FLOOD RISK ASSESSMENT & DRAINAGE STATEMENT

PROPOSED WORKSHOP & OFFICE EXTENSION
MILL GREEN ROAD
PINCHBECK
SPALDING
PE11 3PU

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FLOOD RISK ASSESSMENT FOR PROPOSED WORKSHOP & OFFICE EXTENSION, MILL GREEN ROAD, PINCHBECK, SPALDING. PE11 3PU

INTRODUCTION

The Government has placed increasing priority on the need to take full account of the risks 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.

Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. Local Plans should apply 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 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 years flood) for coastal areas under present expectations or the highest known flood. However they do not take into account of the presence of defences or the likelihood that flood return intervals will be reduced by climate change.

This Flood Risk Assessment has been prepared in support of the 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 The Anglian Business Centre, Mill Green Road, Pinchbeck, Spalding, PE11 3PU within the South Holland District Council's administrative area. **Plan 1**

The Site would be classed as Non Major Development applying the Town & Country Planning (Consultation) (England) Direction 2009 as the site is to be developed is less than one hectare.

The National Grid Reference is TF 23402 24661.

This flood risk assessment has been prepared for a planning application at the premises of Anglia UK Ltd for the erection of additional offices, workshop building and the relocation of an existing portakabin. **Plan 2**

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 3a 'High Probability' and partly 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 .**Map1**

Table 1: Flood Zones Definition

Zone 3a - high probability

Definition
This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses
The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.

The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

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;
- relocate existing development to land in zones with a lower probability of flooding; and
- create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Applying the Flood Risk Vulnerability Classification in Table 2 of (NPPF), the proposed industrial use for the site is classified as "Less Vulnerable," Table 1 of NPPF TG states that such uses are permitted in Flood Zone 3a

Table 2: Flood Risk Vulnerability Classification

Less vulnerable

- Police, ambulance and fire stations which 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 agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do *not* need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

From the topographic survey the road level on Mill Green Road at the site entrance is 3.25mODN with the ground levels for the proposed office building averaging 3.25mODN The ground level for the proposed Workshop averages 3.00mODN.. It is proposed that the ground floor level for the two storey offices be 3.40mODN and the workshop be 3.20mODN. **(Plan 3)**

DRAINAGE AUTHORITIES

Environment Agency

The Environment Agency is responsible 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 Glen
- Welland & Deepings Internal Drainage Board system Vernatt's Drain

River Glen

The River Glen lies 1.30kmnorth of the site and the right bank of the River Welland is formed by the B1180 road.

The following is an abstract from Table 8R SHSFRA

Location	Chainage (km)	Peak 1 in 100 year fluvial Flood level (mODN) 2007	2115	Peak I in 1000year fluvial Flood Level (mODN) 2007	2115	Crest Level (mODN)	Defence Type
Railway Bridge	6.4	4.39	4.71	4.58	4.78	5.15	No raised Defence
	6.6	4.40	4.72	4.59	4.79	5.33	B1180 Road
	6.8	4.42	4.73	4.62	4.81	4.84	B1180 Road

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 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 The NAFRA maps of flooding from Rivers and Sea show that the site is at Medium Risk. Medium means that each year, this area has a chance of flooding of less than1 in 30 (3.3%) but greater than or equel to 1 in 100 (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**

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 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 has to be <0.75.

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

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

It was found that the actual risk from primary sources of flooding (taken as being rivers and the sea) was assessed as being the product of:

- Medium probability (assigned because the standards of the primary defences are variable) and

• Low consequence (assigned because of the District's generally rural nature and because any urban flooding is likely to be shallow with minimal impact).

The findings reflect the considerable protection afforded to the area by coastal and tidal & fluvial flood defences and by the extensive well organised system of lowland IDB fluvial drainage.

The computer modelling used in the SFRA to produce the Hazard, depth and velocity maps simulated the spread of flood waters over the land and allowed for the presence of locally raised features such as road embankments etc. The maps produced by the Environment Agency took a more precautionary approach.

The potential flooding consequences shown on this map relate to flooding from the sea, main rivers and Internal Drainage Board systems taking into account the presence of current flood risk management measures such as flood defences.

The consequences designated as being an Actual Risk arise from direct overtopping of defences, where this would occur, together with assumed breach failure of some defences. Breach failure has been assumed to occur in places where the freeboard between peak sea or river water level and the defence crest level is less than the minimum desirable for structural security of the defence.

From the Actual Peak Depth Spalding - Year 2115 1% Fluvial / 0.5% Tidal Event Probability and Actual Flood Hazard Spalding - Year 2115 1% Fluvial / 0.5% Tidal Event Probability maps from the update of strategic flood risk assessment for South Holland District Council the site is not affected from any breach to the flood defences.

The Residual Peak Depth Spalding - Year 21150.1% Event Probability Map shows that the site is not affected. **Map 3**

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. **Map 4**

Vernatt's Drain

The Vernatt's Drain lies 810m south of the site and the flood defence is formed by an earth bank.

The following is an abstract from Table 10L SHSFRA

Location	Chainage (km)	Peak 1 in 100 year fluvial Flood level (mODN)		Peak I in 1000year fluvial Flood Level (mODN)		Crest Level (mODN)	Defence Type
		2007	2115	2007	2115		
	7.6	3.89	3.89	3.88	3.88	4.69	Earth bank
	6.7	3.89	3.89	3.89	3.89	4.69	Earth Bank
	7.8	3.89	3.89	3.89	3.89	4.36	Earth Bank

SEQUENTIAL APPROACH

When considering the sequential approach for flood risk from fluvial flooding in accordance with NPPF the site would fall into Zone 3a (High Probability)and partly within Flood Zone 2 'Medium Probability' as defined in Table 1: Flood Zones, and illustrated on the Environment Agency's Flood Maps, if defences were not present.

The flood zones as detailed on the flood map show the area of land which theoretically would be inundated by floodwater during a flooding event from either tidal or fluvial sources without flood defences.

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).

The Sequential Test is defined in NPPF with the principal aim of steering new development to areas of the lowest probability of flooding (Flood Zone 1). Where there are no reasonably available sites in Flood Zone 1 then decision makers should first consider Zone 2and then Zone 3a taking into account the flood risk vulnerability of land uses as categorised in Table 2 of NPPF.

