FLOOD RISK ASSESSMENT

Proposed Agricultural & Produce Store
Mill House Farm
Roman Bank,
Fleet
Holbeach
Spalding
PE12 8LW

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Flood Risk Assessment Proposed Agricultural & Produce Store
Mill House Farm, Roman Bank, Fleet, Holbeach
Spalding. PE12 8LW

INTRODUCTION

The Government has placed increasing priority on the need to take full account of the risk associated with flooding at all stages of the planning and development process. This seeks to reduce the future damage to property and the risk to life from incidents of flooding. Their expectations relating to flooding are contained in the National Planning Policy Framework Feb 2021, (NPPF), which identifies how the issue of flooding is dealt with in the drafting of planning policy and the consideration of planning applications by avoiding inappropriate development in areas at risk from flooding and to direct development away from areas at highest risk.

The NPPF provides that development in areas at risk of flooding should be avoided and seeks to direct development away from areas at highest risk. There is a sequential, risk-based approach to the location of development avoiding where possible, flood risk to people and property managing any residual risk and taking account of the impacts of climate change.

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APPLICATION SITE

The site is located on land at Mill House Farm, Roman Bank, Fleet, Holbeach, Spalding PE12 8LW within the administrative area of South Holland District Council. The National Grid Reference is TF40228 26104. **Plan 1**

This flood risk assessment has been prepared for the erection of an additional Agricultural & Produce Storage building, (57.5m x 37m) **Plans 2, 3 & 4**

The National Planning Policy Framework Guidance NPPG defines three levels of flood risk depending upon the

annual probability of fluvial flooding occurring.

Zone 1 – Low Probability (<0.1%)

Zone 2 – Medium Probability (0.1 – 1.0%)

Zone 3 – High Probability (>1.0%)

The majority of the proposed development site is shown to be within Flood Zone 1 'Low Probability' with the remainder to the north being in Flood Zone 2 and a small area of Flood Zone 3, as detailed on the Environment Agency's Flood Zone Maps **without defences**.

Table 1: Flood Zones Definition (Ignoring the presence of defences)

Flood Zone 1- Low Probability
Definition This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). Appropriate uses. All uses of land are appropriate in this zone. **Flood risk assessment requirements** For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention. **Policy aims** In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems.

Applying the Flood Risk Vulnerability Classification in Table 2 of NPPG, the proposed development use for the site is considered to be 'Less Vulnerable'. Table 2 of NPPG states that such uses are permitted in these zones.

Table 2: Flood Risk Vulnerability Classification

Less Vulnerable
• Police ambulance and fire stations that are not required to be operational during flooding • Buildings used for shops, financial, professional, and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable" and assembly and leisure. • Land and buildings used for agricultural and forestry. • Waste treatment (except land fill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works that do not need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flood events are in place).

Site Levels

From Lidar 2mDTM the site of the new building is reasonably level, at 5.40mODN, the levels on the northern boundary are much lower at 4.31mODN with the invert of the watercourse at 3.07mODN. Roman Bank at the site entrance varies from 5.19mODN to 4.57mODN. **Plan 5**

DRAINAGE AUTHORITIES

Environment Agency

The Environment Agency has permissive powers for reducing the risk of flooding from designated main rivers and from the sea.

The following potential sources of flooding affecting the development site has been identified as:

- The Wash
- South Holland Internal Drainage Board system

Flood Zones

The Flood Zone Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood event with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater. In some locations, there are many kilometres of raised flood defences. To meet the requirements of the National Planning Policy Framework, these defences are removed in their entirety to produce the Flood Map for Planning (Rivers and Sea). The map therefore shows the full extent of areas that would be at risk of flooding if no defences existed and water could spread out across the floodplain.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map represents areas at risk of flooding for present day only and does not take account of climate change. In this area the main risk of flooding is from a breach to the tidal defences along the coastline that could affect the site These maps show that the majority of the proposed development site is considered at no risk from flooding as it is all located within an area zoned as Flood Zone 1. **Map 1**

Risk of Flooding from Rivers & Sea

The Risk of Flooding from Rivers and Sea Map shows that the site for the proposed building is at Very Low risk of flooding. Very low means that each year, this area has a chance of flooding of less than 1 in 1000 (0.1%). This takes into account the effect of any flood defences that may be in this area. Flood defences reduce, but do not completely stop the chance of flooding as they can be overtopped or fail. **Map 2**

River Nene, & River Welland.

With the River Nene lying some 9.15Km to the south of the site, and the River Welland some 10.35Km to the north, these flooding sources have been discounted as they are too distant to affect the site.

The main risk is therefore from a breach to the Wash tidal defences which are some 7.50Km to the east of the site at Gedney Drove End.

The Wash, Tidal defences

In this particular area, the main risk of flooding is from a breach to the Wash tidal defences along the coastline that could affect the site, and these are approximately 7.50km to the east of the site.

Coastal flooding may be caused by seasonal high tides such as those driven by the spring neap tide cycle, storm surges and where increase in water level above the astronomical tide level is created by strong on shore winds or by storm driven wave action and a deep atmospheric low pressure. Extreme conditions leading to coastal flooding are most commonly a result of a combination of two or more of these mechanisms.

The area is not affected by any flooding from a Fluvial main River and therefore would only be affected by tidal flooding from the Wash. The Wash Banks constitute the first line of defence against any tidal flooding. These consist of earth embankments along the shores of the Wash and are invariably behind an area of intertidal salt marsh which protects them against damage from wave action, though in the relatively sheltered environment of the Wash this is less of a hazard than the North Sea coastline.

The defences are in fair condition and reduce the risk of flooding (at the defence) to a 0.67% (1 in 150) chance of occurring in any year. The Environment Agency inspect these defences routinely to ensure potential defects are identified.

Breach Analysis to Wash Tidal Defences

From Lincolnshire & Northamptonshire Area Tidal Modal Analysis, levels for East Coast and Wash: Immingham to the West Lighthouse have an assessment date of 2017, which should be used in any consideration of future increases due to climate change. **Map 3**

Peak tide levels (2017) for the 1 in 200-year 50% confidence bound tide level is 5.82mODN at West Lighthouse Peak tide levels (2120) tide level a is 5.82mODN plus Higher Central climate change of 1025mm would be 6.85mODN.

Taking the precautionary approach, the Hazard Rating following a breach which in Flood Risk Assessment (FD 2320) Guidance for New Development Phase 2 R& D Technical Report these are classified as low <0.75, moderate 0.75-1.25, significant 1.25-2.50 and extreme >2.50 based upon an empirical measure of velocity and depth.

HR = d x (v + 0.5) +DF

Where V = Flood flow velocity (m/sec) D = Flood depth (m)

DF = A debris factor included to represent the greater damage, or risk of injury to people, that can occur if debris is swept along with the water. = 0.5 for depths <0.25 or 1.0 for depths.

For the degree of Flood Hazard to be classified as low HR must be <0.75

Flood Hazard			Description
	<0.75	Low	**Caution –** Flood Zone with shallow flowing water or deep standing water.
	0.75 – 1.25	Moderate	**Danger for Some -** (i.e. children) Danger Flood Zone with deep or fast flowing water.
	1.25 – 2.0	Significant	**Danger for Most –** Danger Flood Zone with deep fast flowing water.
	>2.0	Extreme	**Danger for All** – Extreme Danger Flood Zone with deep fast flowing water.

The 2017 Update to SHDC, SFRA has carried out a Tidal & Fluvial Hazard Mapping, for the district, following a breach to the defences. The present-day Residual Flood Hazard, Depth and Velocity District – present day 1% fluvial and 0.5%Tidal Event Probability Maps show that the site where the proposed development is to be located is within an area of no hazard The Hazard, Velocity and Depth Maps, for year 2115, also shows that the site is still within an area of no hazard. **Maps 4, 5 & 6.**

The Environment Agency standing advice recommends that for “Less Vulnerable” developments in Flood Zone, the floor level of buildings should be raised as high as practicable, (for operational needs the FFL will be set to match the FFL of the existing buildings).

Floor levels

It is proposed that the ground floor level for the proposed agricultural stone be set at the same level as the onsite storage building to allow easy access for folk lifts which are used on site..

SOUTH HOLLAND DISTRICT COUNCIL

In order to inform the process of risk assessment and site selection the District Council commissioned Haskoning UK Ltd Consultants to prepare a Strategic Flood Risk Assessment in December 2002.They have carried out an update of this report and this report was published in January 2010 and this was further updated in February 2017.

