

**FLOOD RISK ASSESSMENT  
FOR RESIDENTIAL DEVELOPMENT AT  
STOW ROAD, WIGGENHAL ST MARY MAGDALEN**

**FINAL REPORT**

**ECL0769/VERTEX ARCHITECTURE**

**DATE JUNE 2022**

**ELLINGHAM CONSULTING LTD**

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## CONTENTS

### 1.0 INTRODUCTION

### 2.0 SITE LOCATION AND DESCRIPTION

- 2.1 Site Location
- 2.2 Existing Site
- 2.3 Proposed Development
- 2.4 Local Development Documents
- 2.5 Available Flood Risk Information

### 3.0 FLOOD RISK VULNERABILITY

- 3.1 The Sequential and Exception Test
- 3.2 Vulnerability Classification
- 3.3 Application of the Sequential and Exception Test

### 4.0 SITE SPECIFIC FLOOD RISK

- 4.1 Local Flood Assets
- 4.2 Sources of Flooding
- 4.3 Probability of Flooding
- 4.4 Historic Flooding
- 4.5 Climate Change
- 4.6 Residual Risk

### 5.0 FLOOD RISK MITIGATION

- 5.1 Summary of Risks
- 5.2 Mitigation Measures

### 6.0 CONCLUSIONS

ATTACHMENT 1 – Topographical Survey (Dwg 28103/001 0)

ATTACHMENT 2 – Site Plan and Garage Plans (Dwg 22020 03 A)

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## **1.0 INTRODUCTION**

This Flood Risk Assessment has been prepared in accordance with National Planning Policy Framework (NPPF) and supporting planning practice guidance (PPG) on Flood Risk and Coastal Change.

In areas at risk of flooding or for sites of 1 hectare or more, developers are required to undertake a site-specific Flood Risk Assessment to accompany an application for planning permission. This Flood Risk Assessment has been produced on behalf of Vertex Architecture in respect of a development that consists of a replacement dwelling at 70 Stow Road, Wiggenhall St Mary Magdalen.

A planning application for the proposed development is to be submitted by Vertex Architecture.

## 2.0 SITE LOCATION AND DESCRIPTION

### 2.1 Site Location

The site is at 70 Stow Road, Wiggenhall St Mary Magdalen, King's Lynn, PE34 3DJ. The National Grid Reference of the site is 55968/31072.

The location of the site is shown on Figure 1.

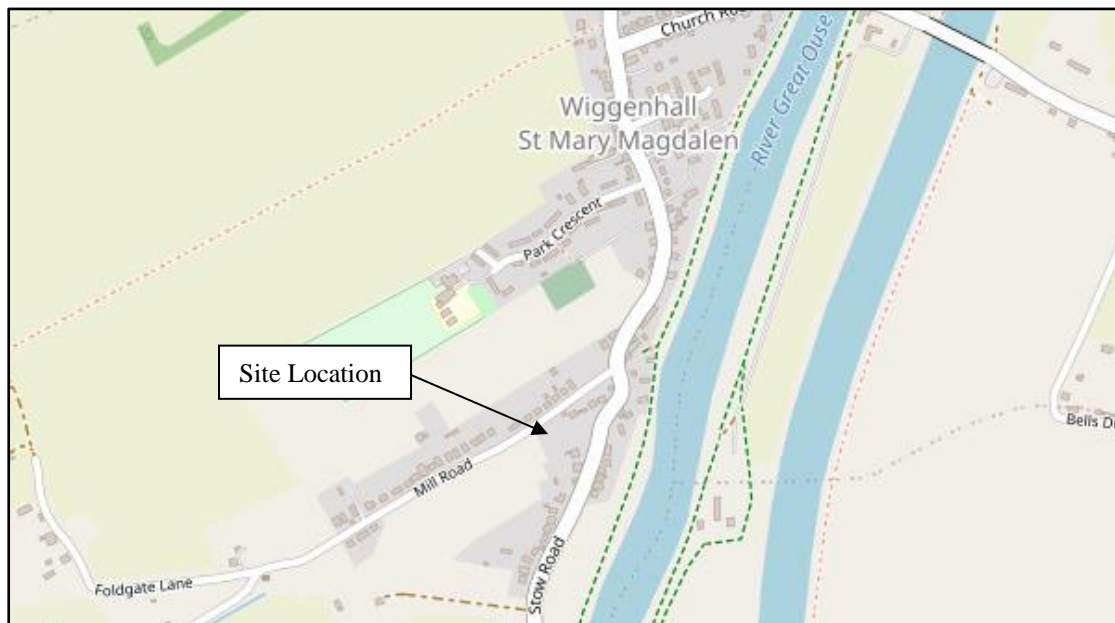


Figure 1 – Location Plan (© OpenStreetMap contributors)

### 2.2 Existing Site

The site is on the north western side of Stow Road. The site consists of an existing dwelling and the surrounding land that includes a caravan and containers. The north western boundary of the site is formed by Mill Road and there are dwellings to the north east of the site. The area of development is approximately 0.12 hectares.

A topographic survey is provided in Attachment 1. Ground levels in the area around the existing dwelling are between +1.7m OD and +1.9m OD. The carriageway level of Stow Road at the access to the site is +1.6m OD.