The proposed commercial use for the site falls within "Less Vulnerable" uses of land in Table 3 Flood Risk Vulnerability Classification and Table 1 shows that developments of this nature are appropriate in Flood Zone 3a and Flood Zone 2. 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 (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

As the proposal is to provide an extension to the existing well established business it would be unreasonable to consider sites elsewhere within the District as this facility is to sustain the established business and provide employment opportunities. Consequentially the Sequential Test is met. With the development being Less Vulnerable the Exception Test is not required.

When applying the Sequential Test a pragmatic approach on the availability of alternatives should be taken into consideration, for example planning applications for extending existing business premises, such as farm holdings where it would be impracticable to suggest that there are more suitable alternative locations for that development to be located elsewhere as stated in NPPF Planning Practice Guidance 2014.

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 annual sea rise due to climate change is given in the NPPF and the recommended contingency allowances are stated in Table 4.

TABLE 4: 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

The effect of global warming on fluvial flood peaks is given in Table 5. It is expected that the overall effect up to 2025 will result in an increase of rainfall of 5%, 2025-2055 10%, 2055-2085 20% and2085-2115 of 30% with Peak River flows increasing by 20%.

TABLE 5: Recommended National Precautionary Sensitivity Ranges for Peak Rainfall Intensities. Peak River Flows, Offshore Wind Speeds and Wave Heights.

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%*	

INFRASTRUCTURE

Surface Water Drainage

The roof water from the roofs of the new buildings will discharge to soakaways designed in accordance with BRE Digest 365, and the new concrete areas will drain into a French Drain situated along the edge of the concrete. See Drainage Statement

Foul Drainage

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 new foul drainage facilities will be connected into the existing sewage treatment plant.

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 offices is raised 200mm above the existing ground level to 3.40mODN and being two storey's there is a safe refuge provided.

- The ground floor of the proposed workshops are to be at 3.20mODN

- Arrange for all service circuits to be routed at first floor level where practical socket outlets, boilers etc. to be a minimum of 0.5m above the raised ground floor level.

- The property Owner will contact the Environment Agency's Floodline on 0845 988 1188 to register the site to receive advance warning of flooding by telephone, mobile, fax, SMS text, email or pager.

CONCLUSION

- 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 Residual peak 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 flood defences.

- The proposed commercial use falls within the "Less Vulnerable" uses of land as defined in Table 2 NPPF for Flood Risk Vulnerability Classification and the proposed development for commercial use is appropriate in Flood Zone 3a.

- Surface water will be discharged using infiltration methods i.e. to soakaways

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

APPENDICES

Map 1	Environment Agency Flood Plain Map.
Map 2	Environment Agency Risk of Flooding from Rivers and Sea Map.
Map 3	SHDC SFRA Residual Peak Depth Spalding - Year 21150.1% Event Probability
Map 4	Welland & Deepings IDB Drainage Map
Plan 1	Site Plan with OS Levels
Plan 2	Proposed Offices Details
Plan 3	Proposed Workshop Details

DRAINAGE STATEMENT
GROUND INFILTRATION TESTS & SOAKAWAY DESIGN
WORKSHOP AND OFFICE EXTENSION FOR ANGLIA UK LTD, MILL GREEN ROAD, PINCHBECK, SPALDING, LINCS.

In accordance with the House of Commons Written Statement (HCWS161 – 18th December 2014) there is a requirement for SuDS to be incorporated in all mixed use / non-residential developments of 1.0 hectare or more (major developments) unless demonstrated to be inappropriate.

In accordance with recognised guidance, National Planning Policy Framework, Building Regulations Part H, 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

The ground tests were undertaken to ascertain the existing ground infiltration rate for the design of the surface water disposal generated by the development.

It is proposed to provide Soakaways for the run-off from the roofs of the buildings to cater for the 1 in 100 year event plus 30% for climate change. Soakaways are an acceptable SUDS means method for the disposal of surface water. The run-off from the new concrete areas will be discharged into a French drain running alongside the edge of the concrete.

Fieldwork tests were carried out to determine the prevailing ground conditions and to undertake ground percolation tests on the 9th May 2015. The test results are shown on the Percolation Graph **(Doc 1)**

This fieldwork was undertaken involved the excavation by machine of 1 No trial hole length 1.5m x 0.3m wide to a depth of 1.90m deep below ground level.

Soakaway testing was carried out in accordance with BRE Digest 365- Soakaway Design.

The results of the tests have been tabulated on the enclosed spread sheet and this indicates a soil infiltration rate (f) of 2.32×10^{-5}m/sec. and indicates that the substrata at this site should provide an effective media for the dispersion of the surface water run-off from the development.

Soil infiltration rate $f = \frac{V_{p75-25}}{A_{p50} \times t_{p75-25}}$

Where;

V_{p75-25} = the effective storage volume of water in the trial pit Between 75% and 25% effective depth;

A_{p50} = the internal surface of the trial pit up to 50% effective depth and includingthe base area;

t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth:

PIT DIMENSIONS	TP1
Length	1.5m
Width	300mm
Depth	1.9m
Depth to Water	300mm
Effective Depth	1.6m
Effective Volume	
$V_{p75\% - 25\%}$	360mm
$Tp_{75\% - 25\%}$	101.3- 34.5 = 66.8 min
A_{p50}	3.33
Soil Infiltration Rate	2.32×10^{-5}

Proposed Workshop

Roof water will be collected in underground pipes within the site curtilage with silt traps incorporated prior to connecting to a soakaway using Polystorm Lite units which provide a 95% void for storage.

A typical soakaway design has been undertaken based on a part roof area of 120m² and an infiltration rate of 2.32×10^{-5} ms as per the calculations (**Doc 2**). For the given roof area the cellular soakaway required is 1.0m wide x 8.0m long x 0.8m deep for a 100 year plus 30% climate change storm event.

The 50% drain down time is calculated at 5.06hrs, well below the 24 hour maximum permitted.

