THE FLOOD RISK CONSULTANCY

Flood Risk Assessment

Aldham Mill Farm, Barnsley Road, Wombwell

Report No: 2013-131 Revision A
Date: 14/02/2014

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Document Control

Document Title: Flood Risk Assessment

Project Number: 2013-131

Revision	Date	Issued to	Comments
/	13/02/2014	Lucy Hawley	FINAL
A	14/02/14	Lucy Hawley	FINAL

Contract

This report describes work commissioned by Lucy Hawley (Planning Consultant) on behalf of Mr & Mrs Smeaton, dated 10th January 2014. Chris Vose and Donna Metcalf of The Flood Risk Consultancy carried out the work.

Disclaimer

This document has been prepared solely as a Flood Risk Assessment for Mr & Mrs Smeaton. The Flood Risk Consultancy accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

Executive Summary

The proposed development covers a gross area of 0.17 Hectares.

A layout plan for development is available, which incorporates demolition of three buildings; and construction of a single replacement building to be used as an agricultural store, with land raising to enable level access from the adjacent field.

The development area is located wholly within Flood Zone 3 of the Environment Agency Flood Map which is defined as land assessed as having a 1 in 100 or greater annual probability of river flooding >0.1%.in any year.

Primary flood risk at the application site is identified from fluvial source the River Dove.

A comparison of modelled flood levels against site levels confirms that there is a risk from fluvial flooding. It is therefore recommended that the floor level of the new building is set at a minimum of 300mm above the 1 in 100 year flood level i.e. 38.15mAOD; and any items to be stored within the building which may be susceptible to water damage are stored at a minimum of 600mm above the same flood level i.e.38.45mAOD.

For assessment purposes the decrease in impermeable area resulting from the development has been taken from 18.2% to 14.8% of the gross development area i.e. 0.006 Hectares.

An overall reduction in impermeable area will provide a reduction in terms of surface water volume leaving the site, compared to the existing roofed and hardstanding's areas.

The overall flood storage volume capacity of the site will be increased following completion of the development; and as such it is concluded that there will be no increased risk to others; due to the displacement of flood water.

An assessment of the potential access/egress route from the site indicates that overall there is a low risk to all; however this may increase as a result of climate change. As such it is advised that the land owner signs up to receive flood warnings from the Environment Agency via the free Flood Warnings Direct Service.

An evaluation of secondary sources of flood risk, such as fluvial; artificial water bodies; and overland flow; indicate that these sources present a low risk of flooding at the application site.

In order to minimise the effect of residual flooding within the proposed development, the implementation of mitigation measures as described throughout the assessment report should reduce flood risk to an appropriate level.

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1.0 Introduction

1.1 Terms of Reference

The Flood Risk Consultancy has been appointed by Mr & Mrs Smeaton to provide a Flood Risk Assessment in support of a planning application for a new agricultural building on land associated with Aldham Mill Farm, Barnsley Road, Wombwell.

The site covers an overall area approximating 0.17 Hectares.

The Environment Agency Flood Map shows the development site to be located within Zone 3; which is land assessed as having a 1 in 100 or greater annual probability of river flooding >0.1%.in any year.

It is usual for the Environment Agency to raise an objection to development applications within the floodplain, or Zones 2 and 3 of the flood map until the question of flood risk has been properly evaluated. The Agency will also object to developments where the total site area is in excess of 1 Hectare until suitable consideration has been given to surface water runoff.

1.2 Approach to the Assessment

An initial assessment indicates that the primary flood risk at the proposed development is from the River Dove.

Consideration has also been given to the site flooding from secondary sources such as groundwater; artificial water bodies; infrastructure failure; overland flow and ponding.

The requirements for flood risk assessments are generally as set out in the 'Technical Guidance to the National Planning Policy Framework', published in March 2012; and in more detail from the Environment Agency's 'Standing Advice on Flood Risk' available from http://www.environment-agency.gov.uk/reasearch/planning/82584.aspx.

1.3 Sequential & Exceptions Test

As set out in the National Planning Policy Framework, the aim of the Sequential Test is to steer new development to areas at the lowest probability of flooding.

The Flood Zones are the starting point for the sequential approach.

The Environment Agency Flood Map shows the development site locate within Zone 3 of the Environment Agency Flood Map, which is defined as land assessed as having a 1 in 100 or greater annual probability of river flooding >0.1%.in any year.

Proposals at Aldham Mill Farm located off Barnsley Road in Wombwell involve demolition of three existing agricultural buildings to provide a single new building with associated land raising; for use as a general store.

In accordance with Table 2 'Flood Risk Vulnerability Classification' of the Technical Guidance to the National Planning Policy Framework, the building is defined as 'less vulnerable'.

As such, Table 1 below indicates that the type of development proposed is considered both acceptable and appropriate for the site.

Table 1: Flood Risk Vulnerability and Flood Zone 'Compatibility'[1]

Flood Risk Vulnerability Classification		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b	Exception Test required	✓	×	×	×

✓ Development is appropriate
× Development should not be permitted

[1] Extracted from Table 3 of the Technical Guidance to the National Planning Policy Framework Document (March 2012)

2.0 Details of the Site

2.1 Site Details

Table 2: Development Location

Site Name:	Land Associated with Aldham Mill Farm
Purpose of Development:	Agricultural
Existing Land Use:	Agricultural
OS NGR:	SE386043
Country:	England
County:	South Yorkshire
Local Planning Authority:	Barnsley Metropolitan Borough Council
Internal Drainage Board:	Danvm DC Internal Drainage Board
Other Authority (e.g. British Waterways/ Harbour Authority)	Not Applicable

Location Plan:

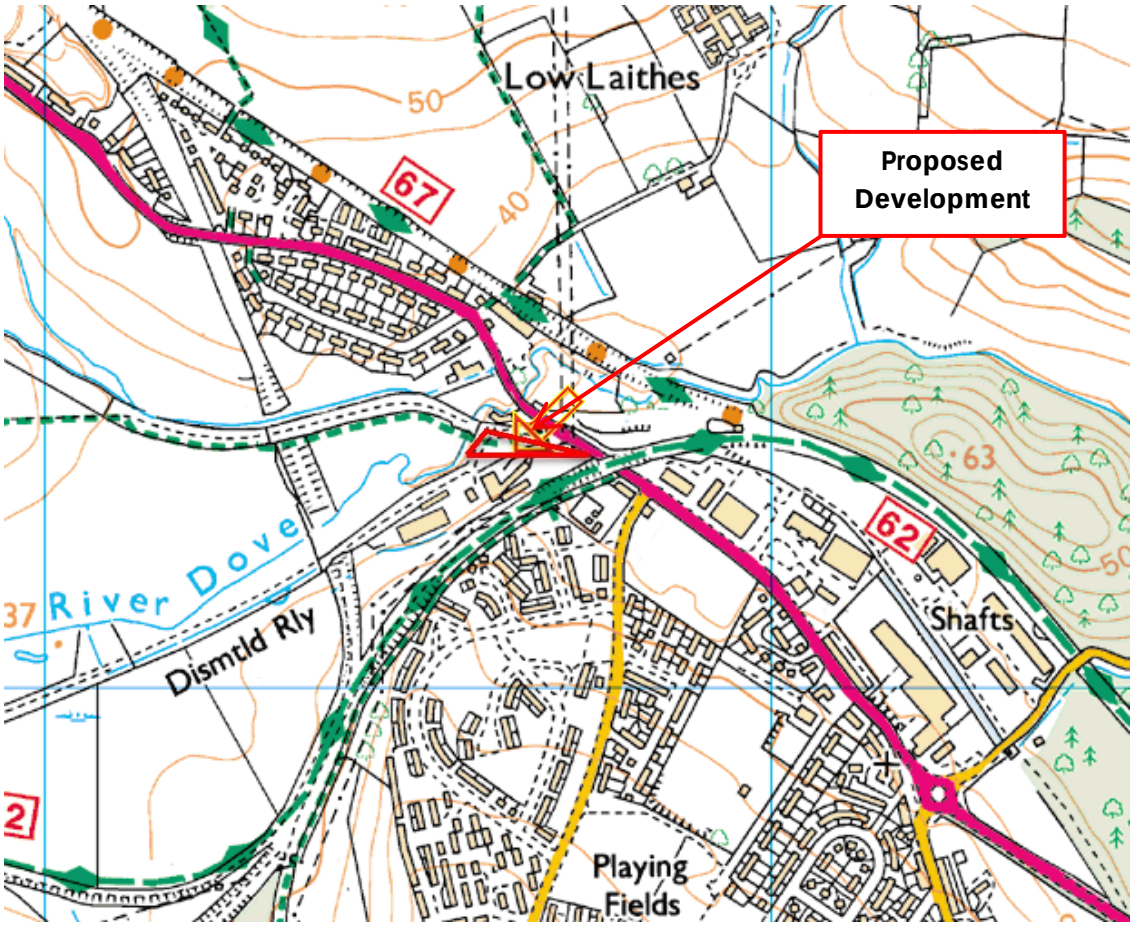


Image produced from the Ordnance Survey Get-a-map service.
Image reproduced with kind permission of Ordnance Survey and Ordnance Survey of Northern Ireland.

2.2 Site Description

The site covers a gross area of 0.17 Hectares and is located within the Wombwell area of Barnsley.

The site at present consists of three agricultural buildings situated immediately adjacent to the south bank of the River Dove.

The land comprising the buildings is elevated at a significantly lower level than the adjoining field; with difference in level approximating 1.4 metres. An informal ramp currently provides access from the field to the buildings.

Table 3: Existing Site Boundaries

North	Bounded by the River Dove behind that is a small over grown wooded area.
East	Bounded by Barnsley Road, opposite are allotments.
South	Is an area used for parking vehicles overlooking a residential development.
West	Overlooks an area used for equestrian training.

