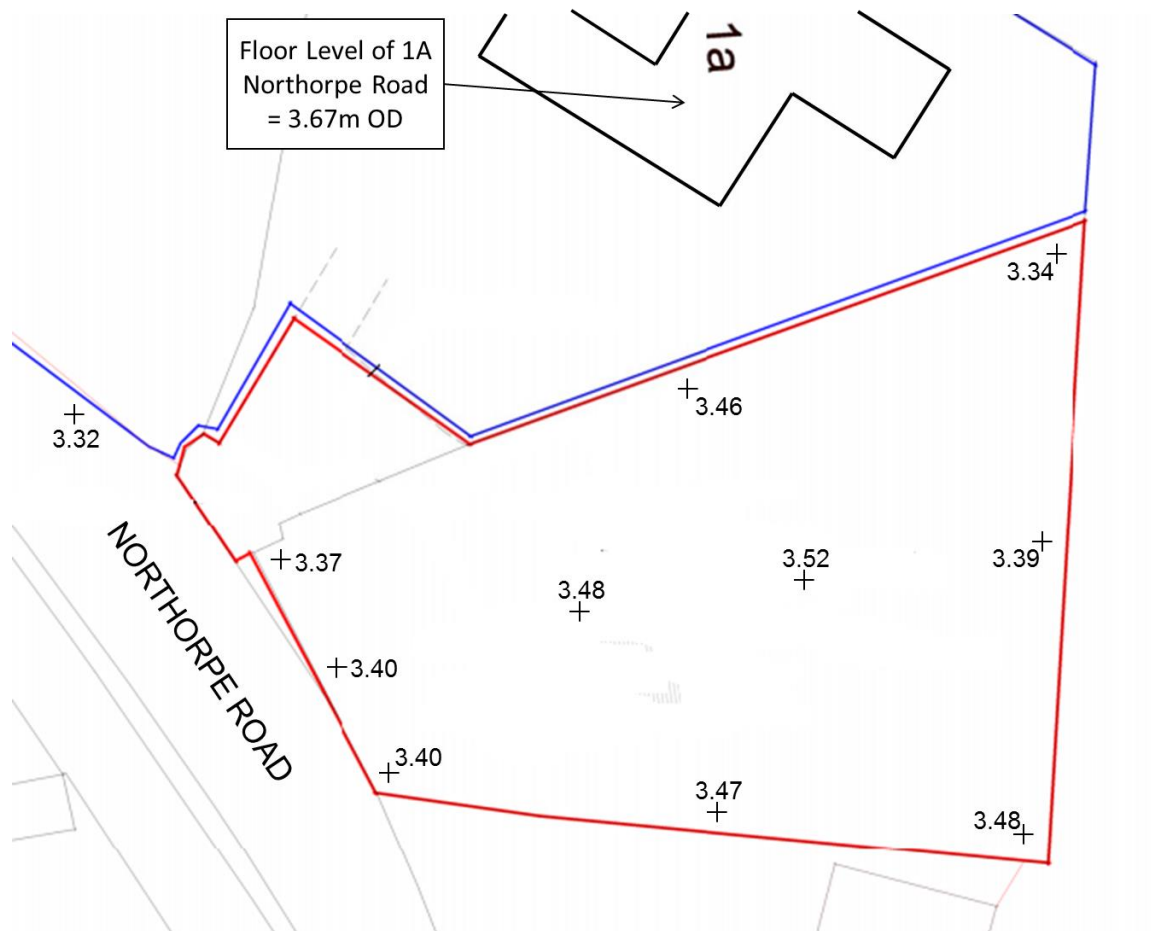
LOCATION PLAN



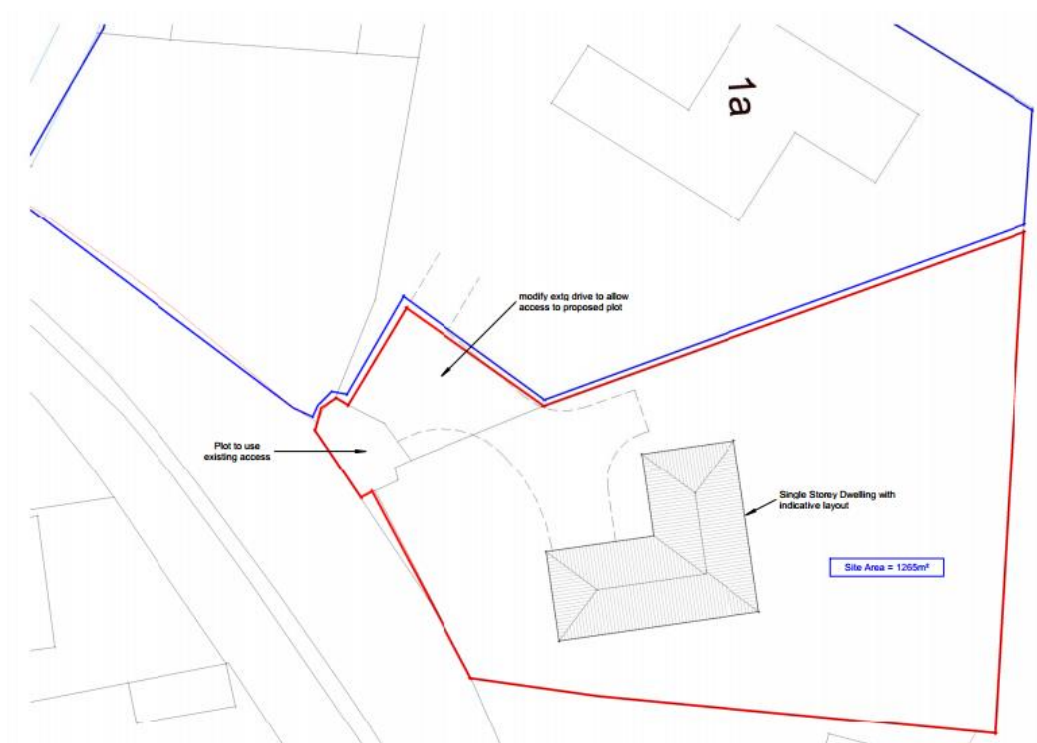
PLAN OF IDB DRAINS



PLAN SHOWING SITE LEVELS



PLAN OF PROPOSED DEVELOPMENT



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 PPS25¹. These allowances are expressed in Table 2. Percentage increases are relative to the present-day.

Table 2 – Adopted Climate change contingency allowances

Parameter	Year 2055	Year 2115
Sea level rise (m)	+ 0.33	+ 1.14
Extreme wave height	+ 10%	+ 10%
Peak river flow and volume	+ 20%	+ 20%
Peak rainfall intensity	+ 20%	+30%

Where flows arise from pumping rather than natural run-off, notably in the Vernatt's Drain and for the Fenland subcatchments of the South Forty Foot Drain, peak flow rates for future eras have been taken as equal to current rates since this SFRA assumes all flood risk management measures will remain in their current state.

2013 Guidance to Planners

Guidance to planners was issued by EA in September 2013

Table 1: Recommended contingency allowances for net sea level rises (Net sea level rise (mm per year) relative to 1990)

	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

Table 2: Recommended national precautionary sensitivity ranges for peak rainfall intensity, peak river flow, offshore wind speed and wave height

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%		
Offshore wind speed	+5%		+10%	
Extreme wave height	+5%		+10%	

Revised 2016 EA Guidance

Table 1 peak river flow allowances by river basin district (use 1961 to 1990 baseline)

River basin district	Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Anglian	Upper end	25%	35%	65%
	Higher central	15%	20%	35%
	Central	10%	15%	25%

For more vulnerable development in flood zone 3(a) the higher central and upper end should be used to assess the range of allowances.

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

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

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

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

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

- 1) Flooding from the tidal River Welland
- 2) Flooding from the South Forty Foot Drain
- 3) Flooding from IDB systems

1) Flooding from the tidal River Welland