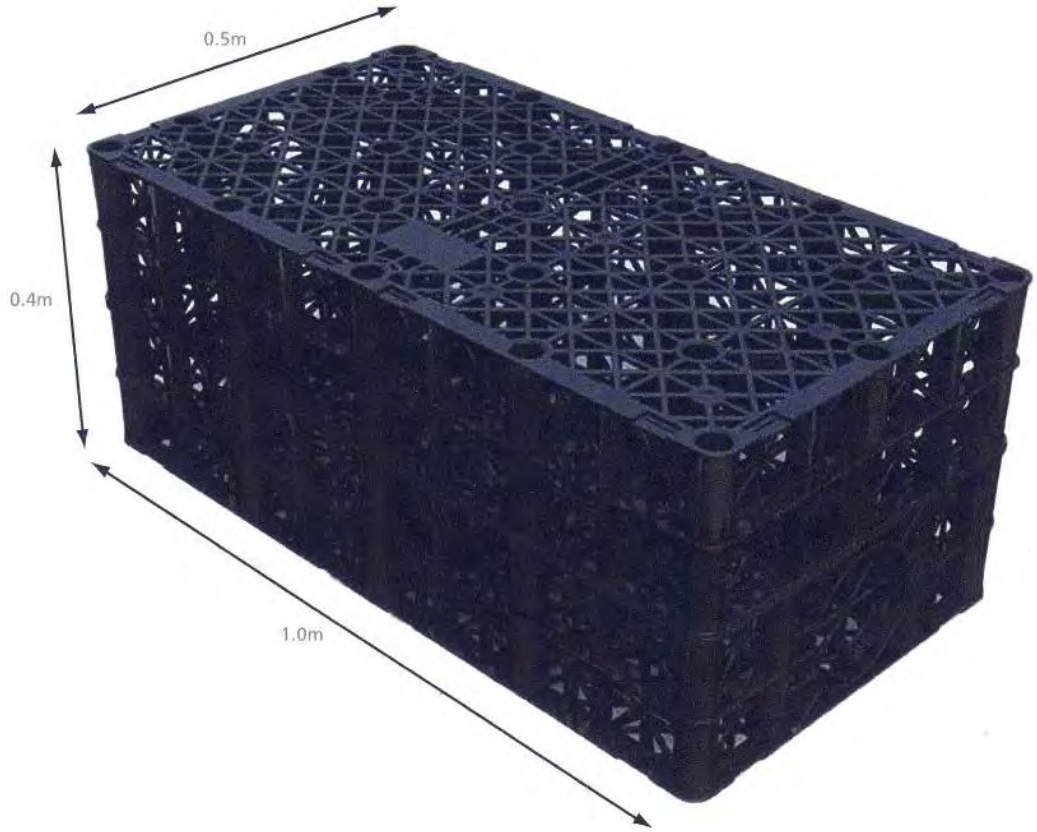
The base of the soakaway structure would be set so as to be at least 1m above the water table and soakaways would need to be sited 5m away from buildings.

Proposed Office Extension

A typical soakaway design has been undertaken based on a part roof area of 96m² and an infiltration rate of 2.32×10^{-5} ms as per the calculations (**Doc 3**). For the given roof area the cellular soakaway required is 1.0m wide x 5.0m long x 0.8m deep for a 100 year plus 30% climate change storm event.

The 50% drain down time is calculated at 4.92Hrs, well below the 24 hour maximum permitted.

Polystorm Lite



Designed for use in landscaped, pedestrian or other non-loaded applications with a load bearing capacity of:

20 tonnes

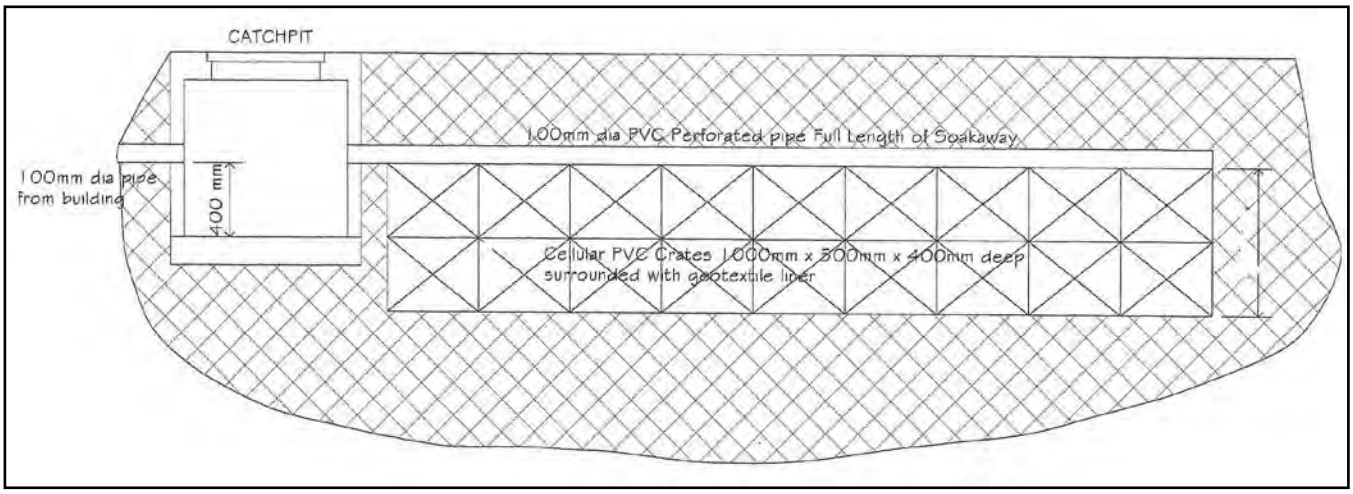
Technical Specification Overview	
Unit type	Polystorm Lite
Product code	PSM2*
Dimensions	1m x 0.5m x 0.4m high
Total volume	0.2m per cube
Unit weight	7kgs**
Cube storage volume	0.19m³ (190 litres)
Surface area	55% perforated
Compressive strength	Maximum 20 tonnes per sq metre
Maximum burial depth	2.5m***

* Each unit includes 4 clips and 2 shear connectors. Please note that brick bond connector may be required at additional cost.

** Pallet weight dependent upon order quantity and transport type.

*** In weak clay soil conditions the maximum burial depth is 1.5 metres. Polystorm Lite should not be installed below the water table.

A typical soakaway detail is shown, which, in order to comply with paragraph 9 of the Technical Guide to the NPPF 2012, demonstrates how the soakaway structure can be monitored and maintained to ensure it will continue to function correctly for the lifetime of the development and prevent any increase in flood risk on or off site.