Vehicular access into Aldham Mill Farm is provided directly from Barnsley Road.

The nearest watercourse to the application site is the River Dove which forms the north boundary; and is located less than 10 metres from the development.

The area within which the buildings are sited slopes in generally in the direction of the watercourse with a level difference approximating 0.5 metres.

Levels located on Barnsley Road directly outside the entrance to the site are shown as 37.6mAOD, with levels located at the far west side of the site indicated as 38mAOD. This indicates an overall slope graduating from west to east over a range less than 1 metre.

The existing site comprises of three buildings and a ramp used for access.

Figure 2.1: Proposed Development Site Viewed West from Barnsley Road.

Source: Google Maps

2.3 Proposed Development Details

The total area designated for development within the red-line boundary approximates to 0.17 Hectares.

The outline planning application proposes the demolition of three existing agricultural buildings and the erection of a single agricultural building to be used as a general store; incorporating land raising to elevate the building to match existing ground levels within the adjoining field.

Vehicular access to the site will be from Barnsley Road utilising an existing access road along the east of the site. Appendix A contains the proposed layout for the development.

Figure 2.2: Aerial Photograph of the Existing Site

Source: Google Earth

3.0 Initial Assessment

3.1 Historical Flooding

3.1.1 British Hydrological Society Flood Event Records

A search on the British Hydrological Society (BHS) Chronology of British Hydrological Events website[2] found no records of historic flooding within the Wombwell area of Barnsley.

3.1.2 Internet Search

An internet search found a number of reported historical flood events within the Wombwell area regarding the floods of 2007 and most recently 2012.

3.1.3 Barnsley Metropolitan Borough Council PFRA (2011)

The Report was prepared by Barnsley Metropolitan Borough Council in July 2011, regarding historical flood events there are four mentioned in Table 4-2 Summary of recent flood events in Barnsley; however only one applies to the subjects site.

- *June 2007: Intense rainfall for a prolonged period culminated in severe flooding on 15th June throughout the whole of the borough. The continuations of the intense rainfall lead to repeat a 2nd, and more significant flooding event on 25th June.*

3.1.4 Barnsley Metropolitan Borough Council SFRA Level 1(2011)

The Barnsley Metropolitan Borough Council SFRA Level 1 Map 2 Historical Flood Events has identified the 2007 floods within the local vicinity of the site.

3.1.5 EA Data – Historic Flooding

Table 4: Historic Flood Events

Flood Event	March 1947	June 2007 Ridings Area	June 2007 Ridings Area	June 2007 SW Flooding
Comments	Extent digitised from large scale 1inch to 1mile map	Fluvial flooding River Dearne, River Dove, Small Bridge Dike	Fluvial flooding in Ridings Area. These outlines are unchecked and likely to have come from eye witness accounts, drop in centres etc…	Surface water flooding recorded from Aerial Photography. Multipl e sources of flooding with respect to NFCDD pulldown.
Start	19/03/1947	25/06/2007	25/06/2007	15/06/2007
End	22/03/1947	26/06/2007	26/06/2007	25/06/2007
Source	Local Authority	Aerial Photography	Aerial Photography	Aerial Photography
Flood Source	Main River	Unknown	Unknown	Other
Cause	Channel capacity exceeded (no flood defences	Unknown	Unknown	Unknown

[2] http://www.dundee.ac.uk/geography/cbhe/

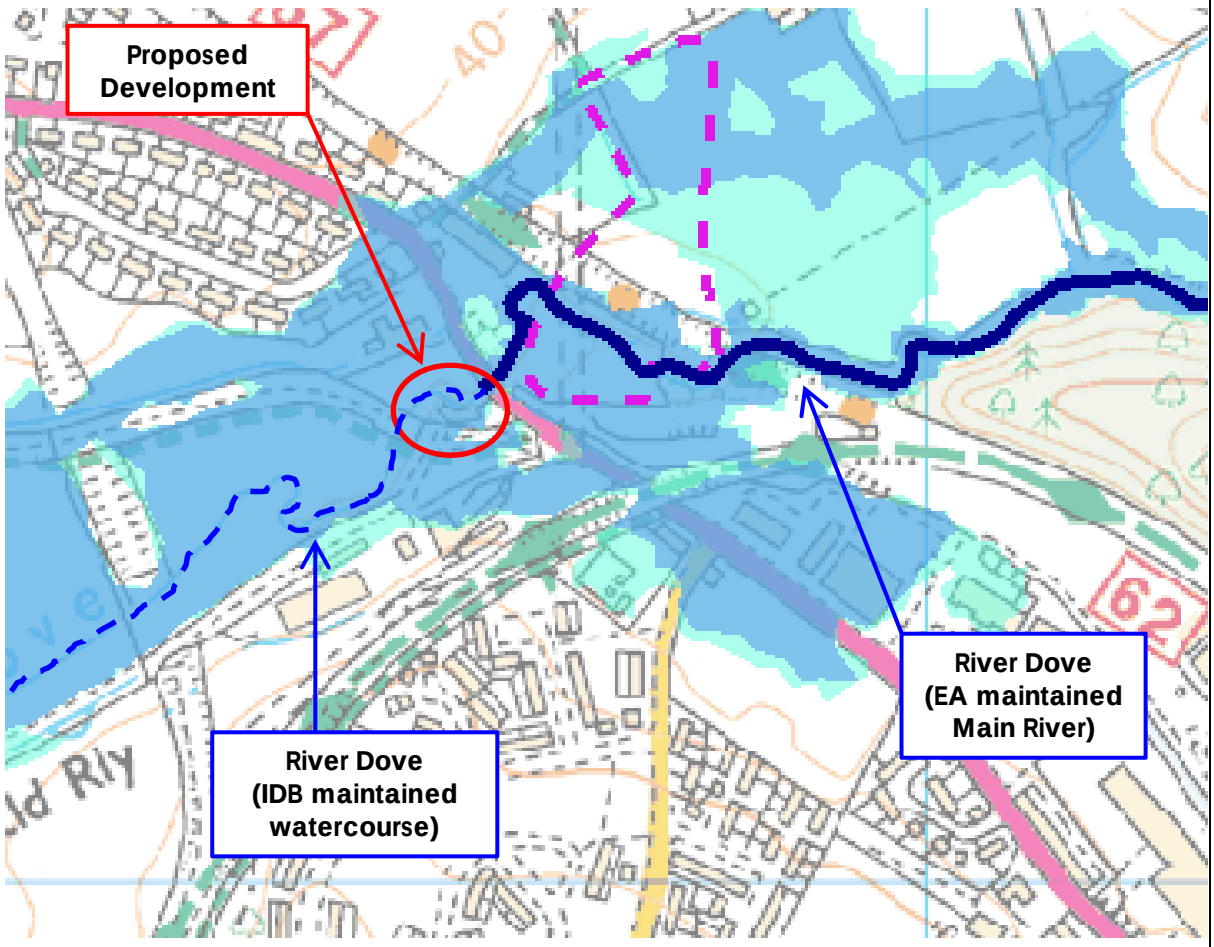
The associated mapping shows that the location of the new building was inundated during the 2007 flood event.

3.1.6 Anecdotal Data

During a site visit in January 2014; the land owner advised that during the 2007 flood event on a shallow depth of flooding was observed at the location of the new building; which did not encroach into the adjoining field.

3.2 The Environment Agency Flood Map

Figure 3.1: The Environment Agency Flood Map



Source: www.environment-agency.gov.uk

Key

- Flooding from rivers or sea without defences (Flood Zone 3)
- Extent of extreme flood (Flood Zone 2)
- Flood defences
- Areas benefiting from flood defences
- Main rivers

The Environment Agency Flood Map illustrated above within Figure 3.1, confirms that the proposed development is situated within Zone 3; and therefore has a high risk from fluvial flooding.

This flood zone is land assessed as having a 1 in 100 or greater annual probability of river flooding >0.1%.in any year.

3.3 Sources of Flooding

Table 5: Possible Flooding Mechanisms

Source/Pathway	Significant?	Comment/Reason
Fluvial	Yes	River Dove
Canal	No	No canals within the local vicinity.
Tidal/Coastal	No	Approximately 40km from tidally influenced rivers.
Reservoir	No	Worsbrough Reservoir
Pluvial (urban drainage)	No	Site is <1 Hectare in size.
Groundwater	No	SFRA states that the area is not susceptible to groundwater flooding.
Overland flow	No	Relatively flat topography within the area surrounding the development.
Blockage	No	Bridges spanning across the River Dove
Infrastructure failure	No	Bridges spanning across the River Dove
Rainfall Ponding	No	No existing pond systems or depressed areas where ponding could occur where identified within the site.

From the initial assessment it is concluded that the primary source of flood risk will be fluvial flooding from the River Dove.

Fluvial

The River Dove is a tributary of the River Dearne and is located at a distance of less than 10 metres from the north of the site, and forms the north boundary.

The River Dove reach immediately downstream of Barnsley Road is classified as a 'main river' and as such is the responsibility of the Environment Agency.

It is noted however that river upstream from Barnsley Road; which incorporates the site up to Worsborough Reservoir; is managed by the Danvm DC Internal Drainage Board.

The river flows generally in an easterly direction, where it joins with the River Dearne between Broomhill and Millhouses. The route of the watercourse flows predominantly in open channel; with bridges spanning the river both immediately upstream and downstream from the proposed development.

Due to the rural nature of the land flanking the upper reaches of the watercourse; there are no formal flood defences along either bank.

