

FLOOD RISK ASSESSMENT

Proposed, Managers Dwelling, 2 Storey Office Building,
Storage Building & 30 No Self-Storage Containers
Anglia Business Centre
Mill Green Road,
Pinchbeck,
Spalding,
Lincolnshire.
PE11 3PU

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FLOOD RISK ASSESSMENT PROPOSED MANAGERS DWELLING, 2 STOREY OFFICE BUILDING, STORAGE BUILDING & 30 NO SELF-STORAGE CONTAINERS, ANGLIA BUSINESS CENTRE, MILL GREEN ROAD, PINCHBECK, SPALDING,

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 2019, (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 at The Anglia Business Centre, Mill Green Road, Pinchbeck, Spalding, PE11 3PU within the South Holland District Council's administrative area. The National Grid Reference is TF 23402 24661. **Plan 1**

This flood risk assessment has been prepared for a planning application for the erection of a Managers Dwelling (725m²), a two storey Office building (Footprint 245m²) and a Storage Building (165m² and the demolition of an existing workshop building and for 30 No Self-storage Containers (6m x 2.4m). **Plans 2, 3, 4, 5, 6, 7 & 8**

The application for the managers dwelling is for the relocation and redesign for that approved under planning No H14-0941-19.and H14-0869-20 Condition 4 for both applications required all GFL's to be 300mm above the existing ground level.

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 proposed development site is shown mainly to be within Flood Zone 3 “High Probability” as detailed on the Environment Agency’s Flood Zone Maps **without defences**, and as defined in Table 1 of NPPG.

Table 1: Flood Zones Definition

Flood Zone 3- High Probability
Definition 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. The water-compatible and less vulnerable uses of land are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable and essential infrastructure uses 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 uses in times of flood Flood Risk Assessments requirements All proposals in this zone should be accompanied by a Flood Risk Assessment. Policy aims 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 techniques. • relocate existing development to land with a lower probability of flooding. • create space for flooding to occur by allocating and safeguarding open space for flood storage.

Applying the Flood Risk Vulnerability Classification in Table 2 of NPPG, the proposed office, storage building & self-storage units are classified as “Less Vulnerable,” Table 1 of NPPG states that such uses are permitted in this zone. The proposed Managers dwelling is classified as “More Vulnerable,” Table 1 of NPPG states that such uses are permitted in this zone subject to the exception test.

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).

More Vulnerable

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels • Non-residential uses for health services, nurseries, and educational establishments
- Landfill and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravan and camping, subject to a specific warning and Evacuation Plan.

Site Levels

From the topographical survey the site is reasonably level, the ground levels around the site for the new office building average 3.20mODN, around the store 3.07mODN, around the dwelling 3.05mODN and for the self-storage containers 3.20mODN. The road level at the site entrance, is 3.28mODN. **Plan 9**

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 have been identified as:

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

- the River Welland (Tidal)
- The River Glen (Fluvial)
- Welland & Deepings Internal Drainage Board system

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. In some locations, such as around the fens and the large coastal floodplains 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.

Flood Zones

These maps show that the site is considered at risk from tidal/fluvial flooding as it is all located within an area zoned as Flood Zone 3a. The 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**

Risk of Flooding from Rivers & Sea

The Risk of flooding from Rivers and Sea map shows the site for the development, to be at Medium Risk. Medium means that each year, this area has a chance of flooding between 1% and 3.3%. 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**

The River Welland Tidal Defences

The River Welland is located some 2.55Km southeast of the site, and is tidal down stream of Marsh Lane Sluice. The tidal defences protecting this site consist of earth embankments, the crest heights are circa 7.00mODN. They are in good 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.

From Lincolnshire & Northamptonshire Area, Tidal Modal Analysis (June 2006) **Map 3**

Peak tide levels Present Day (2006) at Marsh Road (Tidal River) 0.5% (1 in 200) = 5.98mODN

Peak tide levels (2116) at Marsh Road (Tidal River) 0.5% (1 in 200) = 5.98mODN plus climate change allowances from Table 3 of 1.21mm = 7.11mODN

Breach Analysis to River Welland Tidal Defences

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			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.

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

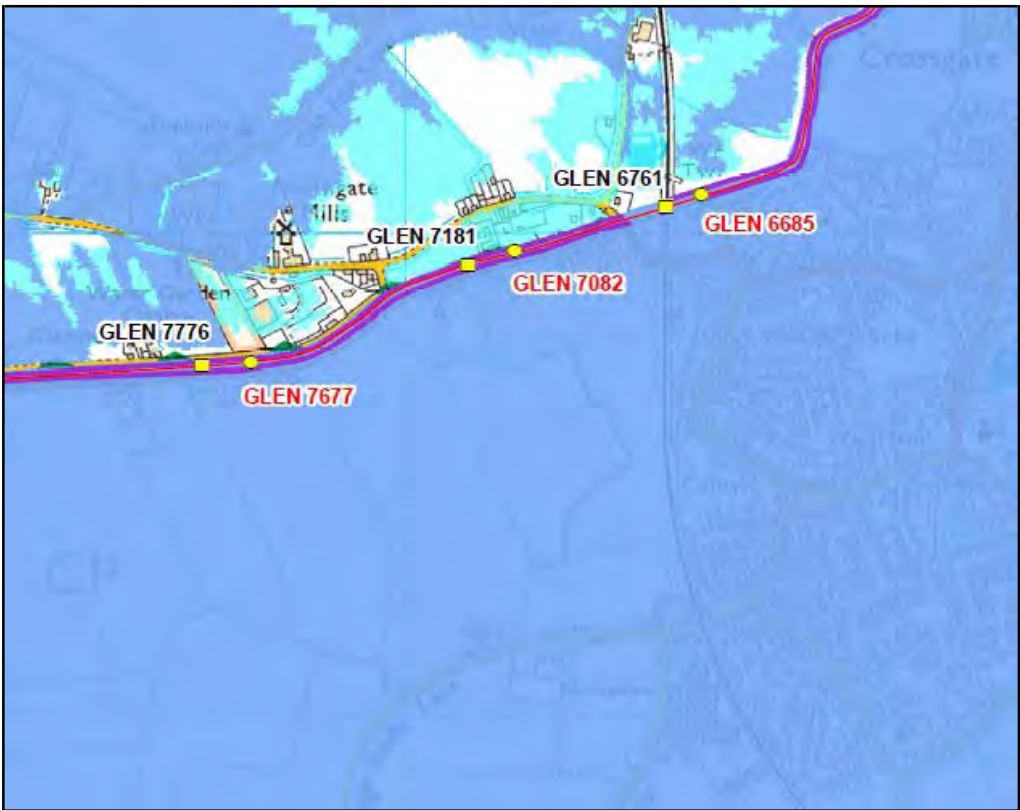
Where V = Flood flow velocity (m/sec)
 D = Flood depth (m)
 DF = A debris factor included to represent the greater damage, or risk of injury to people, that can occur if debris is swept along with the water. = 0.5 for depths <0.25 or 1.0 for depths.

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

The 2017 Update to SHDC, SFRA has carried out a Tidal & Fluvial Hazard Mapping, for Spalding following a breach to the defences. The Hazard, Velocity and Depth Maps, year 2115, for the 1 in 1000-year event, shows that the site where the proposed development is to be located are not within an area affected by flooding from a breach to the flood defences. **Maps 4, 5 & 6.**

River Glen

The River Glen lies some 1.3km to the north of the site and the present day 1 in 100-year flood level with 20% climate change is 4.87mODN. The flood defences of the River Glen between Herring Bridge and the A151 bridge consist of the B1180 Road which are in good condition and the crest heights for the right bank along this stretch of river are circa 5.90mODN. (SHDC SFRA).



Node Map

The fluvial flood data for the model nodes shown on the map are set out in the tables below.

Fluvial Flood Levels (mODN)

The fluvial flood levels for the model nodes shown on the attached map are set out in the table below. They are measured in metres above Ordnance Datum Newlyn (mODN).

Node Label	Easting	Northing	Annual Exceedance Probability - Maximum Water Levels (mODN)										
			50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
GLEN 6685	523603	326081	4.01	4.16	4.23	4.31	4.34	4.35	4.38	4.84	4.44	4.60	4.94
GLEN 7082	523224	325963	4.04	4.17	4.25	4.32	4.36	4.39	4.41	4.87	4.49	4.70	5.01
GLEN 7677	522687	325733	4.06	4.20	4.28	4.35	4.41	4.43	4.45	4.91	4.54	4.79	5.07

Fluvial Flood Flows (m³/s)

The fluvial flood flows for the model nodes shown on the attached map are set out in the table below. They are measured in metres cubed per second (m³/s).

Node Label	Easting	Northing	Annual Exceedance Probability - Maximum Flows (m³/s)										
			50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
GLEN 6761	523531	326057	25.95	29.44	31.06	33.13	34.59	35.32	35.84	43.56	38.87	48.22	56.95
GLEN 7181	523130	325934	25.69	29.20	30.85	32.93	34.37	35.09	35.60	43.18	38.62	48.05	56.90
GLEN 7776	522589	325726	25.40	29.03	30.65	32.71	34.14	34.86	35.37	42.73	38.33	48.07	56.87

This data is taken from the Welland Model (2016) and are the most up-to date currently available. The Environment Agency aim to review the models on a regular basis.

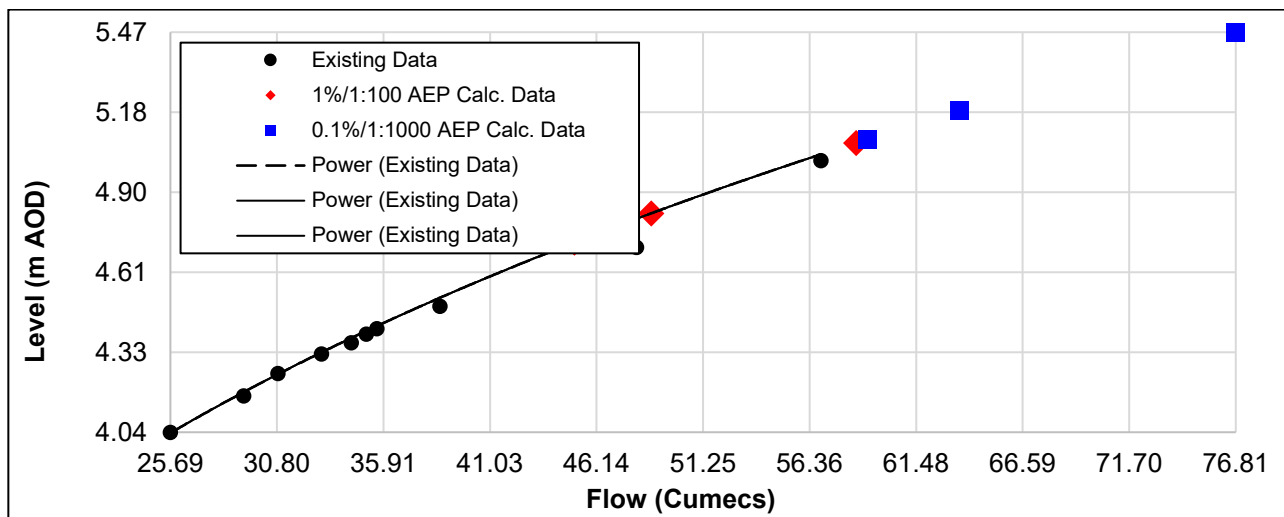
These levels are “in-channel” levels and therefore may not represent the flood level on the floodplain, particularly where the channel is embanked or has raised defences.

The site lies within the Anglian River Basin District, Peak River flows should be adjusted to reflect the latest climate change allowances of 25% and 35% increase in river level for ‘Less Vulnerable’ uses and 35% and 65% for “More Vulnerable” uses. It must also be assumed, to provide a worst-case scenario, that flood defences have been raised during this period to cater for the rise in river level.