Typical Cellular Trench Soakaway

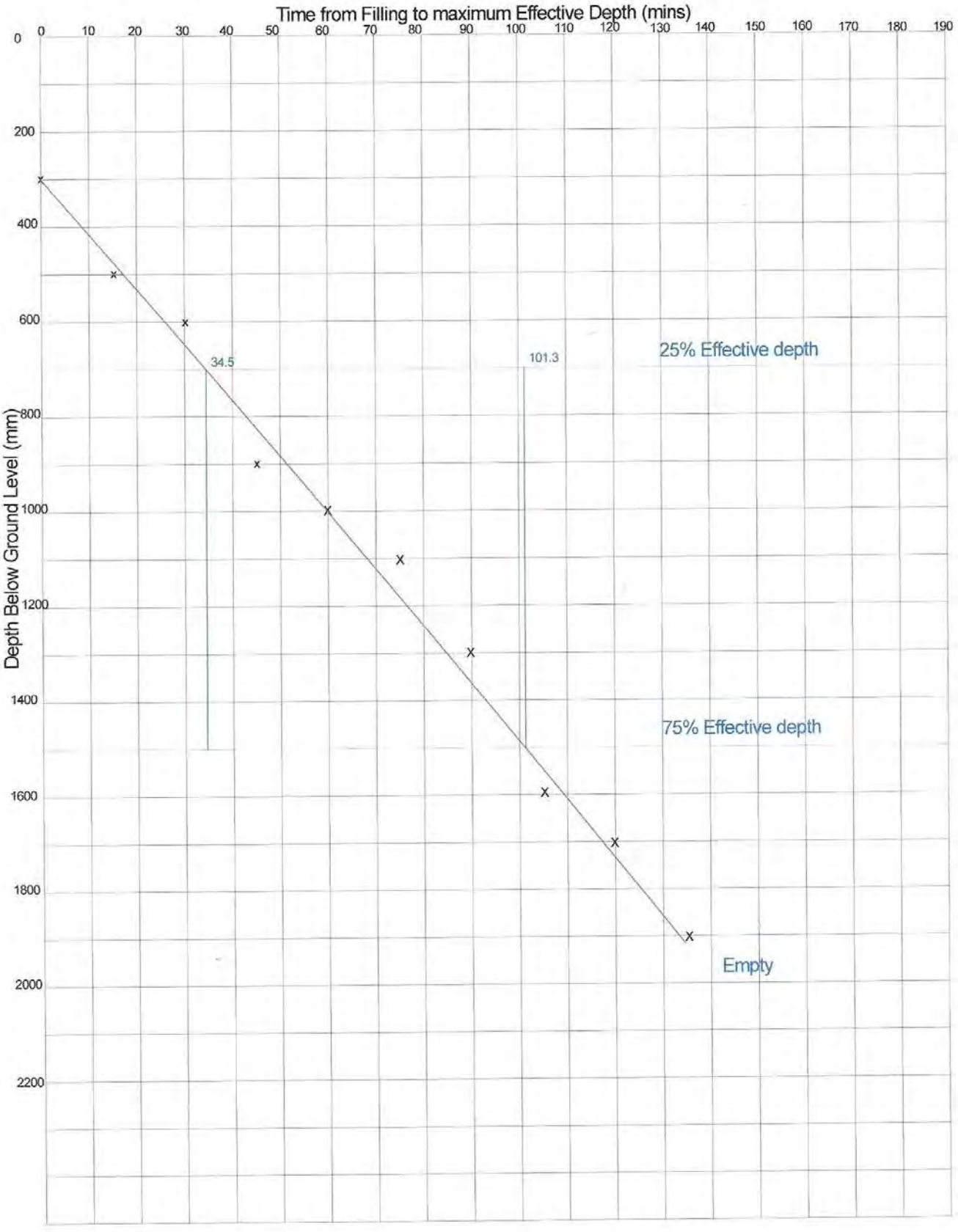
DOC 1

Percoation Test Graph

In accordance with reccommendations of BRE Digest 365

BOREHOLE
Anglia UK Pinchbeck

Date:- 12 May 2015



DOC 2

PROPOSED OFFICE EXTENSION AND WORKSHOP
Soakaway Calculation to BRE Digest 365

Proposed Workshop roof area 450sm

storm duration (D)	M100- D	M100 -D +30%	I	a_{s50} [2(l*d/2)]	a_{s50} [2(W*d/2)]	O	O (w)	S (w)	S (w) + O(w)	I - O	L	S x 0.5	a_{s50} x f	empty
10	0.01986	0.025818	3.09816	0.8	0.8	0.011136	0.011136	0.76	0.771136	3.087024	**4.003216**	1.521222093	9.28597E-05	**4.5505396**
15	0.02508	0.032604	3.91248	0.8	0.8	0.016704	0.016704	0.76	0.776704	3.895776	**5.0157795**	1.90599621	0.000111653	**4.7418701**
30	0.03272	0.042536	5.10432	0.8	0.8	0.033408	0.033408	0.76	0.793408	5.070912	**6.3913043**	2.428695652	0.000137183	**4.9178076**
60	0.0406	0.05278	6.3336	0.8	0.8	0.066816	0.066816	0.76	0.826816	6.266784	**7.5794179**	2.880178806	0.000159234	**5.0243647**
120	0.04704	0.061152	7.33824	0.8	0.8	0.133632	0.133632	0.76	0.893632	7.204608	**8.0621643**	3.063622431	0.000168194	**5.0596775**
360	0.05652	0.073476	8.81712	0.8	0.8	0.400896	0.400896	0.76	1.160896	8.416224	**7.2497657**	2.754910965	0.000153116	**4.997876**
600	0.06909	0.089817	10.77804	0.8	0.8	0.66816	0.66816	0.76	1.42816	10.10988	**7.0789547**	2.690002801	0.000149945	**4.9833006**
720	0.07104	0.092352	11.08224	0.8	0.8	0.801792	0.801792	0.76	1.561792	10.280448	**6.5824694**	2.50133836	0.000140731	**4.9372067**
900	0.07484	0.097292	11.67504	0.8	0.8	1.00224	1.00224	0.76	1.76224	10.6728	**6.0563828**	2.301425459	0.000130966	**4.8812866**

Variables		
Roof Area	120	(Quarter of roof area)
soakway width	1	
soakway depth	0.8	
free volume %	95	
f	0.0000232	