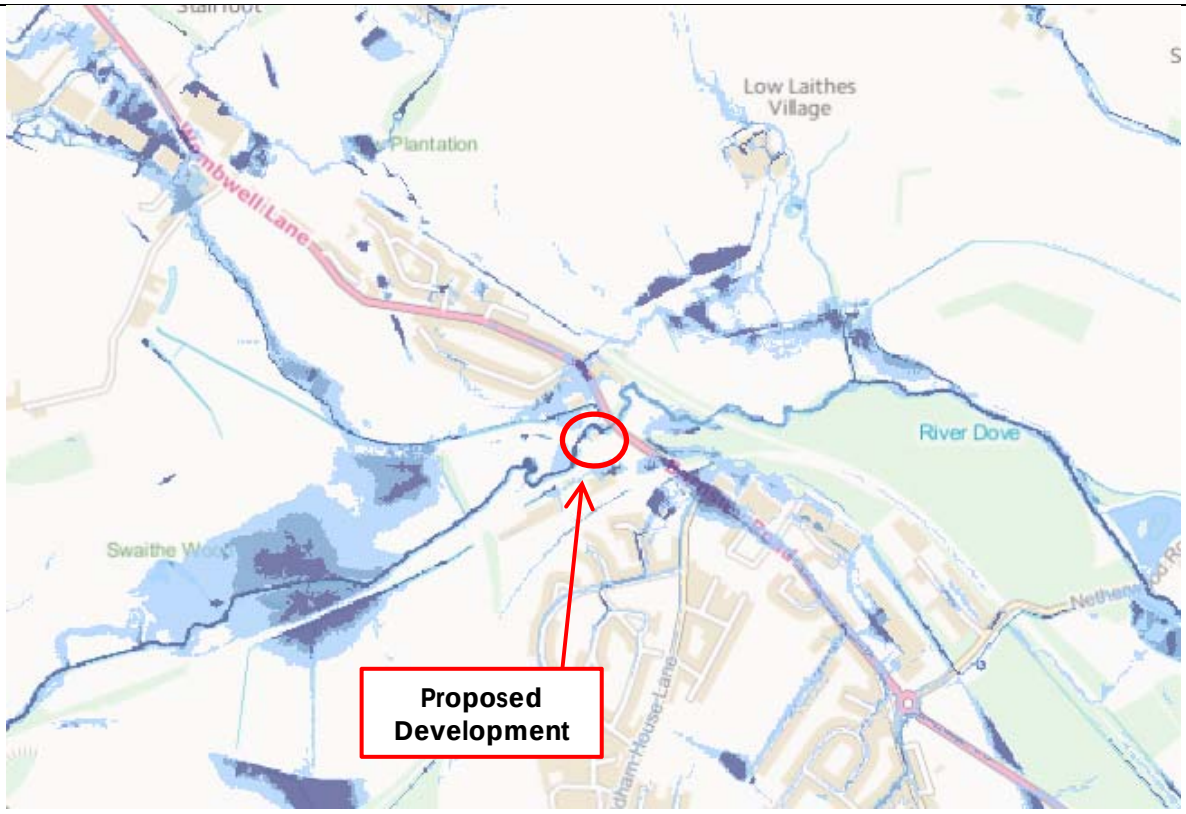
As such, the mechanisms of overtopping and infrastructure failure require further investigation within this assessment.

Pluvial: Surface Water Flooding

Both Barnsley Metropolitan Borough Council's PFRA and SFRA have not identified the proposed development site to be within an area at risk from surface water flooding.

This is confirmed via the Environment Agency's map, which highlights the susceptibility of areas to surface water flooding.

Figure 3.2: Susceptibility to Surface Water Flooding



Source: www.environment-agency.gov.uk

In conclusion surface water flooding from the site is considered to present a low risk to the subject's site.

Groundwater

Section 5.6 of the Barnsley MBC SFRA states: '*that the biggest risk of groundwater flooding is from re-emergence of mine water following cessation of mine pumping'.*

The main areas at risk from groundwater flooding within the borough are identified as:

- Kingstone area of Barnsley
- Kingwell area of Worsbrough
- Millhouses area of Hoyland
- Upperwood area of Darfield

Therefore the risk of groundwater flooding at the Aldham Farm site in Wombwell is considered to be low; and has therefore not been considered further within this report.

Reservoirs

Worsbrough Reservoir is located approximately 3.7Km south west of the proposed development site and is managed by Barnsley MBC.

The reservoir was built to supply water to the Worsbrough branch of the Dearne and Dove Canal and it was completed in 1804. It was enlarged in 1826, when the depth was increased by about 1.5 metres. This gave an extra 20 acres of surface water.

Two new spillways were installed in 1984 to comply with the Reservoirs Safety Act.

Figure 3.3: The Environment Agency Risk of Flooding from Reservoirs

Source: www.environment-agency.gov.uk

The Environment Agency Reservoir Flood Map illustrated above, illustrates the largest area that might be flooded if the storage area were to fail and release the water it is designed to hold during a flood event.

Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensure that reservoirs are inspected regularly and essential safety work is carried out.

Since this is a prediction of a worst case scenario, it's unlikely that any actual flood would be this large; and as such no further consideration has been given to flooding from this source.

4.0 Quantitative Flood Risk Assessment

4.1 National Planning Policy Framework

4.1.1 Environment Agency FRA Requirements (Flood Zone 3)

The Environment Agency's Standing Advice with regard to 'less vulnerable' development within Flood Zone 3 is as follows:

- Ground floor levels to be set at a minimum of (whichever is the higher):
  - 300mm above the 1 in 100 year (1% AEP) fluvial flood level; or 1 in 200 year (0.5% AEP) tidal flood level in any year, including an allowance for climate change.
  - Basement rooms are to have unimpeded access internally to an upper floor level.
- Management of Surface Water
  - Surface Water runoff will be controlled to ensure no flooding of property and no increase in surface water runoff from the site to a watercourse or receiving water body compared to the existing pre-application runoff rate in a 1 in 100 year storm event, plus an appropriate allowance for climate change.
  - Meets the requirements of Approved Document Part H of the Building Regulations 2000.
- Flood resilience/resistance and emergency escape measures/procedures have been incorporated where possible. This applies to any part of the building (e.g. basements) that are situated below the 1 in 100 year (1% AEP) fluvial flood level; or 1 in 200 year (0.5% AEP) tidal flood level in any year, including an allowance for climate change.

4.2 Fluvial: River Dove

4.2.1 General

The River Dove starts at the outfall of Worsbrough Reservoir, and supplied the Worsbrough Arm of the Dearne and Dove Canal.

The watercourse is fed by a number of streams, the main ones being the Brough Green Brook and the Rockley Dike; and is crossed by the A61 road at Worsbrough Bridge.

The Black Dike joins from the south, and then Station Road crosses the river via road bridge. There are then a series of railway bridges; with Swaithe Bridge being the first (Barnsley to Rotherham Railway), while the next three bridges form part of a complex railway junction. The tracks have now been removed; however the bridge crossings remain.

The A633 Barnsley Road crosses at Aldham Bridge, which is followed by another unused railway bridge. Further downstream, Stonyford Bridge carries the B6096 road over the river, and Wombwell Ings, an area of low-lying ground and lakes, is located to the south.

Wombwell Ings is used as a washland, which is flooded in a controlled way when the river is unable to discharge into the Dearne because of high water levels, which are themselves often the result of high levels in the River Don. They were engineered to act as washlands in 1973, as part of the River Dearne Improvement Scheme.

At the location of the development the River Dove flows in open channel; with bridge structures located immediately upstream and downstream of the development site. It is further noted that the banks of the river are undefended.

As such the flood mechanisms of overtopping of the natural river bank; along with the impact resulting from infrastructure failure must be investigated in detail.

4.2.2 Modelled Flood Levels

The Environment Agency has provided modelled flood levels for the River Dove. It is noted however that the development is located at a location just upstream from the start of the modelled length of watercourse.

As such Node Reference Dove01_3789u has been used to assess flood risk at the development; due to its proximity i.e. located immediately upstream of Aldham Bridge.

Table 6: Modelled Flood Levels for the River Dove (Node Ref. Dove01_3789u)

Return Period	Water Level (m)
1 in 2 year	37.25
1 in 5 year	37.46
1 in 10 year	37.59
1 in 25 year	37.72
1 in 50 year	37.80
1 in 75 year	37.83
1 in 100 year	37.85
1 in 100 year plus climate change	38.08

4.2.3 Overtopping

The river bank along the north boundary; and the development area itself is shown to have an average ground level of 36.00mAOD. Furthermore, the field immediately adjacent to the east side of the site is at a level of 37.37mAOD.

Undertaking a direct comparison; the area comprising the existing buildings is shown to become inundated to a depth of 1.25 metres during the 1 in 2 year event.

The adjacent field is shown to remain dry during the more frequent flood events; however is liable to flood during storm events from the 1 in 5 year event.

During the 1 in 100 year event; the existing buildings are likely to become flooded to a depth of 1.85 metres; with the field area inundated to a depth approximating 0.48 metres.

4.2.4 Infrastructure Failure

Due to the close proximity of an access bridge upstream from the development; and Aldham Bridge downstream; it is anticipated that flood levels will be exacerbated if structural failure or blockage were to occur at either structure.

Upstream of Aldham Bridge the watercourse is managed by the Dove and Dearne Internal Drainage Board (IDB); and although not specifically advised; it is presumed that the IDB has a regular schedule for inspection along watercourses within its responsibility.

An IDB has Permissive Powers under the Land Drainage Act 1991 (as amended), that is, it can choose to undertake maintenance work on any watercourse within its district. A Board has the power, if it chooses to cleanse, repair, maintain improve or construct new works within its district and the Board has legislated Powers of Entry onto land for the purpose of undertaking that work.

4.2.5 Conclusion

The River Dove presents a flood risk at the proposed development.

