PROPOSED CHANGE OF USE FROM AGRICULTURAL TO EQUESTRIAN AT WEST DROVE SOUTH, GEDNEY HILL, SPALDING, PE12 0PN

FLOOD RISK ASSESSMENT

View looking west from West Drove South

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 a change of use at West Drove South, Gedney Hill. 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

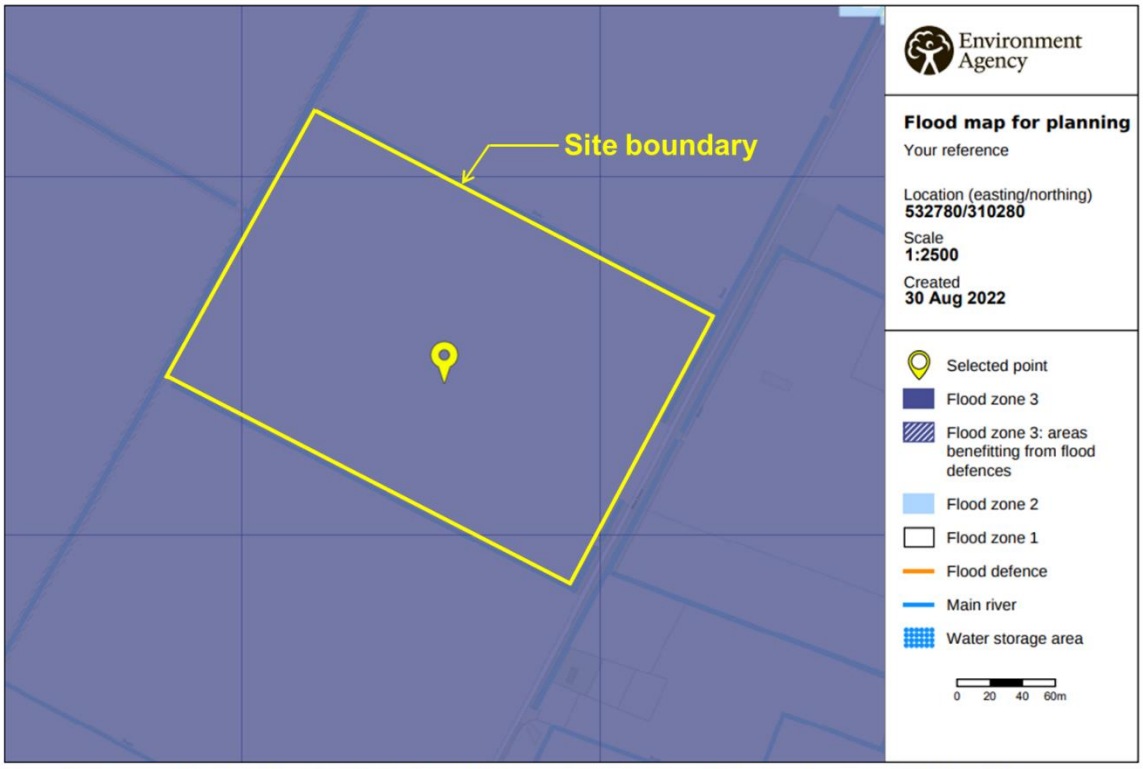
A planning application is due to be submitted to South Holland District Council for permission to change the use of a field west of West Drove South, Gedney Hill, Spalding from agricultural to equestrian. The field will be grassed and divided into 1 acre paddocks, and a stable block, school area, and tractor shed will be constructed, along with parking areas for users of the facility.

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 specified in the Practice Guidance to the National Planning Policy Framework Development and Flood Risk. 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.

Environment Agency (EA) Flood Zones

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



It can be seen that the whole of this immediate area south of Gedney Hill is in Flood Zone 3.

Application Site

The development is located on the western side of the River Nene. The National Grid Reference of the site is 532780 310280.

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 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 which will be used as an equestrian centre with stable block, school area, and tractor shed and paddocks is classified as "Less 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 †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Therefore it can be seen that for "Less Vulnerable" development is satisfactory in flood zone 3(a).

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.

In this area of Gedney Hill most of the available land for this type of development is within flood zone 3(a) and therefore it is not possible to locate this on an alternative site in flood zones 1 or 2.

This flood risk assessment will demonstrate that the site will be safe for the proposed use.

Therefore it is considered that the sequential test is passed.