DOC 3

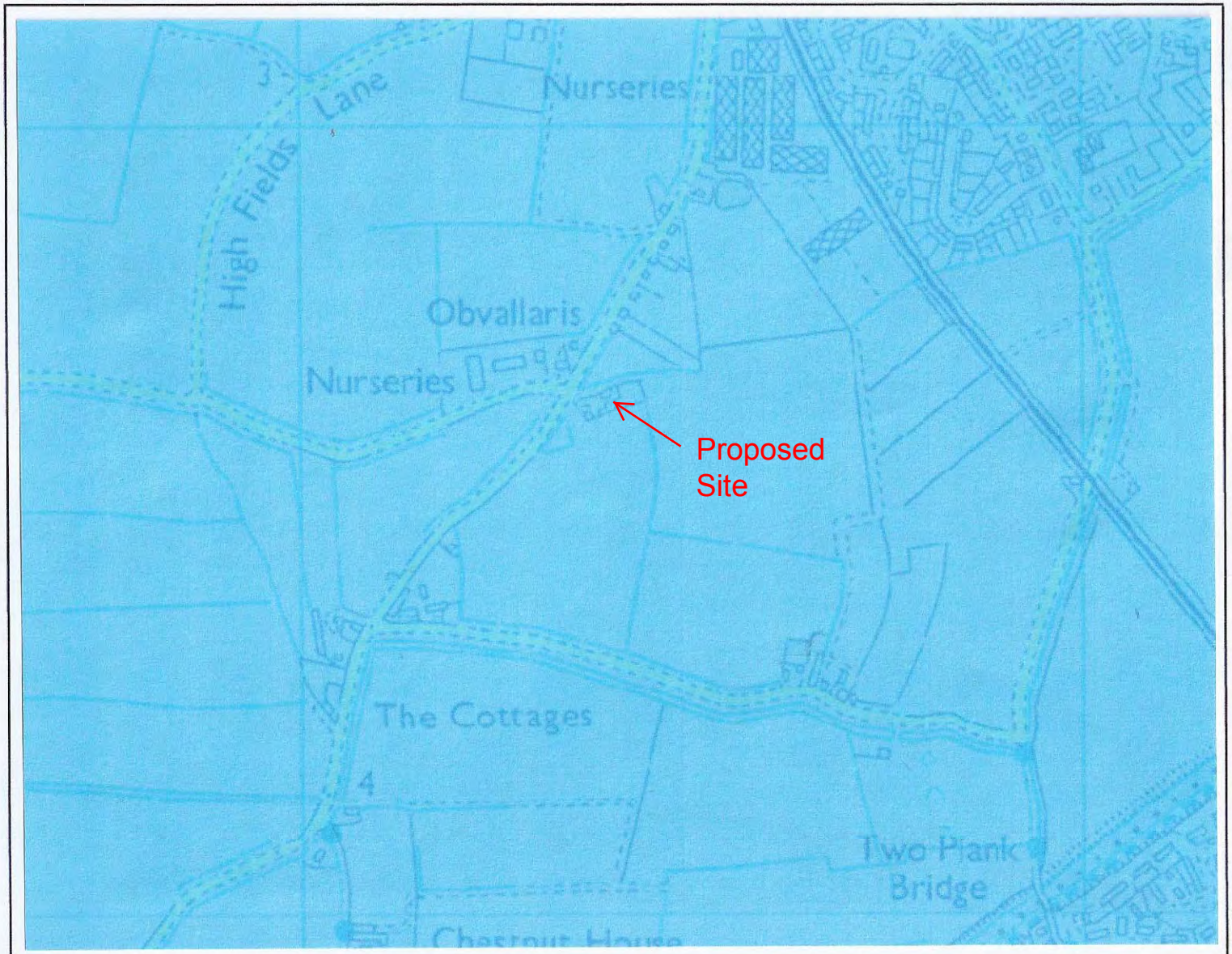
PROPOSED OFFICE EXTENSION AND WORKSHOP
Soakaway Calculation to BRE Digest 365

Proposed Office roof area 192sm

storm duration (D)	M100- D	M100 -D +30%	I	a_{s50} [2(I*d/2)]	a_{s50} [2(W*d/2)]	O	O (w)	S (w)	S (w) + O(w)	I - O	L	S x 0.5	a_{s50} x f	empty
10	0.01986	0.025818	2.478528	0.8	0.8	0.011136	0.011136	0.76	0.771136	2.467392	**3.1996846**	1.215880156	7.79461E-05	**4.3330492**
15	0.02508	0.032604	3.129984	0.8	0.8	0.016704	0.016704	0.76	0.776704	3.11328	**4.0083223**	1.523162492	9.29545E-05	**4.5516985**
30	0.03272	0.042536	4.083456	0.8	0.8	0.033408	0.033408	0.76	0.793408	4.050048	**5.1046221**	1.939756393	0.000113302	**4.7556287**
60	0.0406	0.05278	5.06688	0.8	0.8	0.066816	0.066816	0.76	0.826816	5.000064	**6.0473721**	2.298001393	0.000130799	**4.8802561**
120	0.04704	0.061152	5.870592	0.8	0.8	0.133632	0.133632	0.76	0.893632	5.73696	**6.4198238**	2.439533052	0.000137712	**4.9207652**
360	0.05652	0.073476	7.053696	0.8	0.8	0.400896	0.400896	0.76	1.160896	6.6528	**5.7307459**	2.177683445	0.000124923	**4.8422932**
600	0.06909	0.089817	8.622432	0.8	0.8	0.66816	0.66816	0.76	1.42816	7.954272	**5.5695944**	2.116445888	0.000121932	**4.8215662**
720	0.07104	0.092352	8.865792	0.8	0.8	0.801792	0.801792	0.76	1.561792	8.064	**5.1632996**	1.962053846	0.000114391	**4.7644982**
900	0.07484	0.097292	9.340032	0.8	0.8	1.00224	1.00224	0.76	1.76224	8.337792	**4.7313601**	1.797916833	0.000106374	**4.694955**

Variables		
Roof Area	96	(Half of roof area)
soakway width	1	
soakway depth	0.8	
free volume %	95	
f	0.0000232	

FLOOD MAP



Environment Agency

N
W E
S

Flood Map for Planning (Rivers and Sea)

- Flood Map - Defences
- Areas Benefiting from Flood Defences
- Flood Map - Flood Storage Areas
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2

Flood Map for Planning (Rivers and Sea)
(assuming no defences)

