

**PROPOSED CONVERSION OF TWO BARNs  
TO FORM TWO DWELLINGS ON LAND AT  
COURT FARM, WEST WOODLANDS,  
FROME**

FLOOD RISK ASSESSMENT

J-1180-Rev.01



# PROPOSED CONVERSION OF TWO BARNES TO FORM TWO DWELLINGS ON LAND AT COURT FARM, WEST WOODLANDS, FROME

## FLOOD RISK ASSESSMENT

Report No.	Issue Detail	Originator	Date	Checked by	Date
J-1180	01	JB	29/11/2019	JB	29/11/2019

**For:** Mr. Mark Knight  
The Laurels  
Cooks Lane  
West Cranmore  
Somerset  
BA4 4RH

**Job No:** J-1180  
**Date:** November 2019  
**Edition:** 01

# CONTENTS

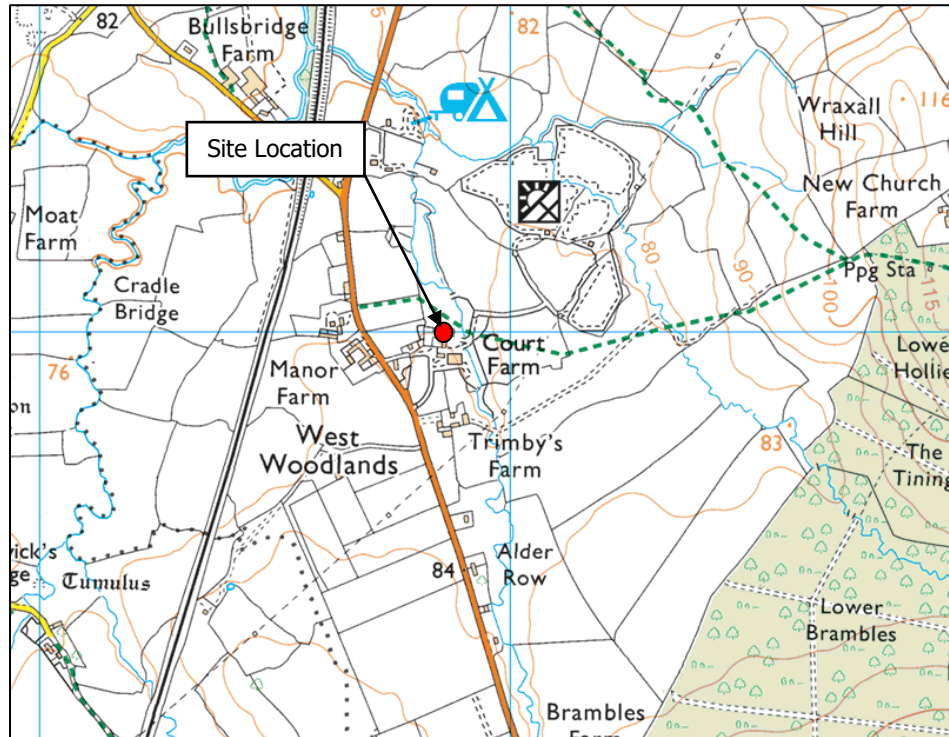
<b>Item</b>	<b>Content</b>	<b>Page No.</b>
1.0	Introduction	1
	<ul style="list-style-type: none"><li>• Site Description</li><li>• Existing Usage</li><li>• Proposed Usage</li><li>• Flood Risk Context</li></ul>	2 2 2 2
2.0	Flood Mechanisms	3
	<ul style="list-style-type: none"><li>• Fluvial (River) Flooding</li><li>• Groundwater Flooding</li><li>• Overland Sheet Flow</li><li>• Tidal Flooding</li><li>• Flooding as a Result of Development</li></ul>	3 3 4 5 5
3.0	Flood Flow Estimation	6
	<ul style="list-style-type: none"><li>• Catchment</li><li>• Methodology</li></ul>	6 6
4.0	HEC-RAS Hydraulic Modelling	8
	<ul style="list-style-type: none"><li>• HEC-RAS Data Inputs</li><li>• Modelling Assumptions &amp; Methodology</li><li>• Modelling Results</li><li>• Sensitivity Analysis</li><li>• Flood Summary</li></ul>	8 8 8 9 9
5.0	Access/Egress	10
6.0	Mitigation Measures	11
7.0	Flood Risk Policy	13
8.0	Summary	14

## APPENDICES

Appendix A	Site Survey Showing Floodplain Extents
Appendix B	Calculations
Appendix C	Proposed Site Plan

### 1.0 INTRODUCTION

Mark Knight is proposing to convert two barns (Barns E and F) into residential accommodation. The site barns are located on the south-eastern side of Court Farm, West Woodlands, which is approximately 4km south of Frome, as shown on the location plan and boundary plan provided as **Figures 1 & 2** below.



**Figure 1 – Location Plan**



**Figure 2 – Aerial Image of the Barns**

**Engineering and Development Solutions Ltd**

Registered Office: Engineering and Development Solutions, Unit 10 Penstraze Business Centre, Truro, Cornwall, TR4 8PN  
Registered in England and Wales No. 10467487  
Phone 01872 306311 Mobile 07973816457

- **Site Description**

The site currently comprises a collection of barns and former farmyard on land at Court Farm, West Woodlands. The Ordnance Survey Grid Reference for the site is ST 77880 43944.

The main access for the site is on its western boundary via an access track, which also serves as vehicular access to a small number of dwellings and barns; the road junction with the B3092 is situated approximately 130m west of the site. The eastern boundary of the site is formed by the Maiden Bradley Brook and agricultural fields and wooded areas beyond; to the north, south and west of the site is agricultural fields and a small number of agricultural and residential dwellings.

The topographic survey, included in **Appendix A**, indicates that the site slopes generally from west to east, towards the watercourse. The site slopes from the access road from elevations of around 79.70m AOD to 79.30m AOD around the barns, which then falls to 77.82m AOD on the eastern boundary of the site.

In the wider context, Maiden Bradley Brook joins the River Frome approximately 700m north of the site. The topography of the land is defined by the stream and agricultural fields on the hillsides.

- **Existing Usage**

The area proposed for redevelopment currently consists of two barns located in the south-eastern part of Court Farm.

- **Proposed Usage**

The proposal is to convert the two barns into two dwellings.

- **Flood Risk Context**

Reference to the Environment Agency (EA) indicative mapping shows that the site is adjacent to the Maiden Bradley Brook and appears to be partly within the associated Flood Zone 2/3 extents, therefore a Flood Risk Assessment (FRA) in accordance with the National Policy Framework on Planning and Flood Risk is required to inform the application.

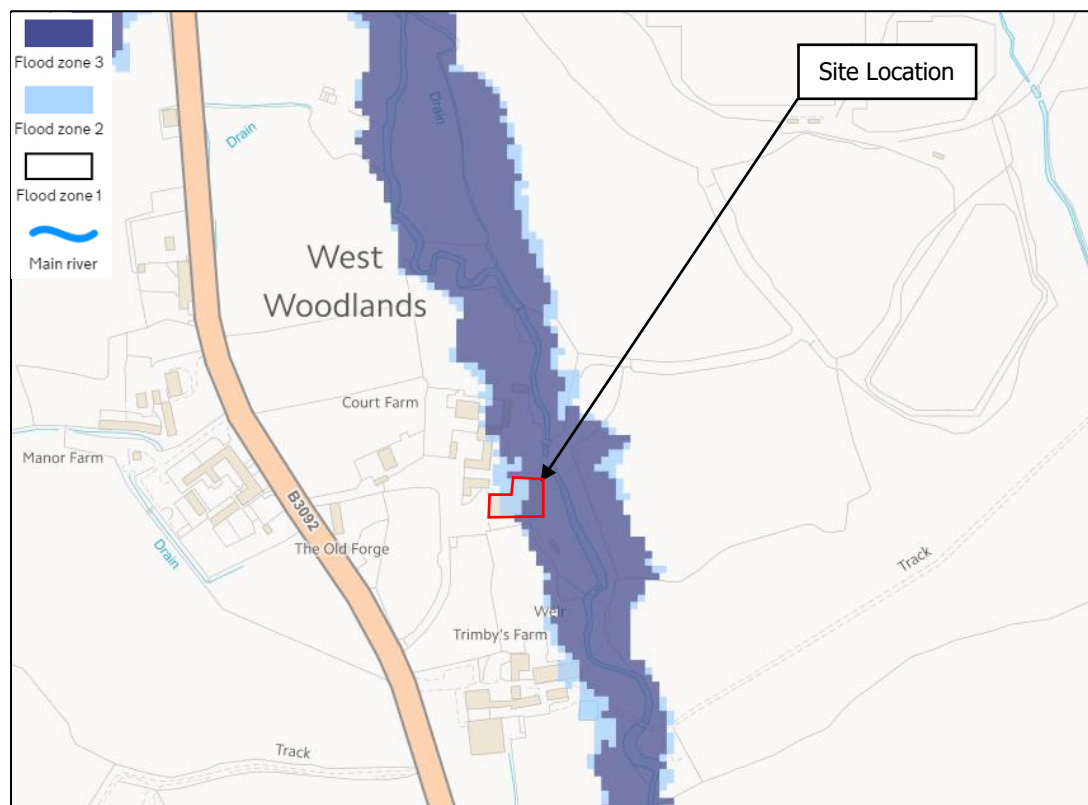
The primary aim of the FRA will be to investigate the extent of the floodplain on the site for a range of return period events and flood scenarios.

To address this requirement, Engineering & Development Solutions (EDS) have been commissioned to prepare an FRA for the proposed development, in accordance with the best practice principles of the National Planning Policy Framework (NPPF), 'West of England Sustainable Drainage Developers Guide' and Planning Practice Guidance (PPG). The report details the findings of this study.