4.3 Surface Water Runoff

4.3.1 General

The gross area of the site approximates 0.17 Hectares which currently comprises three agricultural buildings on land associated with Aldham Mill Farm, Barnsley Road, Wombwell.

Ground levels within the site leading up to the development are relatively flat; however the area in which the proposals are to be sited currently steps down approximately 1.4 metres.

4.3.2 Existing Drainage Regime

Due to the nature of the site i.e. agricultural, there is no positive drainage system currently serving the existing building; and surface water is allowed to drain to ground; where it flows a short distance into the Rover Dove.

4.3.3 Proposed Drainage

The combined roof area of the existing buildings and other hardstanding areas within the site comprise an area of 0.031 Hectares, which equates to 18% of the total site area.

Following development, it is anticipated that the roof and paved areas within the site will decrease to approximately 0.025 Hectares; and as such there will be a corresponding decrease in surface water runoff rates and volumes generated at the site.

Therefore the proposed development provides a betterment in comparison to the existing situation.

5.0 Mitigation Measures

5.1 Land Raising/Finished Floor Levels

Proposals for the development incorporate the construction of a new agricultural building; within a site area to be elevated above existing ground levels; to provide level access from the adjoining field area to the east.

It is advised that land will be raised locally around the perimeter of the new building; via a retaining wall; with the remaining area along the river bank maintained at existing levels.

The building is for non-habitable use and as such to satisfy Environment Agency requirements, the finished floor level of the building should be set at a minimum of 300mm above the modelled 1 in 100 year flood level attributed to the River Dove; to provide a suitable freeboard.

The 1 in 100 year plus climate change flood level is given as 37.85mAOD; and as such it is recommended that the flood level of the barn is set at a minimum of 38.15mAOD.

Due to the risk from fluvial flooding; it is also recommended that goods susceptible to water damage are stored at a level 600mm above the 1 in 100 year flood level i.e. 38.45mAOD.

5.2 Access and Egress

During the 1 in 5 year flood event within the River Dove, modelled flood levels suggest that the field adjacent to the development will become inundated; and as such dry access and egress from the new building will not be possible.

As such an assessment of hazard to people; has been undertaken; along the route from the new building to the site access at Barnsley Road.

5.2.1 Hazard Rating Calculations

From Section 13.3 of document FD2320/TR2 'R&D Outputs: FRA Guidance for New Development: Phase 2', the requirements for safe access and exit from development situated in flood risk areas are as follows, in decreasing order of preference:

- Safe dry route for people and vehicles
- Safe dry route for people
- If a dry route for people is not possible, a route for people where the flood hazard (in terms of depth and velocity of flooding) is low and should not cause a risk to people.
- If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding) is low to permit access for emergency vehicles. However the public should not drive vehicles in floodwater.

Where a dry route is not possible and a route with low flood hazard is identified, the route should not have any service covers that could be removed, or other underwater hazards.

It is often difficult to see underwater hazards even in shallow water, particularly at night or if the water is silty.

In addition, the route should be clearly marked, for example using painted posts.

Vehicles should not be used when:

- The presence of water stops the engine functioning;
- The vehicle floats; or
- The vehicle becomes difficult to control.

Cars will stop and/or float in water as shallow as 0.5m, whilst some emergency vehicles may survive in water of 1m. A fire engine remains controllable in depths of 0.5m up to a flow velocity of 5 m/sec, due to high-level air intakes/exhausts.

The data and information required in assessing safe access and exit depends on the complexity of the approach undertaken, as follows:

Simple Approach

- Flood levels for suitable annual probabilities (advisable to look at the 1% and 0.1% annual probabilities for fluvial flooding or the 0.5% and 0.1% for tidal/coastal flooding).
- Minimum ground levels along access and exit routes.

Intermediate Approach

- Flood depths and velocities for suitable annual probabilities across the development site and surrounding the development site, determined from hydraulic modelling.
- Simple lookup table relating depth and velocity to danger to people

Detailed Approach

- Flood depths and velocities across the development site and surrounding the development site, determined from hydraulic modelling.
- An appropriate means for determining the hazard factor for the site should be determined from the Flood Risks to People report.

Due to the scope of development proposed, an intermediate approach to assessing the safety of the emergency escape route has been adopted.

Intermediate Approach: Methodology

Danger to people is assessed using flood hazard, which can be expressed as a combination of flood depth and velocity.

Hydraulic modelling or the use of results from an existing assessment is needed to predict flood depth and velocity.

The Flood Risks to People project has developed the following equation to relate the flood hazard to flood depth and velocity:

Flood Hazard Rating = ((*v* + 0.5) x D) + DF

Where:
v = velocity (m/s)
D = depth (m)
DF = debris factor

The following table extracted from FD2321/TR1 provides guidance with regard to the appropriate debris factors to be applied.

Table 7: Guidance on Debris Factors for Different Flood Depths, Velocities and Dominant Land Uses (Table 3.1 FD2321/TR1)

Depths	Pasture/Arable	Woodland	Urban
0 to 0.25m	0	0	0
0.25 to 0.75m	0	0.5	1
>0.75m and/or V>2	0.5	1	1

A value for DF of 0 has been applied to the area along the escape route with a depth of inundation less than 0.25m; 0 has been applied to areas where the depth of flooding is less than 0.75m; and a value of 0.5 applied to areas with a depth of flooding in excess of 0.75m.

Using the guidance provided by FD2320/TR2, the following velocities are sufficient for such calculations:

- 0.5 m/s for lowland flat floodplains
- 2.0 m/s for steeper catchments

Based on this, the hazard rating equation has been applied to various combinations of flood depth and velocity to produce a matrix of hazard ratings.

Applying thresholds to these hazard ratings defines the danger to people at various depths and velocities as shown in the following table, extracted from FD2320/TR2.

Table 8: Velocity, Depth and Flood Hazard Matrix

Velocity (m/s)	Depth (m)									
	DF = 0					DF = 0.5				
	0.1	0.2	0.25	0.5	0.75	1.00	1.25	1.50	1.75	2.00
0.00	0.05	0.10	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00
0.50	0.10	0.20	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
1.00	0.15	0.30	0.38	0.75	1.12	1.50	1.88	2.25	2.63	3.00
1.50	0.20	0.40	0.50	1.00	1.50	2.00	2.50	2.50	3.50	4.00
2.00	0.25	0.50	0.63	1.25	1.86	2.50	3.13	3.75	4.38	5.00
2.50	0.30	0.60	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00

	<0.75	Low flood hazard (caution is required)
Class 1	0.75 – 1.25	Moderate hazard - Danger for some (children, the elderly & infirm)
Class 2	1.25 – 2.00	Significant hazard - Danger for most (the general public)
Class 3	>2.00	Extreme hazard - Danger for all (includes the emergency services)

Flood Hazard Rating Calculations

Modelled flood levels have been provided by the Environment Agency for a range of probabilities; and are provided within Table 6.

At the location of the proposed development, the catchment for the River Dove is considered to be fairly flat and therefore a velocity of 0.5m/s has been utilised.

Table 9: Flood Hazard Rating for Safe Access/Egress Route (Aldham Mill Farm)
DF=0 (Flood Depth 0-0.25m); DF= 0 (Flood Depth 0.25-0.75m); DF= 0.5 (Flood Depth >0.75m)

Point Ref.	Existing Ground Level (m)	1 in 2 year		1 in 5 year	
		Flood Depth (m)	Flood Hazard Rating	Flood Depth (m)	Flood Hazard Rating
1	37.37	0	0	0.09	0.09
2	37.57	0	0	0	0
3	37.33	0	0	0.13	0.13
4	37.63	0	0	0	0
5	37.89	0	0	0	0

Point Ref.	Existing Ground Level (m)	1 in 10 year		1 in 25 year	
		Flood Depth (m)	Flood Hazard Rating	Flood Depth (m)	Flood Hazard Rating
1	37.37	0.22	0.22	0.35	0.35
2	37.57	0.02	0.02	0.15	0.15
3	37.33	0.26	0.26	0.33	0.33
4	37.63	0	0	0.09	0.09
5	37.89	0	0	0	0

Point Ref.	Existing Ground Level (m)	1 in 50 year		1 in 75 year	
		Flood Depth (m)	Flood Hazard Rating	Flood Depth (m)	Flood Hazard Rating
1	37.37	0.43	0.43	0.46	0.46
2	37.57	0.33	0.33	0.36	0.36
3	37.33	0.47	0.47	0.50	0.50
4	37.63	0.17	0.17	0.20	0.20
5	37.89	0	0	0	0

Point Ref.	Existing Ground Level (m)	1 in 100 year		1 in 100 year + CC	
		Flood Depth (m)	Flood Hazard Rating	Flood Depth (m)	Flood Hazard Rating
1	37.37	0.48	0.48	0.71	0.71
2	37.57	0.28	0.28	0.51	0.51
3	37.33	0.52	0.52	0.75	0.75
4	37.63	0.22	0.22	0.45	0.45
5	37.89	0	0	0.19	0.19

In summary the resulting calculations indicate that access/egress on to the development at Aldham Mill Farm possesses a Hazard Rating in general less than 0.75 and therefore presents a low hazard, although it is advised that caution is required.

In the event that climate change increases flood level within the land adjoining the River Dove; at a small isolated section of the escape route towards Barnsley Road, the hazard

rating to people is increased to moderate; which may present a danger for vulnerable people such as children or the infirm.