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
	Velocity ……. zero
For year 2115	Depth of flooding … zero
	Extent of flooding .. Low or medium
	Peak Velocity …… zero

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…. zero
	Extent of flooding …low or medium
	Hazard ……. zero
	Velocity …….. zero
For the year 2115	Depth of flooding .. zero
	Extent of flooding …low or medium
	Hazard …… zero
	Velocity ……. zero

Figure 16 of the general maps shows that the site is not within the rapid inundation zone for the present day or in 2115.

Maximum flood level and bank levels in the River Nene

The maximum levels in this tidal section of the River Nene 12.9km east of the site are as follows:

	2007	2115
Peak 1 in 200 year level	5.79m OD	6.93m OD
Peak 1 in 1000 year level	6.13m OD	7.27m OD

The defence level (top of left bank) at chainage 7.8km near the outfall of the North Level Main Drain is between 7.00m and 7.30mOD.

Maximum flood level and bank levels in the River Welland

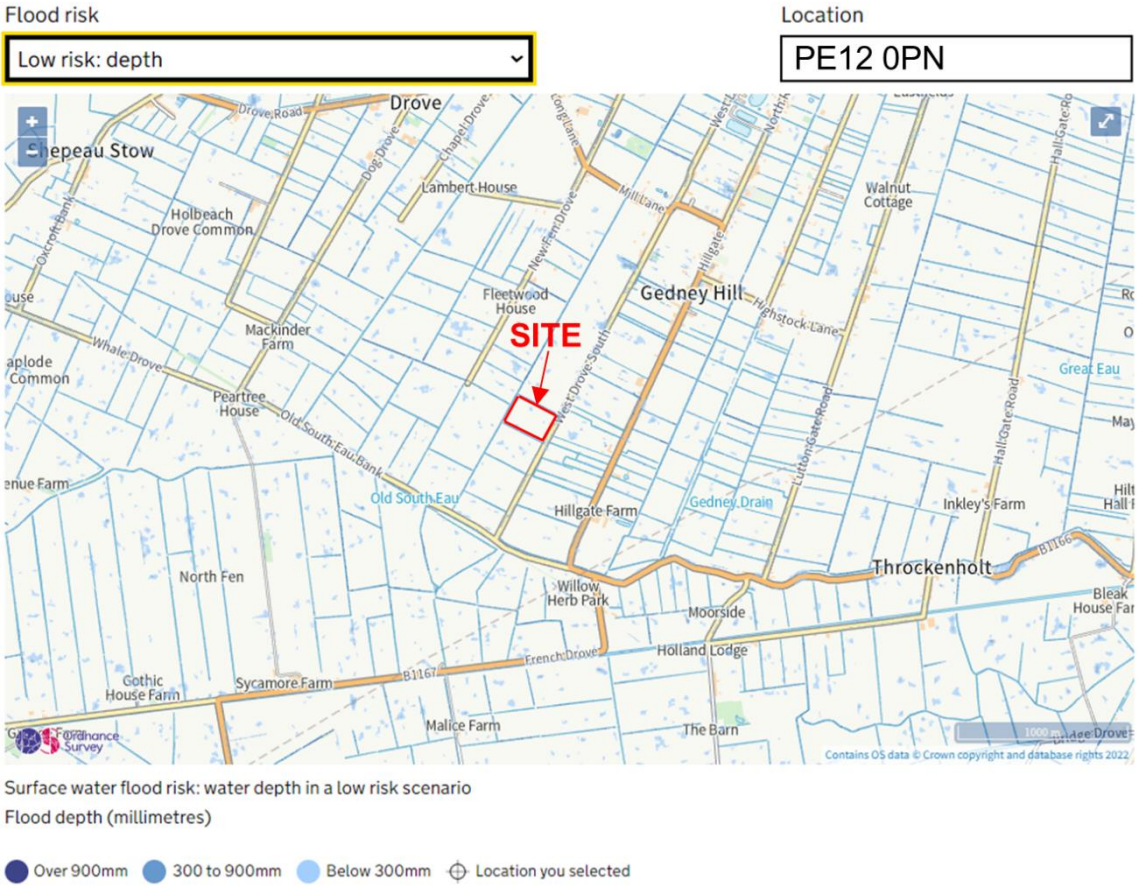
The maximum levels in this fluvial section of the River Welland 8.9km west of the site are as follows:

	2007	2115
Peak 1 in 200 year level	4.65m OD	4.74m OD
Peak 1 in 1000 year level	4.67m OD	4.74m OD

The defence level (top of Barrier Bank) at chainage 6.8km is between 5.80m and 6.10m OD.