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

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

The SFRA does not predict any residual flooding in this area of Donington (see page 9) in a 1 in 200 year event in 2115. The risk of flooding from the tidal River Welland is extremely low due to the reasons set out on page 7 of this report.

An increase of 100mm in maximum tidal levels is only likely to increase the maximum flood depths by around 10mm at the location of the development site, and is unlikely to significantly change the predicted flood depths, or in this case to change the prediction in the SFRA which indicates no flooding will take place in these levels of events in the area of Donington.

The precaution of recommending that the proposed new building should have a ground floor level of 3.75m OD should ensure that the risk of flooding is extremely low in a 1 in 200 year event in 2115.

2) Flooding from the South Forty Foot Drain

As the development is in flood zone 3 and is classed as more vulnerable, the upper end climate change allowance, which is 35%, should first be considered. After considering the effects of this increase the upper end 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 in a significant fluvial event.

Modelling of the South Forty Foot Drain has shown that the maximum level of this watercourse cannot increase above 3.00m OD because this is the height of the banks along the southern section. In addition to this at least 50% of the flow being discharged into the Drain is by electrically driven pumps which will still deliver the same volume of water even if flows significantly increase.

In conclusion the effects of climate change will be that during a significant rainfall event more agricultural land in the Black Sluice area is likely to experience low levels of flooding for short periods to alleviate the situation

Flooding from IDB Systems

Black Sluice 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 Black Sluice IDB will continue to review the modelling they have already carried out and when the Board consider 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 floor levels should be a minimum level of 3.75m OD is satisfactory.