## 2.0 FLOOD MECHANISMS

- **Fluvial (River) Flooding**

Analysis of the Environment Agency indicative flood map shows that part of the site appears to be within Flood Zone 2/3, indicating a medium/high probability of fluvial flooding although it should be noted that this is based on coarse JFLOW data. As such, fluvial flooding is investigated in more detail in **Sections 3 & 4** of this report.

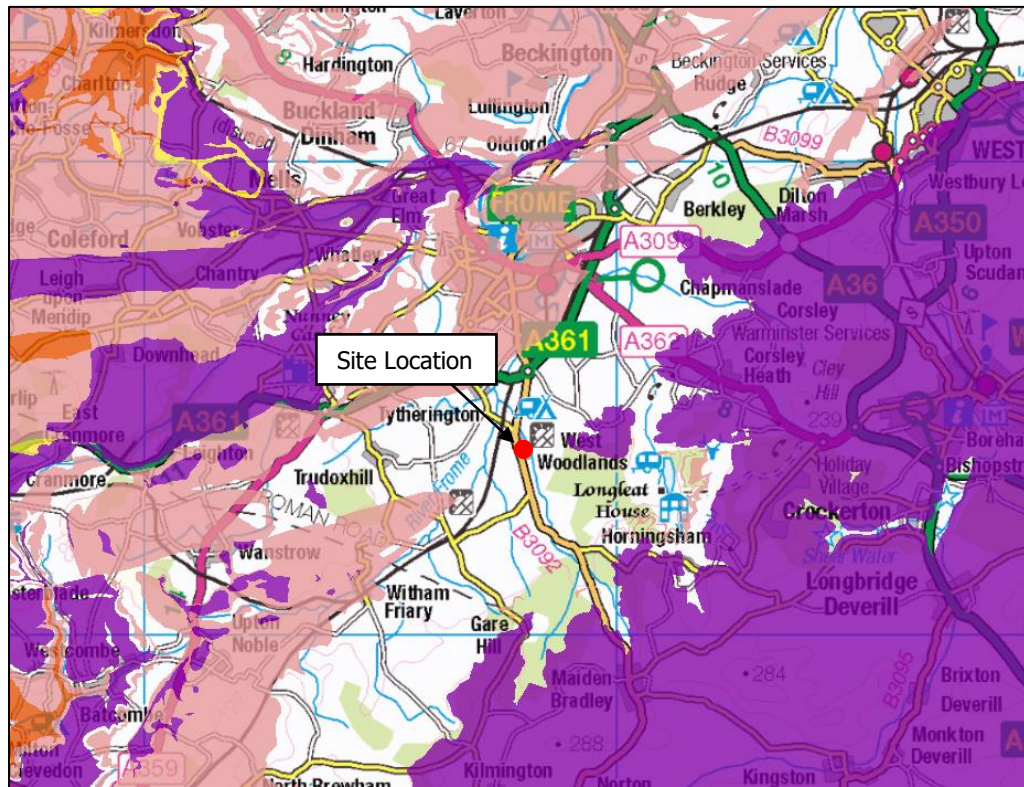


**Figure 3 – Environment Agency Flood Map for Planning (Rivers and Sea) Extract**

Several other possible flooding mechanisms have been considered at the site and are discussed below.

- **Groundwater Flooding**

The site is located on sloping land which falls towards the Maiden Bradley Brook. It is expected that the watercourse will act as a sump that will drain groundwater away from the site. The Environment Agency/BGS map extract below shows aquifer designations of bedrock and superficial deposits.



**Figure 4 – Environment Agency Aquifer Map**

The geology at the site is classified as an unproductive aquifer, which means there is limited potential for groundwater flooding to occur. Further to this, as the site is located near to the watercourse, the groundwater level beneath the site is likely to be largely controlled by this feature, which would act as a sump to drain water in the ground away from the site. Given the above it is anticipated that the site is not at risk from groundwater flooding, therefore this mechanism is not considered any further in this report.

- **Overland Sheet Flow**

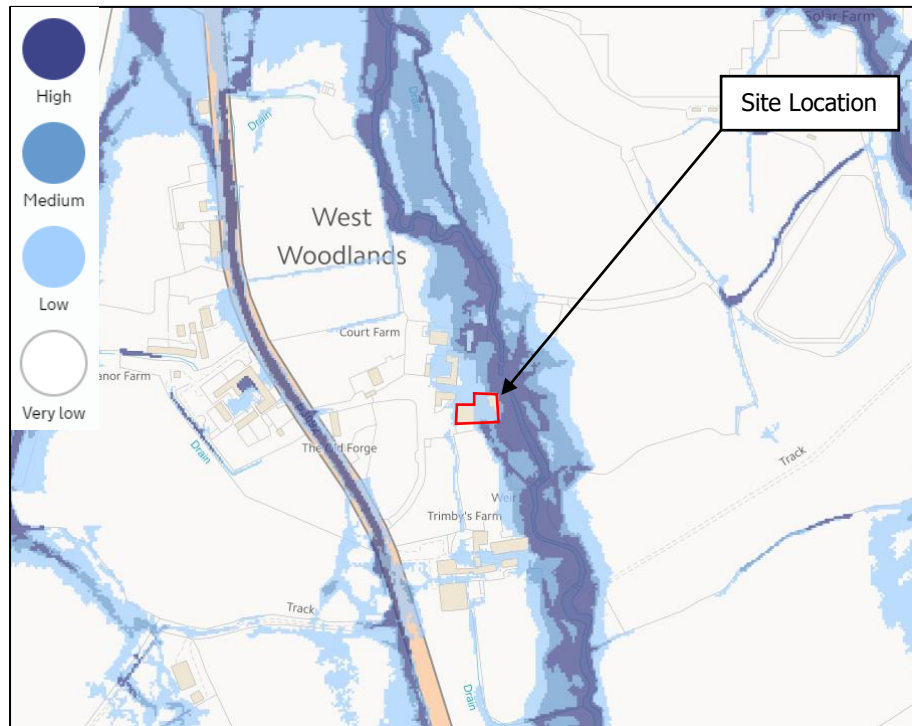
The site is situated within a rural location, with only a few dwellings immediately upstream to the south of the site and agricultural fields beyond. It is considered that there is little potential for significant overland flows to originate from the south of the site. Overland flows originating from the remaining directions would be intercepted by the stream and conveyed past the site.

The EA map extract, **Figure 5** below, shows the risk of surface water flooding for the area. It indicates that the western part of the site is at very low to low risk of flooding from surface water. The eastern part of the site is at medium to high risk, although this is in fact likely to show flooding from the brook itself rather than surface water flooding alone.

It is conceivable that the land in the eastern part of the site may experience surface water flooding during extreme events, however given the proximity of the Maiden Bradley Brook and potential for fluvial flooding, any mitigation measures against fluvial flooding would also relate to surface water flooding.

**Engineering and Development Solutions Ltd**

Registered Office: Engineering and Development Solutions, Unit 10 Penstraze Business Centre, Truro, Cornwall, TR4 8PN  
Registered in England and Wales No. 10467487  
Phone 01872 306311 Mobile 07973816457



**Figure 5 – EA Flood Risk from Surface Water Map Extract**

- **Tidal Flooding**

The site is well outside of any areas of tidal influence, located at a minimum elevation of around 77.67m AOD. Given the nature of the site, situated over 44km inland from the coast, tidal flooding has not been considered further within this report.

- **Flooding as a Result of Development**

Developments have the potential to increase flood risk to properties down slope of the proposed development through the introduction of impermeable areas on previously permeable areas. In this case, the proposal is for the conversion of existing buildings and redeveloping an existing yard. There is limited potential to increase runoff from the site where there is no increase in impermeable area and flood risk to third parties will not be increased.

Nonetheless, there is potential to provide betterment by implementing a sustainable surface water drainage system. The site drainage system could utilise SuDS drainage features designed in line with the advice given in 'West of England Sustainable Drainage Developers Guide'. Infiltration drainage is unlikely to be feasible this close to the brook. Therefore, an attenuation system with a controlled discharge to the stream could be used.

**Engineering and Development Solutions Ltd**

Registered Office: Engineering and Development Solutions, Unit 10 Penstraze Business Centre, Truro, Cornwall, TR4 8PN  
Registered in England and Wales No. 10467487  
Phone 01872 306311 Mobile 07973816457



### 3.0 FLOOD FLOW ESTIMATION

Flood flow estimates have been derived for a variety of return period events. The catchment descriptors for the site were obtained from the FEH web service.

- **Catchment**

The catchment at this site encompasses an area of 11.49km<sup>2</sup> according to Flood Estimation Handbook (FEH) catchment descriptors. An extract of the catchment area, including the Maiden Bradley Brook and its minor tributaries, is shown below in **Figure 5**. The catchment is largely rural immediately upstream of the site.



**Figure 5 – Catchment Boundary**

- **Methodology**

The ReFH2 Rainfall Runoff Method has been used to determine flood flows using the software created by the Centre for Ecology & Hydrology, Version 2.1. The ReFH2 method is the most up-to-date method and is currently the industry standard recognised by the Environment Agency.

The catchment descriptors for the site were entered; this resulted in a rural area, which is accurate for the upstream catchment area. A time step of 30 minutes and duration of 7 hours and 30 minutes were used for calculating the design rainfall as recommended as part of the ReFH2 software. **Table 1** below shows the calculated flows for various return period events; full details of the flow calculations are included in **Appendix B**.

<b>Return Period (Year)</b>	<b>Maiden Bradley Brook Flow (m<sup>3</sup>/s)</b>
20	5.81
100	8.73
100 + CC*	12.22
1,000	17.11

\* CC denotes climate change allowance – 100-year peak flow increased by 40%

**Table 1 – ReFH2 Flow Estimates**

#### 4.0 HEC-RAS HYDRAULIC MODELLING

Steady state flood modelling of the on-site watercourse has been carried out to assess the extent of the flood zones on the site, using HEC-RAS Version 5.0.7 released in March 2019 developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Centre. The modelling has been carried out to assess the likely extents, depths and velocities of flood water within the site.