Information on Surface Water Flooding on Environment Agency Website

The map below 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 the map does not predict any significant surface water flooding in this field.

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 12.9 km from the tidal section of the River Nene, which is maintained by the Environment Agency.

The site is located approximately 8.9 km from the fluvial section of the River Welland, which is maintained by the Environment Agency.

The site is located approximately 7.0km south of the South Holland Main Drain, which is maintained by South Holland IDB.

The site is located approximately 1.5km north of the New South Eau which is the main watercourse that flows into the North Level Main Drain, both of which are maintained by North Level IDB.

The main watercourses in this area south of Gedney Hill are maintained by South Holland IDB.

Existing Ground Levels

There are no ground levels or bench marks in this area but the ground level is understood to be between 2.00m and 2.50m ODN.

Potential Sources of Flooding

The potential sources of flooding to the site are:-

1. Failure or overtopping of tidal defences of the River Nene.
2. Failure or overtopping of fluvial defences of the River Welland (Barrier Bank).
3. Overtopping of the South Holland Main Drain.
4. High water levels in IDB drainage channels.
5. Localised surface water flooding.

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

The west bank of the River Nene is approximately 12.9 km east of the site of the proposed development. The hazard from a breach in the River Nene east of the development site will be considered to be the major risk to the site.

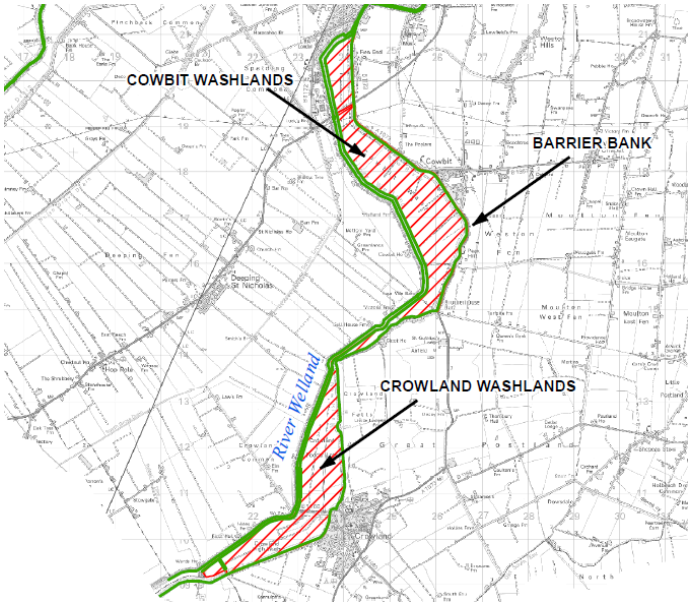
The maps available on the South East Lincolnshire Local Plan website show that there is no predicted risk of flooding in this area south of Gedney Hill in a 1 in 200 year event in 2115.

Adequate mitigation against the risk of flooding from this source will be provided by raising the ground floor level of the proposed stable block and tractor store 300mm above the existing ground level.

2. Overtopping of the Barrier Bank.

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 5.00m 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 Washes are only flooded in extreme conditions (around 1 in 50 years) and are used the rest of the time as agricultural land. If a breach occurred in the Barrier Bank in this scenario then flood water would flow eastwards towards the proposed development.

The risk of flooding from this source, as the site is 8.9km from the Barrier Bank, can be considered to be very low. On the site it will be adequately mitigated by raising the floor level of the proposed stable block and the tractor store 300mm above the existing ground level.

3. **Overtopping of the South Holland Main Drain**

There is a risk of flooding to the site if water levels in the South Holland Main Drain were to become very high and flood onto the surrounding land. This watercourse is 7.0km north of the proposed site.

The risk of this can be considered to be low as the normal water level of the Main Drain is approximately 0.0m OD and predicted levels in a 1 in 100 year event stay within bank.

Therefore with the added precaution that ground floor level of the stable block and tractor store will be raised at 300mm above ground level this source of flooding can be considered to be adequately mitigated.

4. **High Water Levels in IDB drains**

Although the whole of this area is below high tide level in the Wash and the River Nene, the retained water levels in the drainage channels ensure that the risk of

flooding is extremely low. South Holland IDB maintains a system of sluices, pumping stations, and drainage channels which convey surface water into the River Nene and the Wash and control water levels throughout the South Holland IDB area.