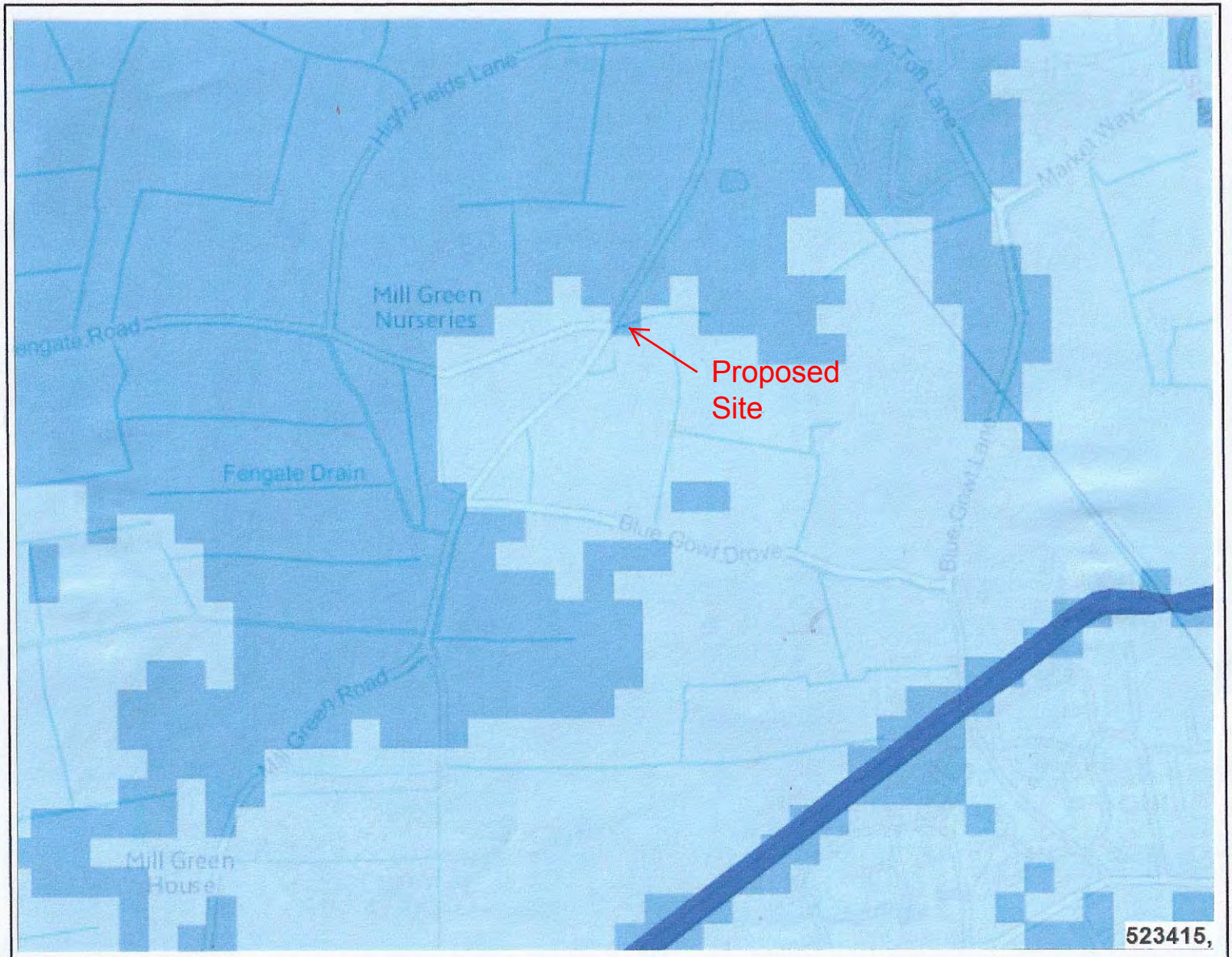
Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

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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

NFRA Flood Map



Environment Agency

N
W E
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Likelihood of Flooding from Rivers and the Sea

National Flood Risk Assessment (NaFRA)