The site is in the King's Lynn Internal Drainage Board's (IDB) area. Surface water at the site would naturally drain through soakaway and hence to the IDB drain system. There is an IDB watercourse along the north western boundary of the site alongside Mill Road.

The online British Geological Survey maps indicate that the site is likely to be underlain by the Kimmeridge Clay Formation mudstone. The bedrock is shown to be overlain with superficial deposits of clay and silt.

## 2.3 Proposed Development

The proposed development consists of a replacement dwelling. The proposed dwelling will have 2 storeys. A Site Plan is provided in Attachment 2.

## 2.4 Local Development Documents

The King's Lynn & West Norfolk Borough Council Local Development Framework - Core Strategy is the adopted Local Plan for the district. Policy CS08 for Sustainable Development states the requirements for flood risk reduction.

The King's Lynn and West Norfolk Borough Council Level 1 Strategic Flood Risk Assessment (SFRA) was prepared in November 2018. The Level 2 SFRA was prepared in March 2019.

The Norfolk LLFA Statutory Consultee Guidance Document has been drafted to support the development of Norfolk County Council (NCC) as Lead Local Flood Authority's (LLFA) role as a statutory consultee to planning and to inform stakeholders in this process such as Local Planning Authorities (LPAs) and developers.

## 2.5 Available Flood Risk Information

An extract from the Environment Agency Flood Map for Planning is provided in Figure 2. The site is located within Flood Zone 3, an area with a high probability of flooding benefitting from defences.



Figure 2 – Environment Agency Flood Map for Planning

The Environment Agency Long Term Flood Risk maps show that:

- the site has a medium risk of flooding from rivers or the sea (annual probability between 1.0% and 3.3%);
- the site has a very low risk of surface water flooding (annual probability less than 0.1%) however the area to the east of the site is at risk; and
- the site is within an area at risk of reservoir flooding when there is also flooding from rivers.

The site is not within one of the settlements considered within the King's Lynn and West Norfolk Borough Council Level 2 SFRA. As such the Level 1 SFRA maps have been reviewed and they show that:

- the site is in Flood Zone 3a;
- the site is not at risk during a 1% annual probability (1 in 100 chance each year) fluvial event including allowance for climate change;
- the site is at risk during a 0.5% annual probability (1 in 200 chance each year) tidal event including allowance for climate change;
- the site is not at risk of surface water flooding including allowance for climate change;
- the site is not susceptible to groundwater flooding;
- the site is at risk from a tidal breach; and
- the site is not at risk from reservoir flooding.

The 2015 Tidal Hazard Mapping merged model extents provided by the Environment Agency have been used to estimate the flood level during a breach.

### **3.0 FLOOD RISK VULNERABILITY**

#### **3.1 The Sequential and Exception Test**

The NPPF requires the application of a Sequential Test to ensure that new development is in areas with the lowest probability of flooding.

The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

#### **3.2 Vulnerability Classification**

Table 2 of the PPG Flood Risk and Coastal Change categorises different types of uses and development according to their vulnerability to flood risk. The proposed development is covered by the description of buildings used for dwellings and is classified as 'More Vulnerable'.

Table 3 of the PPG Flood Risk and Coastal Change sets out Flood Risk Vulnerability and flood zone 'compatibility'. The site is in Flood Zone 3 and the development is 'More Vulnerable' therefore it is necessary to complete the Exception Test.

PPG Flood Risk and Coastal Change defines that the lifetime of the development in terms of flood risk and coastal change is 100 years.

#### **3.3 Application of the Sequential and Exception Test**

It is for the Local Planning Authority, using the evidence provided and taking advice from the Environment Agency as appropriate, to consider whether an application passes the Sequential Test.

The proposed development is a replacement dwelling and therefore it is not necessary to apply the Sequential Test to the development.

The Exception Test requires consideration of the wider sustainability benefits of a development and that the development would be safe and residual risks managed.

The Core Strategy defines the housing distribution for new dwellings across the Borough. Small Villages and hamlets have a target of at least 351 new dwellings over the period from 2011 to 2026. The proposed dwelling will contribute to this target.

Section 5 of this Flood Risk Assessment describes the flood mitigation measures and the management of the residual risks, demonstrating that this development will be safe and not increase flood risk elsewhere. The development is considered to pass the Exception Test.

## **4.0 SITE SPECIFIC FLOOD RISK**

### **4.1 Local Flood Assets**

The site is 100m west of the River Great Ouse. The site is protected by the Great Ouse tidal defences. The River Great Ouse is the responsibility of the Environment Agency.

There is a long-term strategy for the maintenance of the Environment Agency defences which is reviewed and updated periodically.

There is an extensive local drainage network managed by King's Lynn IDB. There is an IDB Watercourse on the north western boundary of the site. The site, and surrounding land, is part of the Mary Magdalen catchment which drains by gravity to the Crabbs Abbey Pumping Station which discharges to the River Great Ouse.

During the operation and maintenance of its pumping stations, associated structures, and channel systems, the IDB seeks to maintain a general standard capable of providing flood protection to its district. A routine maintenance programme is in place to ensure that the Boards assets are commensurate with the standard of protection that is sought.