This Flood Risk Assessment has taken the results of the (2017) updated South Holland Strategic Flood Risk Assessment (SHSFRA) into account in its findings.

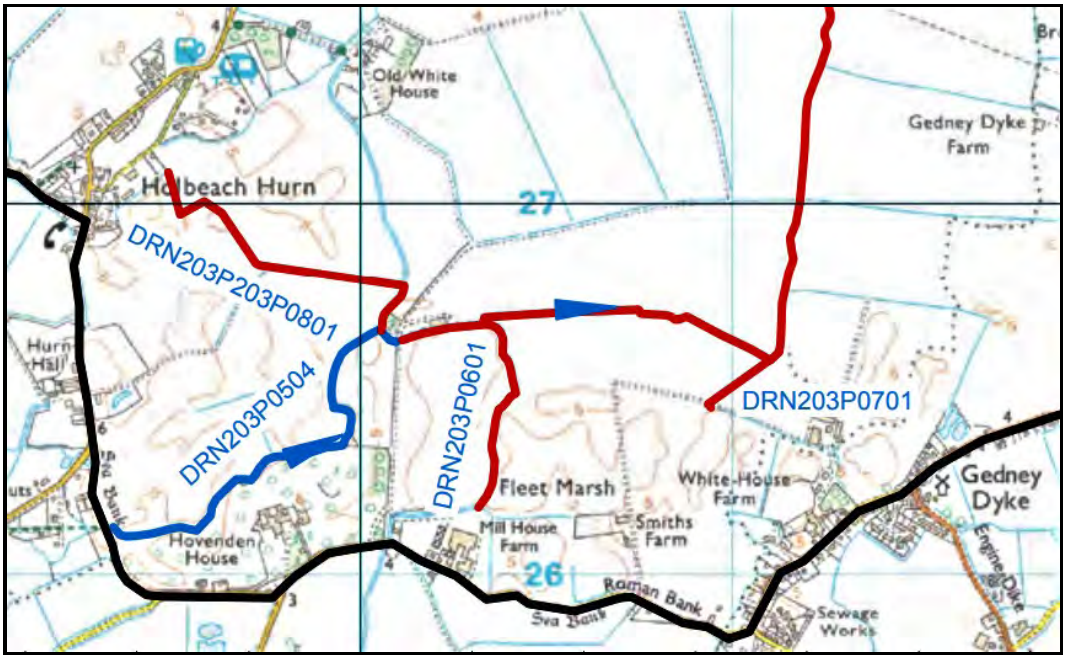
The whole of the tidal flooding information has been replaced by the mapping from the latest Environment Agency

Tidal Hazard mapping. Where the mapping for an area contains both fluvial and tidal components, the more severe of the two has been presented.

SOUTH HOLLAND INTERNAL DRAINAGE BOARD

The proposed development site is located within the catchment area of South Holland Internal Drainage Board. The Board is responsible to operate and maintain the arterial fluvial system.

The site is within Board's catchment Fleet Haven and the nearest watercourse to the site is Drain No DRN203P0601, located adjacent to the northern boundary of the site. This drain outfalls to Fleet Haven Pumping Station which discharges into the Wash.



South Holland IDB Drainage Map

The Board's prior written consent will be required for any of the following works:

- No person without the previous consent of the Board shall erect any building or structure, whether temporary or permanent, or plant any tree, shrub, willow or other similar growth within 9 metres of the landward toe of the bank where there is an embankment or wall or within 9 metres of the top of the batter where there is no embankment or wall, or where the watercourse is enclosed within 9 metres of the enclosing structure.

- No person shall, without the previous consent of the Board, for any purpose, by means of any channel, siphon, pipeline or sluice or by any other means whatsoever, introduce any water into the District or, whether directly or indirectly, increase the flow or volume of water in any watercourse in the District.

- The erection or alteration of any mill dam, weir or other like obstruction to the flow, or erection or alteration of any culvert within the channel of a riparian watercourse.

When planning approval has been obtained an application to discharge the attenuated surface water into the Drain will be submitted to the Board.

FLOODING FROM OTHER SOURCES

Flooding is a natural process and can happen at any time from sources other than watercourses and the sea.

- Flooding from land can occur from intense rainfall, often over short duration of time that is unable to soak into the ground or enter the drainage system. However, with the natural topographic nature of the ground having no high ground around the site. With the proposed ground floor levels being set above the existing ground floor level this will not cause any rapid inundation of the site.

- The area is not known to suffer from any groundwater problems.

- Flooding from sewers can occur from over loading from heavy rainfall caused by blockages or having inadequate capacity. There are no public sewers in the proximity of the site.

- Non-natural or artificial sources of flooding such as reservoirs, lakes, or canals where water is stored above natural ground level could cause flooding if the structure fails or is over topped. There are no known sources within the vicinity of the site.

SURFACE WATER FLOODING

The majority of the site for the proposed units is not shown on the Low Risk scenario Surface Water flood maps, for the 1 in 1000-year event, to be affected from surface water flooding. This type of flooding is usually short lived and associated with heavy downpours of rain, thunderstorms etc. **Map 7**

The maps for surface water and revised maps for river and sea flooding define the risk as High, Medium, Low and Very Low. The chance of flooding for the area defined in any given year is shown below:

- **High:** greater than 1 in 30 (3.3%).
- **Medium:** between 1 in 100 (1%) and 1 in 30 (3.3%).
- **Low:** between 1 in 1000 (0.1%) and 1 in 100 (1%).
- **Very Low:** less than 1 in 1000 (0.1%)

Unlike the fluvial mapping, which is based on a detailed hydraulic model, this mapping is based purely on applying rainfall to a digital terrain model. As such this mapping serves to represent a worst-case scenario which may well overstate the actual probability of flooding in this area.

There is a caveat on the Defra Data website, as to the use of these maps and that they are not to be used to identify that an individual property will flood. Because of the way they have been produced and the fact that they are indicative, these maps are not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

SEQUENTIAL APPROACH

When applying the sequential approach for flood risk in accordance NPPF the site would fall into Zone 1 (Low Probability) as shown on the Environment Agency's Flood Map without defences in place.

The Environment Agency categorise land into one of three Flood Zones.

- Flood Zone 1 is Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)

- Flood Zone 2 is Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding: or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)

- Flood Zone 3a is Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)

Applying the Flood Risk Vulnerability Classification in Table 2 of NPPG, the proposed use is classified as, "Less Vulnerable" use, Table 1 of NPPG states that such uses are appropriate in this zone (as summarised in Table 3 NPPG)

TABLE 3: Flood risk vulnerability and flood zones 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Flood Zone 1	✓	✓	✓	✓	✓
	Flood Zone 2	✓	✓	Exception Test Required	✓	✓
	Flood Zone 3a	Exception Test Required	✓	✗	Exception Test Required	✓
	Flood Zone 3b Functional Floodplain	Exception Test Required	✓	✗	✗	✗

Sequential & Exception Test

NPPF Guidance Paragraphs 159 - 169 requires development within high areas of flood risk be determined using a sequential risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account the impacts of climate change.

The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. The NPPF states that development should not be permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. It is important to note that the Sequential Test does not specifically mean that sites such as this cannot be developed, rather that sites at less risk should be developed first. The whole of the surrounding area is shown on the Flood Map for Planning to be in Flood Zone 3 and there are no other sites in a lower flood zone.

Planning Practice Guidance states: - When applying the Sequential Test, a pragmatic approach on the availability of alternatives should be taken. For example, in considering planning applications for extensions to existing business premises it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere.

The proposal needs a dedicated base and cannot operate on a disaggregated basis, which would result in multiple trips across the district to access various elements of the project. There will be positive economic impacts for the area. It is therefore considered that the Sequential Test has been satisfied.

With the application being for a Less Vulnerable use, the Exception Test is not required.

Also with the site being constructed within the area shown on the Environment Agency Flood Map (without defences) to be in Flood Zone 1, it need not be considered further in relation to the Sequential or Exception Tests for the location of new development with respect to flood risk. Examination of Table 3 shows that for Flood Zone1, **all** vulnerability classifications are appropriate for development.

DRAINAGE STATEMENT

Surface Water Drainage

This drainage statement, for the site, proposes to utilise infiltration techniques to reduce the storm water discharge from the proposed development and to minimise the impact of the development on the surrounding area and to comply with guidelines, which require at least one workable solution for managing surface water.