- **HEC-RAS Data Inputs**

The model has been created using the topographic survey. A total of 6no. cross sections were entered in the model. Cross sections are numbered from section 10 at the upstream end of the model down to section 5 at the downstream end.

The flood flow estimates defined in **Section 4** for the incoming flow of the Maiden Bradley Brook entered the model at the uppermost Cross Section.

##### Flow Boundary Conditions – Maiden Bradley Brook

Upstream: Normal Depth, Gradient of Channel 0.0028

Downstream: Normal Depth, Gradient of Channel 0.0028

##### Geometric Data

Manning's n values: Conservative n values were used to represent the worst-case scenario of heavy vegetation cover within the channel, and un-kept floodplain areas. Values were taken from the HEC-RAS manual as follows.

- Channel – Clean, winding, some pools and shoals – 0.040
- Left bank – Floodplains, pasture no brush, high grass – 0.035
- Right bank – Floodplains, pasture no brush, high grass – 0.035

The HEC-RAS files for this project are available upon request to EDS.

- **Modelling Assumptions & Methodology**

The aim of this modelling study is to seek a quantifiable demonstration of the flood risk at the subject site. Rather than providing outputs for all return periods this modelling study focuses principally upon the 1 in 20-year, 1 in 100-year flood event including a 40% allowance for climate change and the 1 in 1,000-year flood event. Therefore, flood zone extents will be indicative of Flood Zones 2 & 3 as defined in the Planning Practice Guidance (PPG). Values for an 85% climate change scenario are included in **Appendix B**.

For the 1 in 20-year 1 in 100-year + 40% climate change and 1 in 1,000-year flood events the fluvial floodplain extent has been exported. The floodplains have been plotted by translating flood levels at each cross section onto the survey, with areas between sections interpolated by examination of ground levels and falls. Flood levels and velocities for each cross section have also been extracted directly from the model.

- **Modelling Results**

The resulting floodplain drawing is included on Drawing 5001 in **Appendix A** which shows the 1 in 20-year, 1 in 100-year and the 1 in 1,000-year floodplains. Tabulated HEC-RAS results are included in **Appendix B**.

**Engineering and Development Solutions Ltd**

### Floodplains across the subject site

A summary of the flood levels at the site, is presented below in **Table 2**. The table lists the estimated flood levels at Cross Sections 9 & 8, which are the closest cross sections to barns E and F. In-channel flow velocities calculated by the HEC-RAS model have also been listed.

<b>Cross Section</b>	<b>Fluvial Event (Year)</b>	<b>Water Level (m)</b>	<b>Channel Velocity (m/s)</b>
9	20	78.90	0.94
9	100	79.04	1.18
9	100 + CC (40%)	79.17	1.41
9	1,000	79.43	1.20
8	20	78.83	0.55
8	100	78.94	0.70
8	100 + CC (40%)	78.97	0.94
8	1,000	79.04	1.15

**Table 2 – Summary of HEC-RAS Results**

The full set of results is included in **Appendix B**.

- **Sensitivity Analysis**

A sensitivity analysis has been undertaken for the site. The Manning 'n' values have been increased globally across the model by 0.01. This generally results in an increase in flood levels of between 0 to 0.21m across the model. A freeboard allowance of 600mm applied to the design flood level will account for any model sensitivity.

- **Flood Summary**

The flood model indicates that in all flood events considered, channel capacity is exceeded to various extents near to the site. For the present day 1 in 20-year and 1 in 100-year fluvial flood events, the channel capacity is exceeded and water flows over the left river bank opposite the site and does not reach any of the existing buildings on site.

During the present day 1 in 1,000-year out of bank flows are predicted to come close to the south-eastern portion of barn E. The Finished Floor Level (FFL) of each existing barn appears to be above all predicted flood levels, although the land to the east of the barns nearest the stream are predicted to experience flood depths of approximately 100mm – 300mm.

Barns E & F remains outside of the extent of all floods considered in this report including the 1000-year event.

**Engineering and Development Solutions Ltd**

Registered Office: Engineering and Development Solutions, Unit 10 Penstraze Business Centre, Truro, Cornwall, TR4 8PN  
Registered in England and Wales No. 10467487  
Phone 01872 306311 Mobile 07973816457

## **5.0 ACCESS/EGRESS**

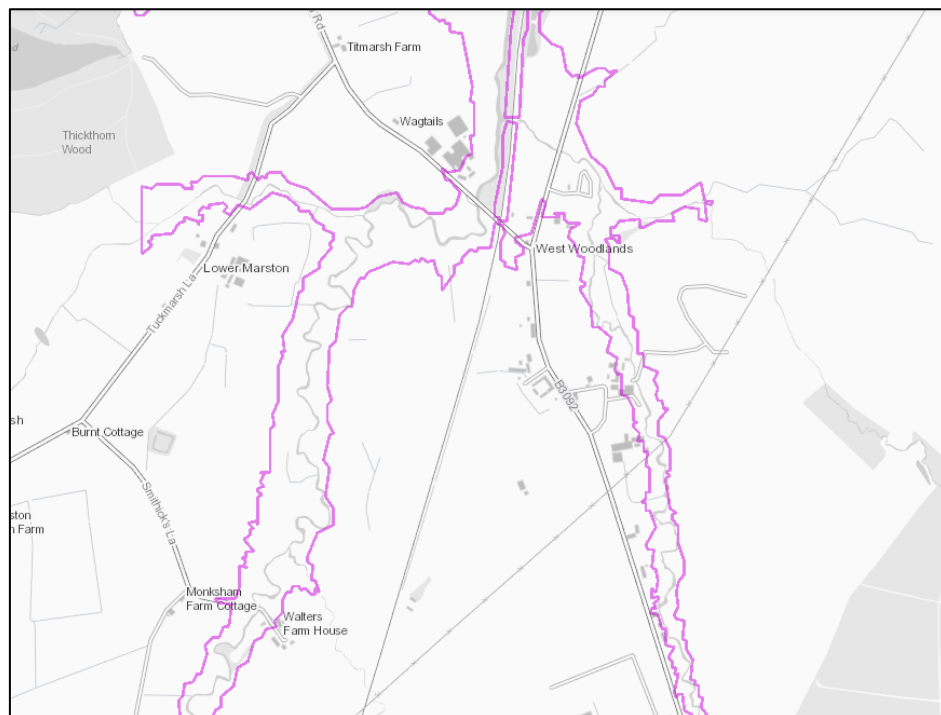
The main access and egress for the site is proposed to be via the existing access road to the west off the B3092.

The proposed driveway has a low point of around 79.50m AOD based on topographic survey information. Therefore, the main access to and from the site is predicted to remain safe, dry and free from flooding during all events considered within this report.

## 6.0 MITIGATION MEASURES

The following mitigation measures are recommended for the proposed development.

- Finished floor levels for the proposed barn conversions (E and F) should be set at a level not lower than 79.77m AOD (100-year fluvial level + 40% climate change + 600mm freeboard).
- If it is not practical to raise the FFLs above 79.77m AOD, the barn conversions should be no lower than the FFL of the existing barns. In this case, flood resistant flooring, finishes and construction techniques should be used where possible to a level of 79.77m AOD. Building materials should have low permeability to keep water out.
- Electrical circuitry and apparatus should be installed above 79.77m AOD. Alternatively, ground based electrical installations should be designed to withstand flooding. Further advice on flood resilient construction is available from Improving Flood Resilience of New Buildings which is available at:  
[www.planningportal.gov.uk/uploads/br/flood\\_performance.pdf](http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf)
- Access for the development to the B3092 on the western boundary will be retained. This area is located above any predicted flood level and would provide a safe access/egress route for occupants if flooding is observed onsite.
- Residents of the site should sign up to the Environment Agency flood alert system for this area. The Environment Agency operate a countrywide flood warning system that covers both river and tidal flooding. In West Woodlands, the system will provide an alert of an extreme flood event which may present a risk to the area.



**Figure 6 Environment Agency Flood Alert Map Extract**

**Engineering and Development Solutions Ltd**

Registered Office: Engineering and Development Solutions, Unit 10 Penstraze Business Centre, Truro, Cornwall, TR4 8PN  
Registered in England and Wales No. 10467487  
Phone 01872 306311 Mobile 07973816457

The flood warning system is free, and the site owner should sign up to the system as soon as the dwelling is occupied. Flood warnings can be issued by phone, text or email. Registration to receive warnings can be either by phone on 0345 988 1188 or online at [www.gov.uk/sign-up-for-flood-warnings](http://www.gov.uk/sign-up-for-flood-warnings)

**7.0 FLOOD RISK POLICY**

Based on the findings of this study, the area proposed for development (Barns E and F) are located within Flood Zone 1 (low probability), and are situated in areas shown as being free from flooding on Drawing 5001 in **Appendix A**.

Safe access egress for the site is available during all extreme fluvial events considered, via the existing access road from the B3092 to the east.

In accordance with Planning Practice Guidance (PPG) Table 2, a residential development 'Buildings used for dwelling houses' is classified as 'More Vulnerable'.

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	✓	x	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	x	x	x

Key: ✓ Development is appropriate.  
 x Development should not be permitted.

**Figure 7 – Extract from PPG - Flood risk vulnerability and flood zone 'compatibility'**

Referring to Table 3 of PPG shown in **Figure 7** above the proposed conversion of the barns (Flood Zone 1) is deemed to be entirely appropriate on a flood risk basis, given the advice outlined in the National Planning Policy Framework.



## 8.0 SUMMARY

Potential mechanisms of flooding have been investigated for the site, which is found to be at low risk of flooding from all sources. However, given the proximity of the Maiden Bradley Brook to the site, further investigation into fluvial flood risks has been undertaken.

A HEC-RAS model has been constructed with a view to quantifying the risk of fluvial flooding to the site.