Given the scale and nature of the proposed development it is considered that additional hydraulic modelling is not appropriate to determine the revised river levels. Using the Climate Change Extrapolation and Simple Breach Tool, the River Glen flood levels for climate change for node Glen7181 have been calculated using the Power Function for $R^2 = 0.9419$ which gives the following:

Adjusted Climate Change Allowances				
Flood AEP	Scenario			
	Central		Higher Central	
1%/1:100	26.62	%	36.95	%
0.1%/1:1000	23.02	%	32.23	%

Adjusted Calculated Levels				
Flood AEP	Climate Change Scenario			
	Central		Higher Central	
1%/1:100	4.72	m AOD	4.82	m AOD
0.1%/1:1000	5.09	m AOD	5.19	m AOD



With the crest level of the B1180 road being circa 5.90mODN the climate change river levels for the 1 in 100 year Central (25%) and Higher Central (35%) would remain in channel. Based upon the crest heights of the flood defence the proposed site is protected with a freeboard of over 1.12m.

Floor levels

The Environment Agency recommends that the floor level should be informed by the predicted flood level. For areas where flood depths are 0 -0.25m the finished floor level should set at a minimum of 300mm above the existing ground level

With the site not being affected by a breach to both fluvial and tidal sources the ground floor for ground floor level for all new buildings will be set 300mm above the existing ground level

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.

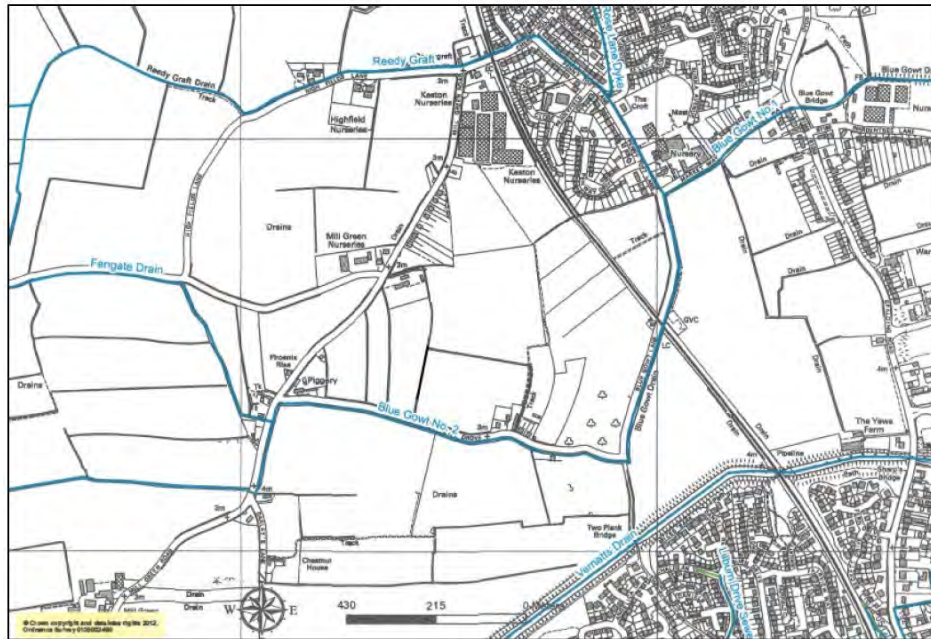
The whole of the tidal flooding information has been replaced by the mapping from the latest Environment Agency Tidal Hazard mapping. Where the mapping for an area contains both fluvial and tidal components, the more severe of the two has been presented.

From the Residual Flood Hazard, Depth and Velocity Spalding - Year 2115 0.1% Tidal Event Probability maps, from the update of strategic flood risk assessment for South Holland District Council, the site is not affected from a breach to the flood defences and has been used in the findings of this assessment.

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 Board's nearest watercourse to the site is the Blue Gowl No 2 some 500m south of the site.



Welland & Deepings 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.

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. The ground floor level for the proposed buildings is to be raised 300mm above the existing ground level. The updated SFRA concluded that flooding from this source is limited to minor isolated cases and is not of strategic significance as regards to flood risk.
- The area is not known to suffer from any groundwater problems.
- Flooding from sewers can occur from overloading from heavy rainfall caused by blockages or having inadequate capacity. 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. The ground floor level for the proposed buildings is to be raised 300mm above the existing ground level. The updated SFRA concluded that flooding from this source is limited to minor isolated cases and is not of strategic significance as regards to flood risk
- 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.

SURFACE WATER FLOODING

Part of the site is shown on the Low-Risk scenario Surface Water flood maps, for the 1 in 1000-year event, to be not affected from surface water flooding. **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.

The Environment Agency and the Lead Local Flood Authority (custodians of the surface water flood risk dataset) have subsequently confirmed that the published high-level data should not be used on a site-specific basis and that mapping is only suitable for National to County Scale use.

SEQUENTIAL APPROACH

When applying the sequential approach for flood risk in accordance NPPF the site would fall into Zone 3a (High Probability) as the site is shown to be within the tidal/fluvial flood plain as shown on the Environment Agency's Flood Map without defences in place.

However, the results of the updated SHSFRA shows that the site is located within a low/medium probability flood zone, but the area is reliant on protection by flood defences providing a standard of protection of 1 in 100 years return period.

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 Test

NPPF Guidance Paragraphs 155 - 165 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 principle of residential development at this site has been established by the granting of planning permission for a dwelling under planning reference H14-0941-19 granted 14th November 2019 and H14-0869-20 granted 3rd December 2020. The sequential and exception tests have been satisfied.

As the proposal for the 'Less Vulnerable' uses are for industrial purposes on the site of the existing 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. In this particular case the business is centred on the land owned and operated by Anglia UK Ltd and to consider areas outside the holding would not be practical. Consequentially the Sequential Test is met, with the development being "Less Vulnerable" the Exception Test is not required.

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 17th of December 2019.

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

Table 1 Peak River Flow Allowances

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

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 Rise

Table 3 Peak Sea level allowance for each epoch in (mm) per year with cumulative sea level rise for each epoch in brackets (use 1981 to 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

DRAINAGE STATEMENT

This drainage statement, for the site, is a preliminary overview and will be subject to the detailed design being undertaken when planning permission and final layout has been determined. It is proposed to utilise attenuation 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 EA guidelines, which require at least one workable solution for managing surface water.

Surface Water Drainage

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

- i) Infiltration
- ii) Watercourse
- iii) Public sewer

Infiltration

No infiltration methods are to be utilised for the disposal of surface water from the new buildings as the infiltration tests carried out by Ground Engineering Ltd were negative. **Document A**

Watercourse

Under both previous applications the principle of making a surface water connection to a watercourse was accepted as a satisfactory method of disposal of surface water from the proposed roof area of the buildings, after attenuation at a maximum discharge rate of 5 litres/sec. (default Greenfield rate)

It is proposed to connect the surface water from the roof of the proposed buildings to the attenuation pond (which will be extended to suit) which was approved under planning application H14--0941-19 and H14-0869-20. The run-off from the storage units will discharge to ground and soak away naturally.

Roof area of proposed buildings 1135m²:

Surface water runoff and storage calculations have been undertaken using a software tool developed by HR Wallingford. **Document B**

The storage volume has been calculated for 40% increase in peak rainfall allowance, discharge rate 5 l/sec = 44m³

The surface water from the building will be collected into underground pipes to convey the flows to the attenuation pond located in the adjacent field and the discharged limited to 5 l/sec to the adjacent watercourse shown on the drainage plan.

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

The management of Anglia UK Ltd will be responsible for the maintenance of the entire surface water drainage system.

Sewer

There are no proposals to connect surface Water drainage to a sewer.

Foul Water Drainage

A private gravity foul drainage system from the proposed building, will be designed in accordance with Building Regulations. Doc. H, which will be connected into the existing foul drainage system serving the existing development.

FLOOD RESILIENCE CONSTRUCTION

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 building will have the following resilient measures incorporated in the construction in accordance with “Improving the flood performance of new buildings” CLG (2007).

- o The ground floor level for the proposed two storey offices are to be set at the same level as the existing offices. A safe refuge is provided for all staff at first floor level.
- o Water, electricity, and gas meters: should be located above the predicted flood level. Electrical services: electrical sockets, heating systems: boiler units and ancillary devices should be installed at least 500mm above the ground floor level to minimise damage to electrical services Electric ring mains should be installed at high level with drops to ground floor sockets and switches.
- o The ground floor to be constructed with a solid concrete floor with no voids beneath and no low-level wall vents.
- o Avoid the use of mineral fibre insulation to the ground floor level (walls & floor) and use a rigid closed cell material as these retain integrity and have low moisture take-up.

- o Where possible, all service entries should be sealed (e.g., with expanding foam or similar closed cell material). Closed cell insulation should be used for pipes which are below the predicted flood level.
- o Use standard gypsum plasterboard up to the predicted flood level (plus freeboard of 50mm) as a sacrificial material fixed horizontally for easy removal and replacement.
- o As this site is in an area that is capable of receiving flood warnings from the Environment Agency Floodline Warning Direct system. It is recommended that the property Owner contact the Environment Agency's Floodline on 0845 988 1188 to register the property to receive advance warning of flooding by telephone, mobile, fax, SMS text, email or pager. The Environment Agency aim to issue a 'severe flood warning' approximately 2 hours before existing defences are overtopped.

CONCLUSION

- o The site does have the protection of fluvial flood defences which are well maintained by the Environment Agency.
- o The proposed site for the proposed building is shown to be within Flood Zone 3 'High Probability' as detailed on the Environment Agency's Flood Zone Maps without defences.
- o The ground floor for the proposed buildings will be set 300mm above the existing ground level.
- o The Flood Risk Vulnerability Classification in Table 2 of NPPG the proposed residential development is classified as "More Vulnerable", the remaining development is classified as "Less Vulnerable".
- o 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.
- o Flooding from other sources is unlikely to affect the site.
- o 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.
- o 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
Pinchbeck

Location (easting/northing)
523394/324652

Created
15 July 2021 15:32

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

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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<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Flood map for planning

Your reference

Pinchbeck

Location (easting/northing)

523394/324652

Scale

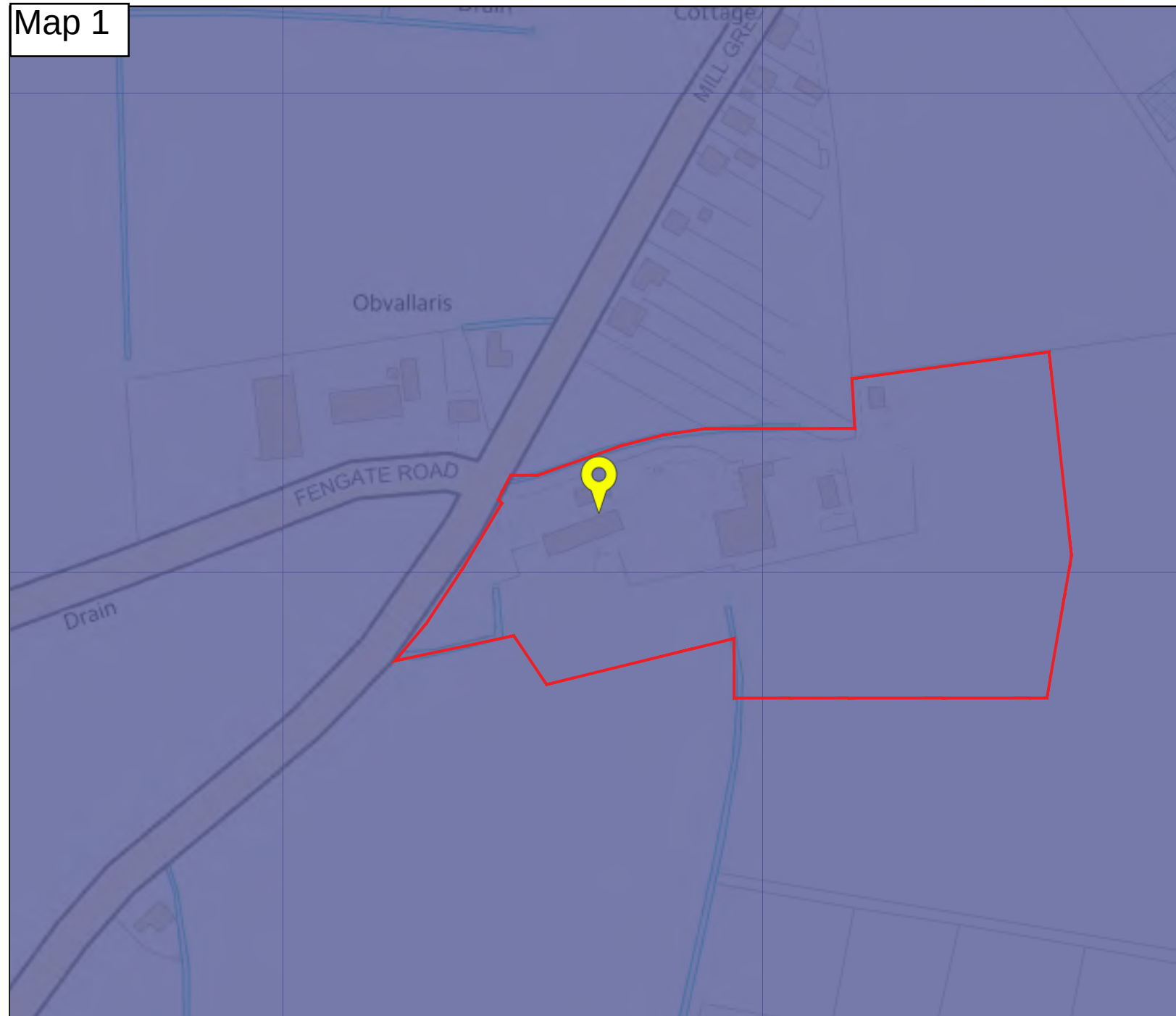
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Created