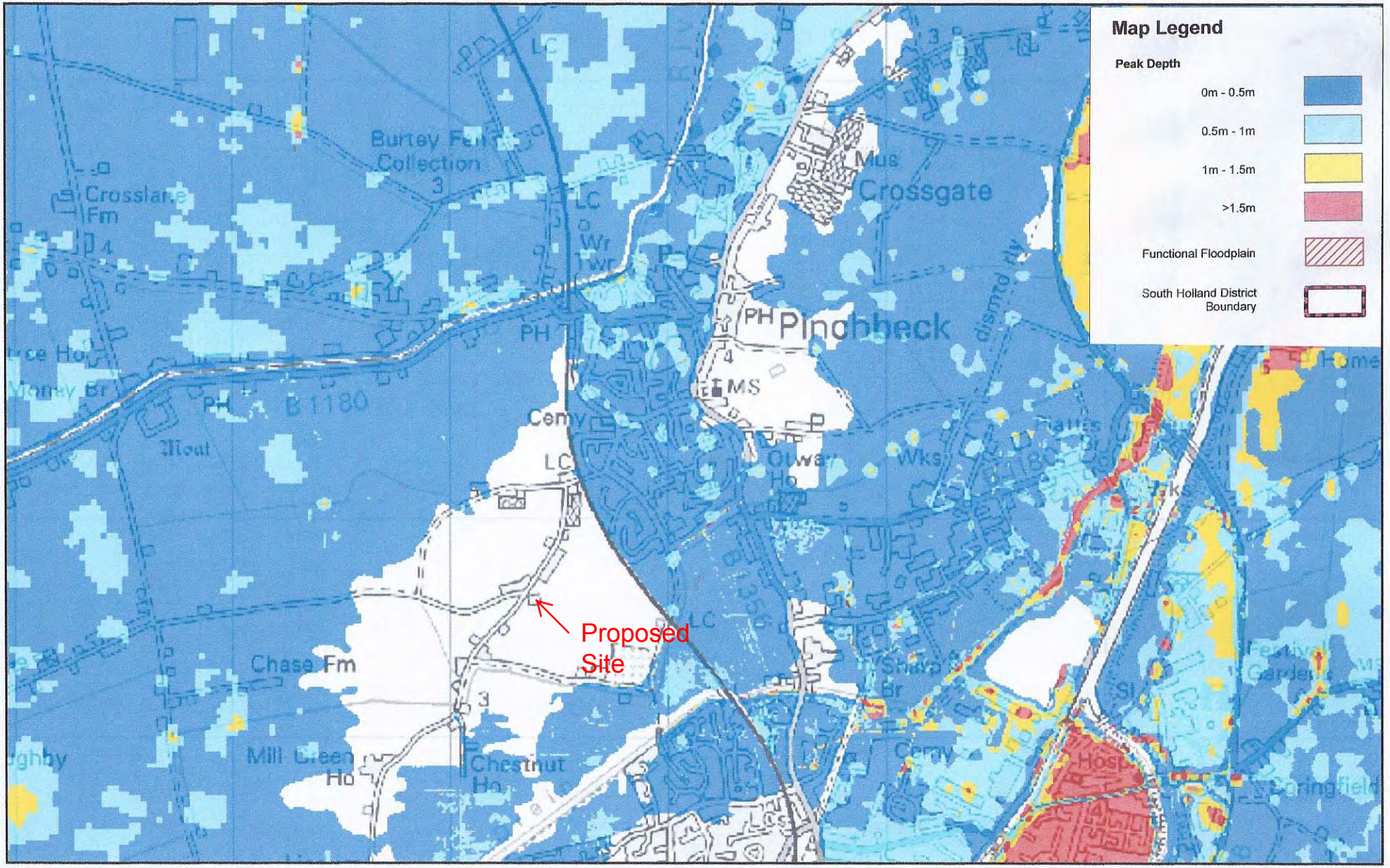
- Very Low
- Low
- Medium
- High

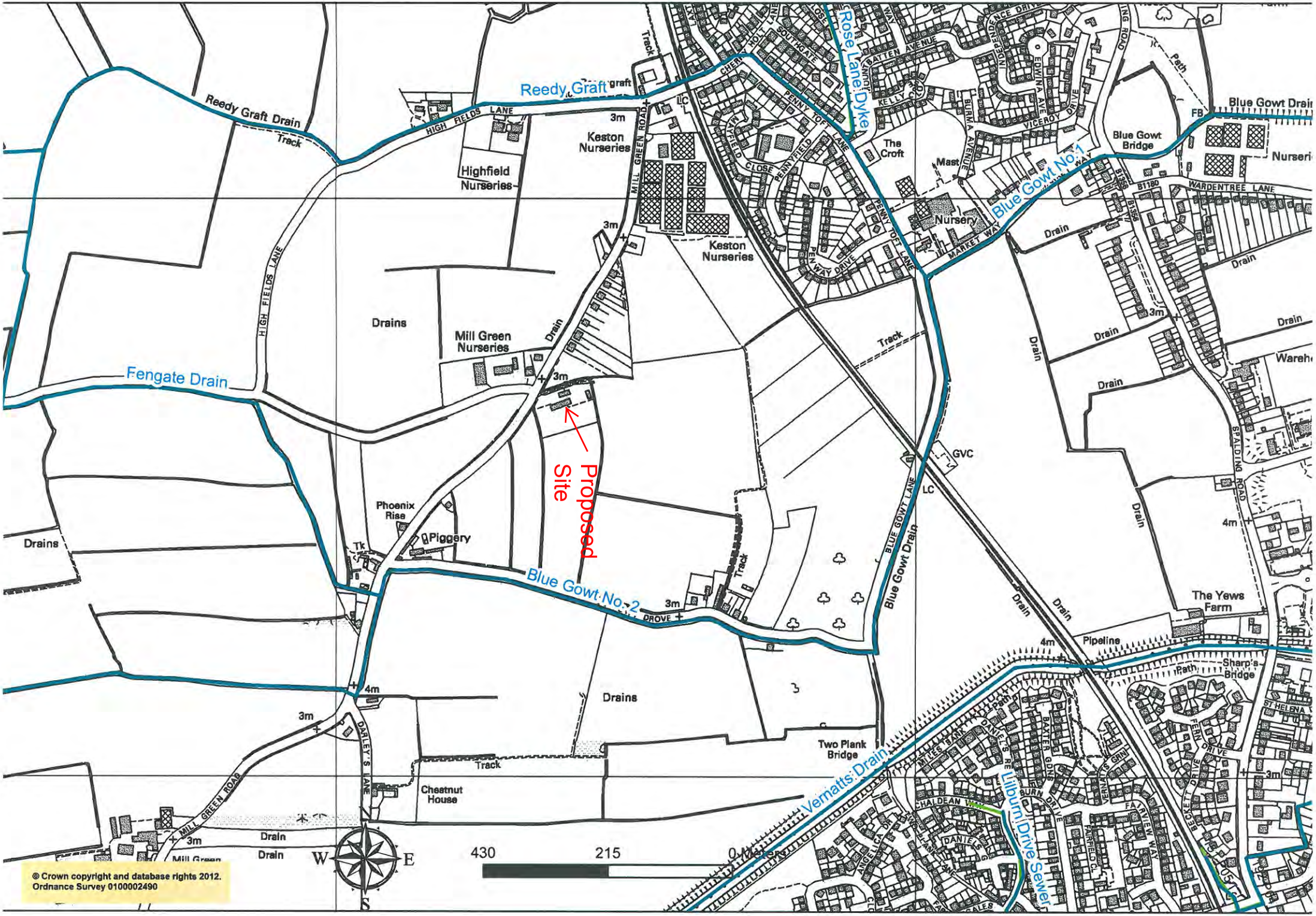
Likelihood of Flooding from Rivers and the Sea (taking into account defences)

High:	Greater than or equal to 1 in 30 (3.3%) chance in any given year
Medium:	Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year.
Low:	Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year
Very Low:	Less than 1 in 1,000 (0.1%) chance in any given year

This information is shown on the Risk of Flooding from Rivers & the Sea map on our website.

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Map Legend
Peak Depth
0m - 0.5m
0.5m - 1m
1m - 1.5m
>1.5m
Functional Floodplain
South Holland District Boundary
Proposed Site
Pinchbeck
Crossgate
Burtoy Fen Collection
Crossland Fm
B1180
Chase Fm
Mill Green Ho
Chestnut Ho
PH
LC
TMS
Cem
Wks
Hosp


Reedy Graft
Reedy Graft Drain
Track
HIGH FIELDS LANE
Highfield Nurseries
Keston Nurseries
MILL GREEN ROAD
3m
Rose Lane Dyke
Blue Gowt Drain
FB
Blue Gowt Bridge
The Croft
Mast
Blue Gowt No.1
WARDENTREE LANE
B1180
B1356
Nursery
MARKET WAY
Drain
Drains
Mill Green Nurseries
Fengate Drain
Proposed Site
Track
GVC
LC
BLUE GOWT LANE
Blue Gowt Drain
SPALDING ROAD
4m
Phoenix Rise
Piggery
Tk
Blue Gowt No.2
DROVE
The Yews Farm
Pipeline
Sharp's Bridge
Path
ST HELENA
Two Plank Bridge
Vernatts Drain
Lilburn Drive Sewer
DARLEY'S LANE
Chestnut House
Mill Green
W
E
S
430
215
0
Kilometres
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Ordnance Survey 0100002490

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SITE PLAN 1:500 0 5 10 15 20

Rev.	By	Notes	Date
-	-	-	-

rdc Robert Doughty Consultancy

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Tel: 01529 421646
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Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client: ANGLIA UK LTD

