

FLOOD RISK ASSESSMENT

PROPOSED RETENTION OF CARAVANS
BAR FARM
LITTLEWORTH DROVE
DEEPING ST. NICHOLAS
SPALDING
PE11 3BN



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FLOOD RISK ASSESSMENT FOR RETENTION OF CARAVANS BAR FARM, LITTLEWORTH DROVE, DEEPING ST. NICHOLAS SPALDING. PE11 3BN

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 March 2012, (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.

The Environment Agency's flood maps show areas that are at risk, from fluvial and tidal flooding. These maps show the limits of the flood plain of the area which could be affected by flood events, over topping or breaching of flood defences. They are based on the approximate extent of floods with a 1% annual probability of exceedance (1 in 100-year flood) for rivers and 0.5% annual probability of exceedance (1 in 200-year flood) for coastal areas under present expectations or the highest known flood. However, they do not consider of the presence of defences or the likelihood that flood return intervals will be reduced by climate change.

This Flood Risk Assessment and Drainage Statement has been prepared in support of a planning application and considers the risk of flooding from fluvial and tidal sources in accordance with National Planning Policy Framework (NPPF). It also considers the risks of localised flooding due to inadequate Foul and Surface Water Sewers, Failure of Reservoirs, Water Main pipe bursts, Sewer Blockages, Pump Failures or High Ground Water Table etc.

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APPLICATION SITE

The site is located at Bar Farm, Littleworth Drove, Deeping St. Nicholas, Spalding, PE11 3BN, within the South Holland District Council's administrative area. **Plan 1**

The National Grid Reference is TF 22433 17764.

This flood risk assessment has been prepared for a planning application to extend the period of the planning permission for a further five years, for 45 No caravans and a Portakabin type laundry and toilet facility, for use of the migrant workers employed to meet the needs of the business, which provides agency drivers to the main logistics companies in Spalding, which was originally granted permission in 2009 and renewed in 2014 for five years. **Plan 2**

The Site would be classed as Non-Major Development applying the National Planning Policy Guidance (NPPG) as the site is to be developed for less than 1 Hectare.

The National Planning Policy Framework Technical Guidance NPPF 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 proposed development site is shown to be within Flood Zone 2 'Medium Probability' as detailed on the Environment Agency's Flood Zone Maps without defences, and as defined in Table 1 of NPPF.

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

Flood Zone 2 – Medium Probability
Definition This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.
Appropriate uses Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in Table 2, are appropriate in this zone. The highly vulnerable uses are only appropriate in this zone if the Exception Test is passed.
Flood Risk Assessment requirements All development proposals in this zone should be accompanied by a Flood Risk Assessment.
Policy aims In this zone, developers and Local Authorities should seek opportunities to reduce the overall level of flood risk in the area 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 NPPF the proposed residential use is classified

as Highly Vulnerable”, with Table 1 of NPPF stating that such uses are appropriate in this zone subject to the Exception Test.

Table 2: Flood Risk Vulnerability Classification

Highly Vulnerable
• Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations that require coastal or water-side locations, or need to be located in other high flood risk areas; in these instances the facilities should be classified as “essential infrastructure”).

From the topographic survey, the road level on Littleworth Drove at the site entrance is at 2.67mODN with the site levels varying from 2.78mODN to 2.21mODN. The floor level of the caravans is 500mm above the natural ground level at a minimum level of 2.70mODN. **(Plan 3)**

The development will be designed to consider the potential flood depth at the site following a breach/ overtopping to the tidal flood defences for scenario year 2115.

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 have been identified as:

- From the River Welland
- Welland & Deepings Internal Drainage Board system

The Flood Zone Maps identify river catchments over 3 sq. km. These maps are a theoretical estimate of areas that could be inundated should no defence exist. In practice, current standards of protection would result in flood envelopes substantially less than shown by these maps. The maps make no allowance for local, site specific features.

The flood zone maps indicate that the area would be flooded without flood defences. The Flood 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.

The flood zone maps show that the site of the proposed development is considered at risk from flooding. These maps indicate that the area would be flooded without flood defences, which are in place, (with an annual probability of more

than 0.5% i.e. return frequency of less than 1 in 200 years for tidal flooding or more than 1.33% return frequency of less than 1 in 100 years for fluvial flooding). **Map 1**

The risk of flooding from Rivers and Sea shows that the site is at a Low risk of flooding. Low means that each year this area has a chance of flooding less than 1 in 1000 (0.1%). This considers 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**

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered that flooding may occur from other sources such as surface water sewers, road drainage, etc.

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.