15 July 2021 15:32

-  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



Flood risk

Extent of flooding



Location

Anglia UK

Map 2



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



Scale 1:550,000



▲ East Coast and Wash

See separate data sheet for predicted flood levels

Created by the Partnerships and Strategic Overview Team, Lincoln

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%	2.5%	50%
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

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>

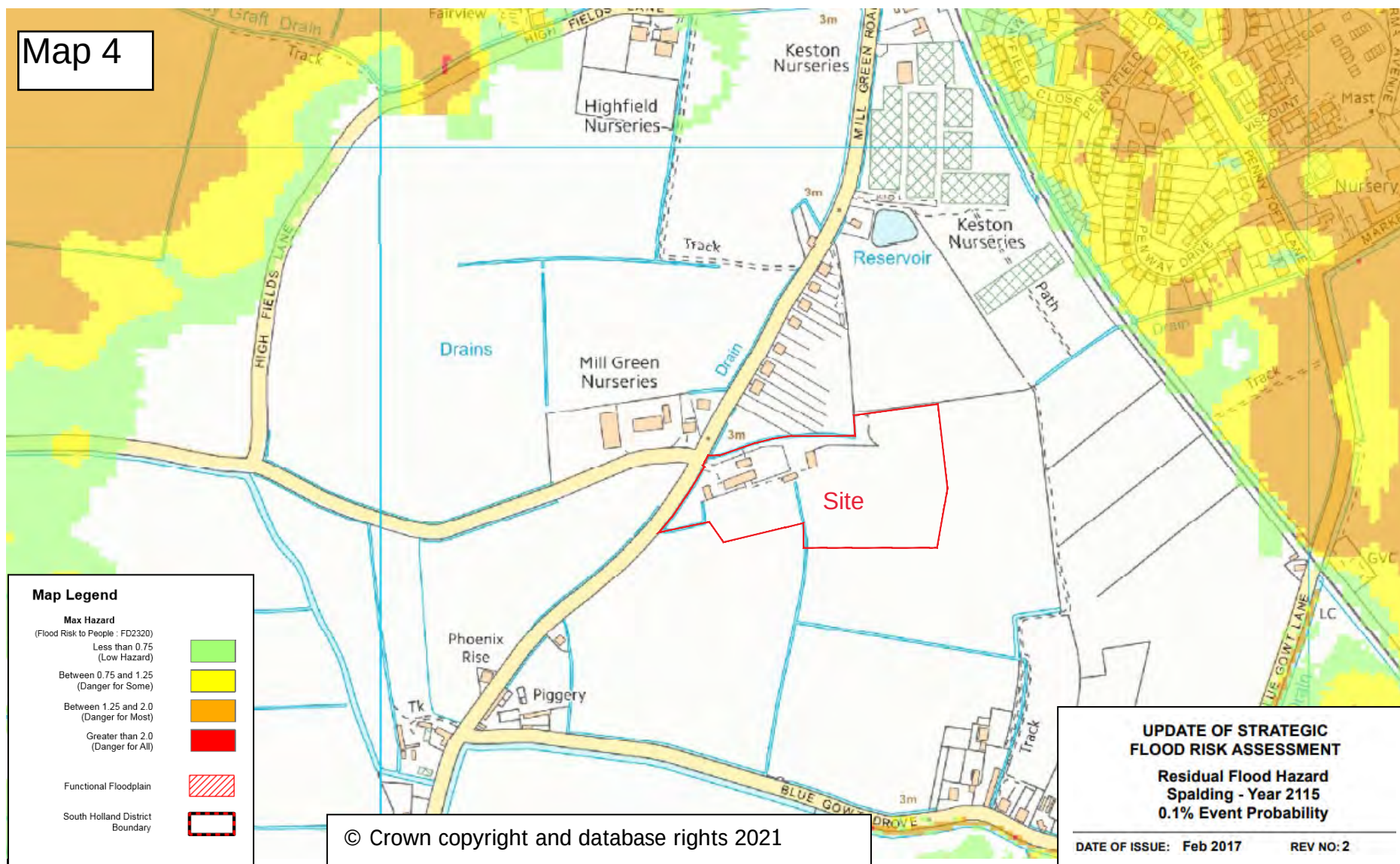
The following notes apply to all Marsh Road, Wisbech, Dog-in-a-Doublet

- 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.

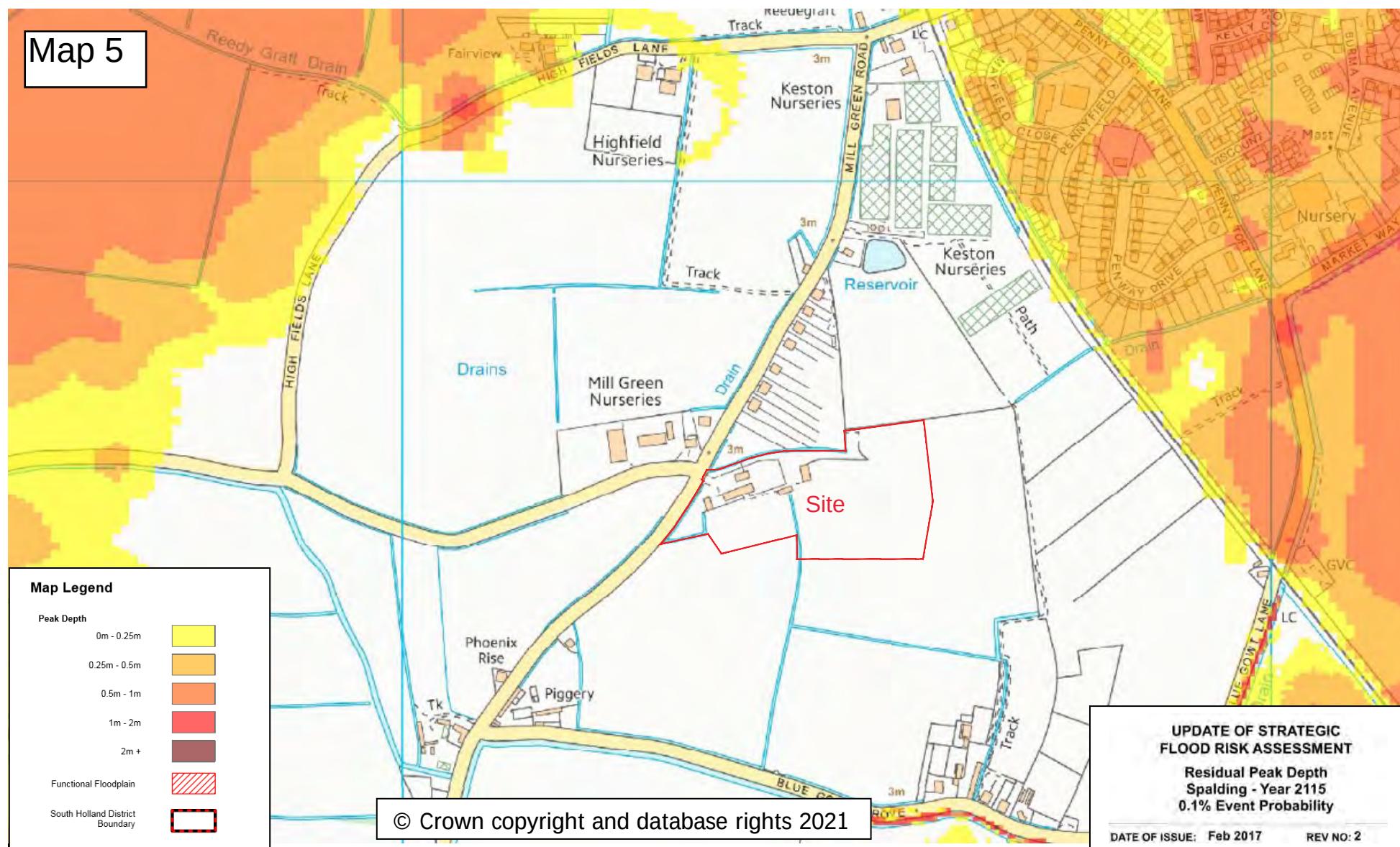
The following notes apply to Grand Sluice

- 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>

Map 4



Map 5



Map 6

Map Legend

Peak Velocity (metres per second)

0 - 0.3	Yellow
0.3 - 1	Orange
1 - 1.5	Red
1.5 - 2.5	Dark Red
2.5 +	Black

Functional Floodplain: Red hatched box

South Holland District Boundary: Red dashed line box

UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT

Residual Peak Depth
Spalding - Year 2115
0.1% Event Probability

DATE OF ISSUE: Feb 2017 REV NO: 2

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**UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT**