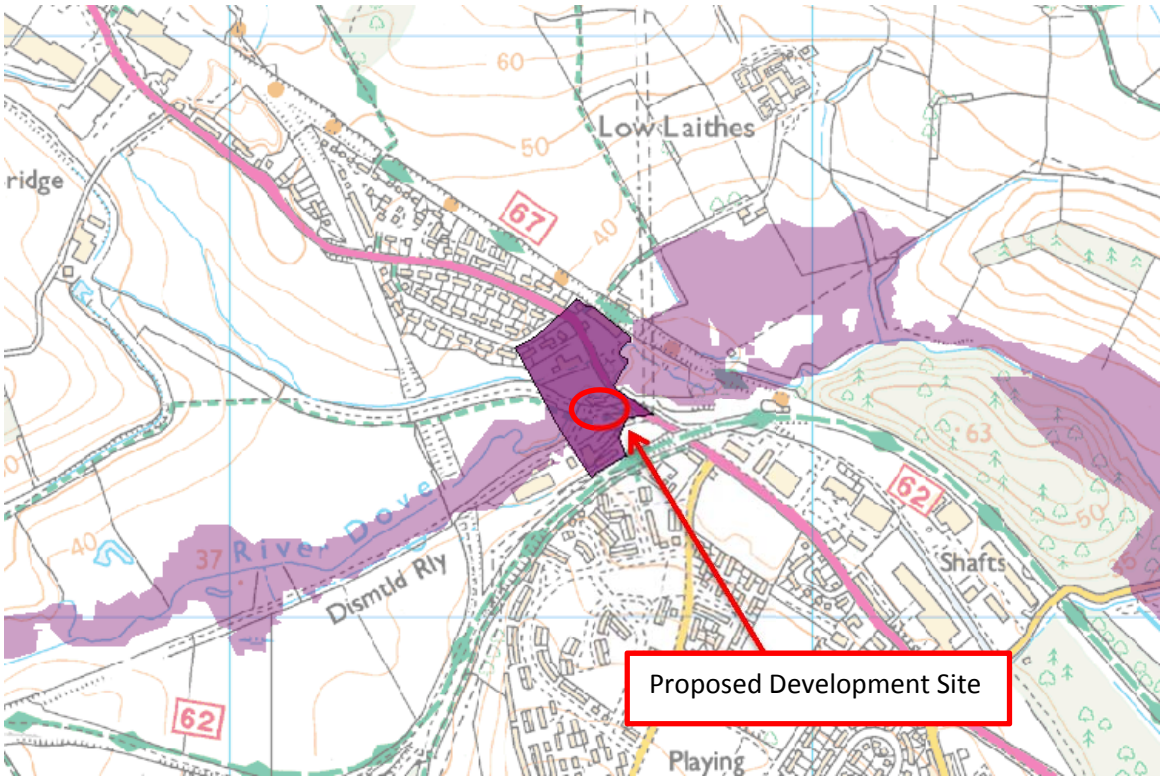
As such it is recommended that the land owner signs up to receive flood warnings or alerts from the Environment Agency; to ensure that all persons are advised to move away from the building in the event of imminent flood attributed to the River Dove.

5.3 Flood Warning

The Environment Agency operates a service known as the Flood Warning's Direct Service; which aims to provide flood alerts and warnings to people located within areas susceptible to fluvial or groundwater flooding.

Figure 5.1 below provides an indication of the area covered by the service.

Figure 5.1: Flood Alert & Warning Coverage



Source: www.environment-agency.gov.uk

5.4 Flood Storage Compensation

The site at present consists of three agricultural buildings and a down ramp to enable access from the adjoining field area.

The development proposals involve demolition of the existing buildings; with a new building elevated to a level comparable with the field to enable level access.

It is advised that only the ground below the new building and access will be elevated; with the raised ground supported by a retaining wall.

As such it is essential to undertake calculations to check that flood volume which is currently able to be stored within the site is not displaced as a result of the land raising works.

Furthermore it is advised that displaced volumes will need to be compensated for on a 'level-by-level' basis as close to the site as possible; to prevent the increase in flood risk to others away from the site.

For calculation purposes, an average base/ground level has been taken from the topographical survey of 36.0mAOD.

The areas of the footprint for each of buildings are as follows:

- Wooden Building 174.64m^2
- Block Building 41.92m^2
- Brick Building 20.23m^2
- Total footprint = 233.8m^2

Tabulated below are the volumes displaced by the buildings currently on site up to the 1 in 100 year return period from node DOVE01_3789u which was the node closest to the site.

Table 10: Volume Displacement Due to Existing Buildings

Return Period	Flood Level (m AOD)	Depth of Water (m)	Plan Area (m^2)	Total Volume for Each Return Period (m^3)
1 in 2 year	37.25	1.25	233.8	292.3
1 in 5 year	37.46	0.19		44.4
1 in 10 year	37.59	0.13		30.4
1 in 25 year	37.72	0.13		30.4
1 in 50 year	37.80	0.08		18.7
1 in 75 year	37.83	0.03		7.0
1 in 100 year	37.85	0.02		4.7
			Total	**427.9**

The volume from the ramp leading down to the wooden building was calculated using cross sections with an average width of 5.13m. The top of the ramp is at a level of 37.35m AOD and the bottom of the ramp is at 36.15m AOD

Table 11: Volume Displaced Due to Existing Ramped Access

Return Period	Flood Level (m AOD)	Cross Sectional Area (m^2)	Width (m)	Volume Displaced (m^3)
1 in 2 year	37.25	36.4	5.13	186.7
1 in 5 year	37.46	11.3		58.0
1 in 10 year	37.59	0		0
1 in 25 year	37.72	0		0
1 in 50 year	37.80	0		0
1 in 75 year	37.83	0		0
1 in 100 year	37.85	0		0
			Total	**244.7**

In total the existing development displaces 672.6m^3.

Table 12: Volume Displaced by Proposed Building

Return Period	Flood Level (m AOD)	Depth of Water (m)	Plan Area (m^2)	Total Volume for Each Return Period (m^3)
1 in 2 year	37.25	1.25	250.8	313.5
1 in 5 year	37.46	0.19		47.7
1 in 10 year	37.59	0.13		32.6
1 in 25 year	37.72	0.13		32.6
1 in 50 year	37.80	0.08		20.1
1 in 75 year	37.83	0.03		7.5
1 in 100 year	37.85	0.02		5.0
			Total	**459.0**

The calculations indicate that overall a net gain in flood storage is achieved as a result of the development on a level-by-level basis; particularly during the more frequent flood events.

As such it is concluded that the development will not increase flood risk elsewhere away from the site.

6.0 Conclusions & Recommendations

The proposed development covers a gross area of 0.17 Hectares, and comprises 3NO agricultural buildings; which are to be replaced by a single building to be used as a general store.

The ground and building will be elevated to enable level access from the adjoining field.

Primary flood risk is identified to be from the River Dove; and undertaking a comparison of modelled flood levels for the watercourse indicates that the site will become inundated during the 1 in 2 year flood event; and the adjoining field will flood during the 1 in 5 year event.

It is therefore concluded that the River Dove presents a flood risk at the development site.

Due to the type of development proposed it is recommended that the finished floor level of the building is set a minimum of 300mm above the 1 in 100 year flood level i.e. 38.15mAOD; with any goods susceptible to water damage stored at a level of 600mm above the design flood level, in order to provide a suitable freeboard.

Surface water runoff rates and volumes are likely to be decreased as a result of the development; and due to the smaller footprint attributed to the new building, calculations indicate that there will be a net gain in flood storage at the site; thereby making a betterment in comparison to the existing situation.

An evaluation of the hazard for people moving away from the building towards Barnsley Road; during flood conditions; indicates that in general the hazard remains low; however in the event of climate change; the hazard rating for part of the rout may be increased.

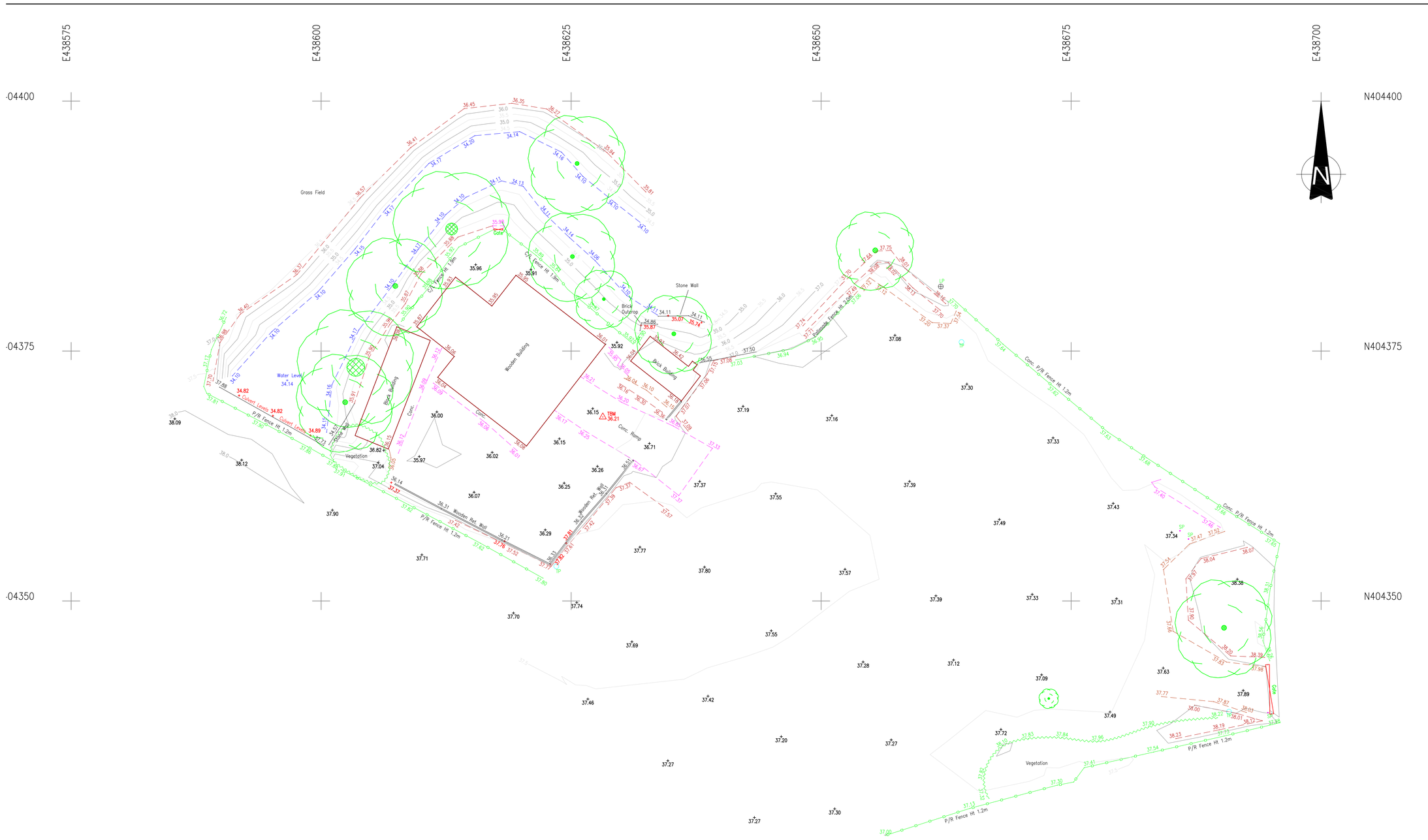
As such it is recommended that the land owner registers to receive flood warnings from the Environment Agency; so that people can be moved away from the building in good time; in the event of a flood within the River Dove.