Flood Hazard value	Degree of flood hazard	Description	Indicative depth range
< 0.75	Low	Caution 'Flood zone with shallow flowing water or deep standing water'	Up to 0.25 m
0.75 – 1.25	Moderate	Danger for some (i.e. children) 'Danger: flood zone with deep or fast flowing water'	Up to 0.5 m
1.25 – 2.0	Severe	Danger for most 'Danger: flood zone with deep fast flowing water'	0.5 m to 3 m
> 2.0	Extreme	Danger for all 'Extreme danger: flood zone with deep fast flowing water'	0.5 m to over 3 m

$$HR = d \times (v + 0.5) + DF$$

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

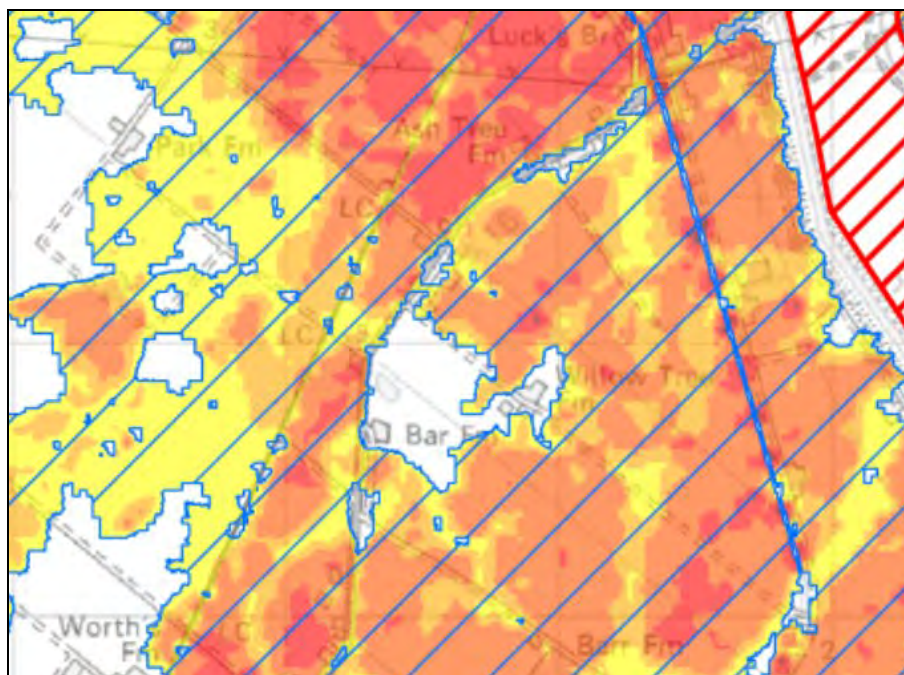
Flood depth (m)	All areas (rural and urban)
≤ 0.25	0.5
> 0.25	1

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

The maps contained in the 2016 Update of South Holland Strategic Flood Risk Assessment have been used as these maps contain the tidal flooding information 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.

The Residual Peak Flood Hazard District year 2115 1% Fluvial/0.5% Tidal Event Probability Map Rev 2 shows the site not within a Hazard Rating Area. **Map 3**

The Residual Peak Depth District Present day 1% Fluvial/0.5% Tidal Event Probability Map Rev 2 shows the site not to be affected.



Present Day Depth Map

With climate change, the Residual Hazard Maps for Scenario year 2115 for the 1 in 100-year fluvial & 1 in 200-year tidal event shows that the site for the development is not within a Hazard Rating area and therefore not subject to flooding from a breach to the flood defences. **Map 4**

The site is not affected by overtopping of the defences for the present day (2006), or with climate change, up to year 2115 scenarios. The site is also shown on the Residual peak depth Extent of Fluvial & Tidal Domination District year 2115 1% Fluvial/0.5% Tidal Event Probability Map not to be affected. **Map 5**

The Environment Agency recommends for any proposal that single storey developments that include ground floor sleeping accommodation should be informed by the flood depths arising from the 2115, 0.1% breach scenario. Any proposals that do not include ground floor sleeping can be informed by the flood depths arising from the 0.5% breach scenario.

With this planning application being for a period of only 5 years, the site, based on the above information, will not be affected from either tidal or fluvial flooding.

South Holland District Council

In order to inform the process of risk assessment and site selection the District Council Commissioned Consultants in 2010 to prepare a Strategic Flood Risk Assessment which has recently been replaced by the 2016 Update of South Holland Strategic Flood Risk Assessment.

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.

Welland & Deepings Internal Drainage Board

The proposed development site is located within Catchment area of Welland & Deepings Internal Drainage Board. The Board is responsible to operate and maintain the arterial fluvial system. The Boards Drain which serves the site is: -

South Drove Drain

This watercourse is one of the Boards main drains which flows north-westwards to Pode Hole pumping station which discharges into Vernatts Drain which flows by gravity to Surfleet Seas End where it discharges through pointing doors into the tidal River Welland. The design flood level in South Drove Drain at Pode Hole Pumping Station is 1.20mODN.

SURFACE WATER FLOODING

Most of the site is not shown on the Surface Water flood maps to be affected by surface water flooding. Very low risk means that each year this area has a chance of flooding of less than 1 in 1000 (0.1%). Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. There is a small area to the north-east of the site that has the potential to be flooded to a depth of up to 300mm. **Map 6**

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 being flat, with no high ground around the site this will not cause any rapid inundation of the site and is likely only lead to local ponding of shallow depth and low velocity following the natural land contours which fall away from the site. With the ground floor levels of the units being raised 500mm above the existing ground level, flooding from this source is limited to minor isolated cases and is not of strategic significance with regards to flood risk.
- The area is not known to suffer from any groundwater problems and therefore is taken as having no strategic significance with regards to flood risk.
- 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 vicinity 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.

RESIDUAL RISKS

There is always a possibility of a flood more than that allowed for which might conceivably cause some flooding to the properties. However, such an event would have a very low probability and the risk of flooding to the property would be extremely small. It is therefore considered that the residual risks associated with flooding are not significant.