**Residual Peak Depth
Spalding - Year 2115
0.1% Event Probability**

DATE OF ISSUE: Feb 2017 **REV NO: 2**

**UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT**

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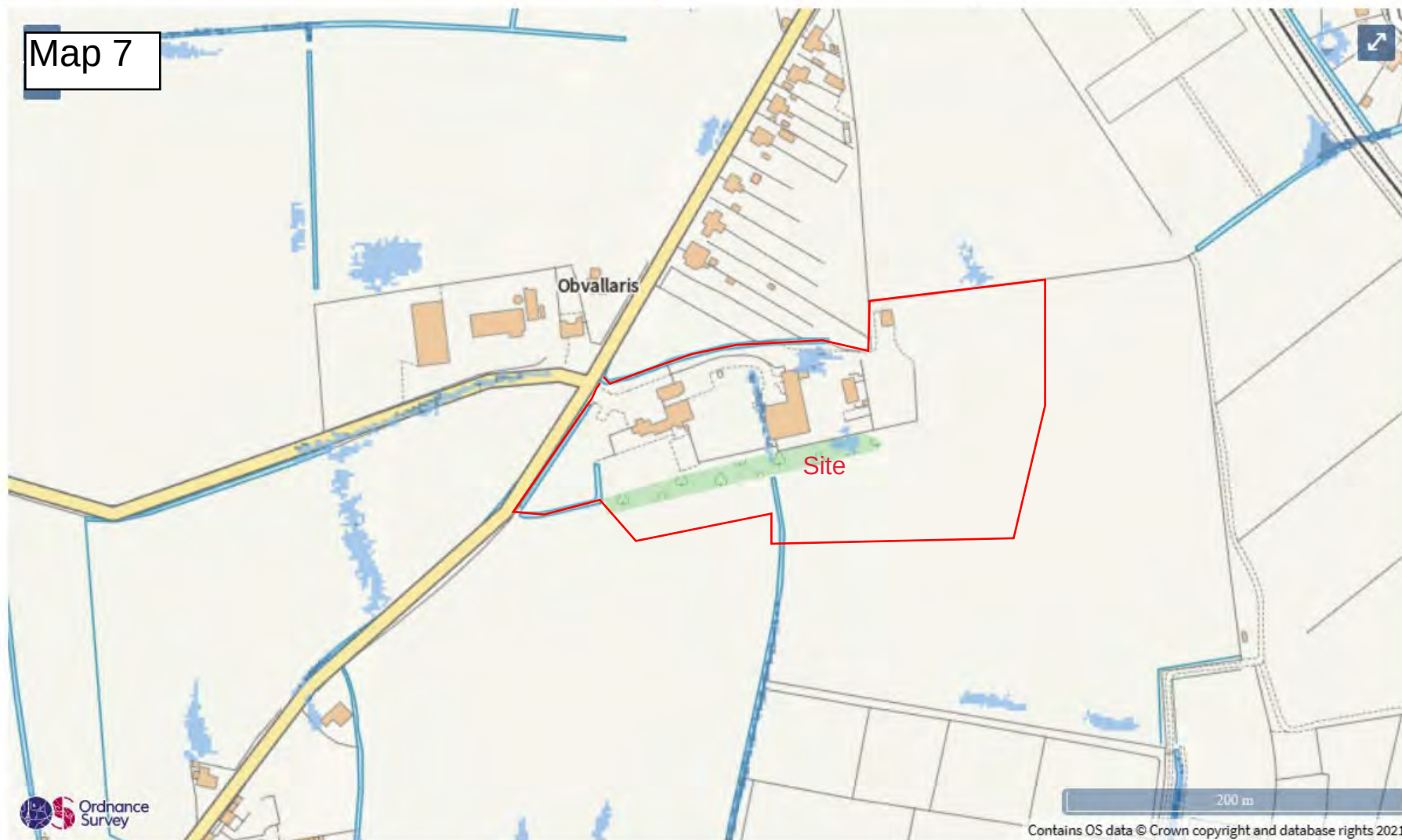
Flood risk

Low risk: depth

Location

Anglia UK

Map 7



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm



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Client
Anglia UK Ltd

Project
Erection of office building, managers dwelling & storage building
Mill Green Road, Pinchbeck

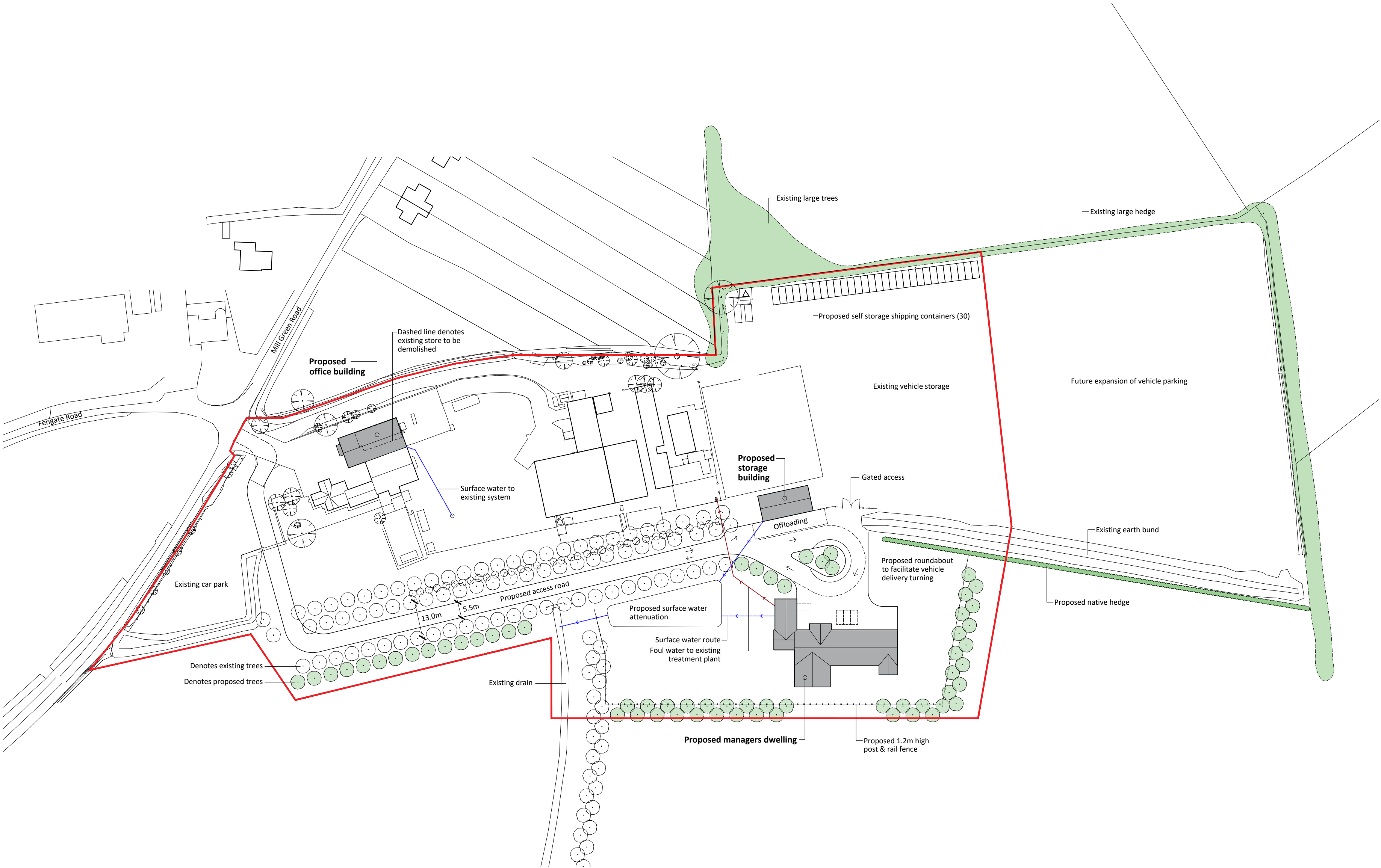
Drawing
Location Plan

Scale @ A3 1: 1250	Date 15/07/21
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Drawn By CH	Checked By PSS
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Job Number 823-24	Status PL	Purpose of Issue Planning
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Drawing No. 823-24_PL_LP01	Rev -
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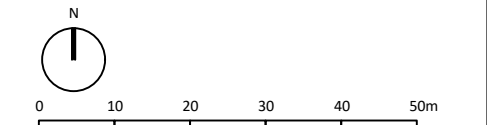
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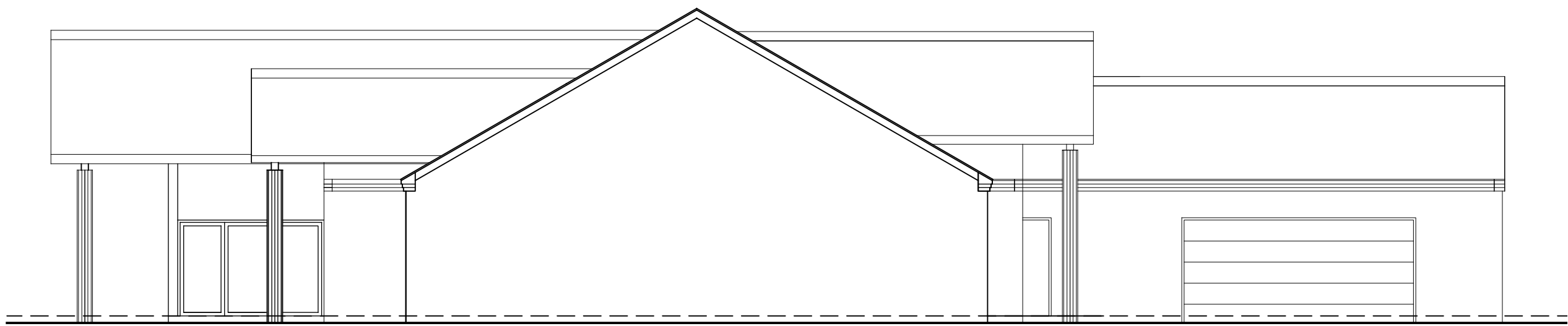
Client
Anglia UK Ltd

Project
Erection of office building, managers dwelling & storage building
Mill Green Road, Pinchbeck

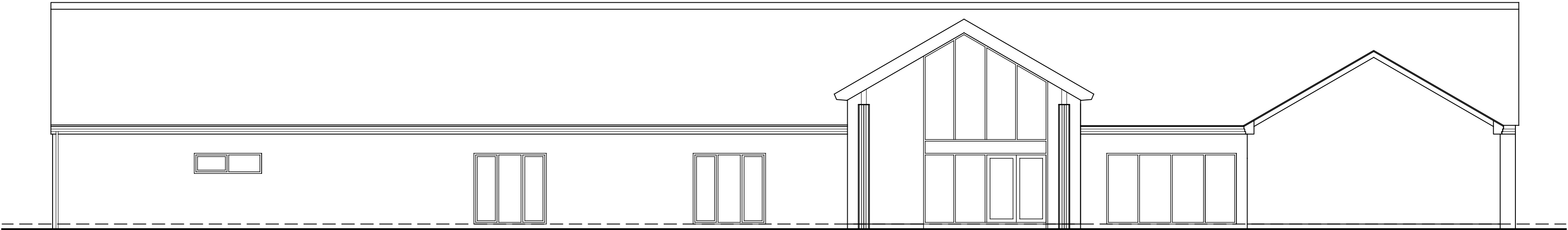
Drawing
Proposed Site Plan

Scale @ A2 1: 1000		Date 13.07.21
Drawn By WW		Checked By LMS
Job Number 823-24	Status PL	Purpose of Issue Planning

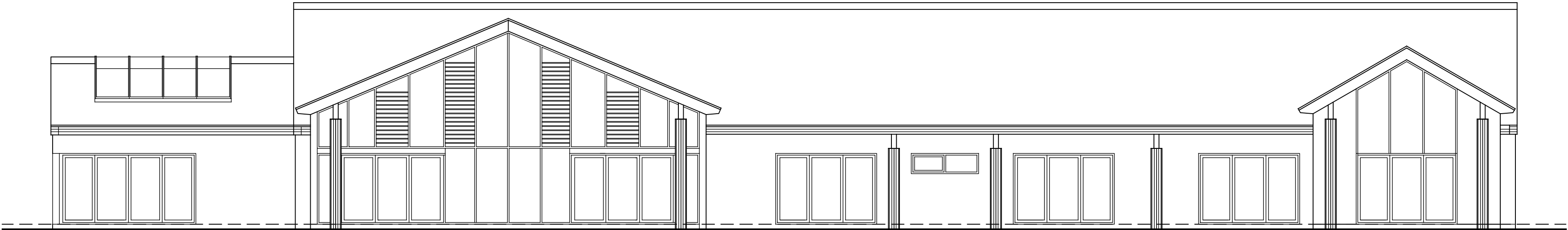
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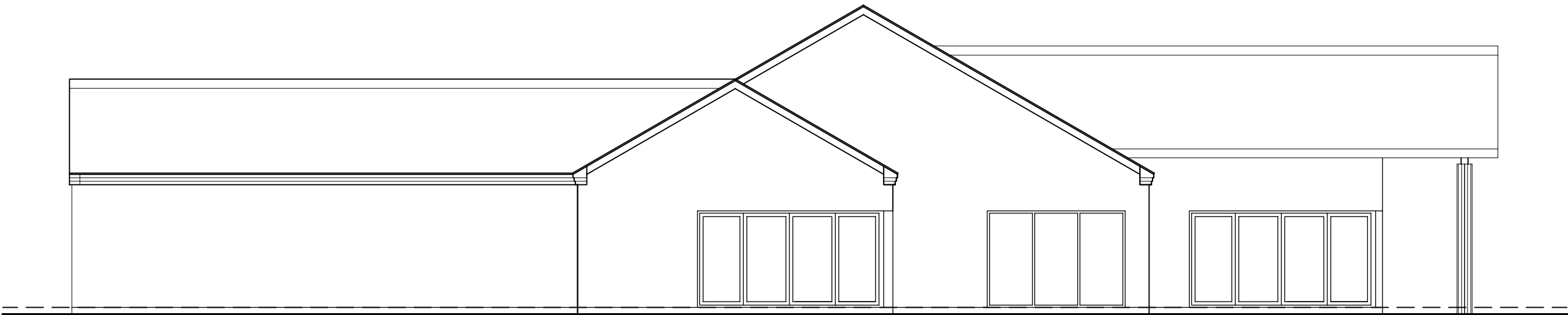
Proposed East Elevation