Flood flow estimates have been undertaken for the 20-year, 100-year, 100-year + 40% CC and 1,000-year events using the industry standard and most up-to-date method ReFH2; the estimated flows are outlined in **Section 3**.

The data from the model has been used to produce a floodplain extents plan for the 20-year, 100-year and 1,000-year flood events at the site (Flood Zones 3 & 2). Drawing 5001 found in **Appendix A** shows the extent of Flood Zones 2 and 3 for the site. A full set of HEC-RAS results are included in **Appendix B** which includes results for the 100-year event with climate change at 40% and 85%.

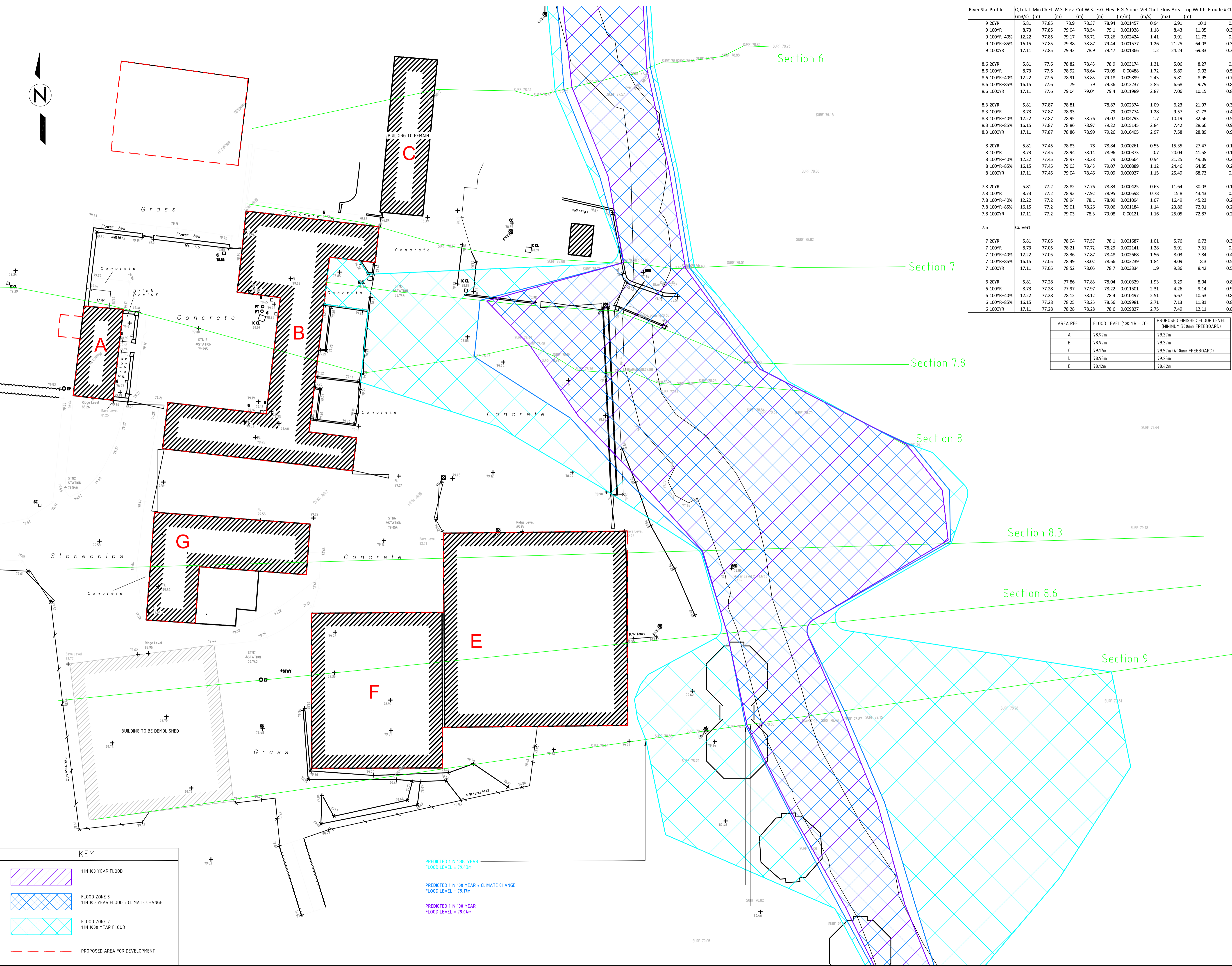
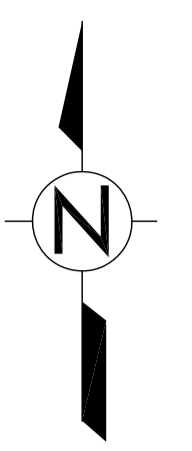
During a 1 in 100-year flood event, at present and including climate change, barns E and F on the north-eastern side of the site remain free from flooding. This area also remains free from flooding during the 1 in 1,000-year event. The land nearest the stream is predicted to experience flooding during the 1 in 1,000-year event at present and 1 in 100-year event including climate change allowance; predicted flood depths are approximately 100mm–300mm.

Access to and from the site via the existing access road off the B3092 would be safe dry and free from flooding during all events considered.

Considering the flood modelling undertaken as part of this study, barns E and F can be concluded as being situated within Flood Zone 1. NPPF states that 'More Vulnerable uses of land are appropriate in this zone' from a flooding perspective.

**APPENDIX A**

**SITE SURVEY SHOWING  
FLOODPLAIN EXTENTS**



**KEY**

	1 IN 100 YEAR FLOOD
	FLOOD ZONE 3 1 IN 100 YEAR FLOOD - CLIMATE CHANGE
	FLOOD ZONE 2 1 IN 100 YEAR FLOOD
	PROPOSED AREA FOR DEVELOPMENT

PREDICTED 1 IN 1000 YEAR FLOOD LEVEL = 79.43m

PREDICTED 1 IN 100 YEAR - CLIMATE CHANGE FLOOD LEVEL = 79.17m

PREDICTED 1 IN 100 YEAR FLOOD LEVEL = 79.04m

River Sta	Profile	Q Total (m <sup>3</sup> /s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. Elev (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m <sup>2</sup> )	Top Width (m)	Froude #	Chl
9	20YR	5.81	77.85	78.9	78.37	78.94	0.001457	0.94	6.91	10.1	0.3	
9	100YR	8.73	77.85	79.04	78.54	79.1	0.001928	1.18	8.43	11.05	0.35	
9	100YR+40%	12.22	77.85	79.17	78.71	79.26	0.002424	1.41	9.91	11.73	0.4	
9	100YR+85%	16.15	77.85	79.38	78.87	79.44	0.001577	1.26	21.25	64.03	0.33	
9	1000YR	17.11	77.85	79.43	78.9	79.47	0.001366	1.2	24.24	69.33	0.31	
8.6	20YR	5.81	77.6	78.82	78.43	78.9	0.003174	1.31	5.06	8.27	0.4	
8.6	100YR	8.73	77.6	78.92	78.64	79.05	0.00488	1.72	5.89	9.02	0.51	
8.6	100YR+40%	12.22	77.6	78.91	78.85	79.18	0.009989	2.43	5.81	8.95	0.72	
8.6	100YR+85%	16.15	77.6	79	79	79.36	0.012337	2.85	6.68	9.79	0.81	
8.6	1000YR	17.11	77.6	79.04	79.04	79.4	0.011989	2.87	7.06	10.15	0.81	
8.3	20YR	5.81	77.87	78.81	78.87	78.87	0.002374	1.09	6.23	21.97	0.37	
8.3	100YR	8.73	77.87	78.93	79	79.07	0.002774	1.28	9.57	31.73	0.41	
8.3	100YR+40%	12.22	77.87	78.95	78.76	79.07	0.004793	1.7	10.19	32.56	0.54	
8.3	100YR+85%	16.15	77.87	78.86	78.97	79.22	0.015145	2.84	7.42	28.66	0.95	
8.3	1000YR	17.11	77.87	78.86	78.99	79.26	0.016405	2.97	7.58	28.89	0.95	
8	20YR	5.81	77.45	78.83	78	78.84	0.000261	0.55	15.35	27.47	0.15	
8	100YR	8.73	77.45	78.94	78.14	78.96	0.00373	0.7	20.04	41.58	0.19	
8	100YR+40%	12.22	77.45	78.97	78.28	79	0.00664	0.94	21.25	49.09	0.25	
8	100YR+85%	16.15	77.45	79.03	78.43	79.07	0.00889	1.12	24.46	64.85	0.29	
8	1000YR	17.11	77.45	79.04	78.46	79.09	0.00927	1.15	25.49	68.73	0.3	
7.8	20YR	5.81	77.2	78.82	77.76	78.83	0.000425	0.63	11.64	30.03	0.17	
7.8	100YR	8.73	77.2	78.93	77.92	78.95	0.00598	0.78	15.8	43.43	0.2	
7.8	100YR+40%	12.22	77.2	78.94	78.1	78.99	0.01094	1.07	16.49	45.23	0.27	
7.8	100YR+85%	16.15	77.2	79.01	78.26	79.06	0.01184	1.14	23.86	72.01	0.28	
7.8	1000YR	17.11	77.2	79.03	78.3	79.08	0.0121	1.16	25.05	72.87	0.29	
7.5	Culvert											
7	20YR	5.81	77.05	78.04	77.57	78.1	0.001687	1.01	5.76	6.73	0.34	
7	100YR	8.73	77.05	78.21	77.72	78.29	0.002141	1.28	6.91	7.31	0.4	
7	100YR+40%	12.22	77.05	78.36	77.87	78.48	0.002668	1.56	8.03	7.84	0.46	
7	100YR+85%	16.15	77.05	78.49	78.02	78.66	0.003239	1.84	9.09	8.3	0.51	
7	1000YR	17.11	77.05	78.52	78.05	78.7	0.003334	1.9	9.36	8.42	0.52	
6	20YR	5.81	77.28	77.86	77.83	78.04	0.010329	1.93	3.29	8.04	0.83	
6	100YR	8.73	77.28	77.97	77.97	78.22	0.011501	2.31	4.26	9.14	0.91	
6	100YR+40%	12.22	77.28	78.12	78.12	78.4	0.010497	2.51	5.67	10.53	0.89	
6	100YR+85%	16.15	77.28	78.25	78.25	78.56	0.009981	2.71	7.13	11.81	0.89	
6	1000YR	17.11	77.28	78.28	78.28	78.6	0.009827	2.75	7.49	12.11	0.89	

AREA REF.	FLOOD LEVEL (100 YR + CC)	PROPOSED FINISHED FLOOR LEVEL (MINIMUM 300mm FREEBOARD)
A	78.97m	79.27m
B	78.97m	79.27m
C	79.17m	79.57m (400mm FREEBOARD)
D	78.95m	79.25m
E	78.12m	78.42m

Copyright - This drawing and any ancillary drawings or data are copyright of EDS and may not be used, copied or amended for any purpose whatsoever without written approval.