The site is approximately 2.3km east of the Middle Level Main Drain, an embanked channel which flows to St German Pumping Station to discharge to the tidal River Great Ouse. The Middle Level Main Drain is the responsibility of the Middle Level Commissioners.

Current maintenance standards of the King's Lynn IDB's, the Middle Level Commissioners and the Environment Agency's defences are generally good.

### **4.2 Sources of Flooding**

The potential sources of flooding that have been identified during this assessment are:

- local blockages in the drainage system;
- an event in the local drainage network that exceeds the standard of protection;
- failure of the outfall to the Crabbe Abbey Pumping Station;
- overtopping and/or breaching of the River Great Ouse tidal defences; and
- overtopping and/or breaching of the Middle Level Main Drain.

The likelihood of overtopping and/or breach of the Middle Level Main Drain is considered less likely and less significant than a tidal breach. As such it has not been considered further in this assessment.

### **4.3 Probability of Flooding**

The probability of flooding associated with blockages in the IDB's drainage system is low due to the maintenance standards already achieved and managed by the IDB.



Through the operation and maintenance of the pumping stations and the channel system the Board seek to maintain a general standard capable to providing flood protection to agricultural land and developed areas of 1 in 20 years and 1 in 100 years respectively. The risk associated with flood events that exceed the standard of protection provided is lowered due to the King's Lynn IDB main drains incorporating freeboard. This freeboard provides storage during the exceedance events.

St Germans Pumping Station offers protection against the 1% annual probability (1 in 100 chance each year) fluvial event with an allowance for climate change. The St German Pumping Station was replaced in 2011 so that a standard of protection against the 1% annual probability (1 in 100 chance each year) event could be maintained.

The site benefits from defences on the River Great Ouse that provide protection during an event with a 0.5% annual probability (1 in 200 chance each year).

#### 4.4 Historic Flooding

During the preparation of this assessment, no evidence was discovered of the site being flooded.

#### 4.5 Climate Change

Climate change is likely to impact the site through increased rainfall intensity and duration affecting the local drainage network and increased flood levels in the River Great Ouse.

The SFRA maps show that the site is at risk during the 0.5% annual probability (1 in 200 chance each year) tidal event with climate change. During an event of this magnitude in the River Great Ouse there is likely to be some overtopping of the defences.

In summary the existing systems and defences are appropriate for the design life of the development (i.e., 100 years).

#### 4.6 Residual Risk

The SFRA indicates that there is a residual risk of flooding at the site during a breach.

The Environment Agency Hazard Mapping indicates the maximum flood depths in the event of a combined breach. The maximum flood depth at the site for the 0.5% annual probability (1 in 200 chance each year) event with climate change is between 1.0m and 2.0m as shown in Figure 3.

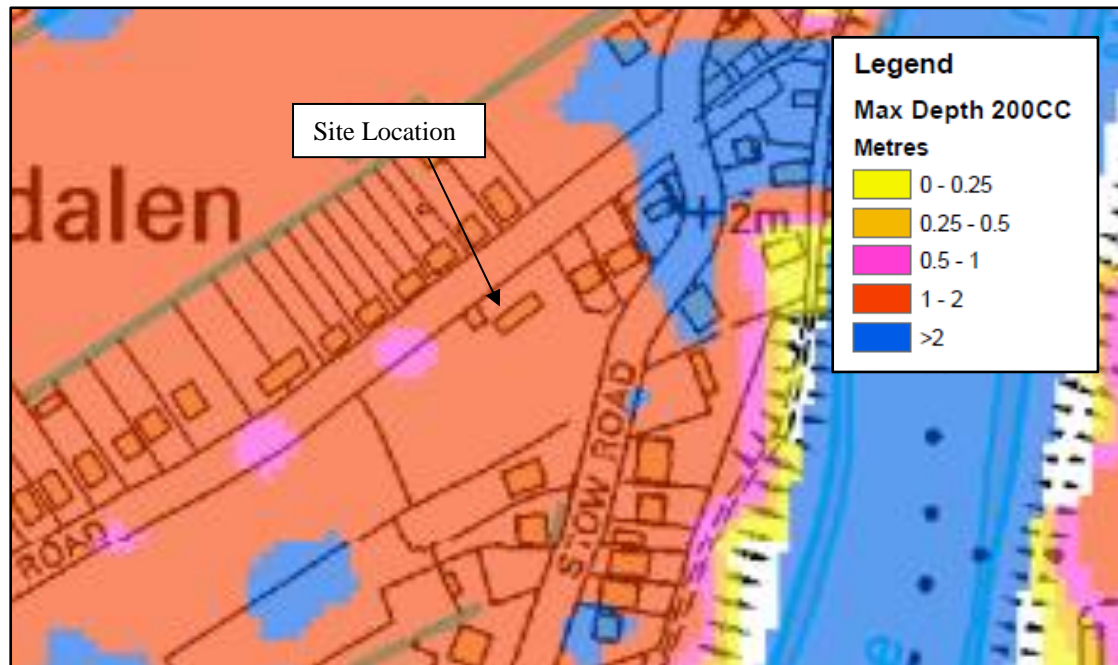


Figure 3 – Environment Agency Hazard Map Maximum Flood Depth

The 2015 Tidal Hazard Mapping merged model extents provided by the Environment Agency have been used to estimate the breach flood level. At four locations which are within the area at risk the tidal hazard mapping model estimated depth and LiDAR ground level have been used to estimate the flood level.