An assessment of other flood sources; such as overland flow; groundwater; ponding and artificial water sources indicates that the risk to the site from these is low.

In order to minimise the effect of residual flooding within the proposed development, the implementation of mitigation measures as described throughout the assessment report should reduce flood risk to an appropriate level.

APPENDICES

Appendix A: - Topographical Survey



SYMBOL LEGEND

- Borehole
- Benchmark
- Bollard
- Bus Stop
- Electric Box
- Electricity Pole
- Fence Post
- Gas Stop Valve
- Gate Post
- Gas Marker
- Gully
- Gas Well
- Kerb Outlet
- Litter Bin
- Leachate Chamber
- Lamp Post
- Manhole Point
- MH Triangular
- Wooden Peg
- Ground Marker
- Marker Post
- Pylon
- Rodding Eye
- Sample Point
- Sign Post
- Spot Height
- Eave Level
- Ridge Level
- Stile
- Survey Station
- Traffic Camera
- Telephone Box
- Trial Pit
- Telegraph Pole
- Deciduous Tree
- Road Sign
- Valve
- Vent
- Water Meter
- Letter Box
- MH Circular
- Knockout Pot

LINETYPE LEGEND

- Bridge
- Bottom of Bank
- Building
- Canopy Edge
- Concrete Edge
- Ditch
- Drop Kerb
- Overhead Cable
- Fence
- Gate
- Kerb
- Path
- Pipe Line
- River
- Surface Water Drain
- Railway Line
- Road Centre Line
- Tarmac Edge
- Top of Bank
- Track
- Wall
- Verge
- Flagstone Paving
- Stone
- Hedgeline
- Grass Edge

MANHOLE LEGEND

MHCT	Cable Television
MHEL	Electricity
MHGA	Gas
MHSW	Surface Water
MHFW	Foul Water
MHBT	British Telecom
MHWT	Water

ABBREVIATIONS

LP.	Lamp Post
TP.	Telegraph Pole
EP.	Electricity Pole
SP.	Sign Post
TS.	Tarrific Sign
BS.	Bus Stop
GM.	Gas Marker Monument
MH.	Manhole
GU.	Gully
FH.	Fire Hydrant
CATV.	Cable Television Point
WM.	Water Meter
WSV.	Water Stop Valve
GSV.	Gas Stop Valve
RE.	Rodding Eye
GU.	Gully
FH.	Fire Hydrant
CATV.	Cable Television Point
WM.	Water Meter
WSV.	Water Stop Valve
GSV.	Gas Stop Valve
RE.	Rodding Eye

SURVEY IS ORIENTED TO ORDNANCE SURVEY NATIONAL GRID.
POSITIONS FIXED BY GPS ACTIVE NETWORK.
LEVELS TO OSGM02.

THIS SURVEY SHOWS PHYSICAL SITE BOUNDARIES ONLY.
CONFIRMATION OF LEGAL OWNERSHIP BOUNDARIES SHOULD BE OBTAINED BY REFERENCE TO THE H.M. LAND REGISTRY TITLE PLAN

THE PLAN SCALE IS FOR GUIDANCE ONLY.
DO NOT SCALE DIRECTLY .
IF IN DOUBT, CONSULT LATITUDE SURVEYS

REV.	DESCRIPTION	DATE

LATITUDE SURVEYS | Chartered Land Surveyors

RICS the mark of property professionalism worldwide

CLIENT

JOB TITLE

WOMBWELL LANE
BARNSLEY

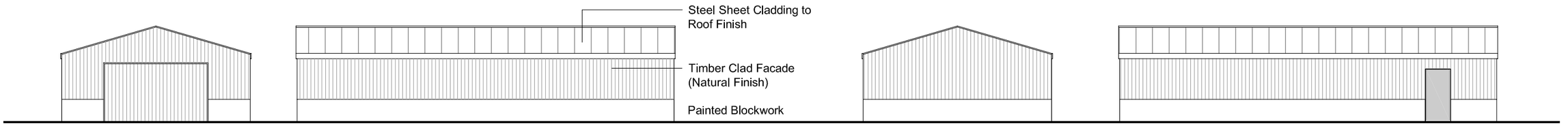
DRAWING TITLE

TOPOGRAPHIC SURVEY

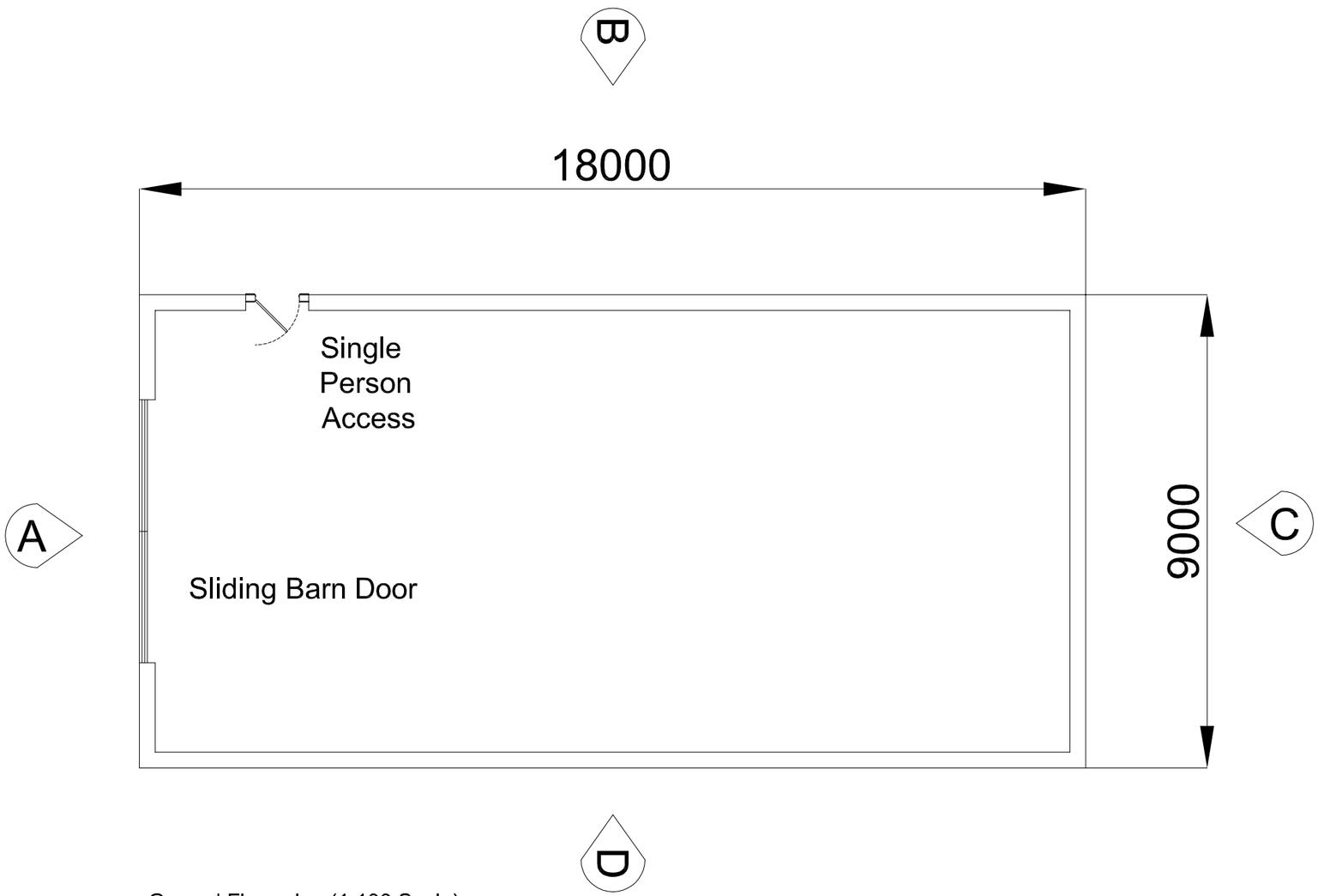
DRAWN	SIGNATURE	DATE	STATUS
GC		03/02/2014	FOR COMMENT ☐
APPROVED	SIGNATURE	DATE	FOR APPROVAL ☐
			DRAFT ☐
			FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
1:100	A1	LH1000-001	