**NOTES**

- This drawing is copyright. Refer to details above.
- This drawing is only to be used for the purposes described in the status box below. Work to figured dimensions only, do not scale.
- This drawing is to be read in conjunction with all other drawings, details and specifications pertaining to the work described.
- Materials and workmanship shall comply to the appropriate British Standards and Codes of Practice unless otherwise stated.
- The activities required to construct the work, shown on drawings clearly marked FOR CONSTRUCTION, may be subject to the provisions of the Construction (Design & Management) Regulations 2015. The Contractor and Client must ensure that they are adequately conversant with these regulations and that the appropriate procedures required under the regulations are observed at all times.
- Design Risk Assessment  
A risk assessment relating to potential hazards associated with the construction, operation and demolition of the work described within this drawing, in so far as it has been designed by EDS, has been undertaken. Risks so identified have been eliminated by design wherever practicable. The situation with regard to residual risks is as follows:  
Planning stage - to be risk assessed at detail design stage.

22-11-19	JB	JC	A	PRELIMINARY ISSUE
DATE	DRWN	CHKD	REV	NOTES
PROJECT MANAGER:-			JAN CLARK	
PROJECT ENGINEER:-			JAMES BROOKS	
DRAWN DATE:-			NOVEMBER 2019	
SCALE & SHEET SIZE:-			1:200 @ A1	

**PRELIMINARY**

EDS Engineering & Development Solutions

- Flood Risk Assessment
- SuDS and Surface Water
- Foul and Sewage Treatment
- Highway Design
- Civil Engineering
- Statutory Approvals

EDS, Unit 10, Penstraze Business Centre, Truro, Cornwall TR4 8PN  
(01872) 306311 (Mob) 07973816457  
Email: jan@edsolutions.co.uk  
www.edsolutions.co.uk

**CLIENT**  
THORNYCROFT BUILDERS LTD

**PROJECT**  
COURT FARM, WEST WOODLANDS, FROME

**DRAWING TITLE**  
HEC-RAS MODELLED FLOOD EXTENTS

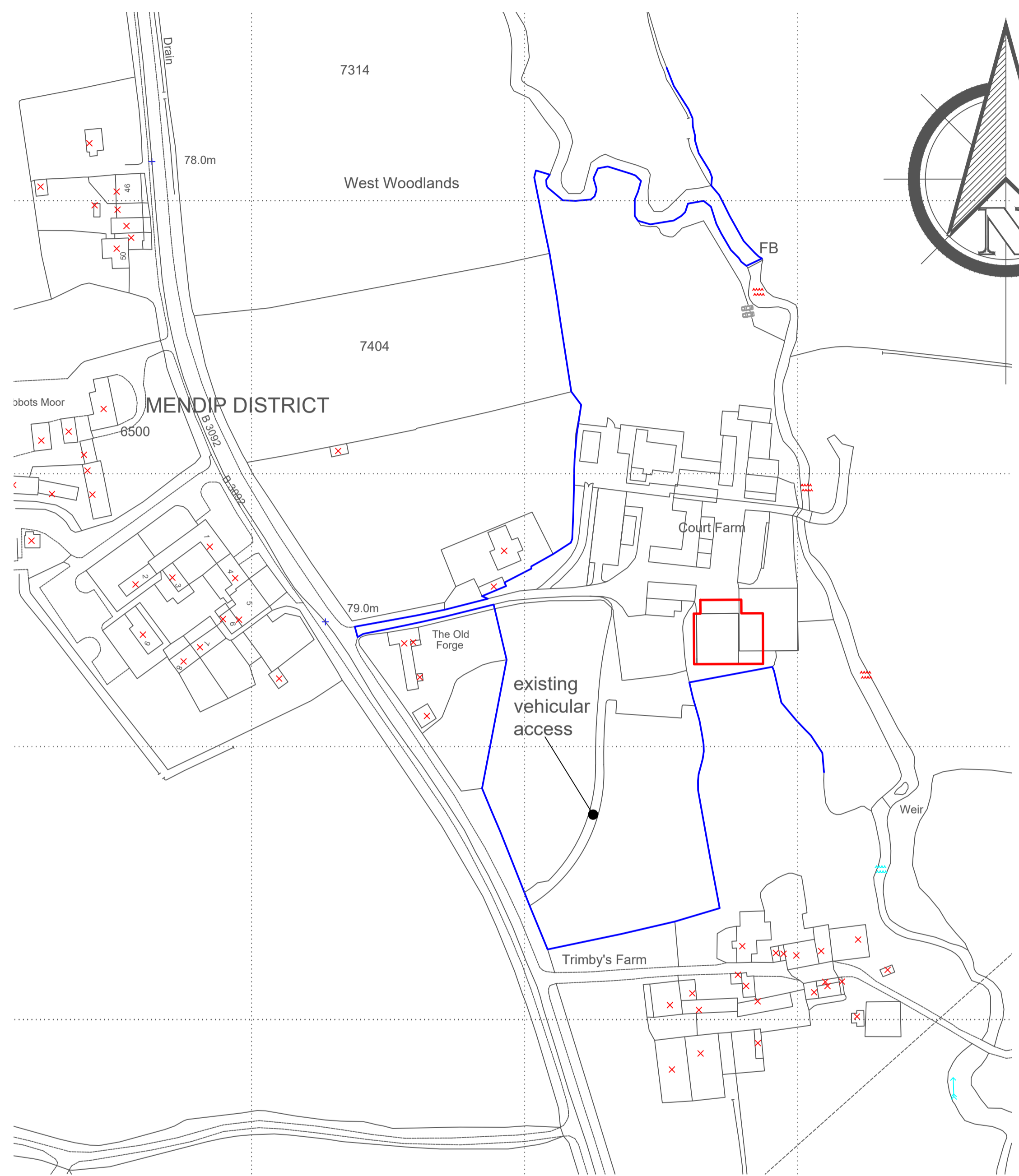
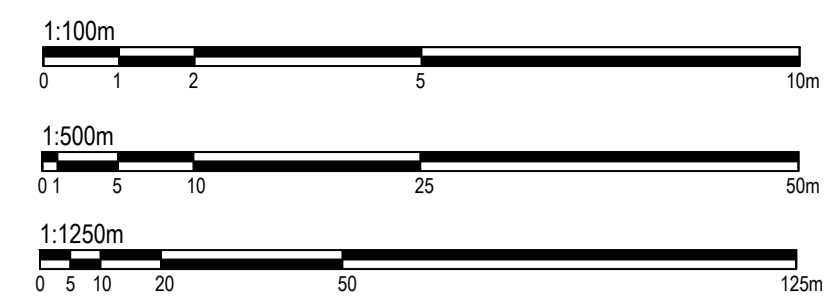
PROJECT No.	DRAWING No.	REV.
J-1180	5001	A

## **APPENDIX B    CALCULATIONS**

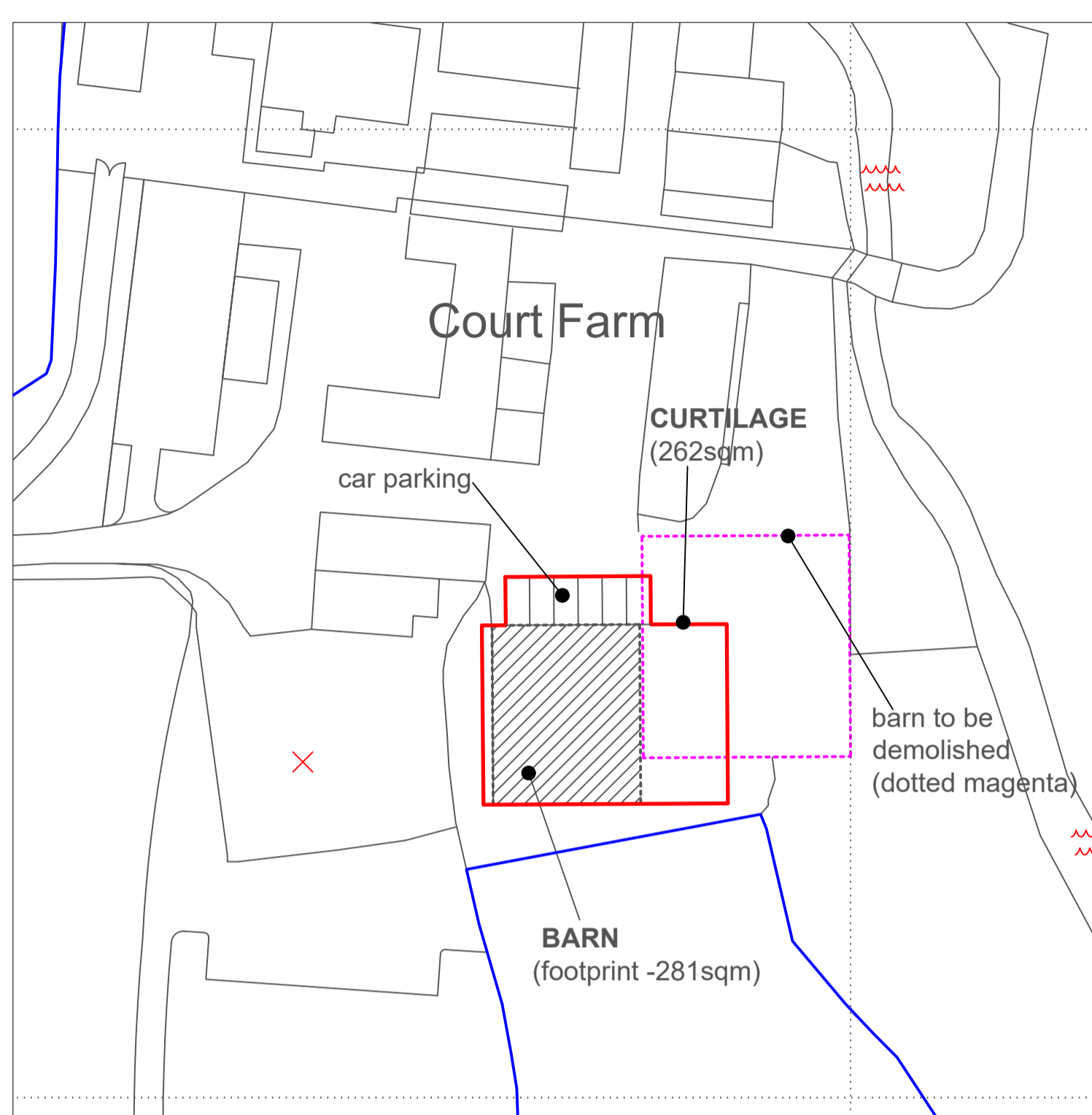
HEC-RAS Plan: Plan 05 River: Tributary of Fr Reach: West Woodlands