Proposed North Elevation



Proposed South Elevation



Proposed West Elevation

Notes

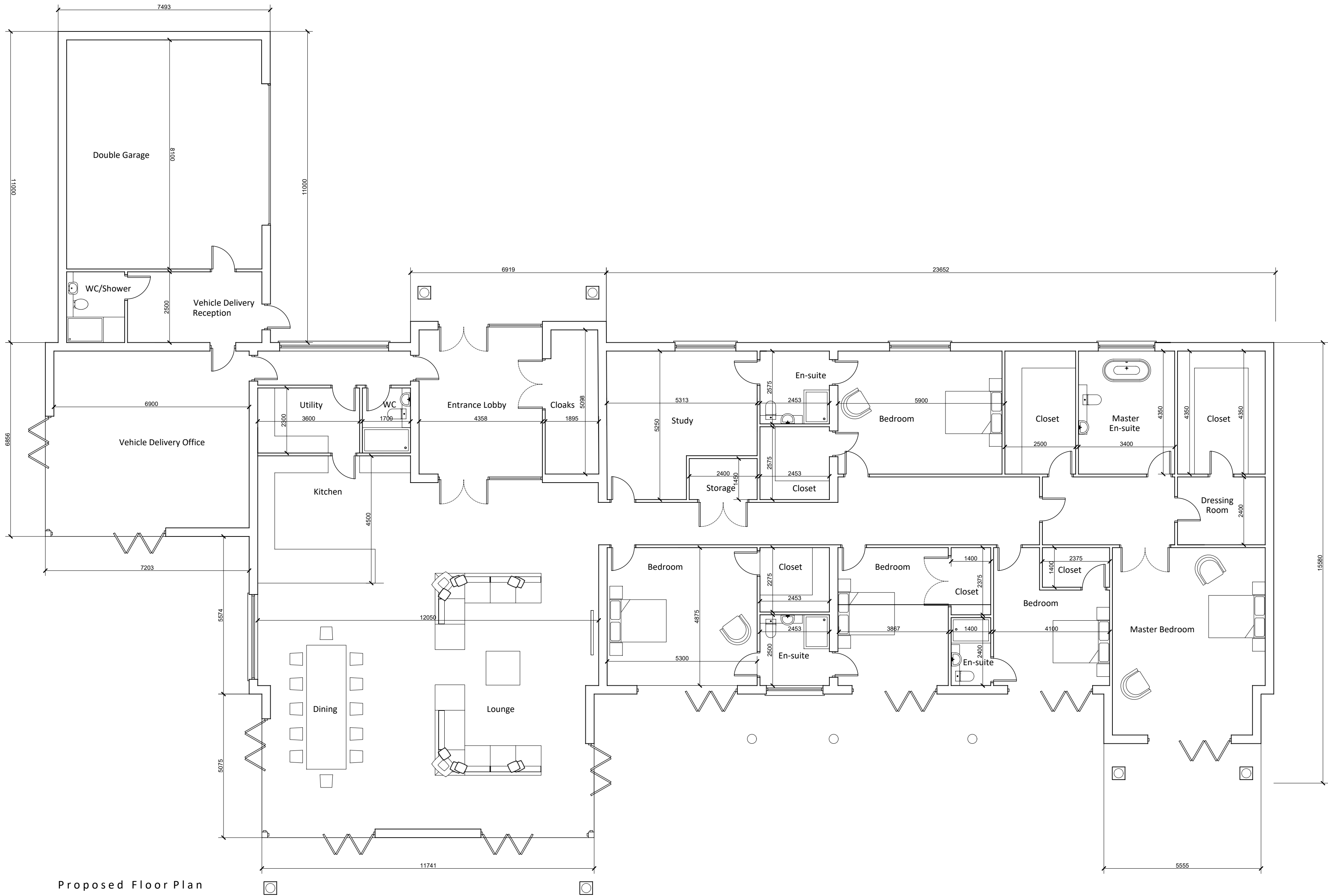
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Project Erection of office building, managers dwelling & storage building Mill Green Road, Pinchbeck		
Drawing Proposed managers dwelling - Elevations		
Scale @ A1 1: 100		Date 14/07/21
Drawn By PSS		Checked By PSS
Job Number 823-24	Status PL	Purpose of Issue Planning
Drawing No. 823-24_PL_EL02	Rev -	



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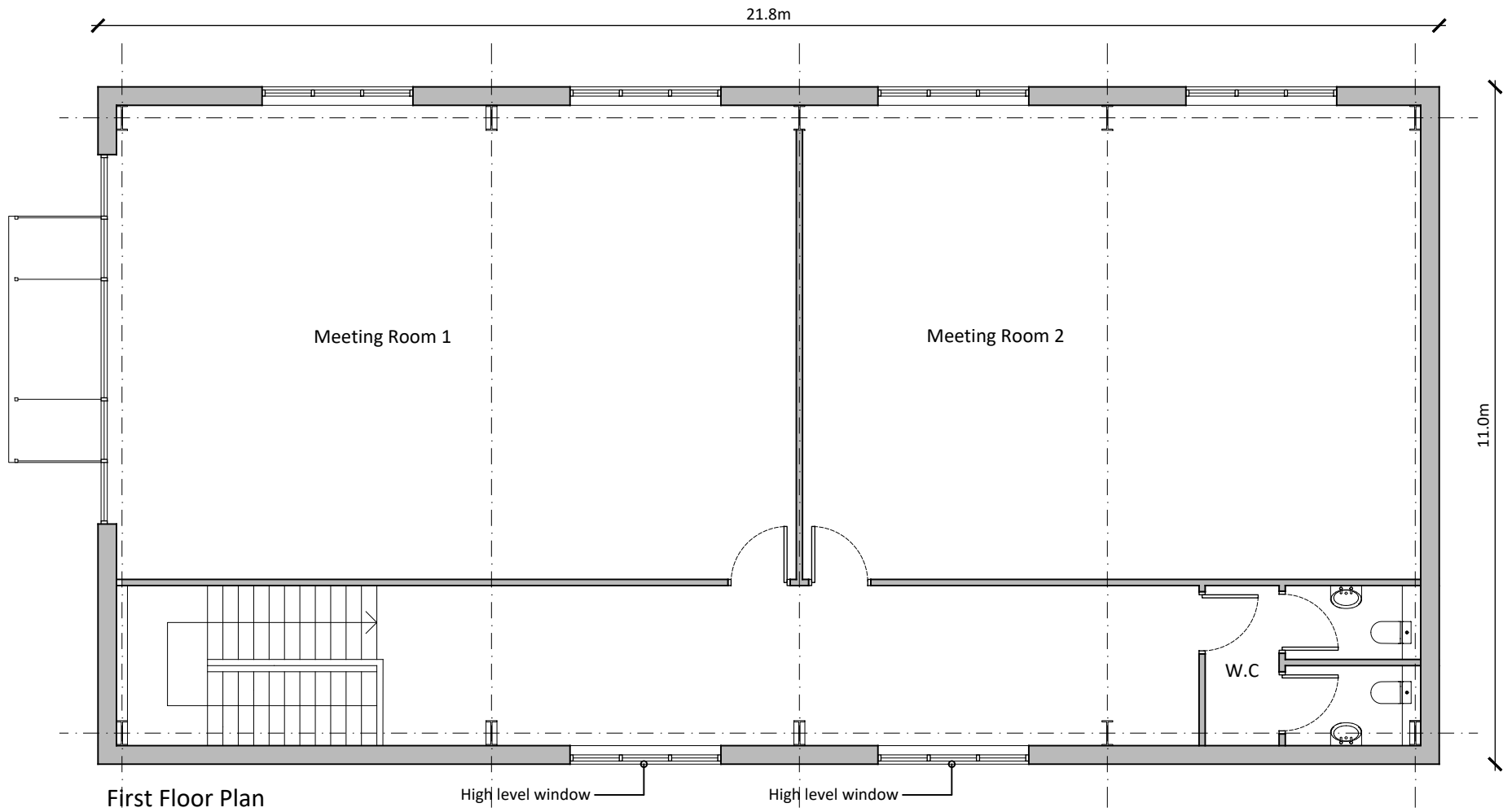
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Client Anglia UK Ltd		
Project Erection of office building, managers dwelling & storage building Mill Green Road, Pinchbeck		
Drawing Proposed managers dwelling - Floor plan		
Scale @ A1 1: 100		Date 14/07/21
Drawn By PSS		Checked By PSS
Job Number 823-24	Status PL	Purpose of Issue Planning
Drawing No. 823-24_PL_PL02		Rev -