SEQUENTIAL APPROACH

When applying the sequential approach for flood risk in accordance NPPF the site of the barn would fall into Flood Zone 3 (High Probability) as the site is shown to be within the fluvial flood plain 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 outside the 0.1% floodplain (with a chance of flooding of less than 0.1% chance in any given year);
- Flood Zone 2 is land that falls between the 1 in 100-year extent and the 1 in 1000-year extent (a chance of flooding between 1% and 0.1% in any given year);
- Flood Zone 3a is land which falls within the 1 in 100-year flood extent (has a 1% chance of a flood occurring in any given year).

Applying the Flood Risk Vulnerability Classification in Table 2 of NPPF, the proposed use for a caravan permanent use development for the site falls within "Highly Vulnerable" uses of land in Table 3 Flood Risk Vulnerability Classification and Table 1 shows that developments of this nature are appropriate in this zone subject to the exceptions test. All development is permitted in Zone 1. Development in Zones 2 and 3 is restricted based on Table 3 of NPPF replicated below

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	✓	✗	✗	✗

NPPF Guidance Paragraphs 100 - 104 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.

Sequential Test

The proposed permanent caravan use site is shown on the flood maps to be within Flood Zone 2 and highly vulnerable uses are permitted subject to passing the Exception Test.

The Local Planning Authority's opinion, for the current approval, was that there are no other sequentially preferable sites available for a caravan site of this nature, the principle has been established, therefore the Exception and Sequential Test is passed.

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 19th February 2016.

The site is located within the Anglian River Basin, for sites within Flood Zone 3 and for "More vulnerable" land uses the Higher Central and Central river flow allowances figures in Table 1 should be used.

Table 1 Peak river flow allowances by river basin district (1961 to 1990 baseline)				
River basin District	Allowance category	Total potential change anticipated for '2020s' (2015 to 2039)	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%

The effect of global warming on peak rainfall allowances is given in Table 2

Table 2 Peak rainfall intensity allowance in small and urban catchments (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%

The annual sea rise due to climate change is given in NPPF and the recommended contingency allowances are stated in Table 3.

Table 3 Peak sea level allowance for each epoch in (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)					
Area of England) (Use River Basin maps	1990 to 2025	2026 to 2050	2051 to 2080	2081 to 2115	Cumulative Rise 1990 to 2115 (m)
East, Midlands, London, South East	4 (140mm)	8.5 (212.5mm)	12 (360mm)	15 (525mm)	1.24m

DRAINAGE STATEMENT

Surface Water Drainage

The rainwater from the roof of the existing caravans falls on to the grassed areas and infiltrates into the ground, all the existing parking/driveways is constructed using permeable materials. There are no proposals to change this as no problems have been experienced.

Foul Water

As the site is not within an area served by public foul sewers therefore there are no public sewers in the vicinity of the site the existing foul drainage is connected to the existing package sewage treatment plant. There are no proposals to change this arrangement.

As there is a positive drainage system to cater for the run-off from the development, the development proposal will not have adverse impact on the wider catchment elsewhere.

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 actually entering a building.
- **Flood-resilient works:** - these reduce the amount of damage caused by water entering the building.

The proposed properties 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 of the caravans is raised 500mm above the existing ground level.
- The Site Owner is already registered with the Environment Agency's Floodline to receive advance warning of flooding by telephone, mobile, fax, SMS text, email or pager.
- A Flood Evacuation Plan has previously been drawn up and accepted as being suitable for the site by South Holland's Emergency Planning officer.

CONCLUSIONS

- The site does have the benefit of protection from tidal/fluvial flooding by existing defences which are properly maintained to a 1 in 200 /100year standard of protection from tidal/fluvial flooding.
- The proposal is for the retention of the existing caravans and facilities for migrant workers relating to the business for a further five years.

- The Actual Risk of flooding maps contained in South Holland's Strategic Flood Risk Assessment 2010 shows that the site is unaffected from flooding from a breach to the defences.
- The proposed residential use falls within the "Highly Vulnerable" uses of land as defined in Table 2 NPPF for Flood Risk Vulnerability Classification and the proposed development for residential use is appropriate in Flood Zone 2 subject to the Exceptions Test. The Local Planning Authority's opinion, for the current approval, was that there are no other sequentially preferable sites available for a caravan site of this nature, the principle of use has been established, and therefore the Exception and Sequential Test is passed.
- Flooding from other sources is unlikely to affect the site.

APPENDIX

Map 1	Environment Agency Flood Map.
Map 2	Flooding from Rivers and Sea Map
Map 3	The Residual Peak Flood Hazard District year 2115 1% Fluvial/0.5% Tidal Event Probability Map Rev 2 shows the site not within a Hazard Rating Area.
Map 4	Residual Peak Depth Map District Year 2115 1% Fluvial / 0.5% Tidal Event Probability. South Holland SFRA
Map 5	Residual Peak Depth Extent of Fluvial & Tidal Domination District Year 2115 1% Fluvial / 0.5% Tidal Event Probability. South Holland SFRA
Map 6	Surface Water Flood Map
Plan 1	Layout Plan
Plan 2	Topographical Survey