Reach	River Sta	Profile	Q Total (m <sup>3</sup> /s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m <sup>2</sup> )	Top Width (m)	Froude # Chl
West Woodlands	10	20YR	5.81	78.00	78.94	78.50	79.00	0.003242	1.14	5.11	5.72	0.38
West Woodlands	10	100YR	8.73	78.00	79.09	78.65	79.20	0.004554	1.46	5.99	5.80	0.46
West Woodlands	10	100YR+40%	12.22	78.00	79.23	78.81	79.39	0.006152	1.80	6.80	5.88	0.53
West Woodlands	10	100YR+85%	16.15	78.00	79.38	78.97	79.61	0.007413	2.09	7.73	5.96	0.59
West Woodlands	10	1000YR	17.11	78.00	79.42	79.01	79.65	0.007756	2.16	7.92	5.98	0.60
West Woodlands	9	20YR	5.81	77.85	78.90	78.37	78.94	0.001457	0.94	6.91	10.10	0.30
West Woodlands	9	100YR	8.73	77.85	79.04	78.54	79.10	0.001928	1.18	8.43	11.05	0.35
West Woodlands	9	100YR+40%	12.22	77.85	79.17	78.71	79.26	0.002424	1.41	9.91	11.73	0.40
West Woodlands	9	100YR+85%	16.15	77.85	79.38	78.87	79.44	0.001577	1.26	21.25	64.03	0.33
West Woodlands	9	1000YR	17.11	77.85	79.43	78.90	79.47	0.001366	1.20	24.24	69.33	0.31
West Woodlands	8.6	20YR	5.81	77.60	78.82	78.43	78.90	0.003174	1.31	5.06	8.27	0.40
West Woodlands	8.6	100YR	8.73	77.60	78.92	78.64	79.05	0.004880	1.72	5.89	9.02	0.51
West Woodlands	8.6	100YR+40%	12.22	77.60	78.91	78.85	79.18	0.009899	2.43	5.81	8.95	0.72
West Woodlands	8.6	100YR+85%	16.15	77.60	79.00	79.00	79.36	0.012237	2.85	6.88	9.79	0.81
West Woodlands	8.6	1000YR	17.11	77.60	79.04	79.04	79.40	0.011989	2.87	7.06	10.15	0.81
West Woodlands	8.3	20YR	5.81	77.87	78.81		78.87	0.002374	1.09	6.23	21.97	0.37
West Woodlands	8.3	100YR	8.73	77.87	78.93		79.00	0.002774	1.28	9.57	31.73	0.41
West Woodlands	8.3	100YR+40%	12.22	77.87	78.95	78.76	79.07	0.004793	1.70	10.19	32.56	0.54
West Woodlands	8.3	100YR+85%	16.15	77.87	78.86	78.97	79.22	0.015145	2.84	7.42	28.66	0.95
West Woodlands	8.3	1000YR	17.11	77.87	78.86	78.99	79.26	0.016405	2.97	7.58	28.89	0.99
West Woodlands	8	20YR	5.81	77.45	78.83	78.00	78.84	0.000261	0.55	15.35	27.47	0.15
West Woodlands	8	100YR	8.73	77.45	78.94	78.14	78.96	0.000373	0.70	20.04	41.58	0.19
West Woodlands	8	100YR+40%	12.22	77.45	78.97	78.28	79.00	0.000664	0.94	21.25	49.09	0.25
West Woodlands	8	100YR+85%	16.15	77.45	79.03	78.43	79.07	0.000889	1.12	24.46	64.85	0.29
West Woodlands	8	1000YR	17.11	77.45	79.04	78.46	79.09	0.000927	1.15	25.49	68.73	0.30
West Woodlands	7.8	20YR	5.81	77.20	78.82	77.76	78.83	0.000425	0.63	11.64	30.03	0.17
West Woodlands	7.8	100YR	8.73	77.20	78.93	77.92	78.95	0.000598	0.78	15.80	43.43	0.20
West Woodlands	7.8	100YR+40%	12.22	77.20	78.94	78.10	78.99	0.001094	1.07	16.49	45.23	0.27
West Woodlands	7.8	100YR+85%	16.15	77.20	79.01	78.26	79.06	0.001184	1.14	23.86	72.01	0.28
West Woodlands	7.8	1000YR	17.11	77.20	79.03	78.30	79.08	0.001210	1.16	25.05	72.87	0.29
West Woodlands	7.5		Culvert									
West Woodlands	7	20YR	5.81	77.05	78.04	77.57	78.10	0.001687	1.01	5.76	6.73	0.34
West Woodlands	7	100YR	8.73	77.05	78.21	77.72	78.29	0.002141	1.28	6.91	7.31	0.40
West Woodlands	7	100YR+40%	12.22	77.05	78.36	77.87	78.48	0.002668	1.56	8.03	7.84	0.46
West Woodlands	7	100YR+85%	16.15	77.05	78.49	78.02	78.66	0.003239	1.84	9.09	8.30	0.51
West Woodlands	7	1000YR	17.11	77.05	78.52	78.05	78.70	0.003334	1.90	9.36	8.42	0.52
West Woodlands	6	20YR	5.81	77.28	77.86	77.83	78.04	0.010329	1.93	3.29	8.04	0.83
West Woodlands	6	100YR	8.73	77.28	77.97	77.97	78.22	0.011501	2.31	4.26	9.14	0.91
West Woodlands	6	100YR+40%	12.22	77.28	78.12	78.12	78.40	0.010497	2.51	5.67	10.53	0.89
West Woodlands	6	100YR+85%	16.15	77.28	78.25	78.25	78.56	0.009981	2.71	7.13	11.81	0.89
West Woodlands	6	1000YR	17.11	77.28	78.28	78.28	78.60	0.009827	2.75	7.49	12.11	0.89
West Woodlands	5	20YR	5.81	76.58	77.70	77.37	77.76	0.002860	1.23	6.04	14.24	0.39
West Woodlands	5	100YR	8.73	76.58	77.85	77.60	77.92	0.002859	1.34	8.41	16.47	0.40
West Woodlands	5	100YR+40%	12.22	76.58	77.99	77.75	78.07	0.002859	1.45	10.85	18.29	0.40
West Woodlands	5	100YR+85%	16.15	76.58	78.12	77.86	78.21	0.002857	1.54	13.63	24.38	0.41
West Woodlands	5	1000YR	17.11	76.58	78.15	77.87	78.24	0.002857	1.56	14.30	24.69	0.41