Project: Workshop & Office Extension

Drawing title: Design Sheet

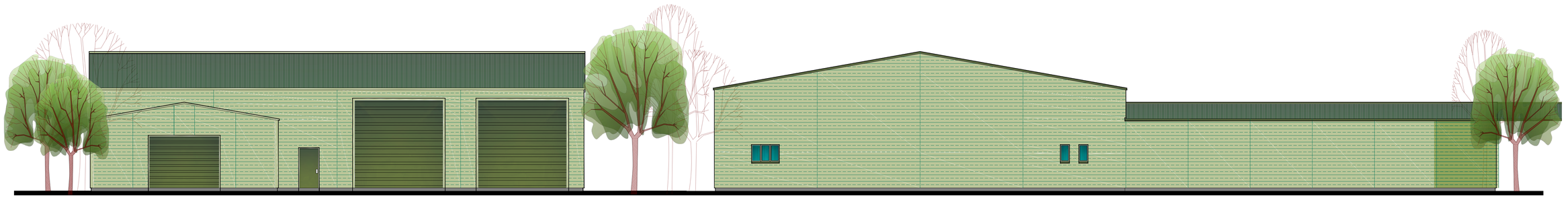
Drawing No.	Rev.	Drawn
823 / 14 / DS01	-	RB

Scale	Date	Checked
1:500	01 / 02 / 2013	-

All measurements should be checked against on site conditions and any discrepancies should be brought to the attention of the Robert Doughty Consultancy.

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PROPOSED NEW WORKSHOP

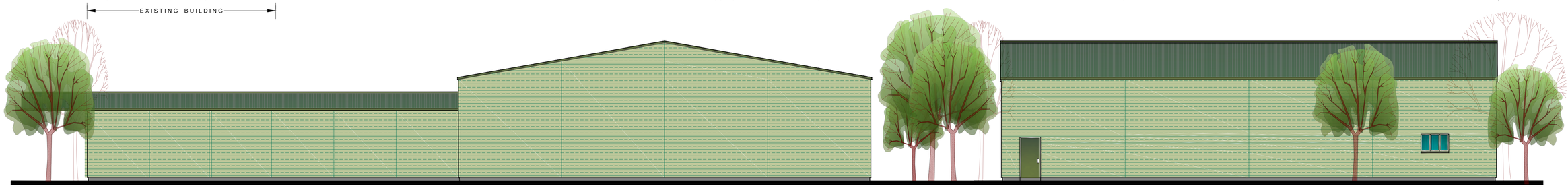


FRONT ELEVATION A

EXISTING BUILDING

SIDE ELEVATION B

EXISTING BUILDING



SIDE ELEVATION D

EXISTING BUILDING

REAR ELEVATION C



FLOOR PLAN



LOCATION PLAN 1:1250 0 10 20 30

Rev.	By	Notes	Date
-	-	-	-

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Fax: 01529 421358
Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client: ANGLIA UK LTD		
Project: Workshop Extension, Mill Green Road, Pinchbeck		
Drawing title: Design Sheet		
Drawing No. 823 / 14 / DS02	Rev. -	Drawn RB
Scale 1:100 @ A1	Date 01 / 02 / 2013	Checked -

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PROPOSED NEW OFFICES



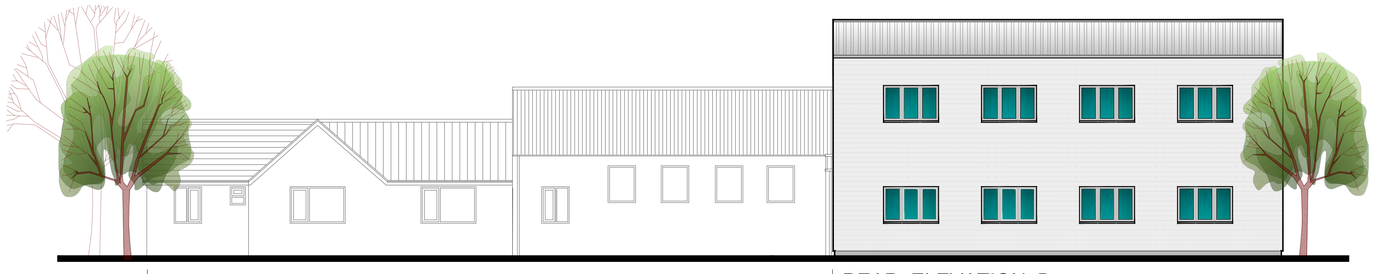
SIDE ELEVATION A

EXISTING BUILDINGS



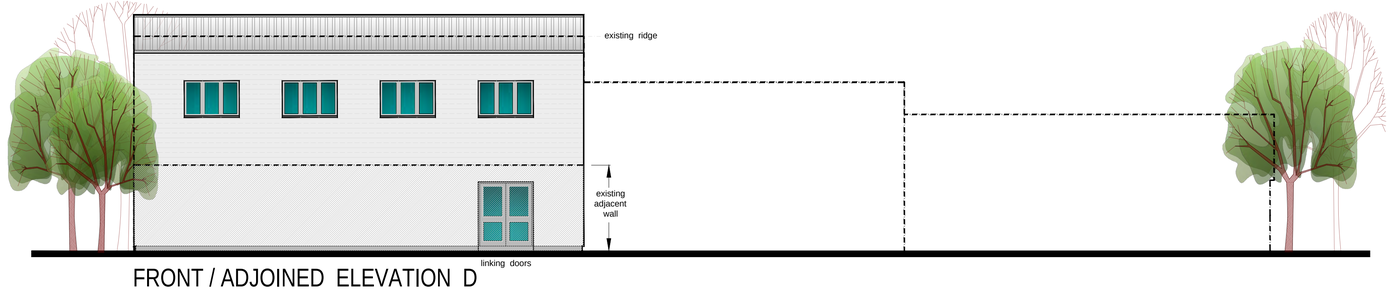
EXISTING BUILDING

SIDE ELEVATION C



EXISTING BUILDINGS

REAR ELEVATION B



FRONT / ADJOINED ELEVATION D

EXISTING BUILDINGS



GROUND FLOOR PLAN B



FIRST FLOOR PLAN

Rev.	By	Notes	Date
-	-	-	-

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Client: ANGLIA UK LTD

Project: New Offices Extension/Block, Mill Green Rd, Pinchbeck

Drawing title: Design Sheet

Drawing No.	Rev.	Drawn
823 / 14 / DS03	-	RB
Scale	**Date**	**Checked**
1:100 @ A1	01 / 02 / 2013	-

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