Appendix B: - Development Proposals



Elevation A | Elevation D | Elevation C | Elevation B



Ground Floor plan (1:100 Scale)

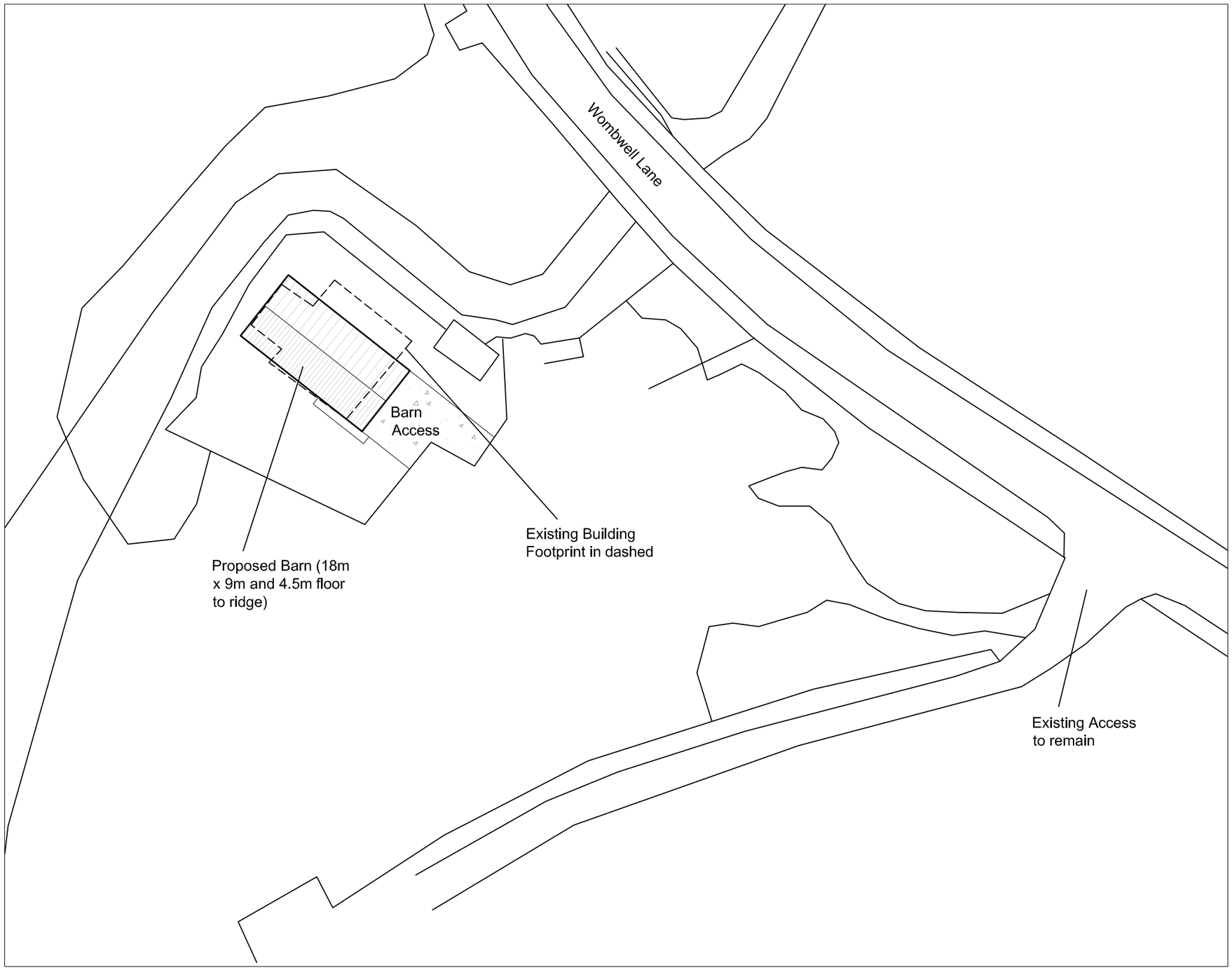
ALDAM MILL FARM

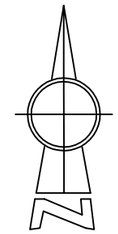
PROJECT
PROPOSED BARN UNIT
AT ALDAM MILL FARM

PLANS & ELEVATIONS

DRAWING NUMBER	REV
2013-CAH-AMF-01	----

SCALE @ A3	PLANS BY
1:200 & 1:100	C HUNTER - 07920402413





ALDAM MILL FARM

PROJECT
PROPOSED BARN UNIT
AT ALDAM MILL FARM

SITE PLAN

DRAWING NUMBER	REV
2013-CAH-AMF-02	----

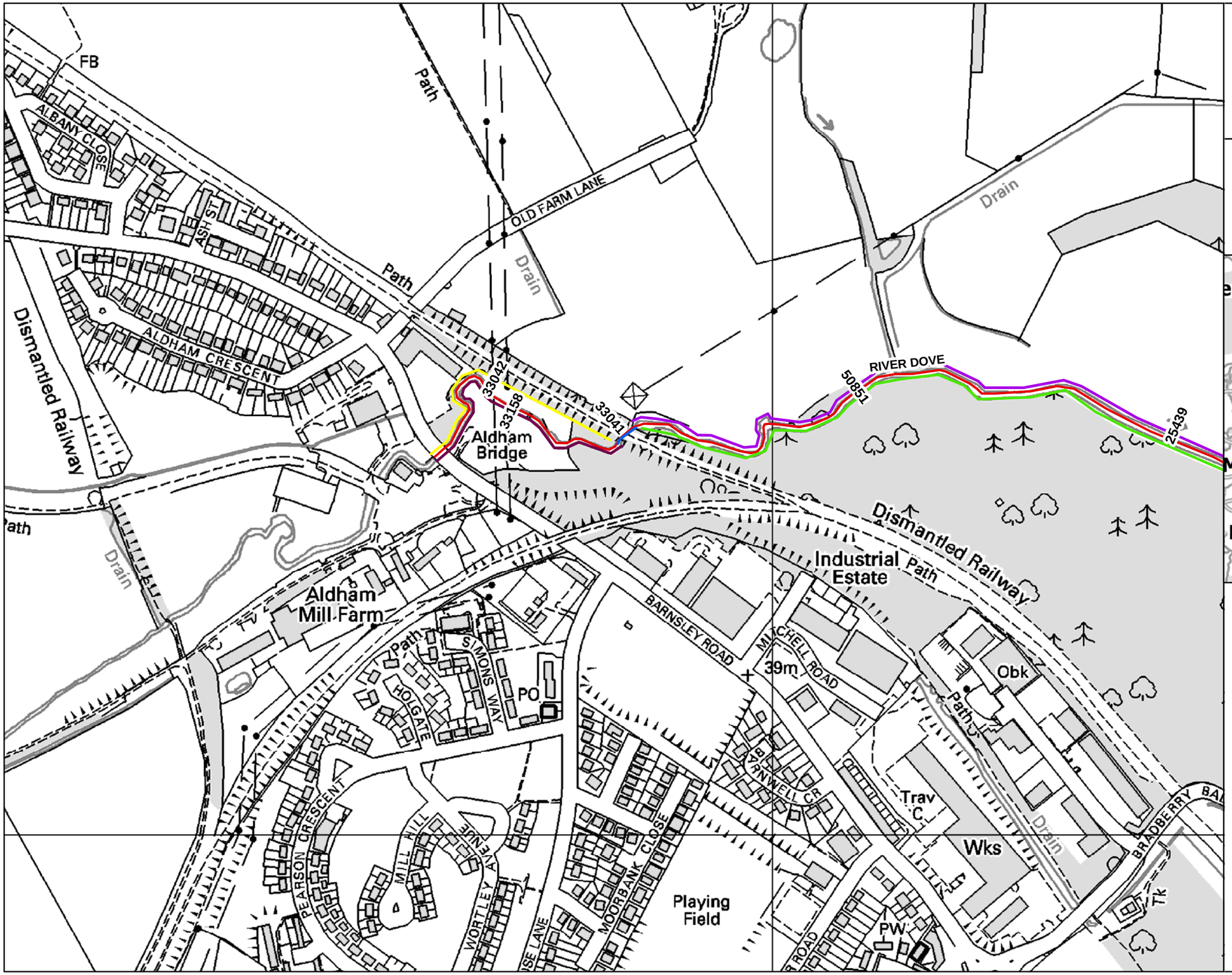
SCALE @ A3	PLANS BY
1:500	C HUNTER - 07920402413

Appendix C: - Environment Agency Data

RFI no: 28152 Asset Information

Asset ID	Asset Type	Asset Subtype	Maintainer	Description	Design Standard Of Protection	Actual Downstream Crest Level	Actual Upstream Crest Level	Actual Condition Rating
33042	defence	high_ground	private	Natural Ground	30	0	0	3
33158	defence	high_ground	private	Open channel	30	0	0	2
25439	defence	high_ground	private	Natural Ground	30	0	0	5
50851	defence	high_ground	private	Natural Ground	30	0	0	3
33041	channel	simple_culvert	private	Culvert	50	0	0	2

Asset Location Map for Alden Mill Farm, Wombwell, Barnsley - Date Created: 20/01/2014 Ref: 28152