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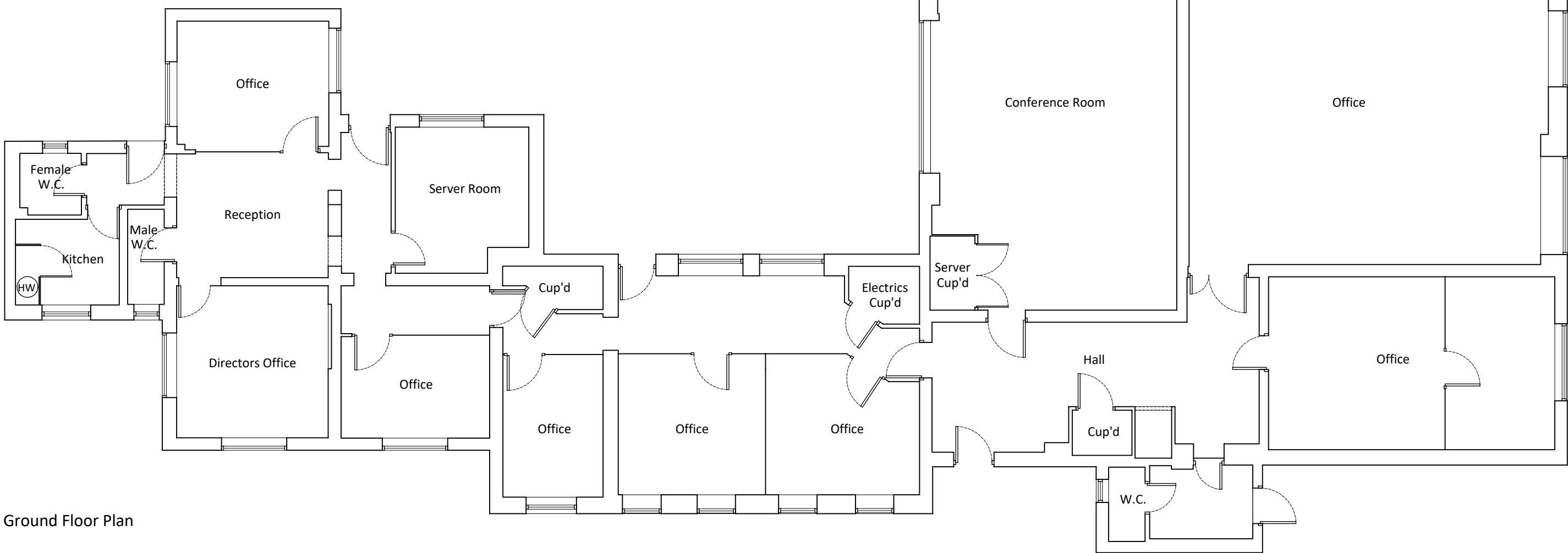
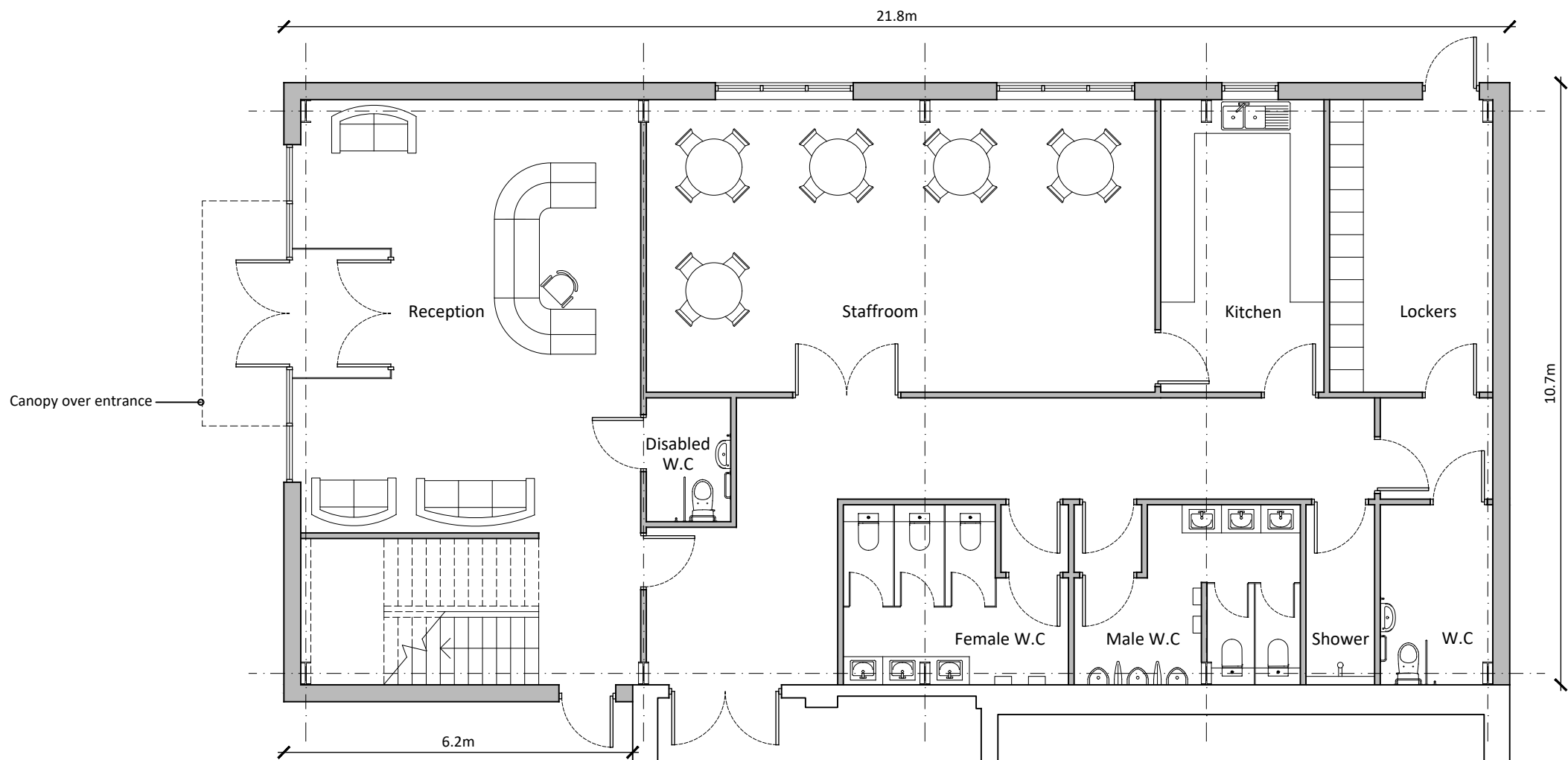
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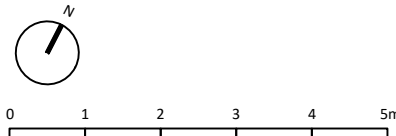
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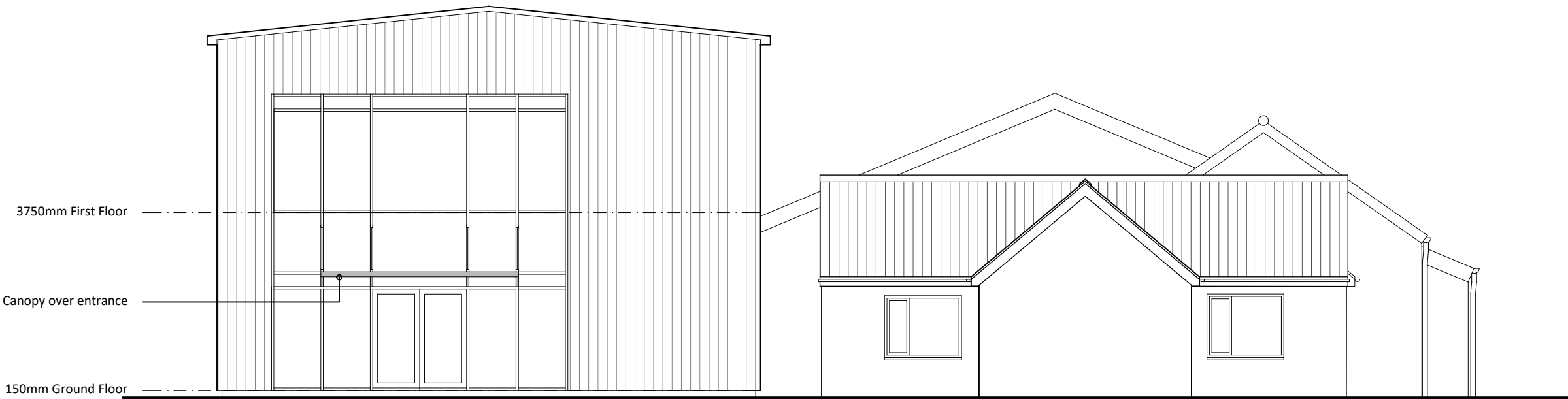
First Floor Plan



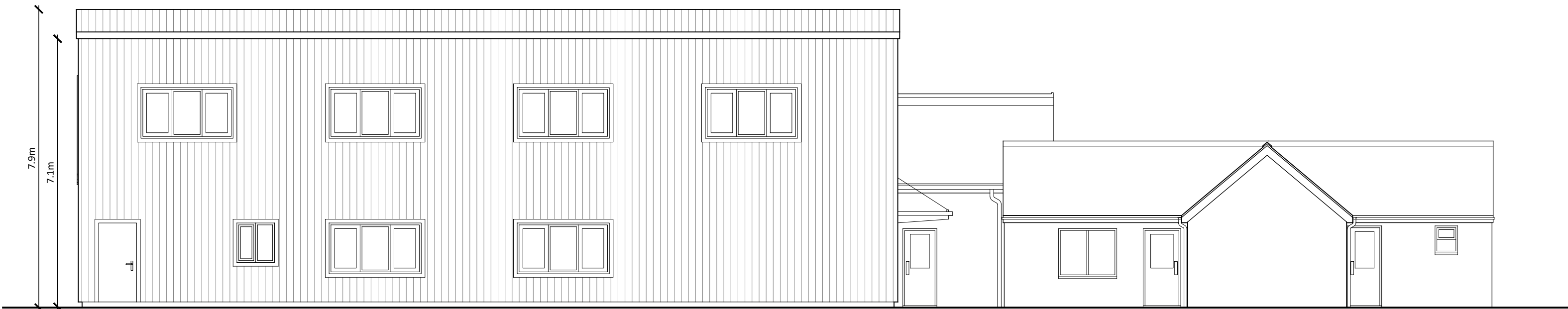
Ground Floor Plan



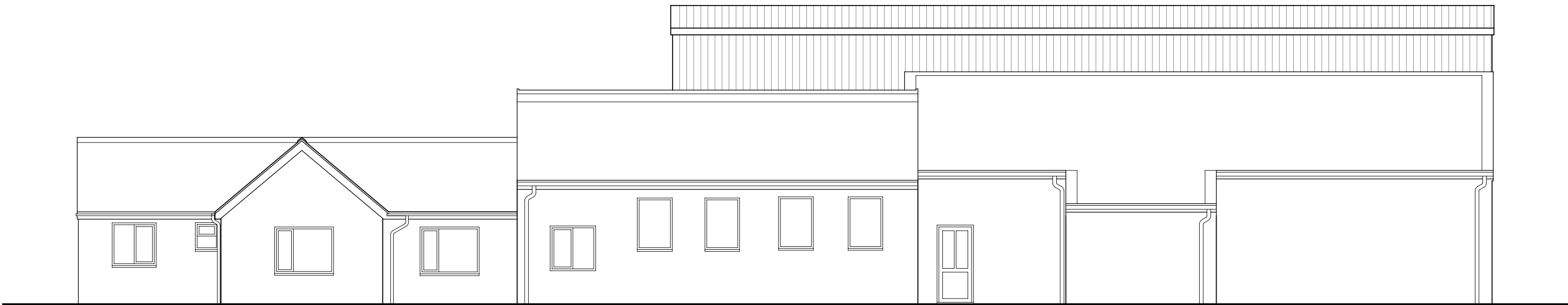
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Client Anglia UK Ltd		
Project Erection of 2 storey office building Mill Green Road, Pinchbeck		
Drawing Proposed Floor Plans		
Scale @ A1 1: 100		Date 22/02/21
Drawn By CH		Checked By PSS
Job Number 823-24	Status PL	Purpose of Issue Planning
Drawing No. 823-24_PL_PL01		Rev -