There are possibilities of failure of outfall sluices, but these are mitigated by the high level of maintenance given to these structures by the IDB. If a failure did occur the IDB would immediately be warned of the problem by their telemetry system and take action to repair the fault or to bring in temporary pumps to reduce the risk of any flooding in the area. Similarly any failures of culverts or other blockages would be dealt with immediately.

IDB systems are designed to provide a freeboard of between 600mm and 1000mm to all land in a 1 in 10 year return period rainfall event. This normally provides a standard of service of between 1 in 50 years and 1 in 100 years against flooding. In an extreme event water levels will rise but this will be a slow process and it would be at least 24 hours before levels were high enough to begin to flood low land in the area.

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 continue to provide satisfactory standards of protection with higher run-offs predicted with climate change.

The watercourse on the western boundary of the site is a watercourse which is maintained by the Board. This drain flows northwards and the water level in this drain is controlled by Fleet Fen Pumping Station which lifts the water into the South Holland Main Drain.

The water level in the South Holland Main Drain is controlled by the sluice alongside Nene Way 1.5km south of Sutton Bridge, where the water discharges into the tidal River Nene at low tide.

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.

Therefore the IDB system provides an adequate control of water levels in the area to mitigate against any flooding in a 1 in 100 year event.

5. **Localised Flooding due to failure of local drainage systems**

Any localised flooding that could occur on the site will be mitigated by raising the floor levels of the proposed stable block and tractor shed by 300mm above the existing ground level.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of this field or any of the adjoining land having been flooded in the past fifty years.

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 people on the site to make arrangements to protect the horses and 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 predictions of flood depths for this flood risk assessment use information provided by the Environment Agency which was produced in 2006. The EA have issued new guidance on recommended contingency allowances for predicted sea level 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 13 to 16). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

South East Lincs Advice Matrix

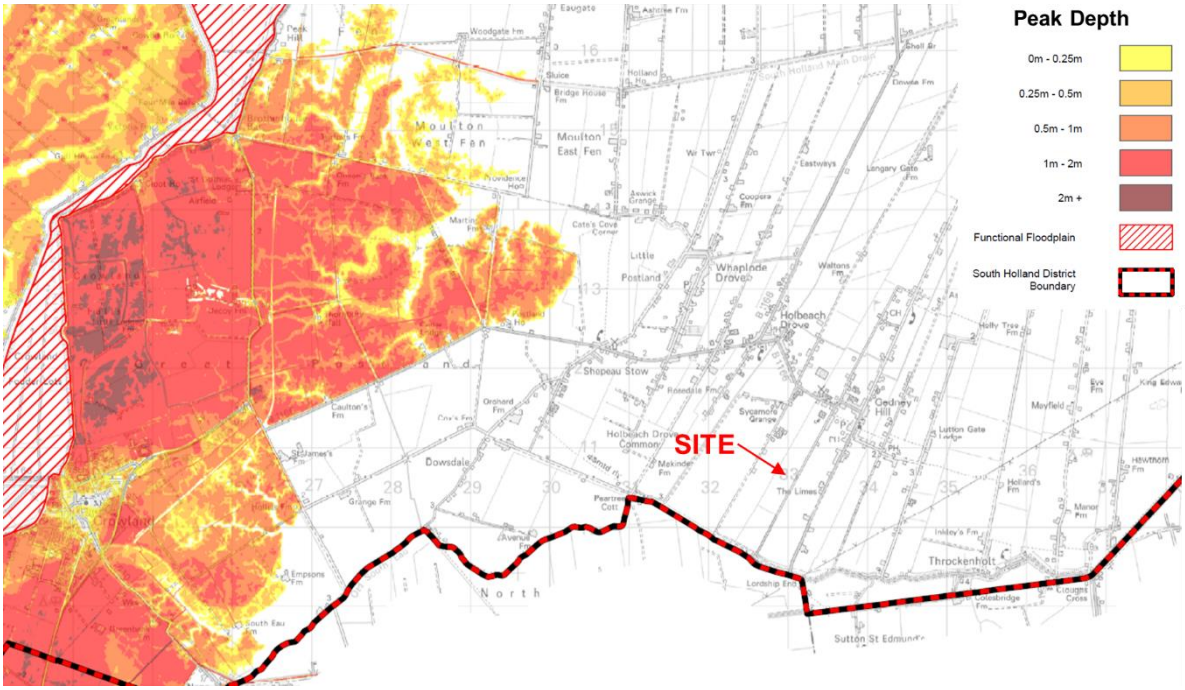
Advice can be found on the recommended mitigation required by referring to a spreadsheet on the South East Lincolnshire website.