**APPENDIX C      PROPOSED SITE PLAN**



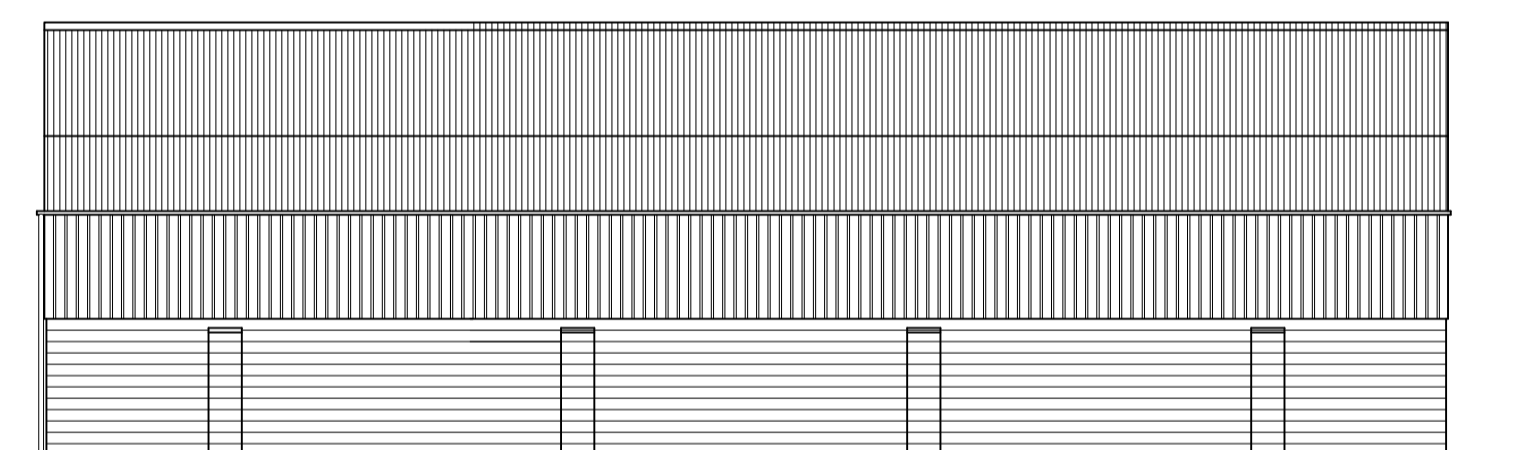
**LOCATION PLAN(1:1250@A1)**



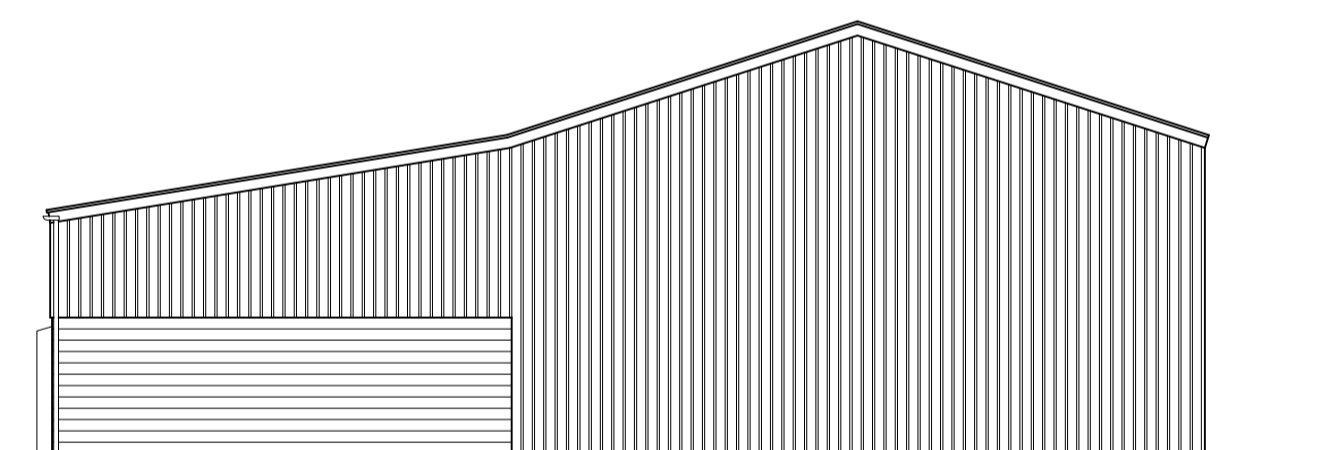
**BLOCK PLAN(1:500@A1)**



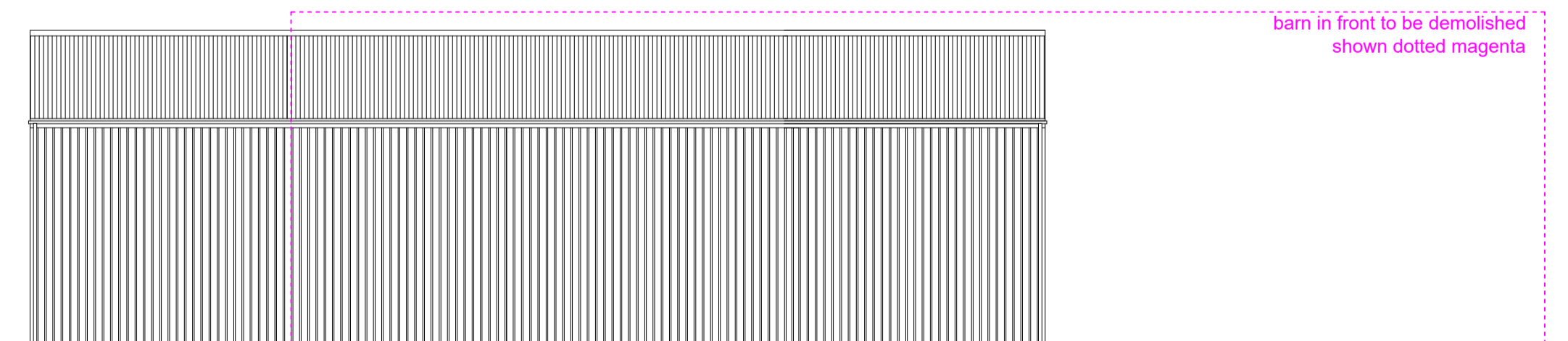
**EXISTING FLOOR PLAN(1:100@A1)**



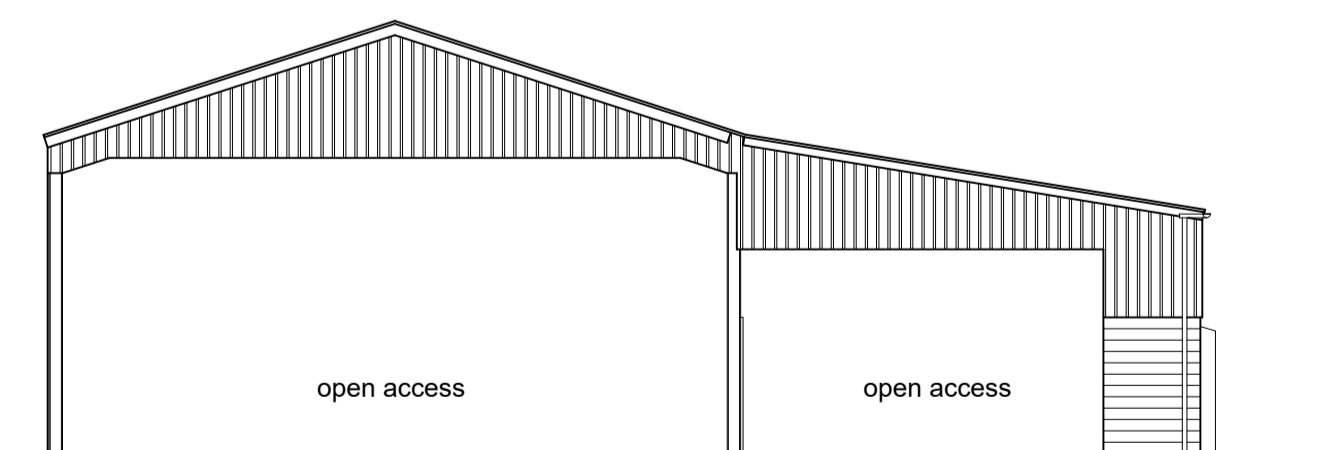
**EXISTING WEST ELEVATION (1:100@A1)**



**EXISTING SOUTH ELEVATION (1:100@A1)**

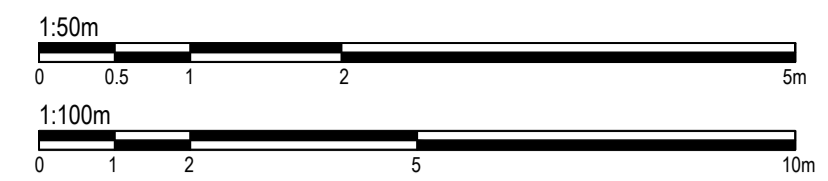


**EXISTING EAST ELEVATION (1:100@A1)**

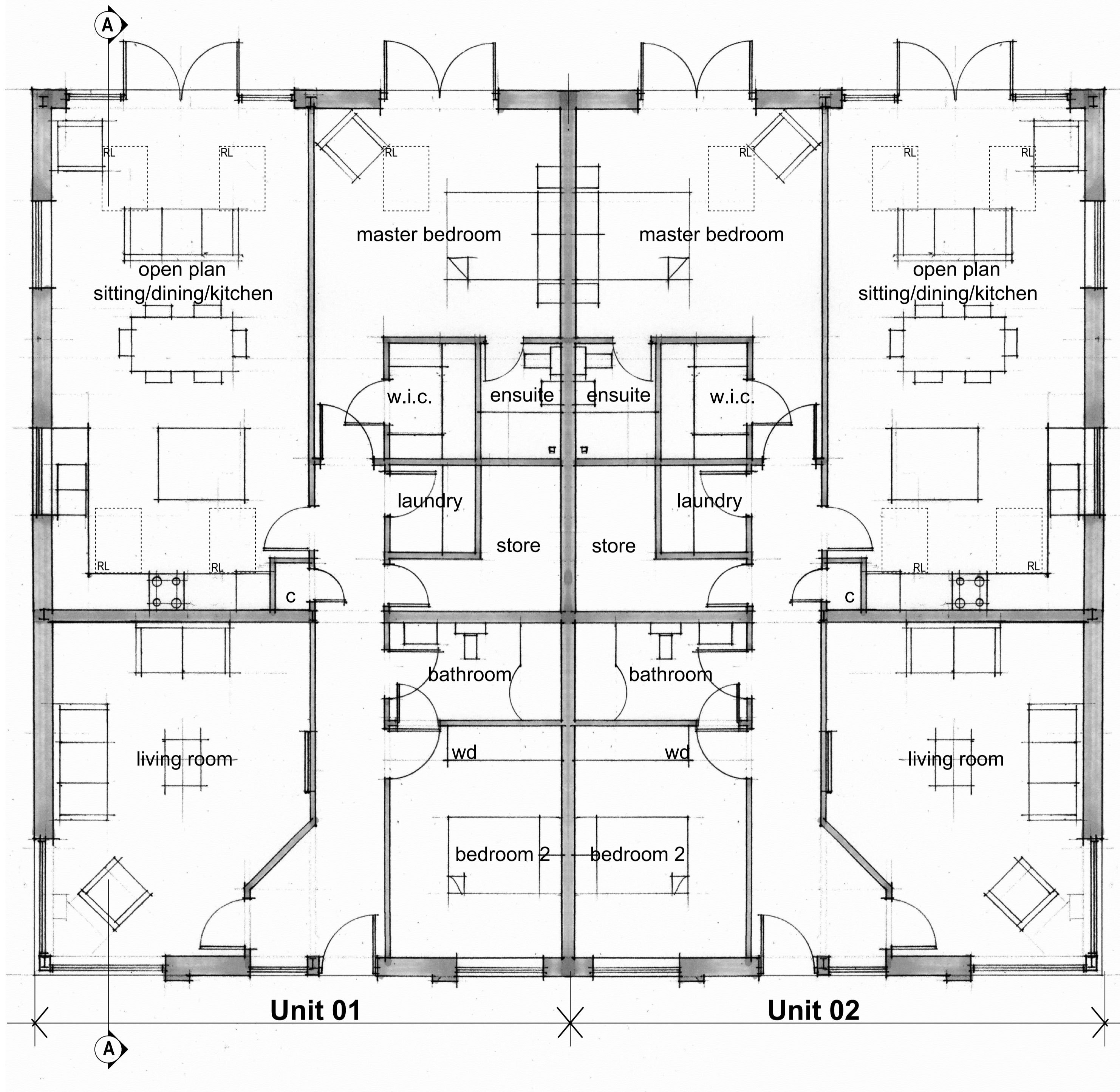


**EXISTING NORTH ELEVATION (1:100@A1)**

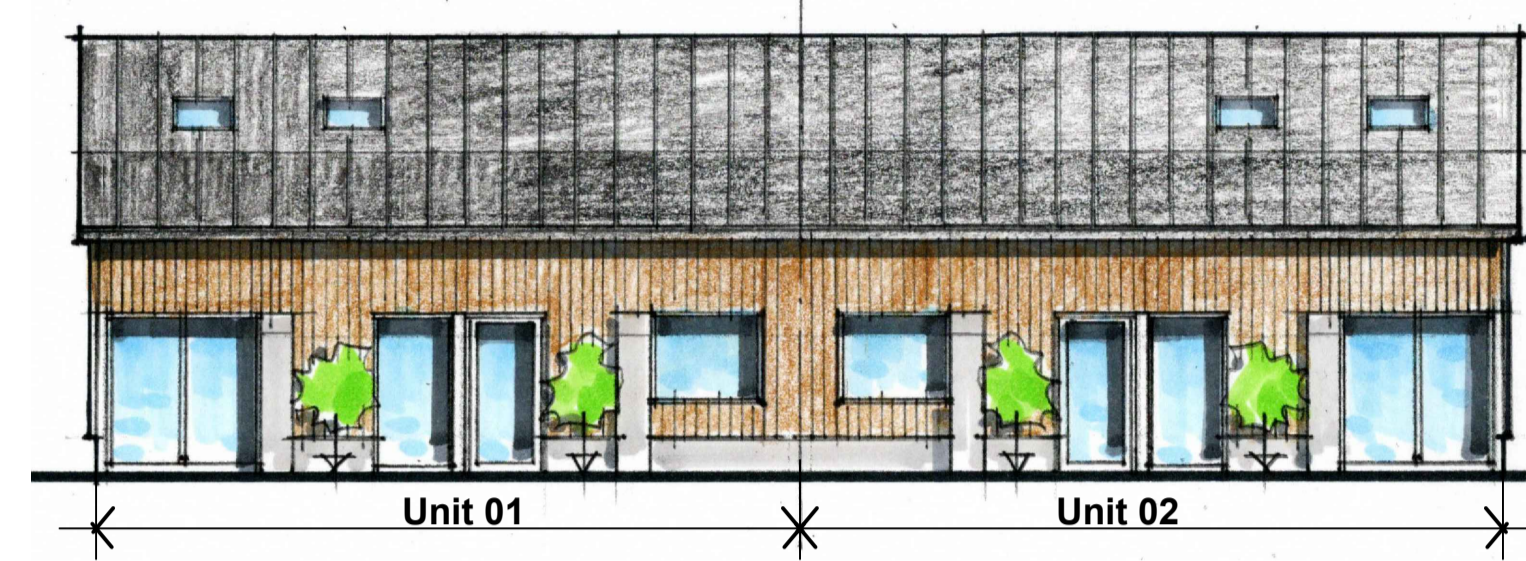
Applicant: Mr Mark Knight  
 Project: Proposed Change Of Use Of Agricultural Building To Dwelling House  
 Address: Court Farm, West Woodlands, Frome, Somerset  
 Drawing no: 2019/KNIGHTM/01-B  
 Date: May 2019



Gross Internal Floor Area - Approx. 133m<sup>2</sup>/unit