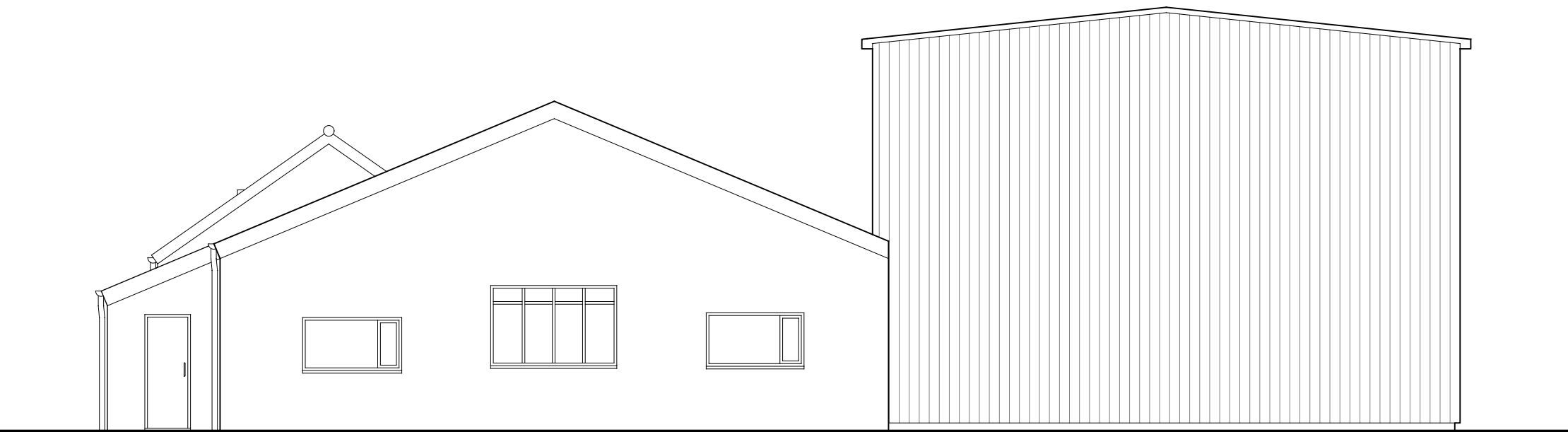
West Elevation



North Elevation



South Elevation



East Elevation

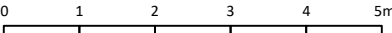


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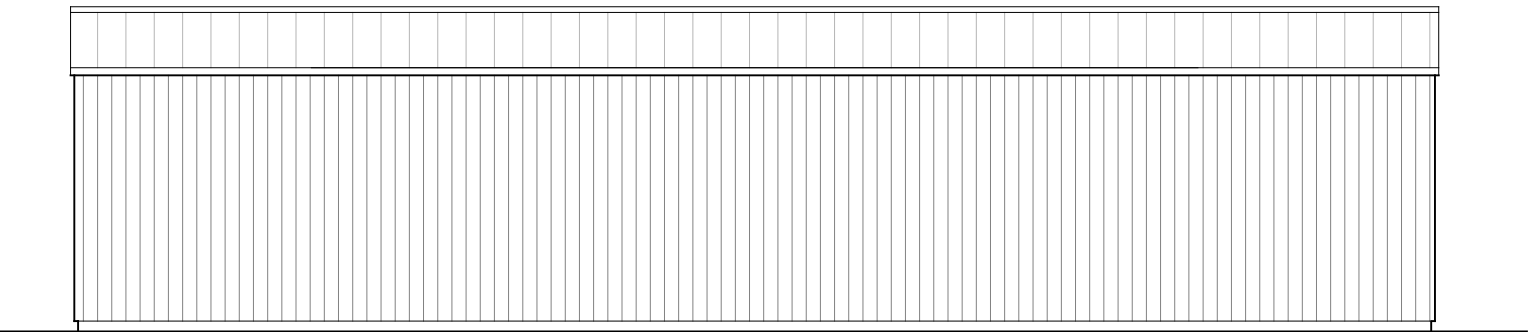
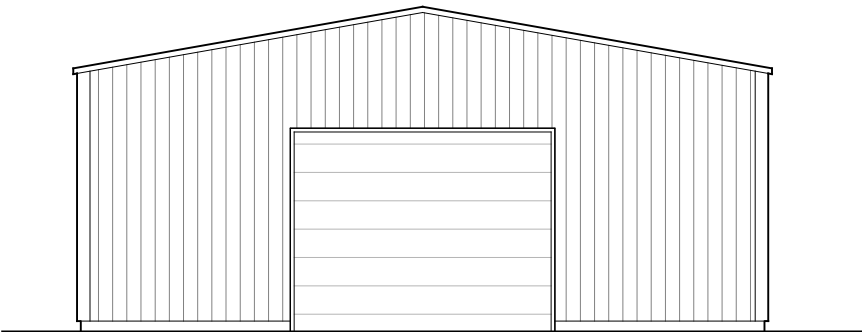
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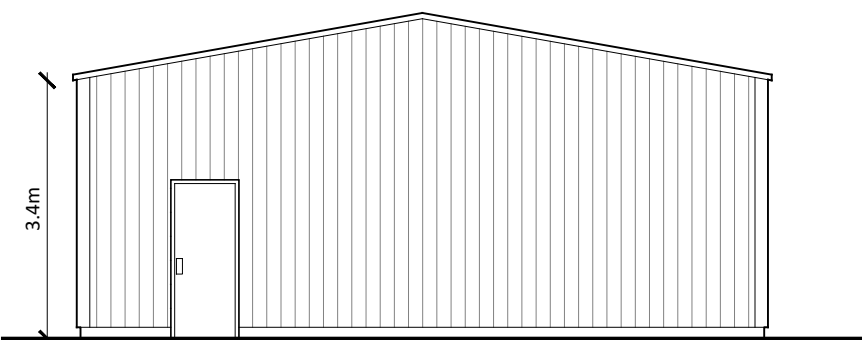
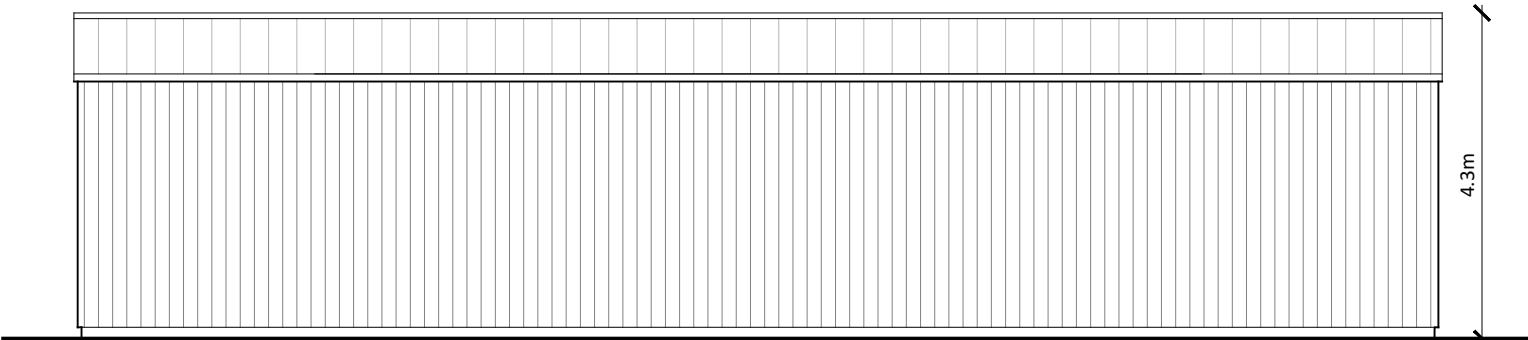


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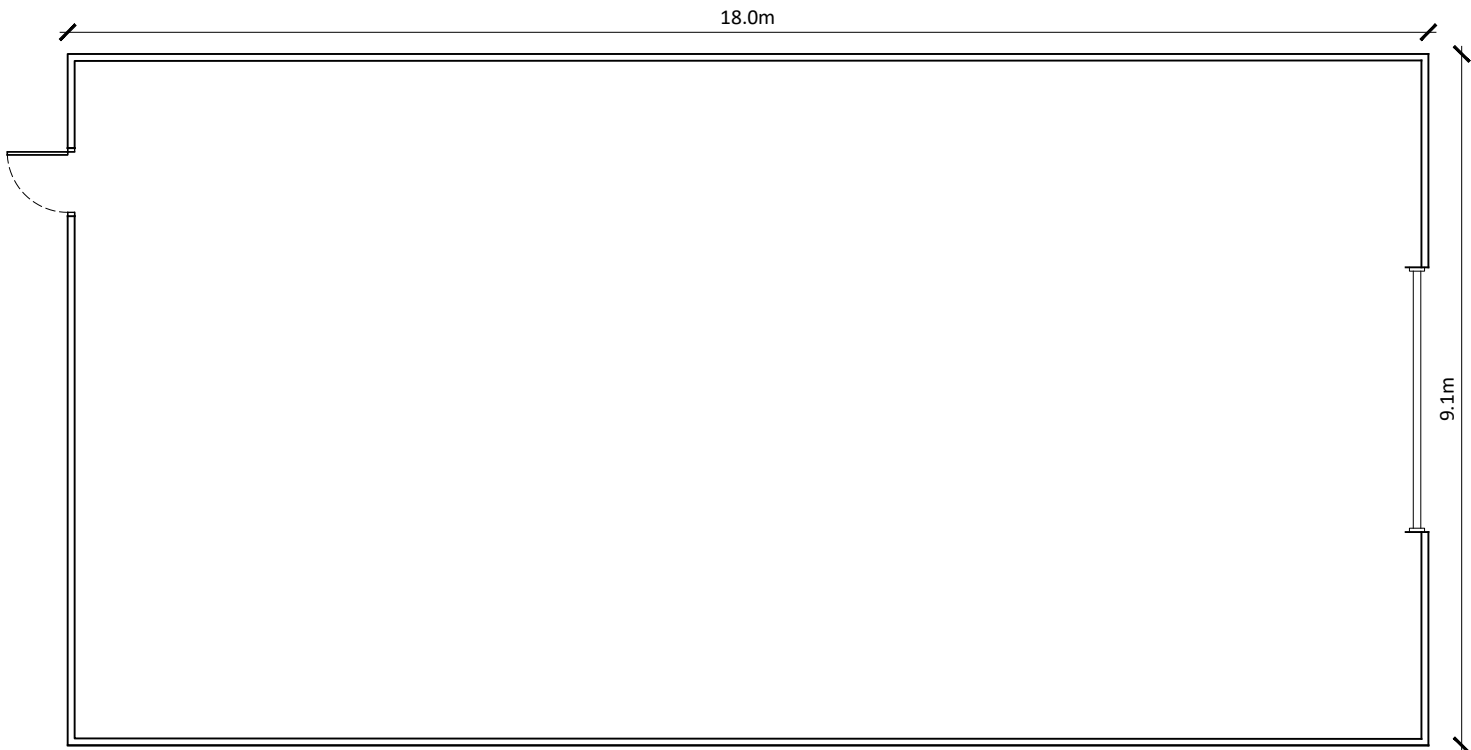
East Elevation

North Elevation



South Elevation

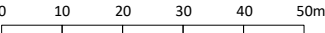
West Elevation



Floor Plan



Roof Plan (not to scale)