Exit full screen

Toll Bar House

Willow Tree Farm

Site

Bar Farm

LITTLEWORTH DROVE A1175



Development location



Flood zone 3



Areas benefiting from flood defences



Flood zone 2



Flood zone 1



Flood defence



Main river



Flood storage area





 Flood risk from rivers or the sea

☒ Extent of flooding

☐ Depth and flow estimates at monitoring stations

 Flood risk from surface water

☐ Extent of flooding

☐ High risk: depth

☐ High risk: velocity

☐ Medium risk: depth

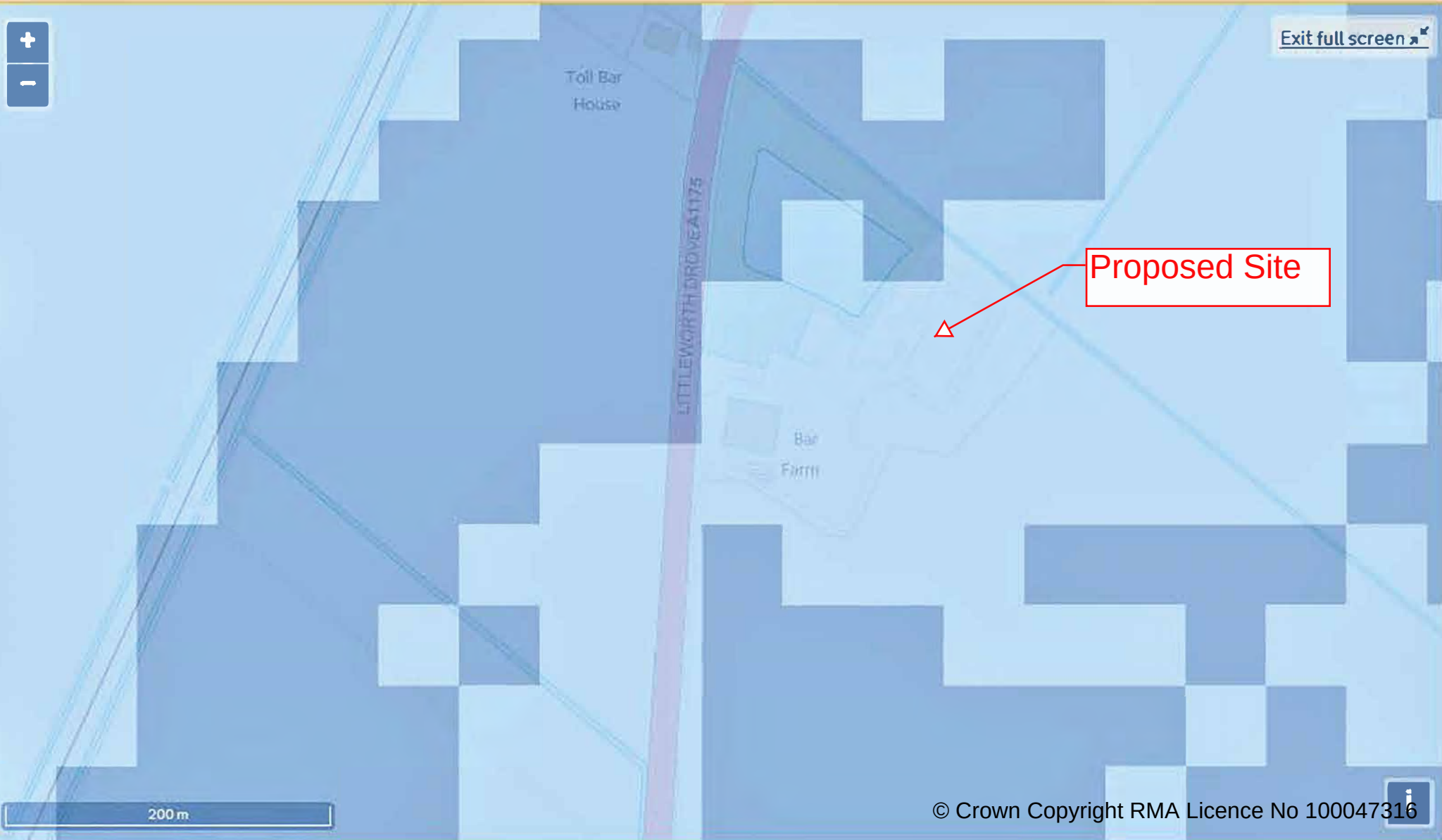
☐ Medium risk: velocity

☐ Low risk: depth

☐ Low risk: velocity

 Flood risk from reservoirs

☐ Extent of flooding



Flood risk



High



Medium



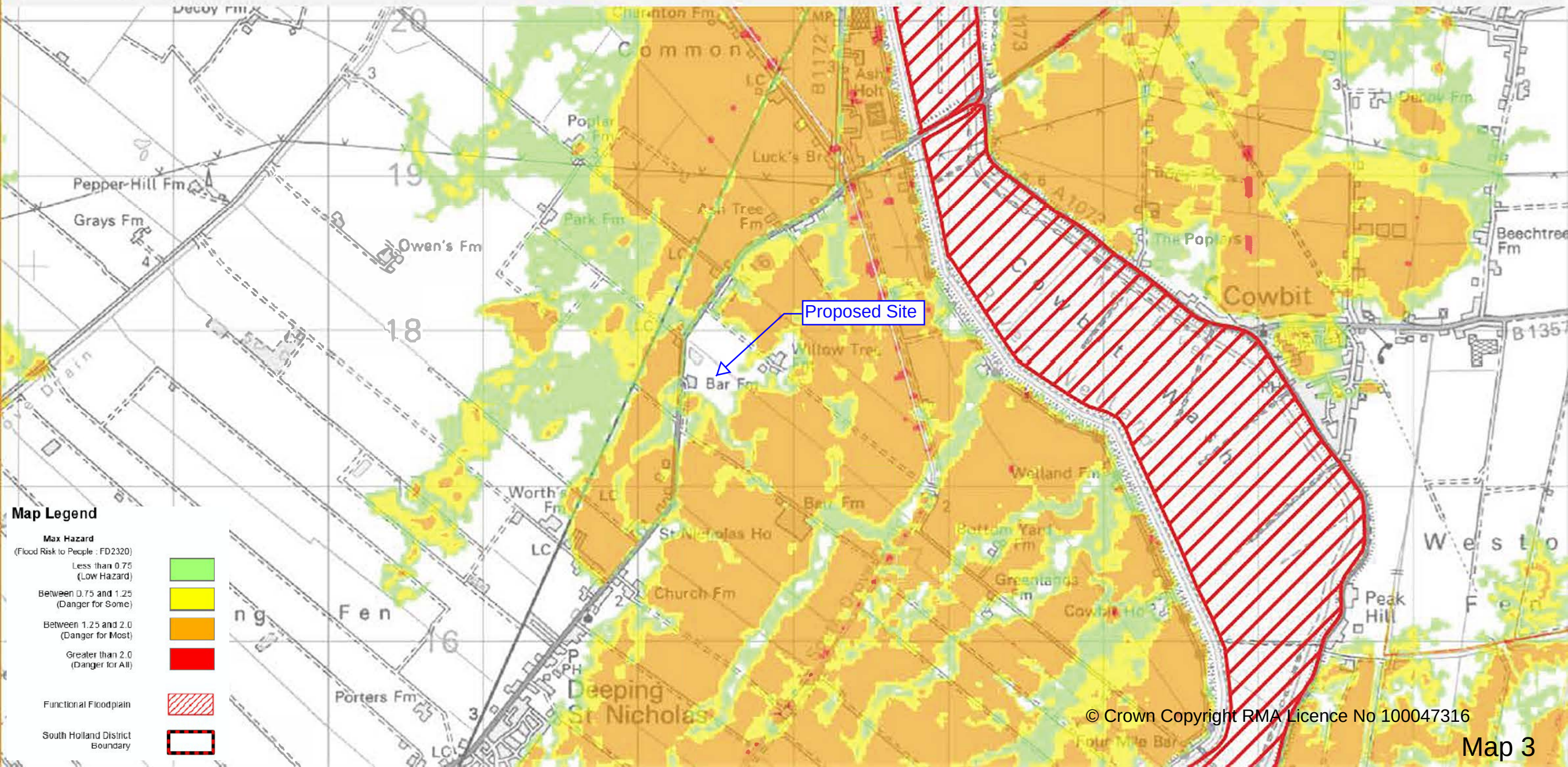
Low



Very low

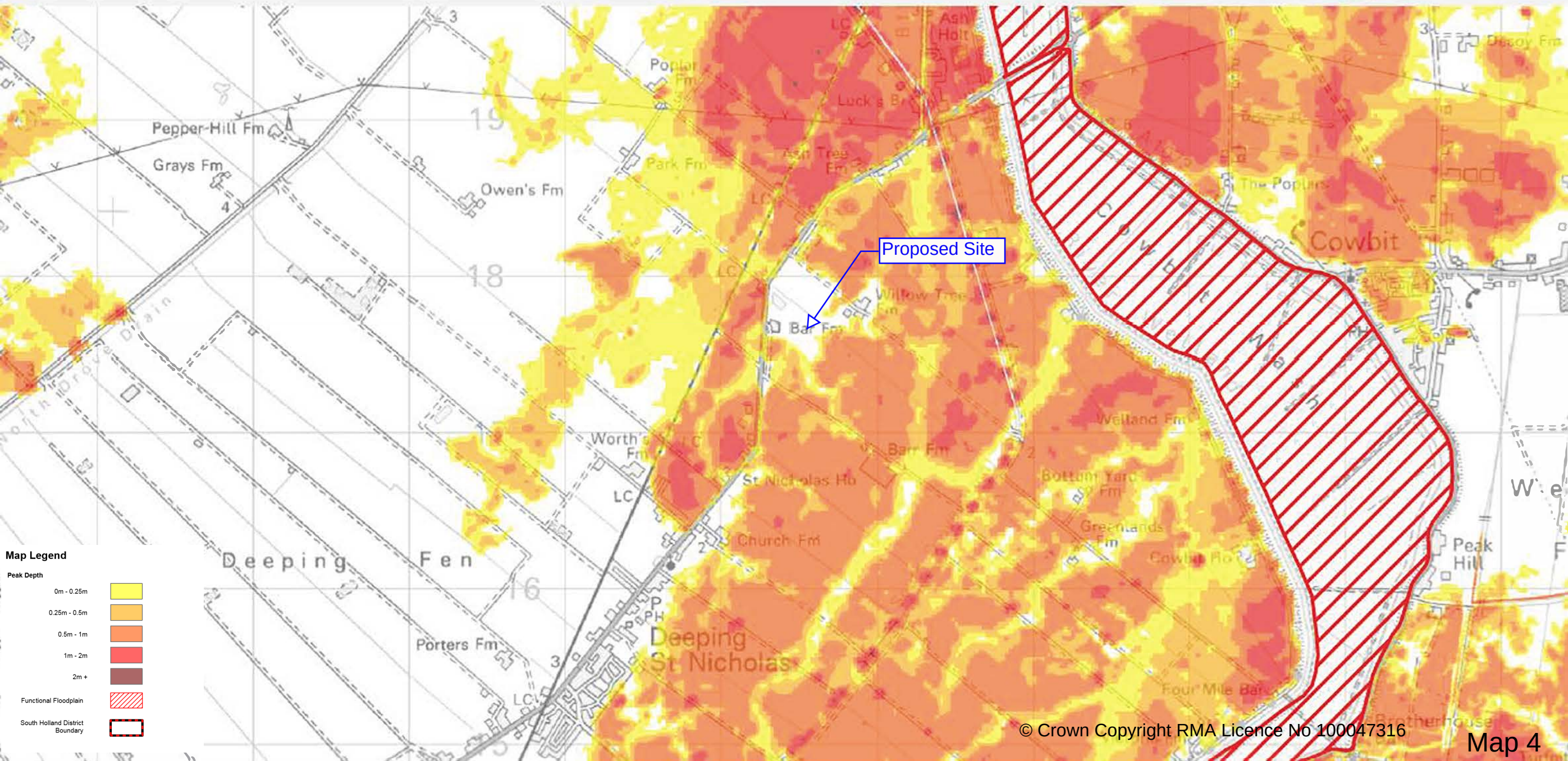


Location you selected



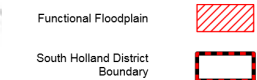