As the development is for a change of use which is in flood zone 3 and there is no flood hazard reference should be made to Category G4 which states “No Comment”

Summary of Risk of Flooding to the Site

The main risk of flooding to the site is if a breach were to occur in the west bank of the tidal River Nene. The risk of this happening along this section of bank can be considered to be low. The bank has a wide top and bank slopes are not steep.

The relevant part of the map showing the predicted peak depths in this area if a breach occurred in the west bank of the River Nene in 2115 in a 0.5% tidal event probability or a breach occurred in the bank of the River Welland in a 1.0% fluvial event is shown on the next page.



It can be seen that there is no predicted flooding in the whole area of Gedney Hill and Holbeach Drove in a 1 in 100 year fluvial event or a 1 in 200 year tidal event.

The risk of flooding from high water levels in the IDB system is extremely low.

Recommendations

In any area at risk of flooding it is recommended that new buildings should be raised a minimum of 300mm above the existing ground level.

The owners of the proposed equestrian centre should register with the Environment Agency's Floodline Warnings Direct Service.

Surface water from the roofs of the proposed stable block and tractor store should be discharged into a soakaways.

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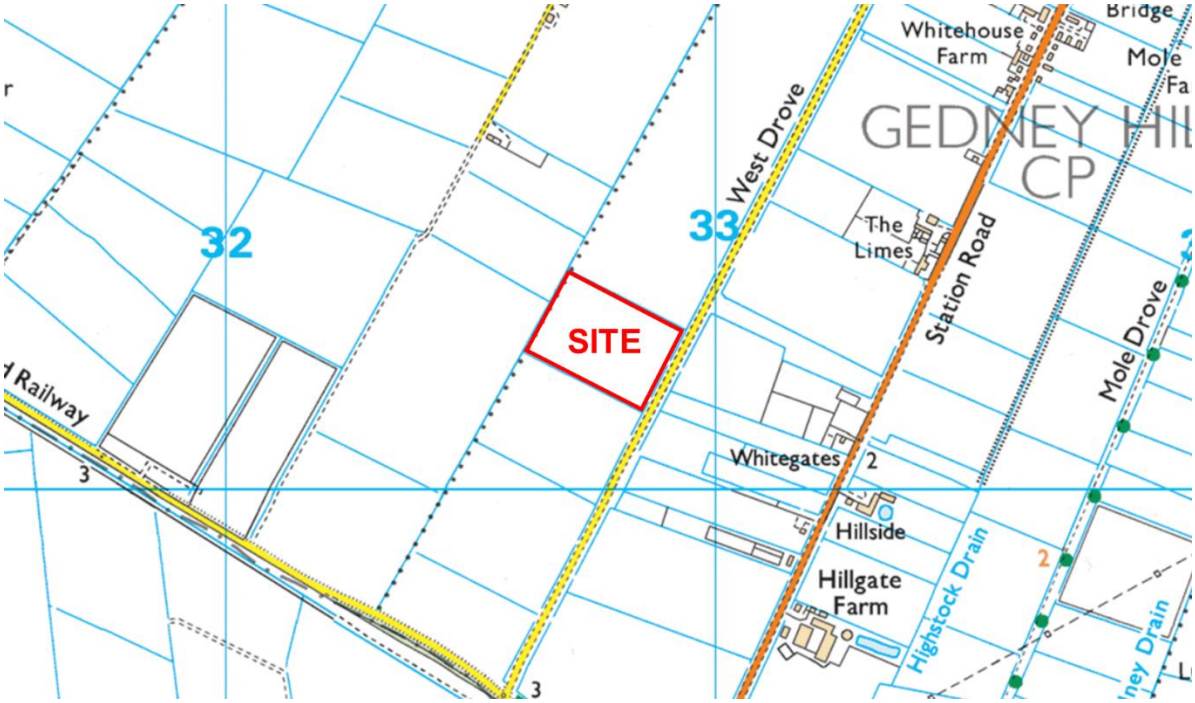
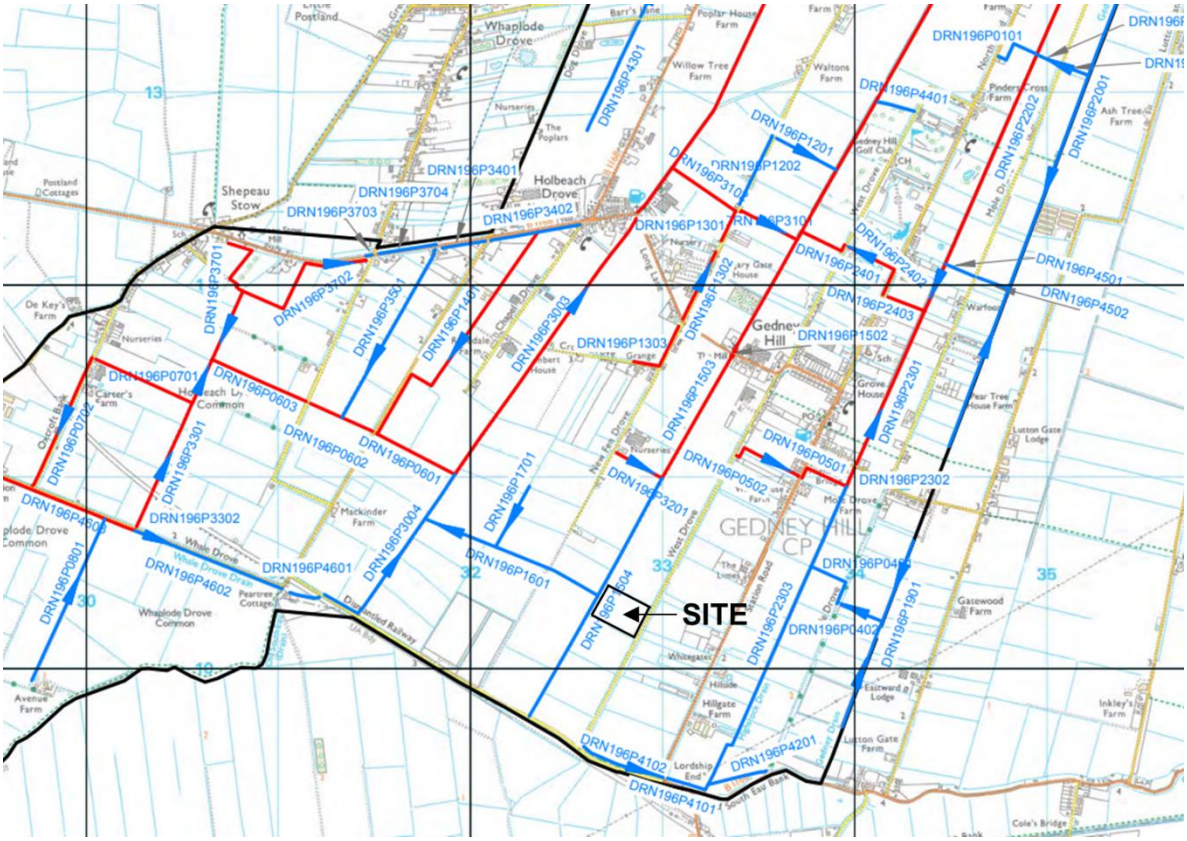
26th September 2022

LOCATION PLAN



PLAN OF IDB DRAINS



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 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

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 less vulnerable development in flood zone 3(a) the central and the higher central 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 the main source of flooding where the new climate change recommendations could affect the predictions of flood levels in 2115 at the development site is flooding from the tidal River Nene

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

Therefore it can be seen that the revised guidance increases the maximum allowance for sea rise in 2115 by 100mm. This will not have the effect of increasing the predicted flood level at the site in a 1 in 200 year breach event in 2115 by the maximum of 100mm, but it will probably be only between 10mm and 50mm. It is unlikely that this increase will significantly change the maps of flood risk at present issued by the Environment Agency.

Flooding from IDB drainage system

As the development is in flood zone 3 and is classed as less vulnerable, the advice from the Environment Agency is that the central climate change allowance, which is 25%, should be considered. After considering the effects of this increase the higher central allowance, which is 35%, should be considered to assess the effect of this.

IDB's have been using an allowance of 20% for climate change over the past few years in their assessments and modelling of their systems. Generally IDB's are happy that their systems provide a 1 in 100 year standard to most urban areas at the present time.

South Holland 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 South Holland 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 the 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 of the proposed stables and tractor store should be raised a minimum of 300mm above the existing ground level, is satisfactory.