Point	Easting	Northing	Ground Level	Depth	Water Level
1	559680	310730	+1.50m OD	1.61m	3.11m OD
2	559700	310700	+1.21m OD	1.69m	2.90m OD
3	559660	310680	+1.21m OD	1.62m	2.83m OD
4	559680	310680	+1.35m OD	1.60m	2.95m OD

Table 1 – Estimated Flood Water Level during a breach

The approximate locations of the Points are shown in Figure 4.

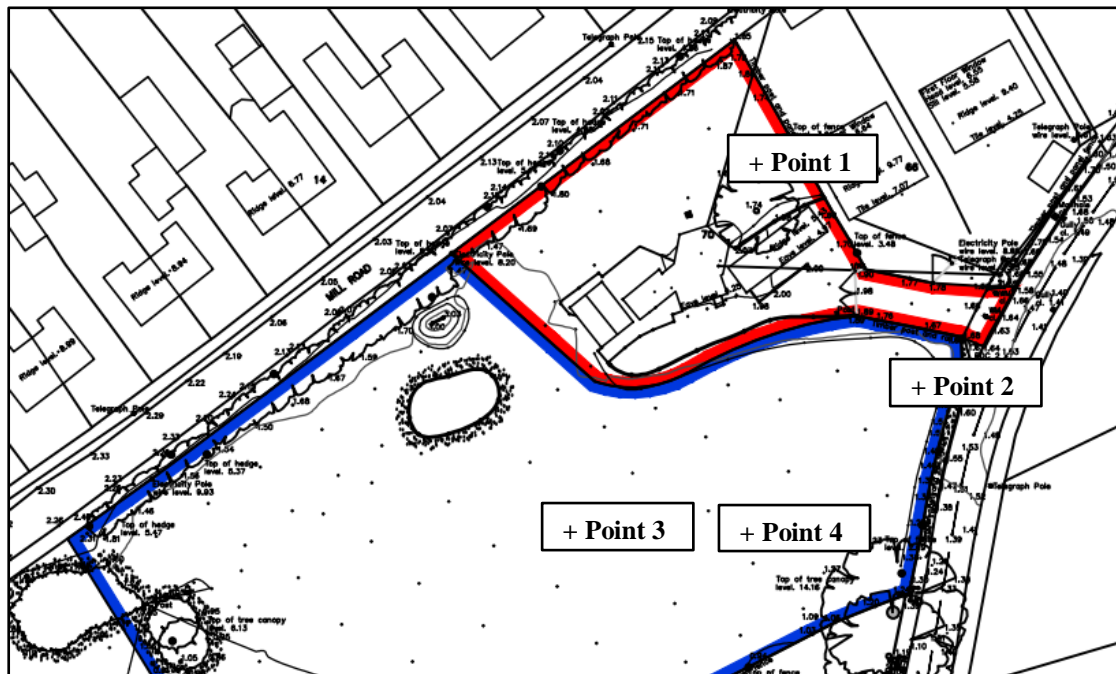


Figure 4 – Locations Used to Estimate Flood Water Level During a Breach

The analysis shows that a conservative estimate of the flood level at the site is +3.1m OD. Based upon the ground levels around the proposed development being +1.7m OD a maximum flood depth of 1.4m can be estimated.

## 5.0 FLOOD RISK MITIGATION

### 5.1 Summary of Risks

The probability of this development flooding from localised drainage systems is low. Failure of Crabbe Abbey Pumping Station could lead to an increased level of risk at the site.

The probability of the site flooding from any Environment Agency system is less than 0.5% annual probability (1 in 200 chance each year) because of the standards of the existing flood defence systems. Over time there will be a gradual increase in risk to the site due to climate change. During the design life of the development it is anticipated that the site would be affected through overtopping.

There is a residual risk to the site should there be a breach of the Environment Agency tidal defences. The peak flood level that could occur at the site due to combined breaches is +3.1m OD, a depth of 1.4m in the vicinity of the proposed development.

The proposed arrangement increases the impermeable area so there will be an increased volume of surface water. This has the potential to increase flood risk.

### 5.2 Mitigation Measures

The NPPF Planning Practice Guidance (PPG) on Flood Risk and Coastal Change provides direction regarding Making Development Safe from Flood Risk. Paragraphs 059 and 060 advise on flood resistance and flood resilience. The PPG states that resistance and resilience measures may be suitable in some circumstances. One example given when they are suitable is as a measure to manage residual flood risk. The mitigation measures required at this site are to manage the residual risk from a breach in the defences therefore flood resistance and resilience are appropriate.

The overall height of the dwelling is constrained by the proximity of adjoining dwellings. It is recommended that the finished floor level of the dwelling should be +2.5m OD and that there is 0.6m of flood resistant and flood resilient construction above. The finished floor level will be approximately 0.8m above ground level.

The risk of flooding is lowered as the proposed dwellings have 2 storeys with all sleeping accommodation on the first floor.