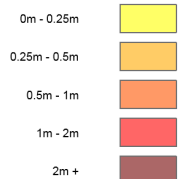
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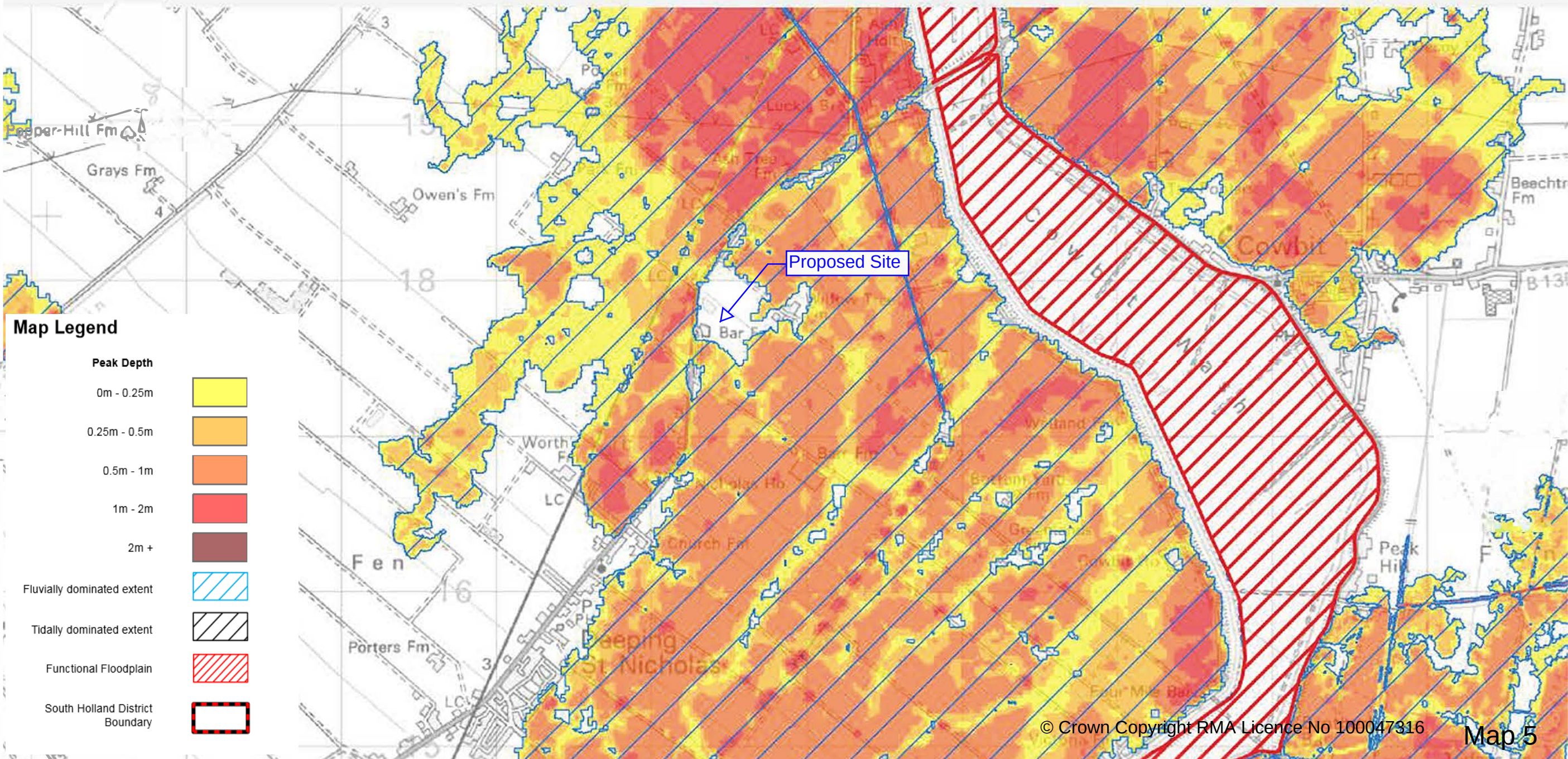
- Max Hazard**
(Flood Risk to People : FD2320)
- Less than 0.75 (Low Hazard)
 - Between 0.75 and 1.25 (Danger for Some)
 - Between 1.25 and 2.0 (Danger for Most)
 - Greater than 2.0 (Danger for All)
- Functional Floodplain
- South Holland District Boundary