In accordance with recognised guidance, National Planning Policy Framework 2012, there is a hierarchy of where surface water should discharge. This hierarchy should be followed where practicable, and is as follows:

1) Infiltration
2) Watercourse
3) Public sewer

Ground Conditions

The British Geological Survey maps for the area around the site shows that the Superficial Deposits are Tidal Flat Deposits - Clay and Silt overlaying bedrock of West Walton Formation) Mudstone and Siltstone.

From these maps, the underlying soil conditions shown are relatively impermeable, therefore the infiltration rate may be too low for soakaways to be designed to adequately cope with large storm events from the entire site. It is therefore considered that soakaways will **not be a viable option for dealing with surface water** from the site.

Infiltration

There are no proposals for any surface water to discharge by infiltration due to the findings from British Geology Maps described above.

Watercourse

It is proposed that the surface water run-off from the building roof will be attenuated in an underground storage tank and discharged into the dyke on the northern boundary at Greenfield rates of discharge. Calculations using the Wallingford Tool for Surface Water Storage Requirements reveals that a volume of 137m^3 is required at a discharge rate of 5 litres/sec. **Document 1**

Sewers

There are no proposals to discharge surface water to sewers.

Foul Water Drainage

There are no additional proposals for the need for additional foul drainage requirements.

As there is a positive drainage system capable of receiving flows from the development there is no likely impact on neighbouring property.

CLIMATE CHANGE

Global warming is now recognised that it is likely to affect the frequency and severity of extreme events as both tidal and fluvial flooding. The Climate change allowances in the NPPF Guidance was updated on the 20th of July 2021.

Peak River Flow Allowances

For flood risk assessments use the Management Catchment Climate Changes for the peak river flow map. Management catchments are sub-catchments of River Basin Districts.

The site is located within the Welland Management Catchment within the Anglian River Basin District, for sites within Flood Zone 2 or 3a and for “More Vulnerable” land uses, the Central allowances figures, in the Table below, should be used.

Peak River flow allowances within the Management Catchment Allowances				
River Basin District /Management Catchment	Allowance category	Total potential change anticipated for '2020s' (2015 to2039)	Total potential change anticipated for '2050s' (2040 to2069)	Total potential change anticipated for '2080s' (2070 to2115)
Anglian/ Welland	Upper End	22%	26%	53%
	Higher Central	10%	10%	28%
	Central	5%	4%	17%

The effect of global warming on peak rainfall allowances is given in Table 1.

Table 1 Peak Rainfall Intensity

Table 1 Peak rainfall intensity allowance in small and urban catchments (1961 to1990 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%

The annual sea rise due to climate change is given in NPPF and the recommended contingency allowances are stated in Table 2.

Table 2 Peak Sea Level Rise

Table 2 Peak Sea level allowance for each epoch in (mm) per year with cumulative sea level rise for each epoch in brackets (use 1981to 2000 baseline)						
Area of England) (Use River Basin	Allowance	2000 to 2035	2036 to 2065	2066 to 2095	2096 to 2125	Cumulative Rise 2000 to 2125 (m)
Anglian	Higher Central	5.8 (203mm)	8.7 (261mm)	11.6 (348mm)	13 (390mm)	1.20m
Anglian	Upper End	7 (245mm)	11.3 (339mm)	15.8 (474mm)	18.1 (543mm)	1.6m

FLOOD PROTECTION

Any impact of damage to the properties can be foreseen and mitigated against by relatively simple design and construction techniques. There are two forms of flood protection works: -

- **Flood-resistance or proofing works**: - these try to reduce the amount of water entering a building.
- **Flood-resilient works: -** these reduce the amount of damage caused by water entering the building.

The proposed amenity building will have the following resilient measures incorporated in the construction in accordance with "Improving the flood performance of new buildings" CLG (2007).

- The ground floor level for the proposed building is to be set level with the existing buildings FFL's.
- Arrange for all service circuits to be routed at high level and where practical socket outlets and

switchgear. to be a minimum of 0.5m above the raised ground floor level.

CONCLUSION

- The site does have the protection of tidal flood defences which are well maintained by the Environment Agency.

- The proposed site or the additional building is shown to be within Flood Zone 1 ‘Low Probability' with the remainder to the north of the site being in Flood Zone 2 and a small area of Flood Zone 3, as detailed on the Environment Agency's Flood Zone Maps **without defences**.

- The 2017 Update to SHDC, SFRA Tidal & Fluvial Hazard Mapping, for District following a breach to the defences, show that the site where the proposed development is to be located is within an area of no hazard, for both the present day and for year 2115.

- The Flood Risk Vulnerability Classification in Table 2 of NPPG the proposed building is classified as “Less Vulnerable”, with Table 1 of NPPG stating that such uses are appropriate in this zone.

- Any impact of damage to the property can be foreseen and mitigated against by relatively simple design and construction techniques. They will be constructed using materials which are flood resilient construction as outlined in the report.

- Flooding from other sources is unlikely to affect the site.

- No obvious constraints have been identified that may impact the proposed development and the type of mitigation measures that can be used to reduce the flood risk, there is no increase in the flood risk to others. Following the guidelines contained within the NPPF, the proposed development is considered to be suitable assuming appropriate mitigation is maintained for the lifetime of the development.

- Any impact of damage to the properties can be foreseen and mitigated against by relatively simple design and construction techniques. They will be constructed using materials which are flood resilient construction a stated in the report.

- It is therefore concluded that the proposed development can be constructed, safely and sustainably, to meet the requirements of NPPF.

Flood map for planning

Your reference	Location (easting/northing)	Created
Fleet	**540243/326096**	**17 Sep 2021 16:49**

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

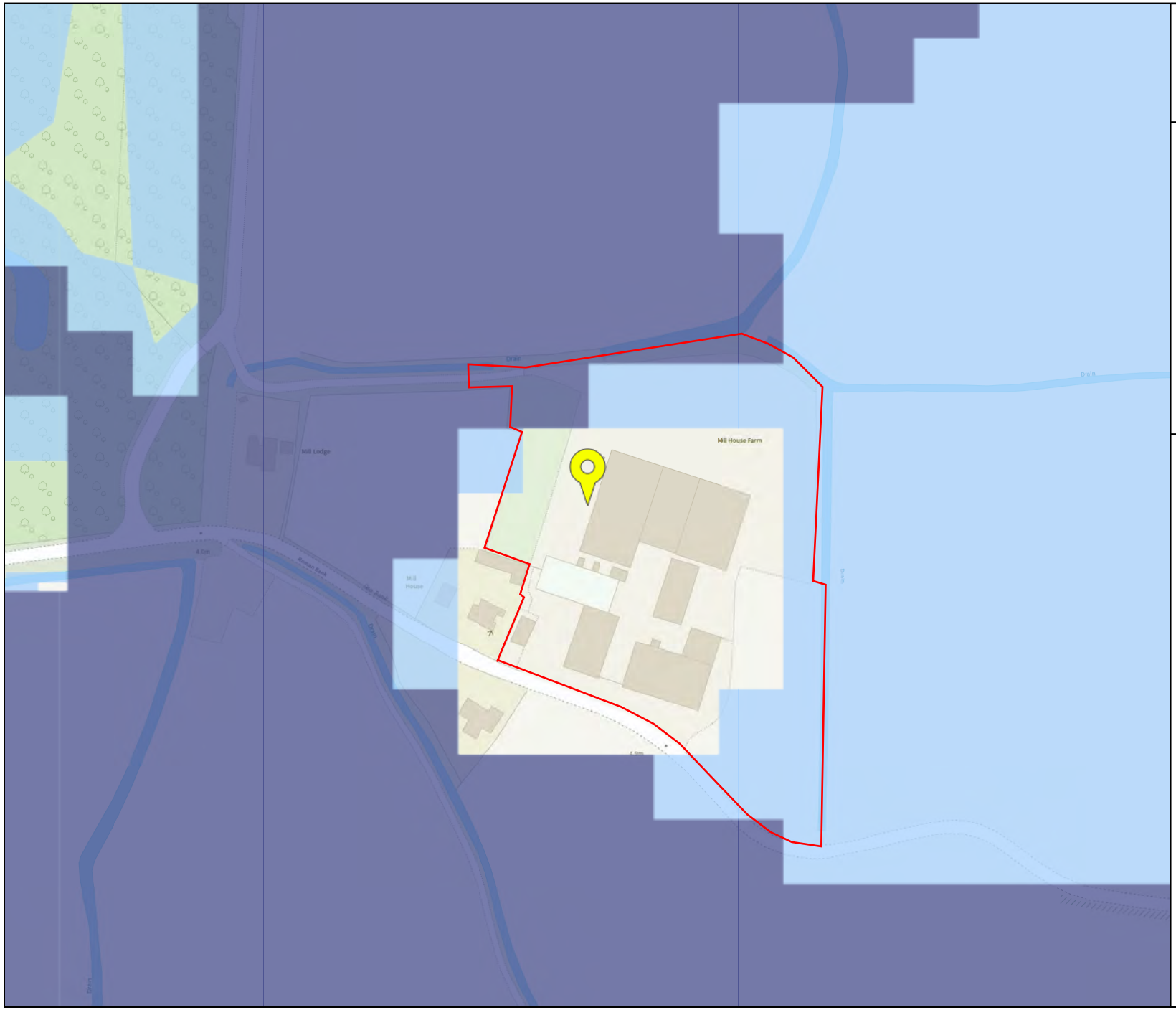
Notes

The flood map for planning shows river and sea flooding data only. It doesn’t include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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Environment Agency