The developer should ensure that the eventual occupier of the dwelling is sufficiently aware of the risk of flooding, and the standard of the existing defences. The Environment Agency operates a flood warning system for properties at risk of flooding to enable householders to protect life or take actions to manage the effect of flooding on property. Floodline Warnings Service is a national system run by the Environment Agency for broadcasting flooding warnings. The occupier of the dwellings should register to receive flood warnings.

During an extreme event it is anticipated that sufficient time would be available to take precautionary actions to limit the potential impact of flooding.

Failure of Crabbe Abbey Pumping Station may occur. However, in these circumstances, if conditions were such to put properties and land at risk of flooding, the Internal Drainage Board would take emergency action to maintain the drainage level of service by using temporary pumping equipment.

## 6.0 CONCLUSIONS

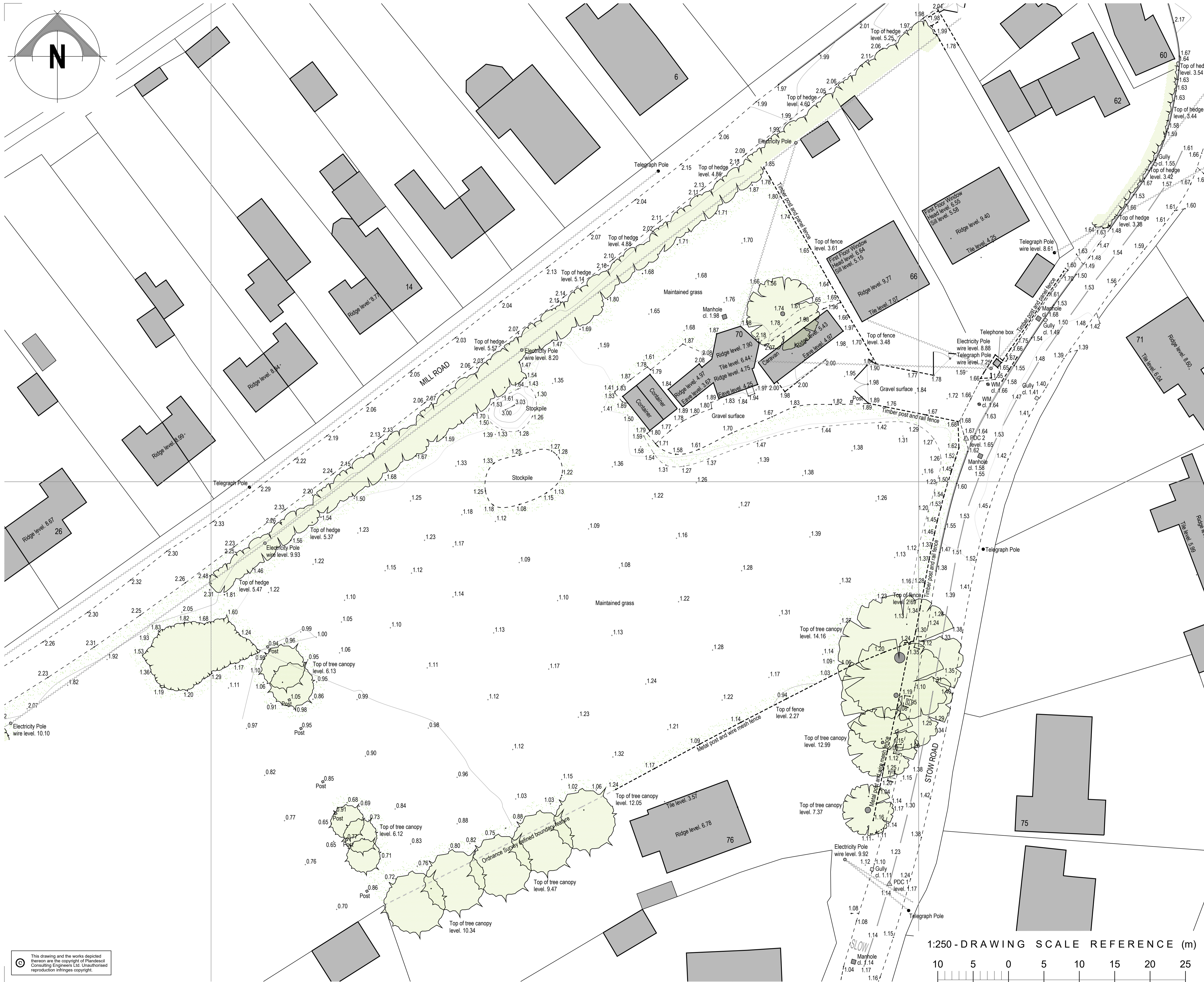
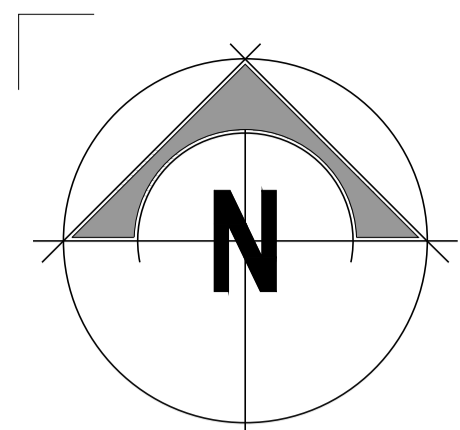
As a result of the assessment, the following conclusions have been reached.