Map Legend

Peak Depth





Map Legend

- Peak Depth**
 - 0m - 0.25m
 - 0.25m - 0.5m
 - 0.5m - 1m
 - 1m - 2m
 - 2m +
- Fluvially dominated extent**
- Tidally dominated extent**
- Functional Floodplain**
- South Holland District Boundary**



 Flood risk from rivers or the sea

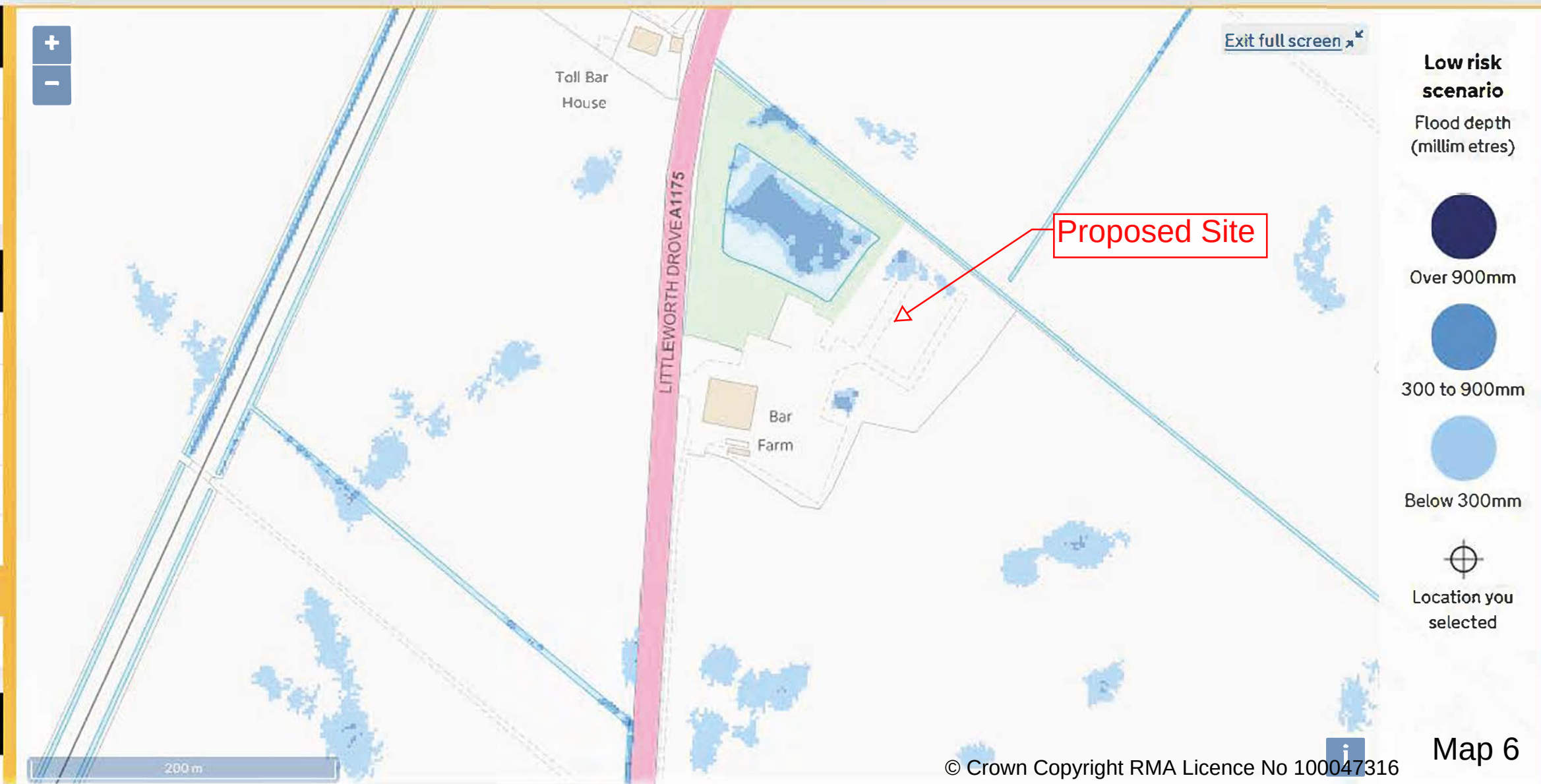
- ☐ Extent of flooding
- ☐ Depth and flow estimates at monitoring stations