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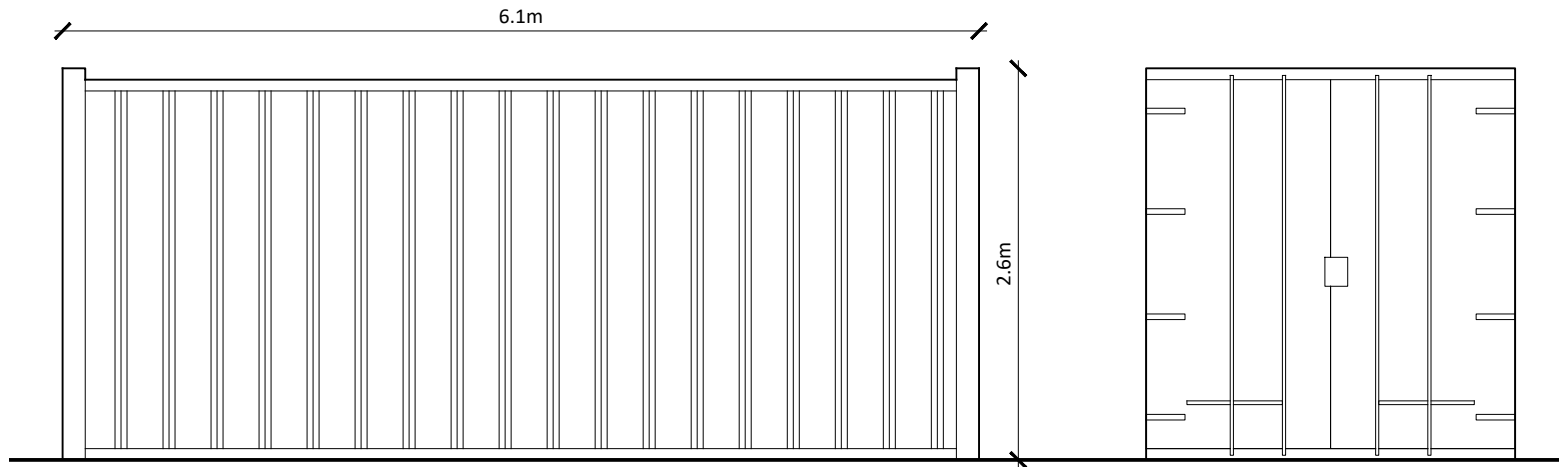
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Dimensions
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CDM 2015
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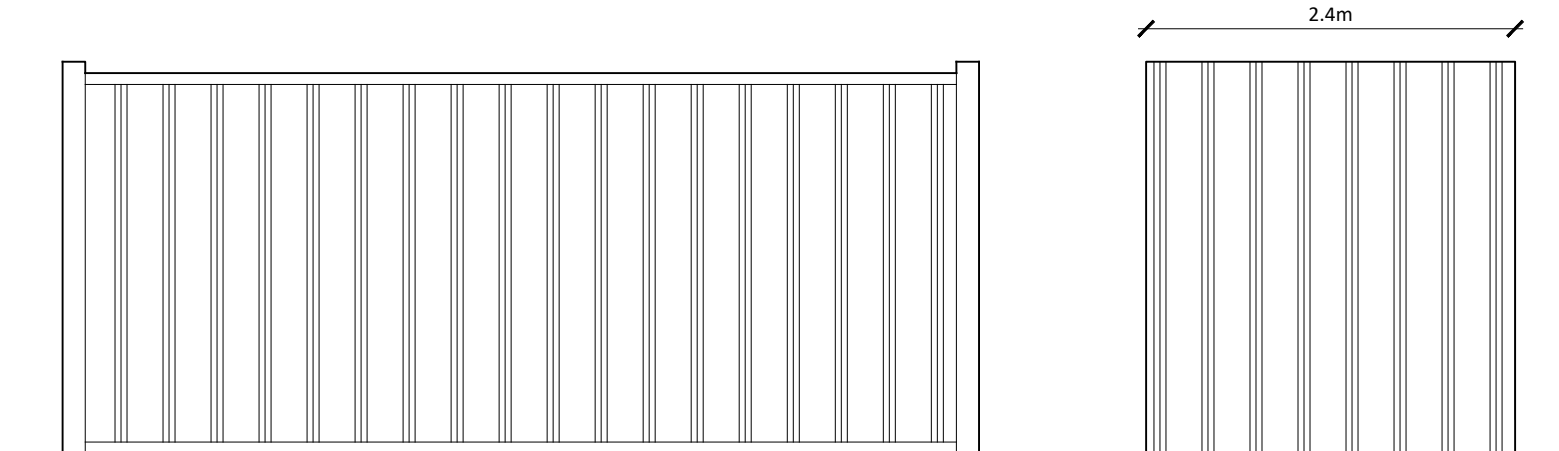
Rev	Description	Date
rdc Robert Doughty Consultancy 32 High Street, Helpringham Sleaford, Lincolnshire, NG34 0RA Tel: 01529 421646 Email: admin@rdc-landplan.co.uk Web: www.rdc-landplan.co.uk		
Client Anglia UK Ltd		
Project Erection of office building, managers dwelling & storage building Mill Green Road, Pinchbeck		
Drawing Proposed storage building		
Scale @ A3 1: 100		Date 15/07/21
Drawn By WW		Checked By LMS
Job Number 823-24	Status PL	Purpose of Issue Planning
Drawing No. 823-24_PL_GA03		Rev -

Plan 8



Side Elevation

Front Elevation



Side Elevation

Rear Elevation

Notes

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CDM 2015

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Rev	Description	Date
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rdc
Robert Doughty
Consultancy

32 High Street, Helpringham
Sleaford, Lincolnshire, NG34 0RA

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

Client

Anglia UK Ltd

Project

Erection of office building, managers dwelling
& storage building
Mill Green Road, Pinchbeck

Drawing

Shipping container detail

Scale @ A4

1: 50

Date

16/07/21

Drawn By

WW

Checked By

LMS

Job Number

823-24

Status

PL

Purpose of Issue

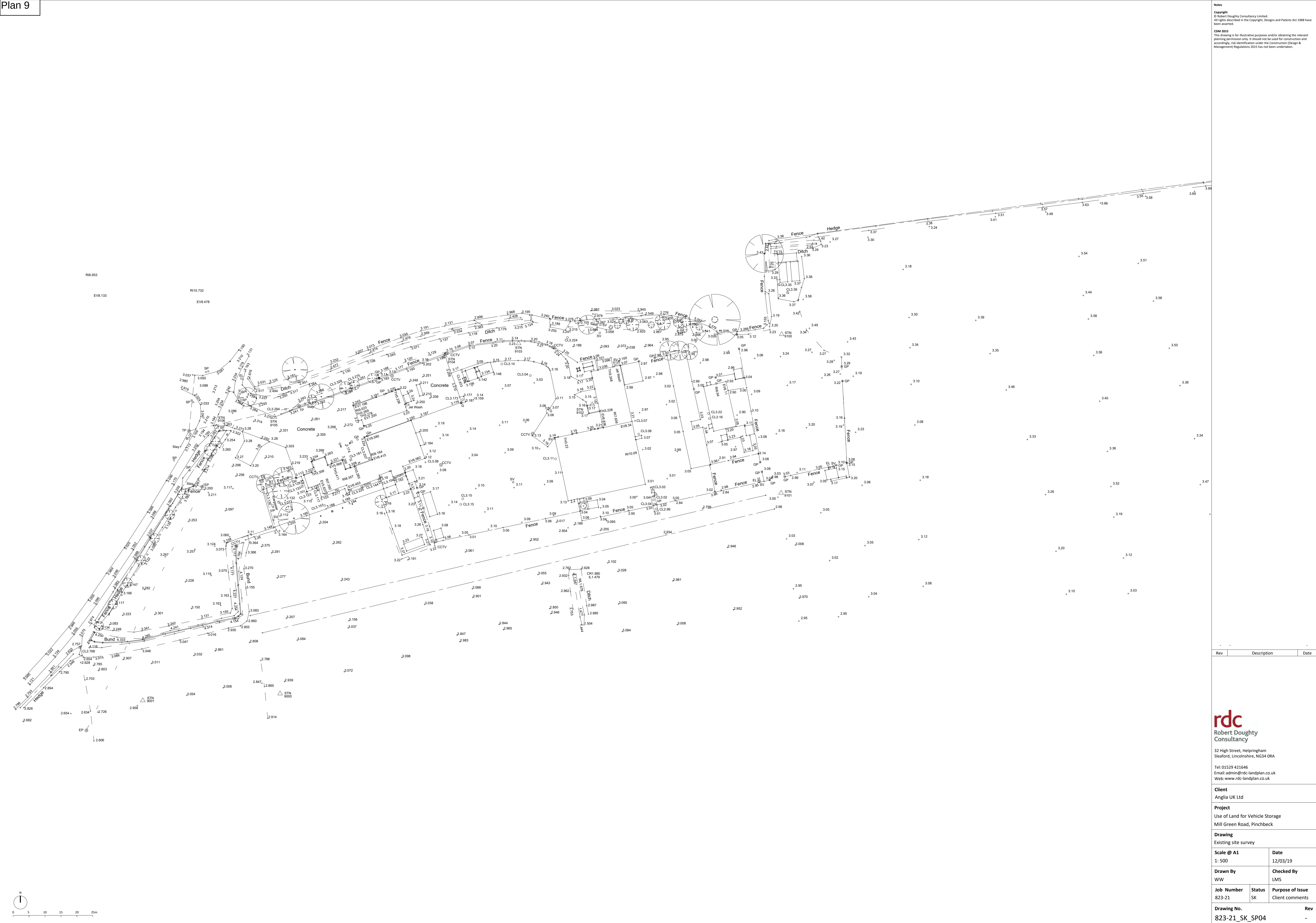
Planning

Drawing No.

823-24_PL_GA04

Rev

-



SOAKAWAY TEST RESULTS**BRE DIGEST 365 - SOIL INFILTRATION RATE**

Project: Anglia (UK) Limited, Mill Green Road, Pinchbeck
 Client: Anglia (UK) Limited

Project No: C14686
 Sheet No: 1/1

Trial Pit: TP1 FIRST FILLING
 Depth: 1.00
 Length: 1.00
 Width: 0.30

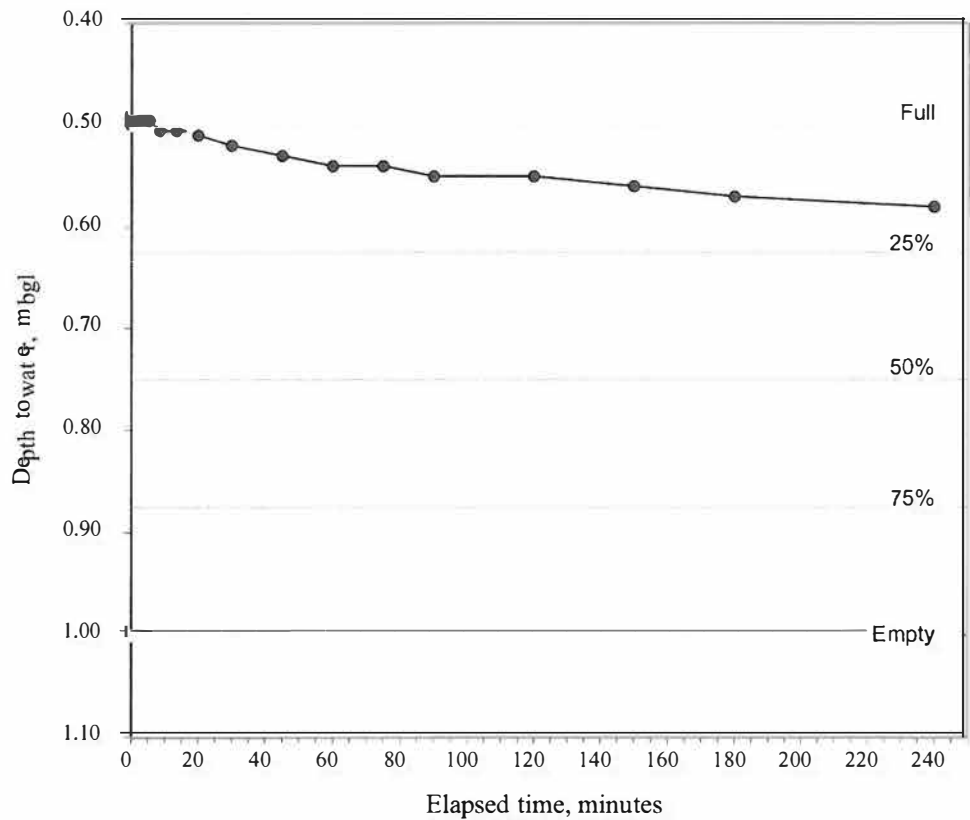
Description of Stratum under test: Firm, brown and orange brown, slightly sandy, silty CLAY

Depth to water prior to test: dry
 (below ground level)

Elapsed Time min	Depth to Water m
0	0.50
1	0.50
2	0.50
3	0.50
4	0.50
5	0.50
7	0.50
10	0.51
15	0.51
20	0.51
30	0.52
45	0.53
60	0.54
75	0.54
90	0.55
120	0.55
150	0.56
180	0.57
240	0.58

All dimensions given in metres

DEPTH TO WATER vs ELAPSED TIME



$$f = (V75 - V25) / A50(T75 - T25)$$

$$V75 - V25 = 0.075$$

$$A50 = 0.950$$

$$T75 - T25 = 2340$$

Soil Infiltration Rate $f = \underline{5.62E-07} \text{ m/s}$



Surface water storage requirements for sites

www.uksubs.com | Storage estimation tool

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

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 characteristics

Total site area (ha):	0.1135
Significant public open space (ha):	0
Area positively drained (ha):	0.1135
Impermeable area (ha):	0.1135
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):	0.11
Net impermeable area for storage volume design (ha):	0.11
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.

Design criteria

Climate change allowance factor:

Urban creep allowance factor:

Volume control approach:

Interception rainfall depth (mm):

Minimum flow rate (l/s):

Methodology

esti

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	97.79
FEH / FSR conversion factor:	1.27	1.27
SAAR (mm):	560	560
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological 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):	0.16	0.16
Q_{BAR} for net site area (l/s):	0.16	0.16

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):	44	44
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	44	44

This report was produced using the storage estimation tool developed by HRWallingford and available at www.uksubs.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://www.uksubs.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.