- The proposed development consists of a 2 storey replacement dwelling at 70 Stow Road, Wiggenhall St Mary Magdalen.
- The site is located within an Internal Drainage Board catchment and through the operation and maintenance of the pumping stations and the channel system the Board seek to maintain a general standard capable to providing flood protection to agricultural land and developed areas of 1 in 20 and 1 in 100 years respectively.
- The proposed development is in Flood Zone 3. The site benefits from defences on the Tidal River Great Ouse that provide protection against the 0.5% annual probability (1 in 200 chance each year) event. When climate change is considered the site is at risk from overtopping.
- During a breach of the tidal defences the maximum flood level at the site is +3.1m OD, a flood depth of 1.4m in the area of the replacement dwelling.
- The finished floor level of the dwelling should be at +2.5m OD with 0.6m of flood resistant and flood resilient construction above.
- The development passes the Sequential Test and Exception Test and is therefore suitable for the proposed location.

## **ATTACHMENT 1**

**TOPOGRAPHICAL SURVEY (Dwg 28106/001)**





**Survey Notes**

- All levels and coordinates relate to a GPS derived datum. Control was established using Ordnance Survey's Active GPS Network OSGB36. Translated from ETRS89 using OSGM15 and OSTN15 models. Positions were recorded using Trimble R12 GPS RTK equipment using the VRS correction service. Control station information may not be shown on this drawing, please contact Plandescil Ltd should you require assistance.
- All levels shown adjacent to kerb lines have been taken at channel face unless stated otherwise.
- Not all existing services are necessarily shown on this drawing. All services that could be located at the time of the survey have been positioned but should be taken as approximate and used as a guide to their presence. Clarification of all underground routes should be confirmed by the individual service provider and prior to project construction.
- Land ownership boundaries and legal title extents have not been identified in this survey. Fences have been surveyed at post positions and changes of direction. Hedges located at face or line of main stem, see drawing note to specify.
- Not all trees have been surveyed, trees shown as below have been fixed by trunk position. Level relates to ground at base of trunk.
  - Example of surveyed tree, species not recorded unless stated. Trunk diameter shown to scale, average canopy spread surveyed and plotted to scale.
  - Areas of dense trees and vegetation have been shown by the approximate ground coverage and have no trunk positioning.
  - Areas of non surveyed planting, positions shown indicatively only, or perimeter surveyed where level information is present.
- This survey has been merged with Ordnance Survey Master Map Data. Boundaries and physical objects have only been fixed where level information is present. See Licence details No. AL100005917 All Ordnance Survey mapping is subject to their own accuracy and tolerances.
- The information presented in this survey is a recording of what was present and accessible at the time of survey. Areas of the site not surveyed are represented by Ordnance Survey mapping.
- The original survey drawing is produced to scale, printed copies to be scaled at users risk. If any stated dimensions are not clear please contact Plandescil Ltd for assistance.

**Survey Control Station Table**

Station Ref.	Easting	Northing	Level m. AD	Description
PDC1	559695.854	310643.176	1.17	Survey Nail
PDC2	559706.706	310706.084	1.65	Survey Nail

See notes for description of site datum and value

Rev	Date	Chkd	Description
0	16.03.22	CSJ	First Issue



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civil / structural / environmental / surveying

Client  
**Vertex Architecture**

Project  
**70 Stow Road  
Wiggenhall St Mary Magdalen  
King's Lynn. PE34 3DJ**

Drawing Title  
**Topographical Survey**

Scale	U.N.O.	Date	Drawn By
1:250 (A1)		March 2022	JMW
Drawing No.	28106/001	Rev	0

1:250 - DRAWING SCALE REFERENCE (m)