Flood map for planning

Your reference
Fleet

Location (easting/northing)
540243/326096

Scale
1:2500

Created
17 Sep 2021 16:49

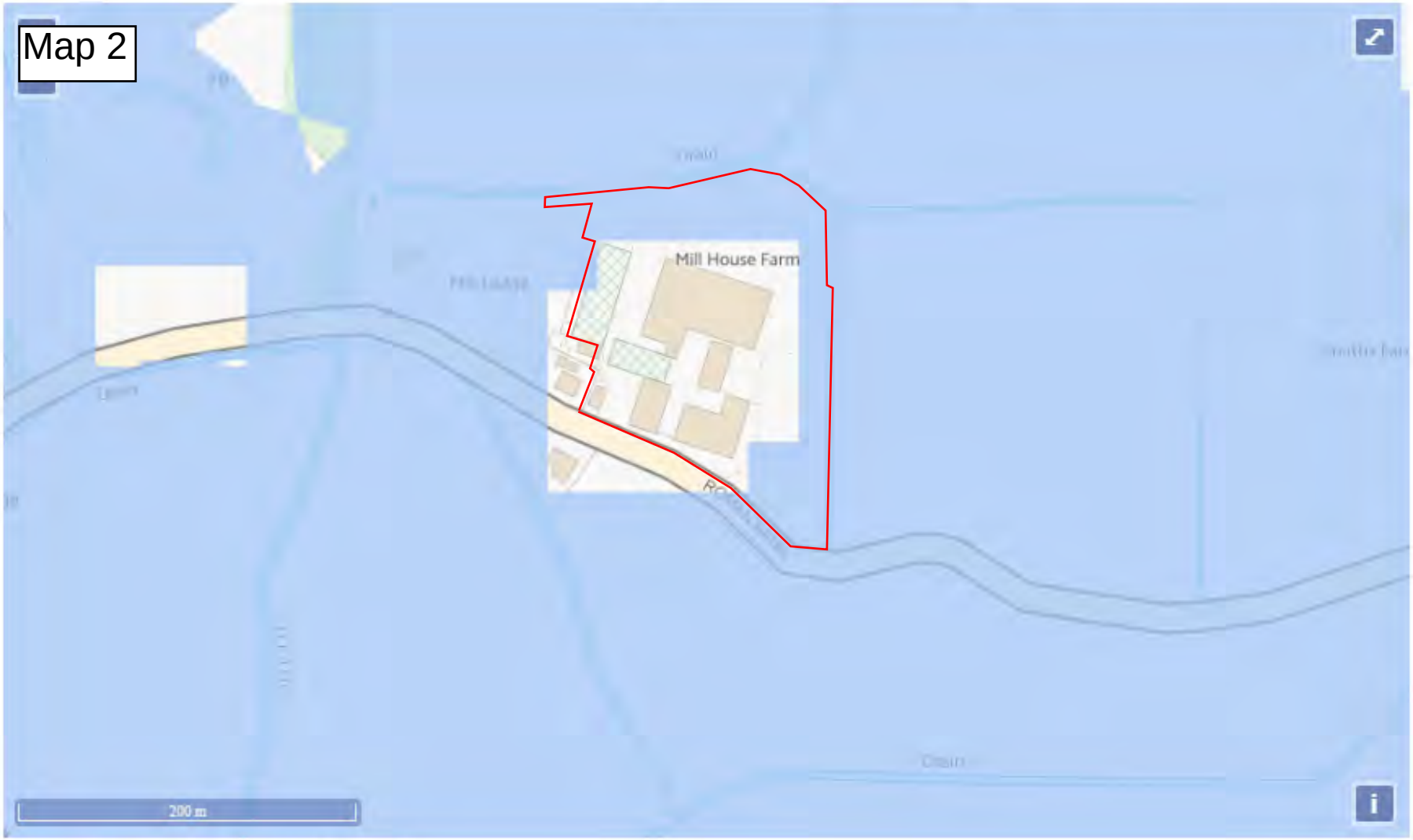
- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

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Extent of flooding

Enter a place or postcode



Extent of flooding from rivers or the sea

High Medium Low Very low

East Coast and Wash - 2018 Coastal Flood Boundary [CFB] Dataset
Key Node Points

Map 3



Environment Agency

Scale 1:550,000

N W E S

▲ East Coast and Wash

See seperate data sheet for predicted flood levels

Created by the Partnerships and Strategic Overview Team, Lincoln

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

CFB Ref	Location	Easting	Northing	Annual Chance (1 in x) of Tide Level in metres ODN																	
				1			10			50			100			200			300			1000		
				Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound		
				2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
3888	**Immingham**	520440	417625	4.16	4.17	4.19	4.50	4.53	4.62	4.73	4.80	5.00	4.83	4.93	5.19	4.93	5.06	5.41	4.98	5.14	5.55	5.15	5.38	6.01
3890	**Haborough Marsh**	522100	416512	4.14	4.15	4.17	4.48	4.51	4.60	4.70	4.77	4.97	4.80	4.90	5.16	4.90	5.03	5.38	4.94	5.10	5.51	5.11	5.34	5.97
3898	**Grimsby**	529295	413162	3.98	3.99	4.01	4.31	4.34	4.43	4.53	4.60	4.80	4.61	4.71	4.97	4.71	4.84	5.19	4.74	4.90	5.31	4.88	5.11	5.74
3906	**Buck Beck**	534709	407369	3.87	3.88	3.90	4.19	4.23	4.31	4.41	4.50	4.68	4.50	4.61	4.86	4.61	4.75	5.10	4.64	4.82	5.22	4.80	5.05	5.66
3910	**Tetney**	538035	405537	3.85	3.86	3.89	4.17	4.22	4.30	4.40	4.50	4.67	4.49	4.61	4.86	4.60	4.75	5.10	4.63	4.82	5.21	4.80	5.06	5.66
3918	**Donna Nook**	544641	401997	3.82	3.83	3.86	4.14	4.19	4.27	4.38	4.48	4.65	4.47	4.60	4.85	4.58	4.74	5.10	4.63	4.82	5.22	4.81	5.08	5.68
3928	**Saltfleet**	549131	393360	3.78	3.79	3.82	4.11	4.16	4.26	4.36	4.46	4.64	4.47	4.59	4.86	4.57	4.74	5.11	4.63	4.83	5.25	4.83	5.11	5.74
3942	**Boygrift**	555131	380860	3.72	3.74	3.77	4.06	4.11	4.22	4.33	4.43	4.65	4.43	4.57	4.87	4.56	4.73	5.13	4.62	4.83	5.28	4.85	5.15	5.82
3968	**Gibraltar Point**	557652	356181	4.16	4.17	4.20	4.51	4.56	4.67	4.76	4.85	5.08	4.85	4.97	5.27	4.94	5.10	5.49	4.99	5.18	5.63	5.14	5.41	6.09
3992_14	**Hobhole**	535990	340116	4.96	4.97	5.01	5.40	5.44	5.56	5.66	5.76	5.98	5.78	5.90	6.20	5.88	6.04	6.44	5.92	6.11	6.57	6.03	6.31	6.99
	Grand Sluice*	532366	344510	4.93	4.94	4.98	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
3992_9	**Boston Barrier**	532754	342852	4.93	4.94	4.98	5.41	5.45	5.57	5.73	5.83	6.05	5.85	5.97	6.27	5.93	6.09	6.49	5.94	6.13	6.59	5.98	6.26	6.94
3992_5	**Fosdyke Bridge**	531886	332234	4.87	4.88	4.92	5.31	5.35	5.47	5.58	5.68	5.90	5.71	5.83	6.13	5.82	5.98	6.38	5.87	6.06	6.52	6.01	6.29	6.97
4008	**West Lighthouse**	550094	329971	4.87	4.88	4.91	5.21	5.26	5.37	5.46	5.56	5.78	5.56	5.68	5.98	5.66	5.82	6.21	5.71	5.90	6.35	5.86	6.14	6.81
-	**Marsh Road**	525988	324065	-	5.04	-	-	5.44	-	-	5.73	-	-	5.85	-	-	5.98	-	-	-	-	-	-	-
-	**Wisbech**	546110	309940	-	4.83	-	-	5.25	-	-	5.53	-	-	5.66	-	-	5.78	-	-	-	-	-	-	-
-	**Dog-in-a-Doublet**	527200	299287	-	3.67	-	-	4.00	-	-	4.22	-	-	4.32	-	-	4.42	-	-	-	-	-	-	-