 Flood risk from surface water

- ☐ Extent of flooding
- ☐ High risk: depth
- ☐ High risk: velocity
- ☐ Medium risk: depth
- ☐ Medium risk: velocity
- ☒ Low risk: depth
- ☐ Low risk: velocity

 Flood risk from reservoirs

- ☐ Extent of flooding



Low risk scenario

Flood depth (millimetres)

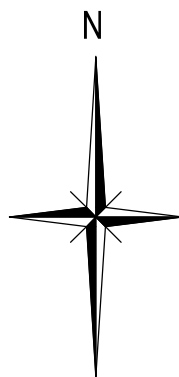
 Over 900mm

 300 to 900mm

 Below 300mm

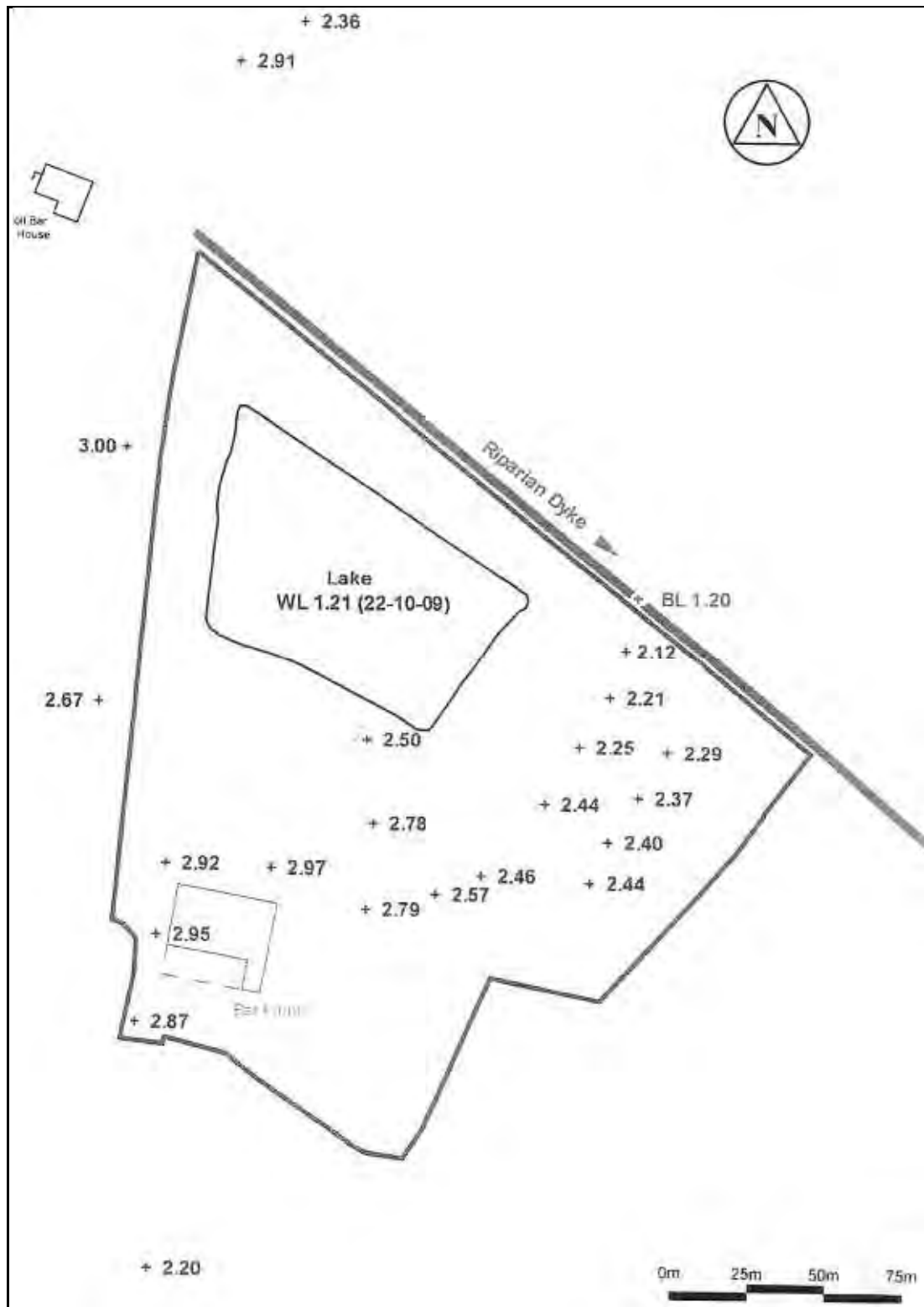
 Location you selected

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Rev.	By	Notes	Date
		32 High Street, Helpingsham Sleaford, Lincolnshire NG34 0RA Tel: 01529 421646 Fax: 01529 421358 Email: admin@rdc-landplan.co.uk Web: www.rdc-landplan.co.uk	
Client: SPALDING RECYCLING LTD			
Project: Barr Farm , Deeping St Nicholas			
Drawing title: Existing Site layout			
Drawing No. 739/14/SL01		Rev.	Drawn GJ
Scale 1 : 500. 1 : 2500		Date 09/04/2014	Checked
All measurements should be checked against on site conditions and any discrepancies should be brought to the attention of the			



PLAN 2