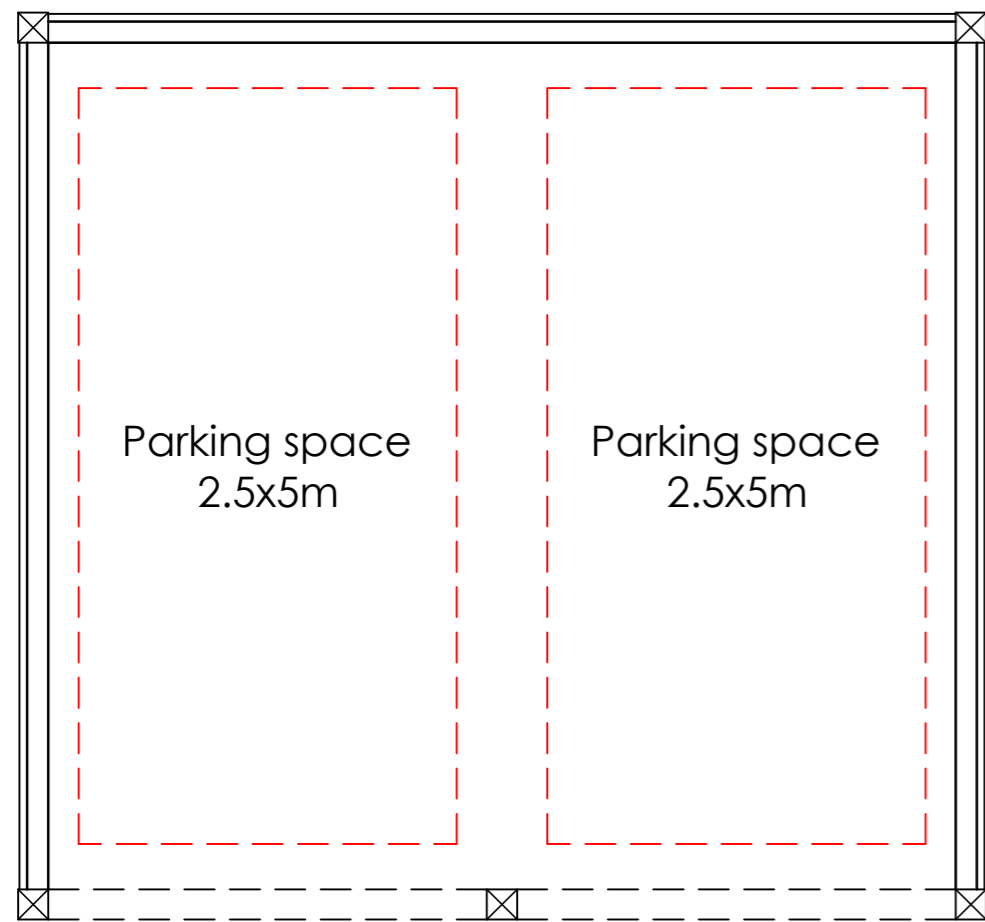
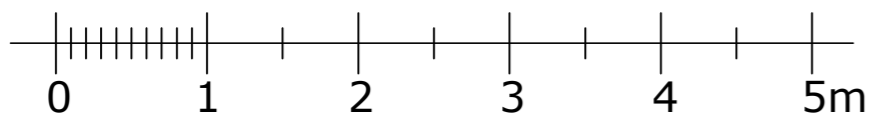


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**ATTACHMENT 2**

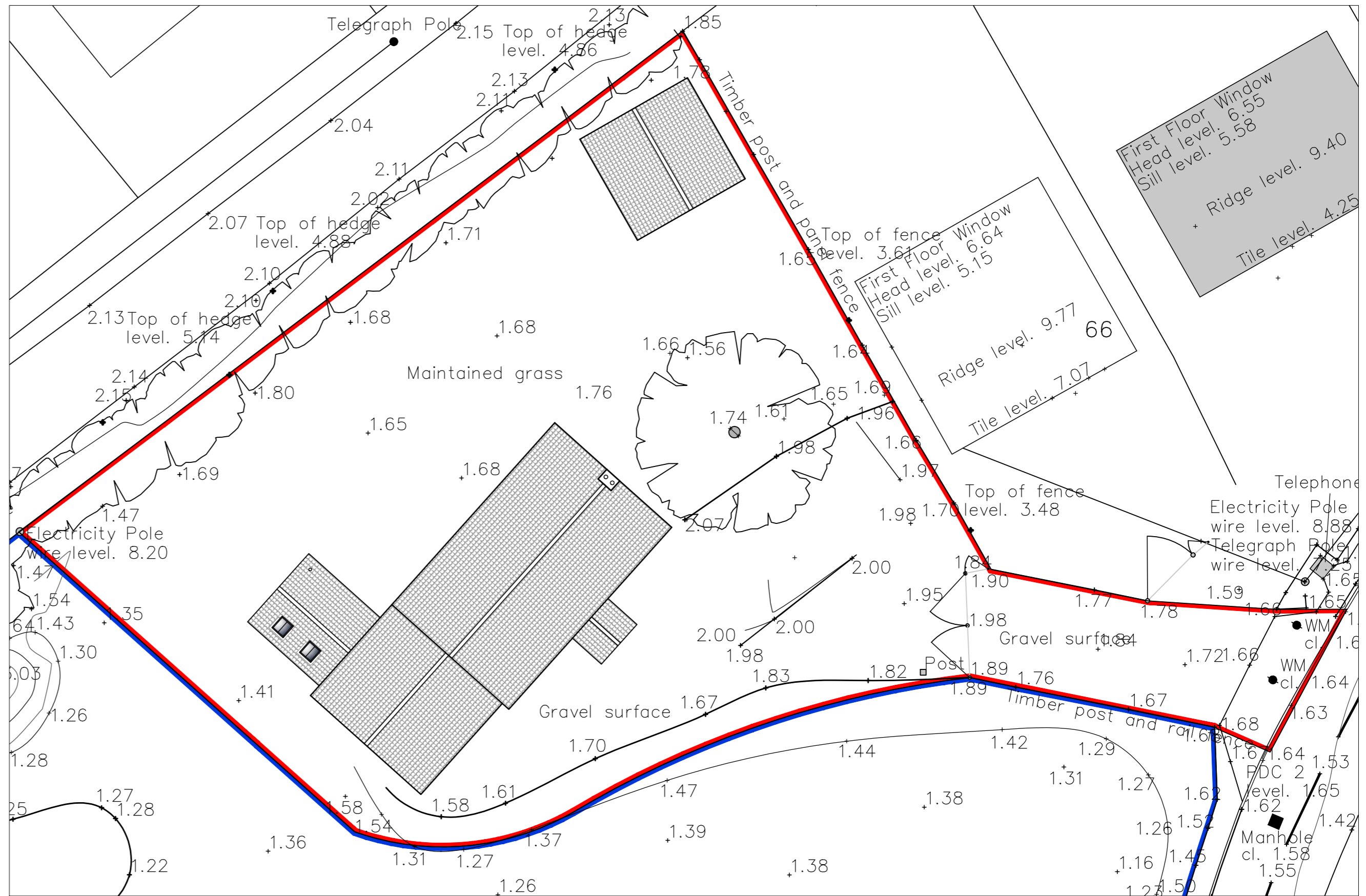
**SITE PLANS AND GARAGE PLANS  
(DWG 22020 03 A)**