See next page for notes

Customer services line: 03708 506 506
Calls to 03 numbers cost the same as calls to standard geographic numbers
(i.e. numbers beginning with 01 or 02)

Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

NOTES:

The following notes apply to all CFB sites (ie all on table excluding Marsh Road, Wisbech, Dog-in-a-Doublet)

- The base date for the data is 2017.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590

The following notes apply to all Marsh Road, Wisbech, Dog-in-a-Doublet

- The base date for the data is 2006
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- These levels will be updated as their respective tidal river models are updated.

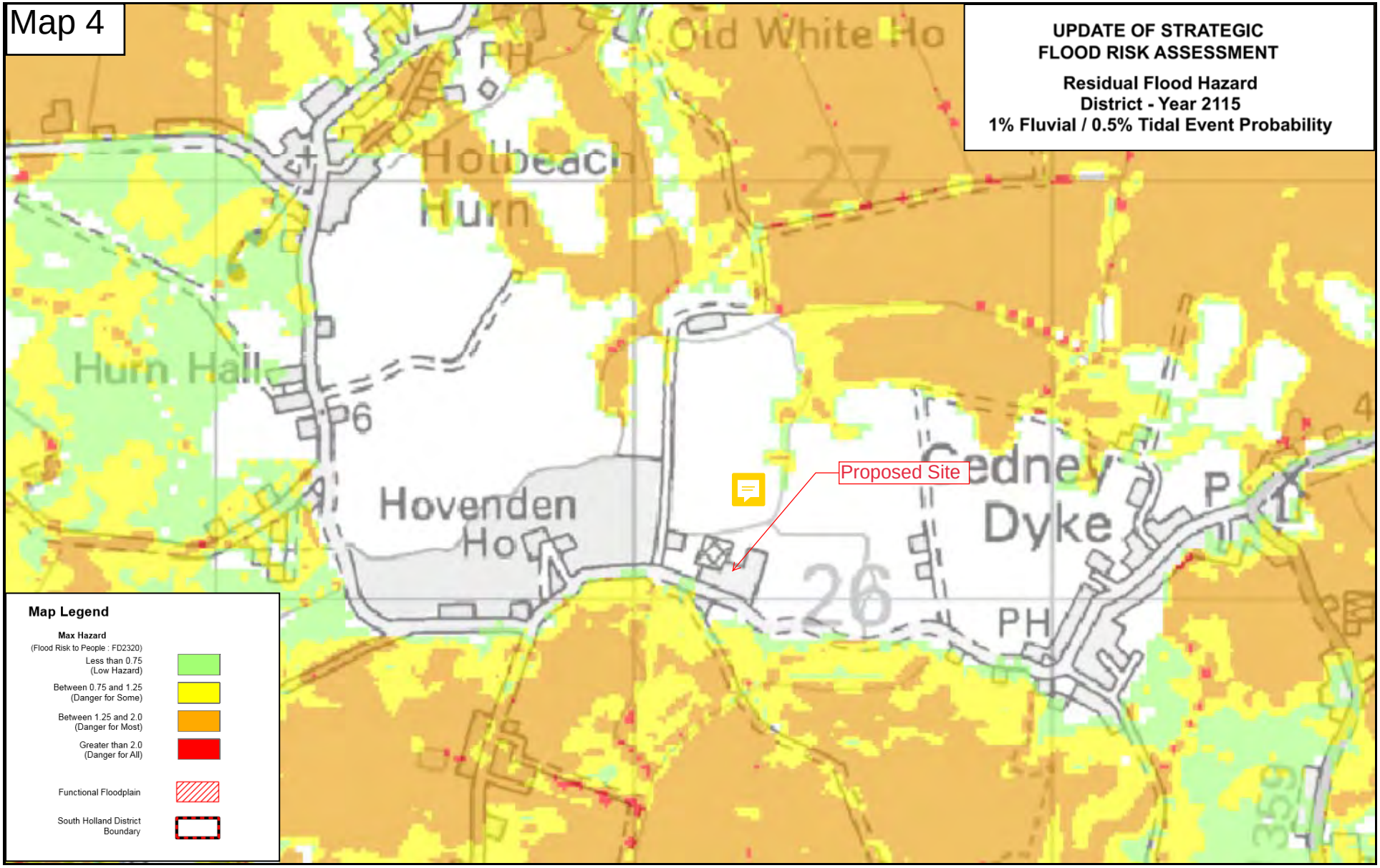
The following notes apply to Grand Sluice

- The data is based on CFB 2018 data for Boston Barrier site, capped at 5.3mAOD to reflect use of the barrier.
- The base date for the data is 2017
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590

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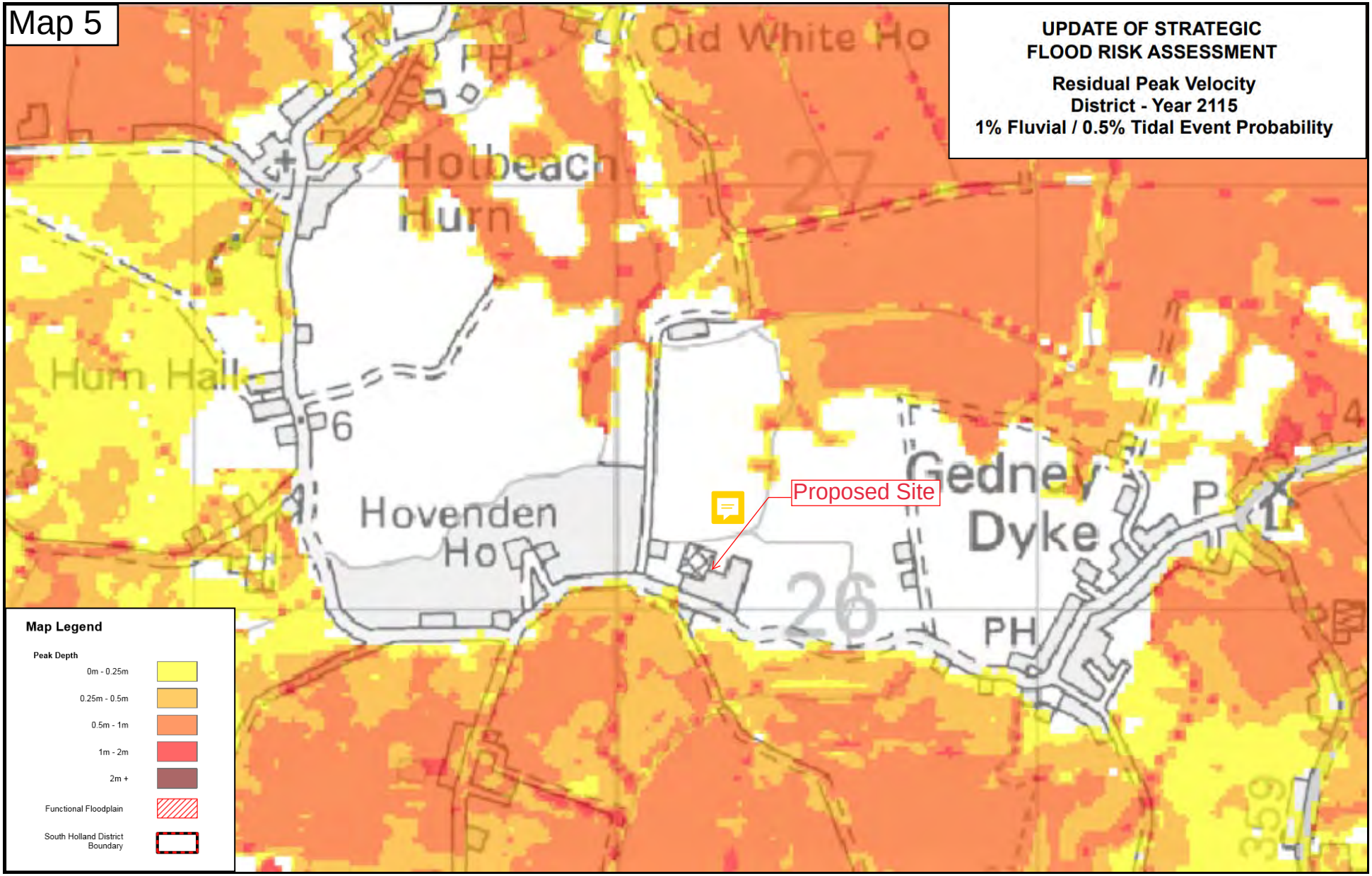
Map 4


UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT
Residual Flood Hazard
District - Year 2115
1% Fluvial / 0.5% Tidal Event Probability
Old White Ho
PH
Holbeach
Hurn
27
Hurn Hall
P6
Hovenden
Ho
Proposed Site
Cedney
Dyke
P
26
PH
Map Legend
Max Hazard
(Flood Risk to People : FD2320)
Less than 0.75
(Low Hazard)
Between 0.75 and 1.25
(Danger for Some)
Between 1.25 and 2.0
(Danger for Most)
Greater than 2.0
(Danger for All)
Functional Floodplain
South Holland District
Boundary

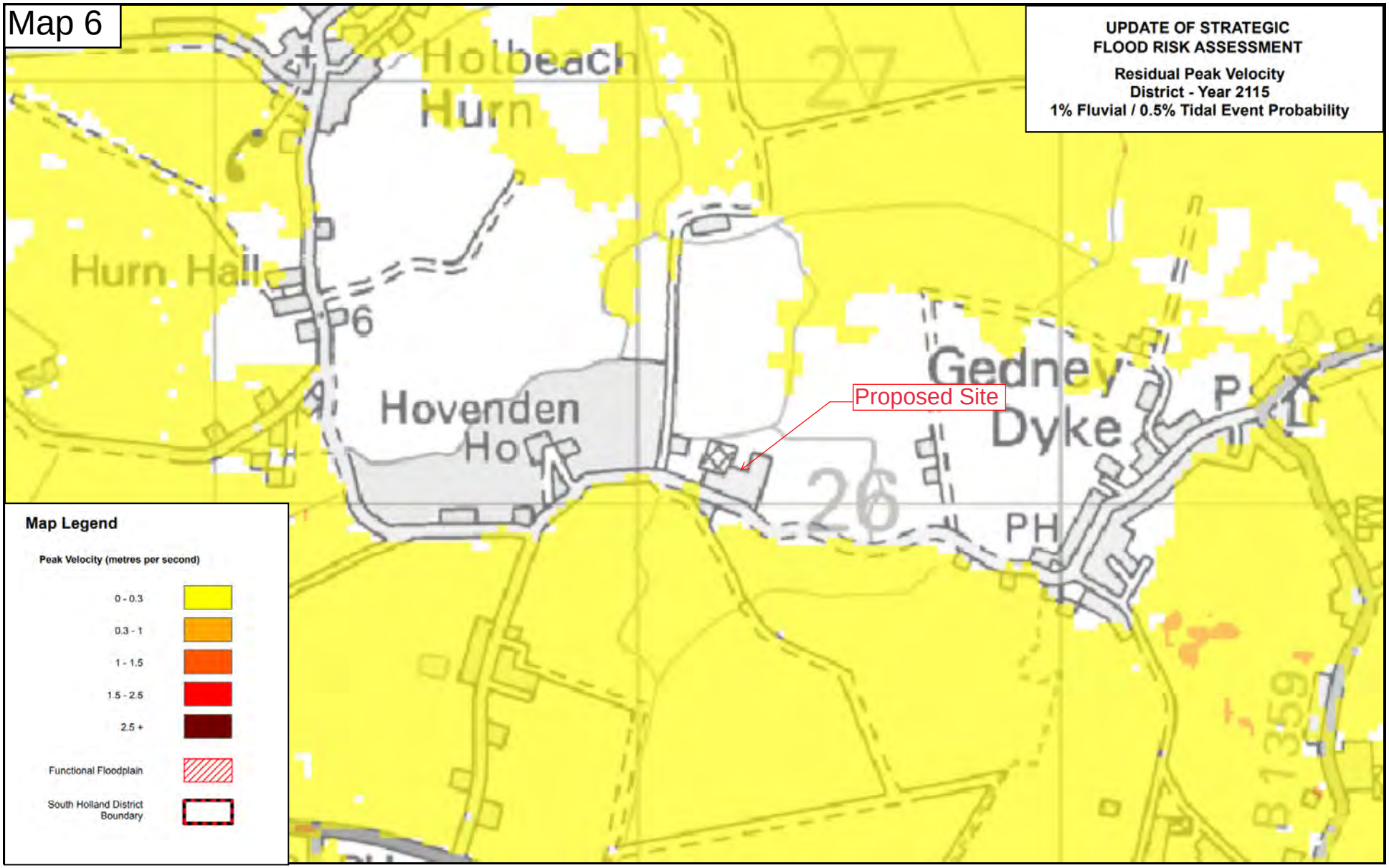
Map 5

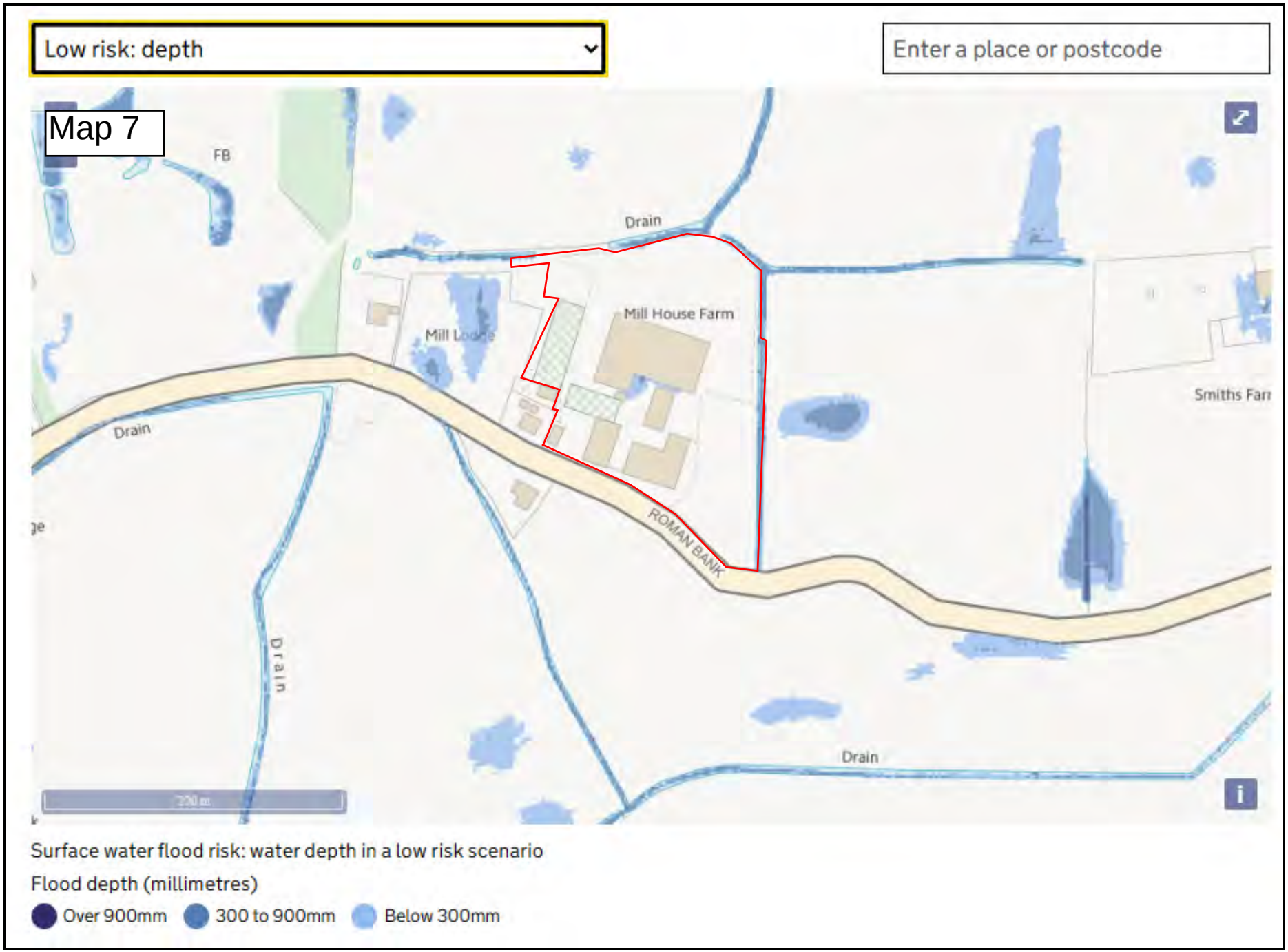
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT