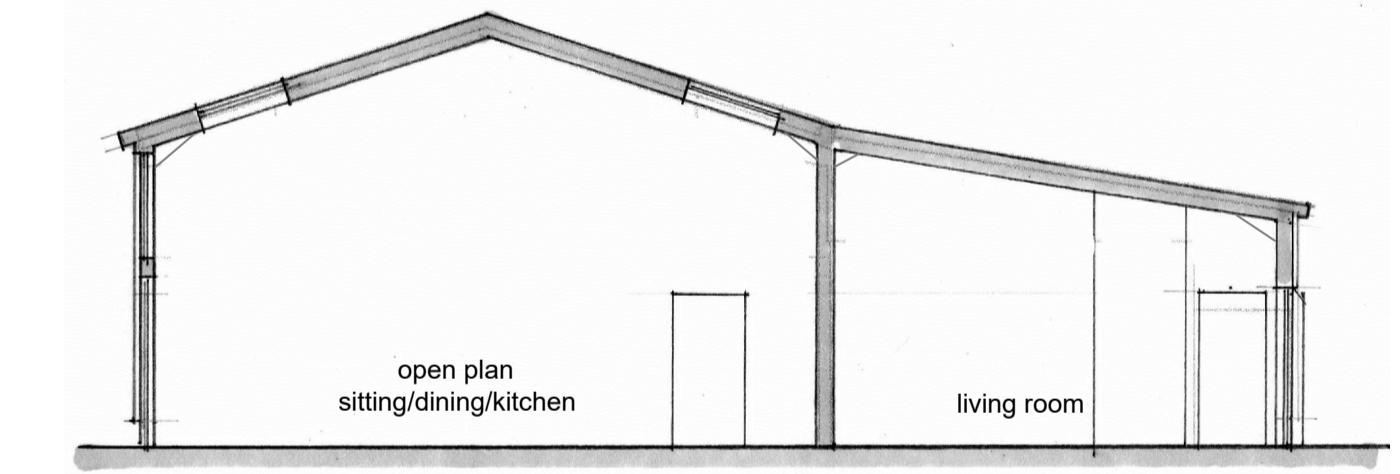
**FLOOR PLAN (1:50@A1)**



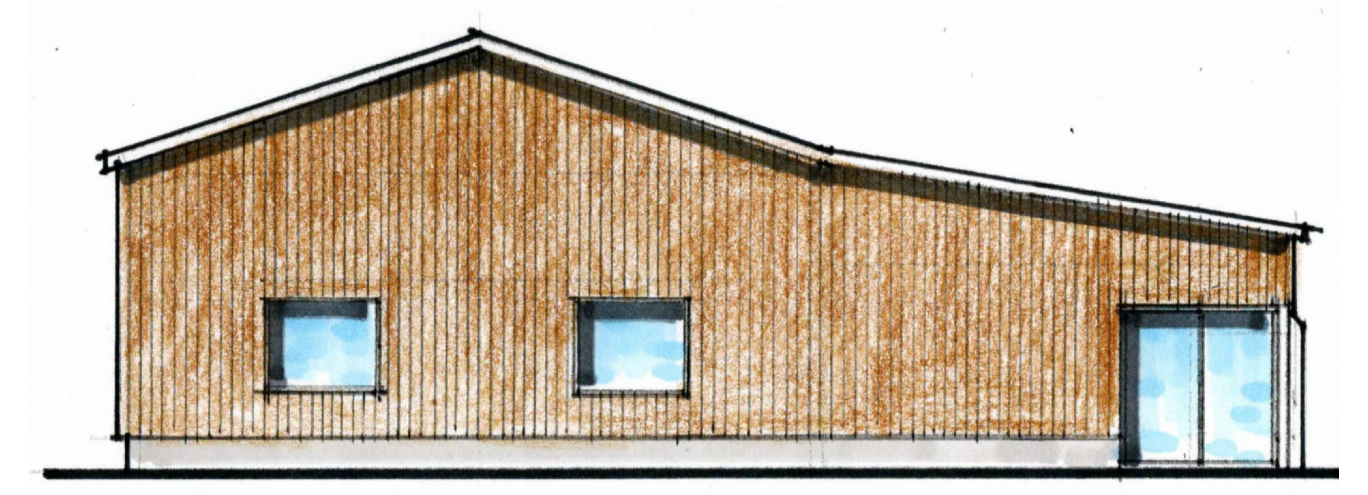
**WEST ELEVATION (1:100@A1)**



**EAST ELEVATION (1:100@A1)**



**SECTION THROUGH A-A (1:100@A1)**



**NORTH ELEVATION (1:100@A1)**



**SOUTH ELEVATION (1:100@A1)**

**materials**

- Roofing:**
- standing seam or profile sheet roofing
- Walls:**
- timber or profile sheet cladding
  - rendered masonry low level wall

Applicant: Mr Mark Knight  
 Project: Proposed Change Of Use Of Agricultural Building  
 To Dwelling House  
 Address: Court Farm, West Woodlands, Frome, Somerset  
 Drawing no: 2019/KNIGHTM/02-B  
 Date: May 2019





**Engineering and Development Solutions Ltd**

Registered Office: Unit 10 | Penstraze Business Centre | Truro | Cornwall | TR4 8PN  
Registered in England No. 10467487