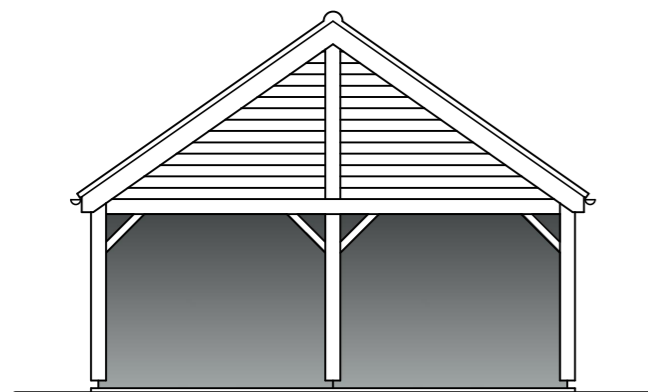
Ground floor plan 1:50

Materials to be;

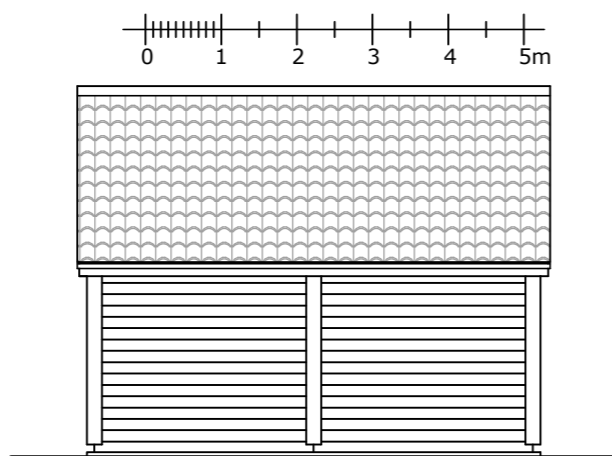
- Red clay pan tiles
- Black UPVC guttering
- Natural oak posts
- Timber cladding



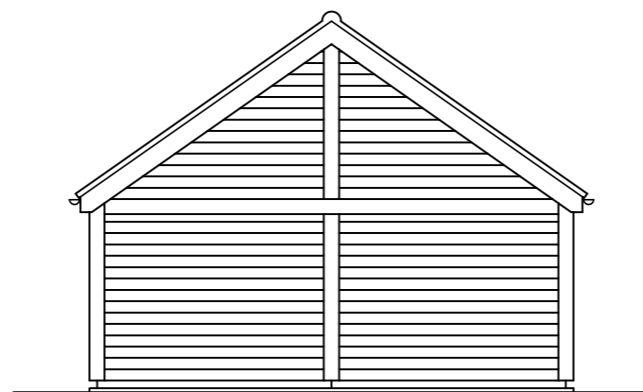
Proposed Site Plan 1:200



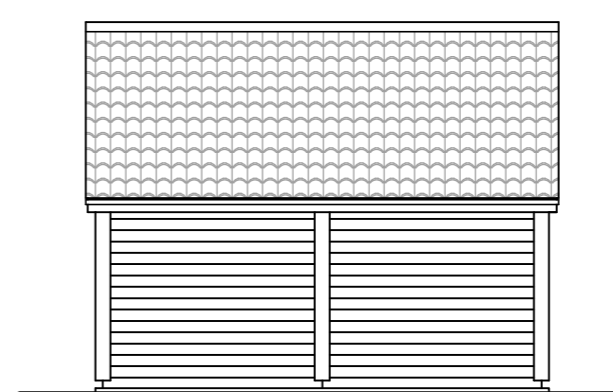
South-East Elevation 1:100




North-East Elevation



North-West Elevation



South-West Elevation

Revision:	Date:	Description:
 <b>VERTEX ARCHITECTURE</b> <small>Info@vertexarchitecture.co.uk   01485 532286   www.vertexarchitecture.co.uk</small> <small>2-3 Northgate Precinct, Hunstanton, Norfolk PE36 6EA</small>		
Project: 70 Stow Road, Wiggshall St Mary Magdalen, Kings Lynn, PE34 3DJ		
Subject: Replacement Dwelling Proposed Garage Plans & Elevations		
Date: May 2022		Scale: 1:50, 1:100 @A2
Project No.: <b>22020</b>	Drawing No.: <b>03</b>	Revision: <b>A</b>