Residual Peak Velocity
District - Year 2115
1% Fluvial / 0.5% Tidal Event Probability



Map 6


UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT
Residual Peak Velocity
District - Year 2115
1% Fluvial / 0.5% Tidal Event Probability
Holbeach
Hurn
Hurn Hall
Hovenden
Ho
Gedney
Dyke
Proposed Site
PH
B1359
Map Legend
Peak Velocity (metres per second)
0 - 0.3
0.3 - 1
1 - 1.5
1.5 - 2.5
2.5 +
Functional Floodplain
South Holland District Boundary


Low risk: depth
Enter a place or postcode
Map 7
FB
Drain
Mill House Farm
Mill Lodge
Smiths Farm
Drain
ROMAN BANK
Drain
Drain
Surface water flood risk: water depth in a low risk scenario
Flood depth (millimetres)
Over 900mm
300 to 900mm
Below 300mm

Plan 1



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Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client
Mr G Franklin

Project
Proposed Agricultural Produce Store
Mill House Farm, Roman Bank, Fleet

Drawing
Location Plan

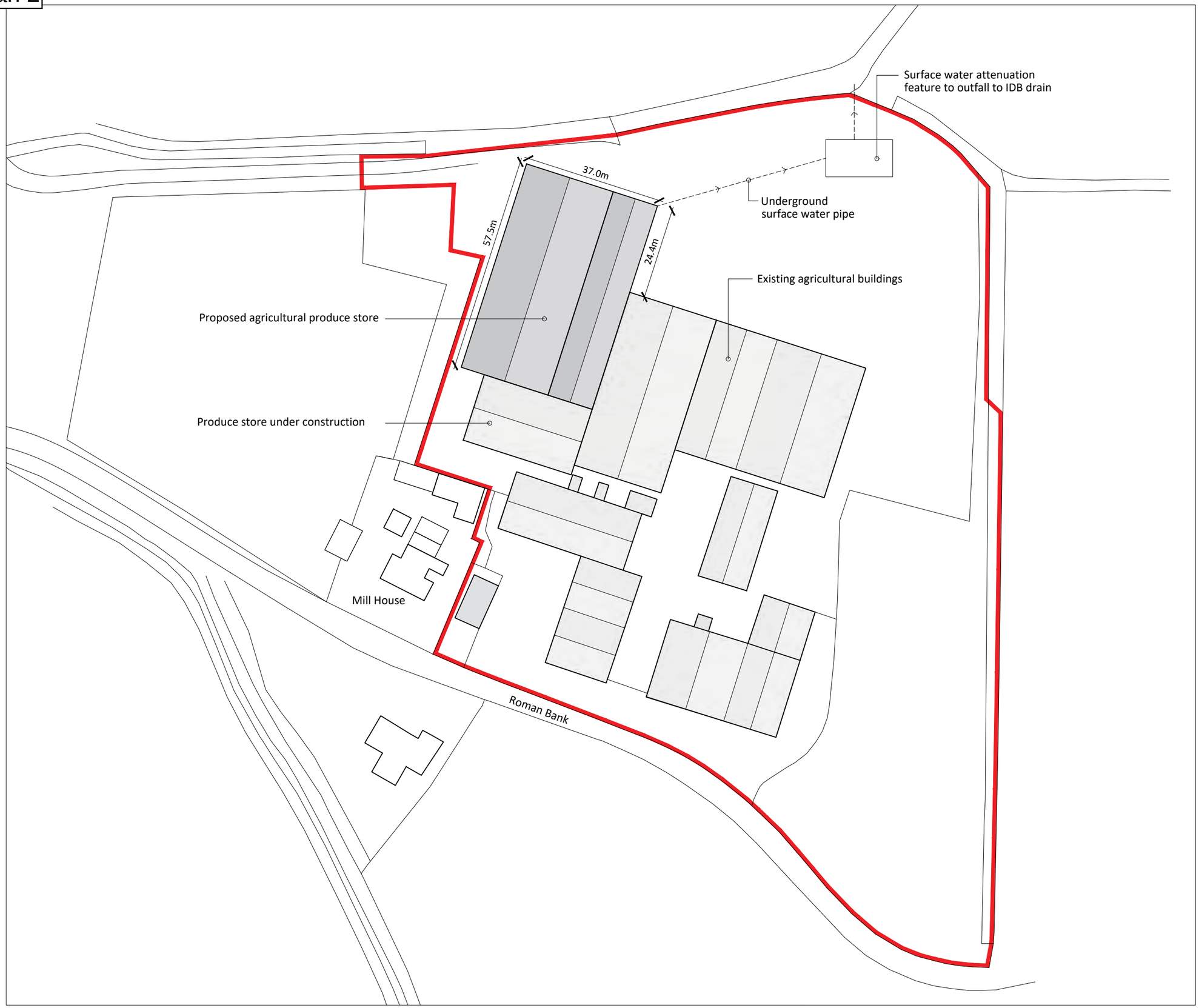
Scale @ A4	Date
1: 2500	26/05/21

Drawn By	Checked By
WW	LMS

Job Number	Status	Purpose of Issue
1185-9	SK	Discussion

Drawing No.	Rev
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Plan 2



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0 10 20 30 40 50m

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Client
Mr G Franklin

Project
Proposed Agricultural Produce Store
Mill House Farm, Roman Bank, Fleet

Drawing
Proposed Site Plan

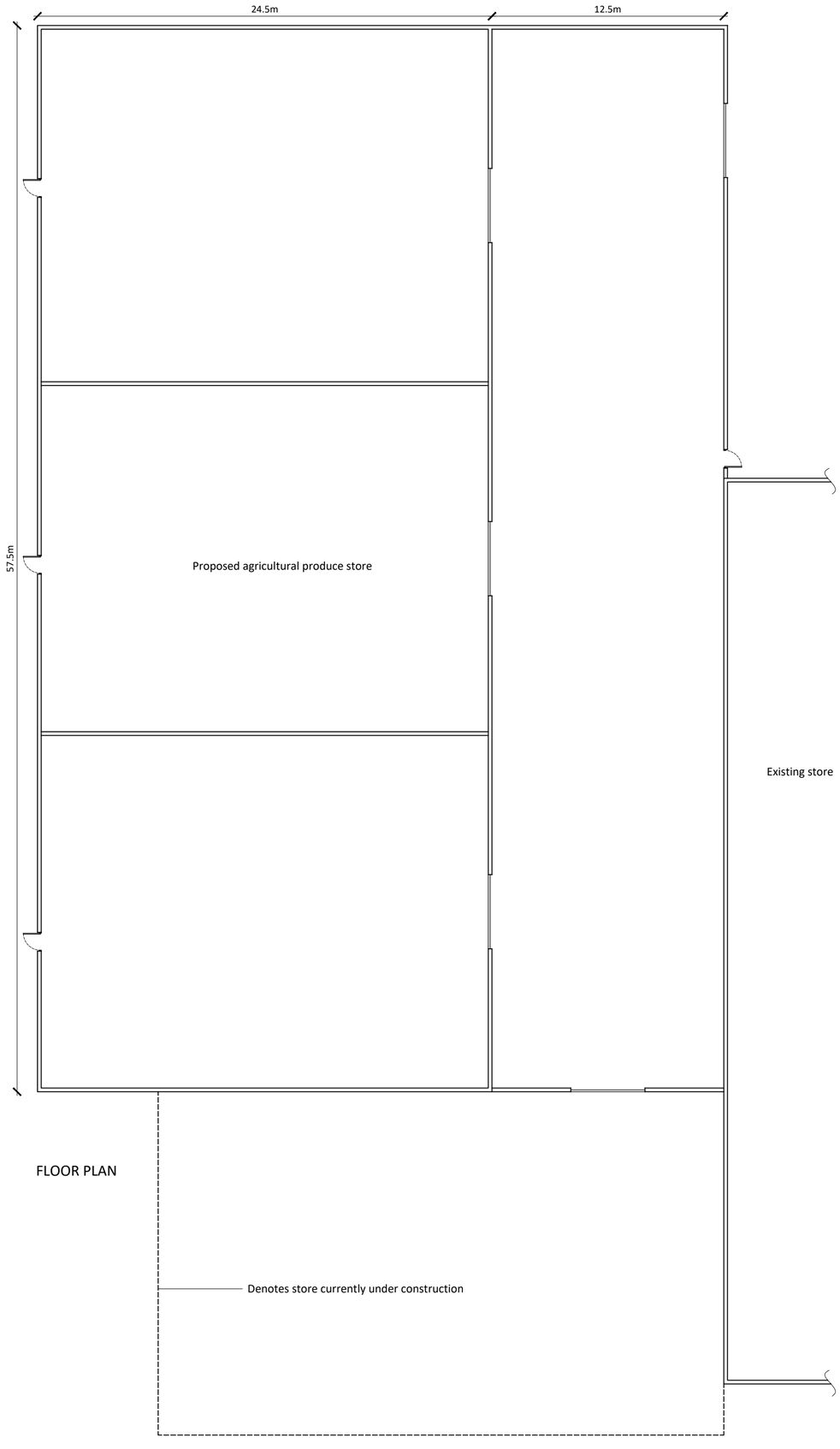
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Drawn By	Checked By
WW	LMS

Job Number	Status	Purpose of Issue
1185-9	SK	Discussion

Drawing No.	Rev
1185-9_SK_SP01	-

Plan 3



FLOOR PLAN

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Client
Mr G Franklin

Project
Proposed Agricultural Produce Store
Mill House Farm, Roman Bank, Fleet

Drawing
Proposed Floor Plan

Scale @ A2	Date
1: 200	26/05/21

Drawn By	Checked By
WW	LMS

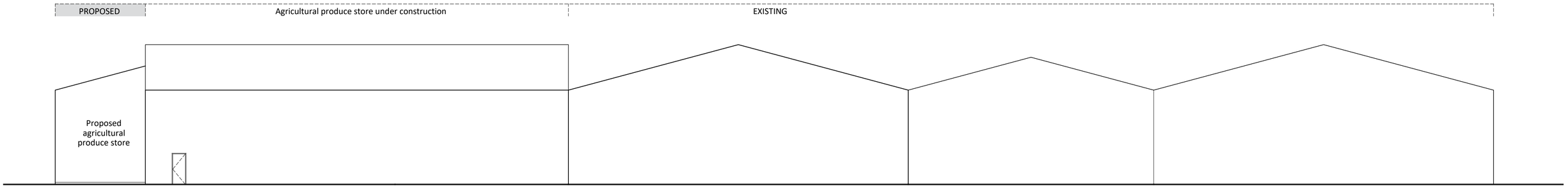
Job Number	Status	Purpose of Issue
1185-9	SK	Discussion

Drawing No.	Rev
1185-9_SK_PL01	-

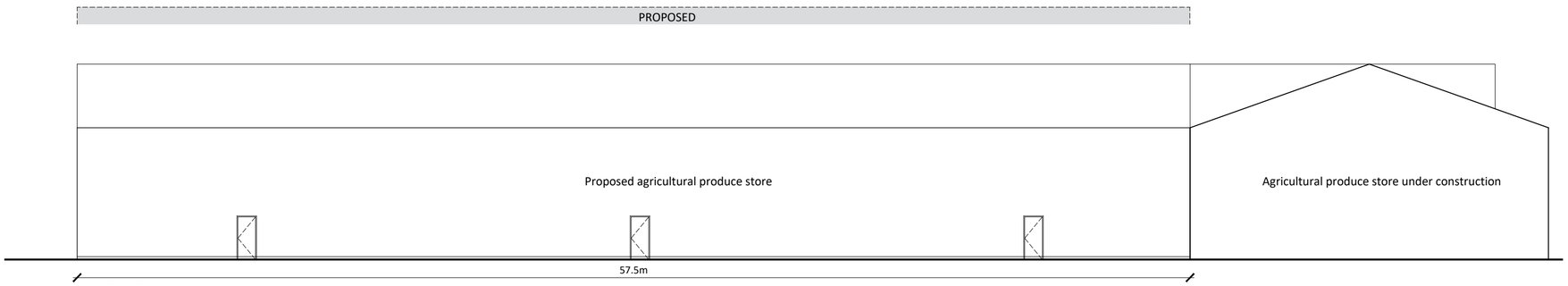
Plan 4



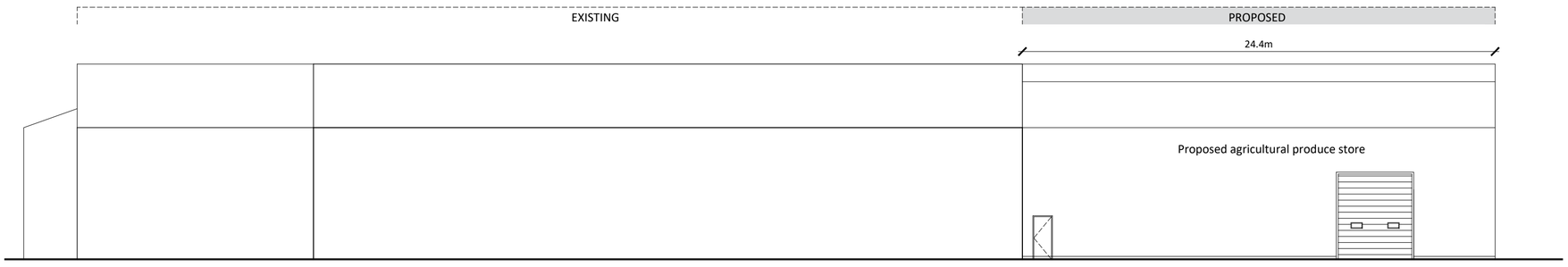
NORTH ELEVATION



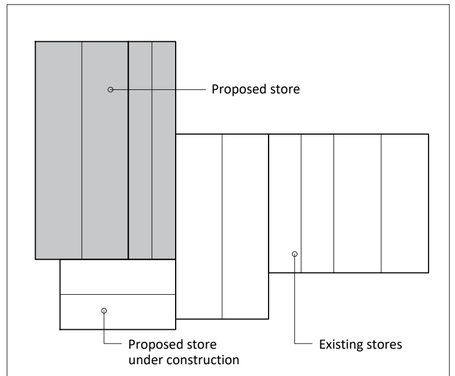
SOUTH ELEVATION



WEST ELEVATION



EAST ELEVATION



KEY (NTS)

0 2 4 6 8 10m

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Client
Mr G Franklin

Project
Proposed Agricultural Produce Store
Mill House Farm, Roman Bank, Fleet

Drawing
Proposed Elevations

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Drawing No. 1185-9_SK_EL01 **Rev** -

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Plan 5



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Web: www.rdc-landplan.co.uk

Client
Mr G Franklin

Project
Proposed Agricultural Store
Mill House Farm, Roman Bank, Fleet

Drawing
Existing Site Plan

Scale @ A3	Date
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Drawn By	Checked By
WW	LMS

Job Number	Status	Purpose of Issue
1185-9	SK	Discussion

Drawing No.	Rev
1185-9_SK_SP02	-

Document A

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	RM Associates
Site name:	Mill House Farm
Site location:	Fleet

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	52.81441° N
Longitude:	0.07954° E
Reference:	2283962110
Date:	Sep 17 2021

Site characteristics

Total site area (ha):	0.213
Significant public open space (ha):	0
Area positively drained (ha):	0.213
Impermeable area (ha):	0.213
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.21
Net impermable area for storage volume design (ha):	0.21
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	4
SPR:	0.3	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	101.64
FEH / FSR conversion factor:	1.32	1.32
SAAR (mm):	579	579
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 10 year:	1.65	1.65
Growth curve factor 30 year:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Q_{BAR} for total site area (l/s):	0.31	0.82
Q_{BAR} for net site area (l/s):	0.31	0.82

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	5

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	5	5
1 in 30 years (l/s):	5	5
1 in 100 year (l/s):	5	5

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	125	125
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	125	125

This report was produced using the storage estimation tool developed by HRWallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.