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LEGEND

- Main River

Defences

ASSET_ID

- 25439
- 33041
- 33042
- 33158
- 50851

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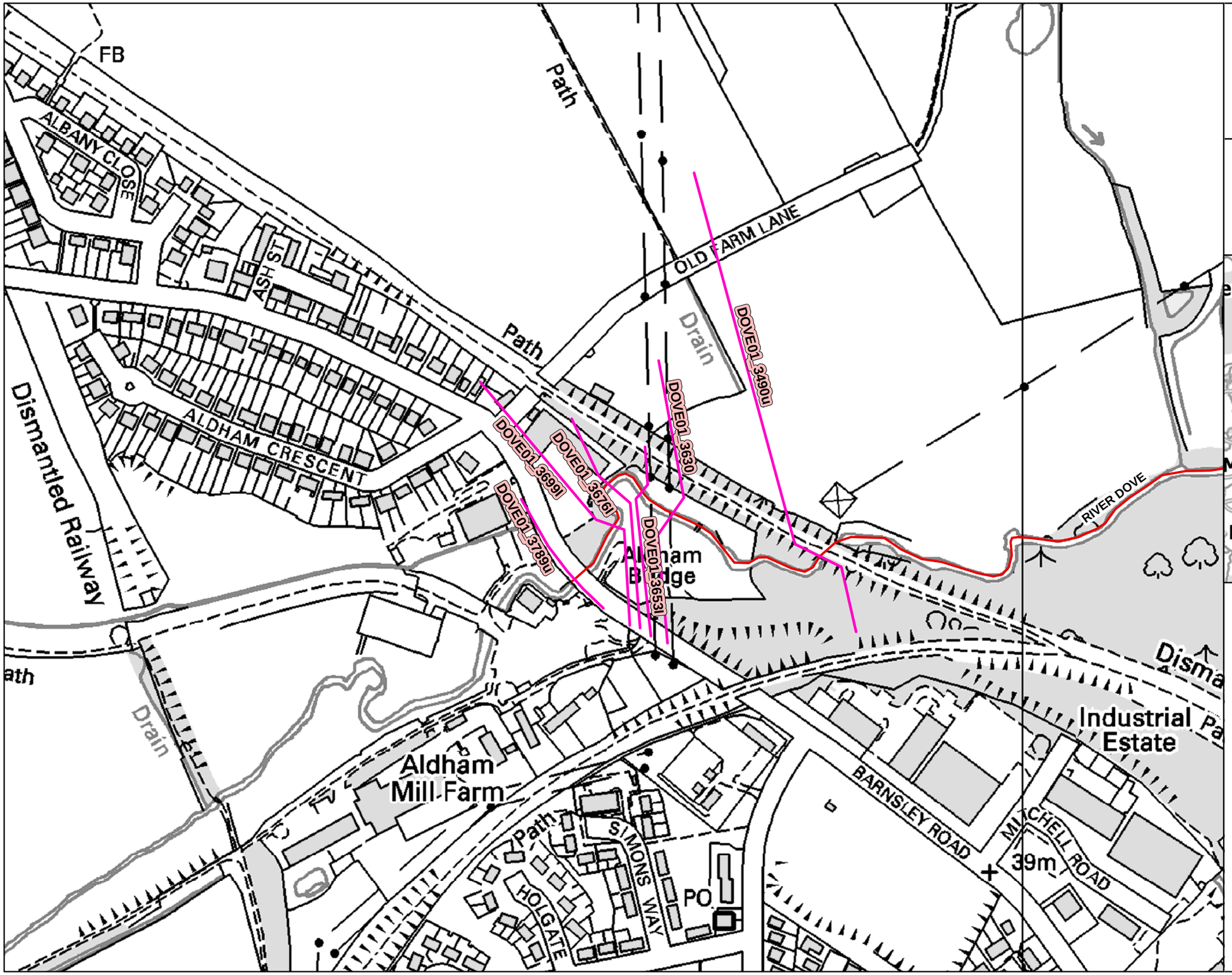
Cross Section Location Map for Alden Mill Farm, Wombwell, Barnsley - Date Created: 20/01/2014 Ref: 28152



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LEGEND

Main River

Cross Sections

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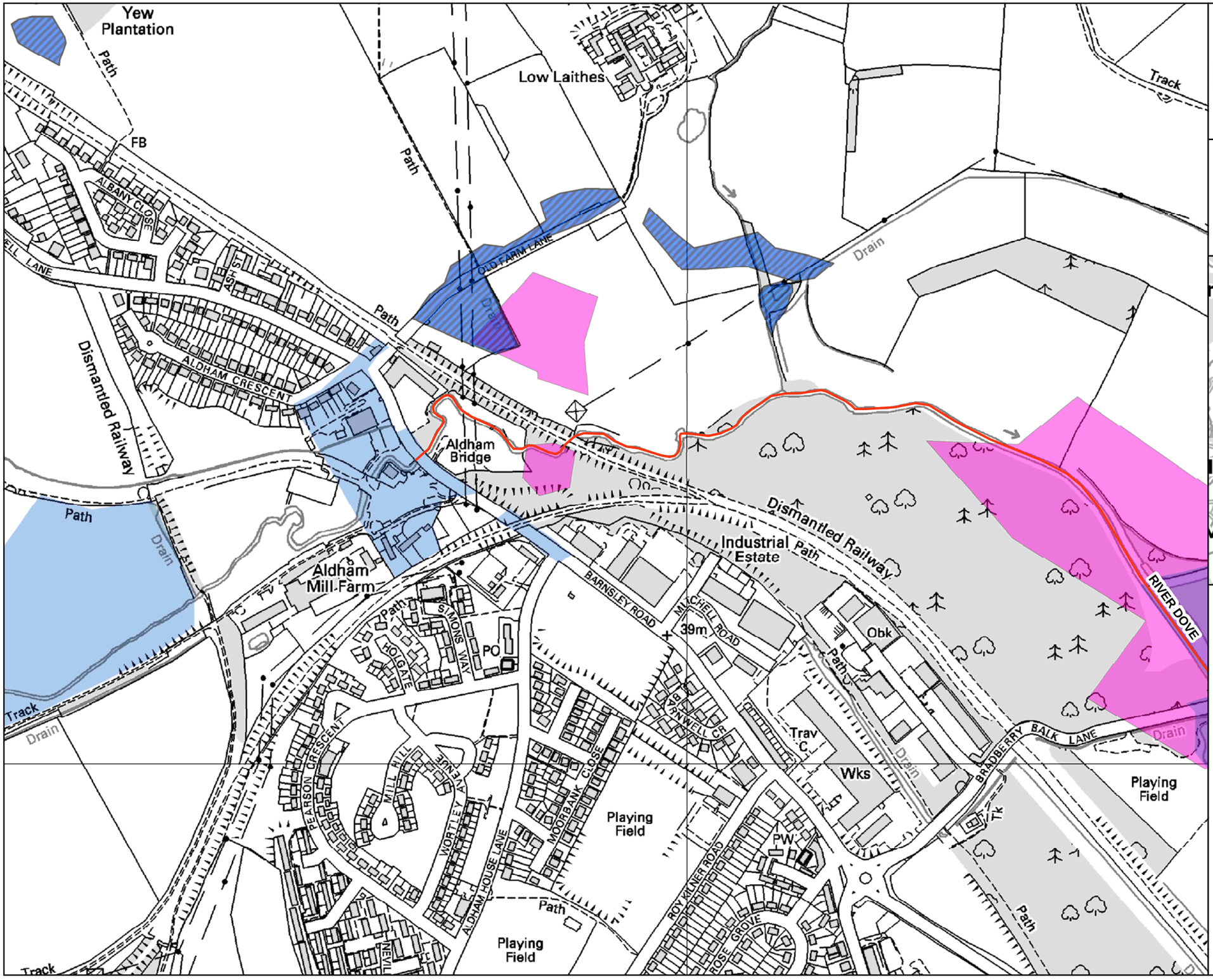
RFI no: 28152 River Dove Model Results (Level - mAOD)

NodePointName	Return Period	Level Value
DOVE01_3630	101	35.97
DOVE01_3630	100	35.67
DOVE01_3630	75	35.59
DOVE01_3630	50	35.53
DOVE01_3630	25	35.39
DOVE01_3630	10	35.17
DOVE01_3630	5	35.01
DOVE01_3630	2	34.68
DOVE01_3490u	101	36.00
DOVE01_3490u	100	35.68
DOVE01_3490u	75	35.60
DOVE01_3490u	50	35.53
DOVE01_3490u	25	35.34
DOVE01_3490u	10	35.16
DOVE01_3490u	5	34.99
DOVE01_3490u	2	34.54
DOVE01_3789u	101	38.08
DOVE01_3789u	100	37.85
DOVE01_3789u	75	37.83
DOVE01_3789u	50	37.80
DOVE01_3789u	25	37.72
DOVE01_3789u	10	37.59
DOVE01_3789u	5	37.46
DOVE01_3789u	2	37.25
DOVE01_3653l	101	35.92
DOVE01_3653l	100	35.37
DOVE01_3653l	75	35.31
DOVE01_3653l	50	35.57
DOVE01_3653l	25	35.40
DOVE01_3653l	10	35.22
DOVE01_3653l	5	35.08
DOVE01_3653l	2	34.72
DOVE01_3699l	101	37.10
DOVE01_3699l	100	37.10
DOVE01_3699l	75	37.09
DOVE01_3699l	50	37.10
DOVE01_3699l	25	37.10
DOVE01_3699l	10	37.11
DOVE01_3699l	5	37.11
DOVE01_3699l	2	37.10
DOVE01_3676l	101	36.44
DOVE01_3676l	100	36.35
DOVE01_3676l	75	36.33
DOVE01_3676l	50	36.37
DOVE01_3676l	25	36.36
DOVE01_3676l	10	36.30
DOVE01_3676l	5	36.25
DOVE01_3676l	2	36.00

Flood History Map for Alden Mill Farm, Wombwell Lane, Barnsley - dated: 23/01/2014 [Ref: 28152]



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N
W E
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Flood Extents

Legend

- Main River
- 2007 Flood Event Surface Water Flood Extent
- 2007 Flood Events Flood Extent
- River Don 1947 Flood Event Flood Extent

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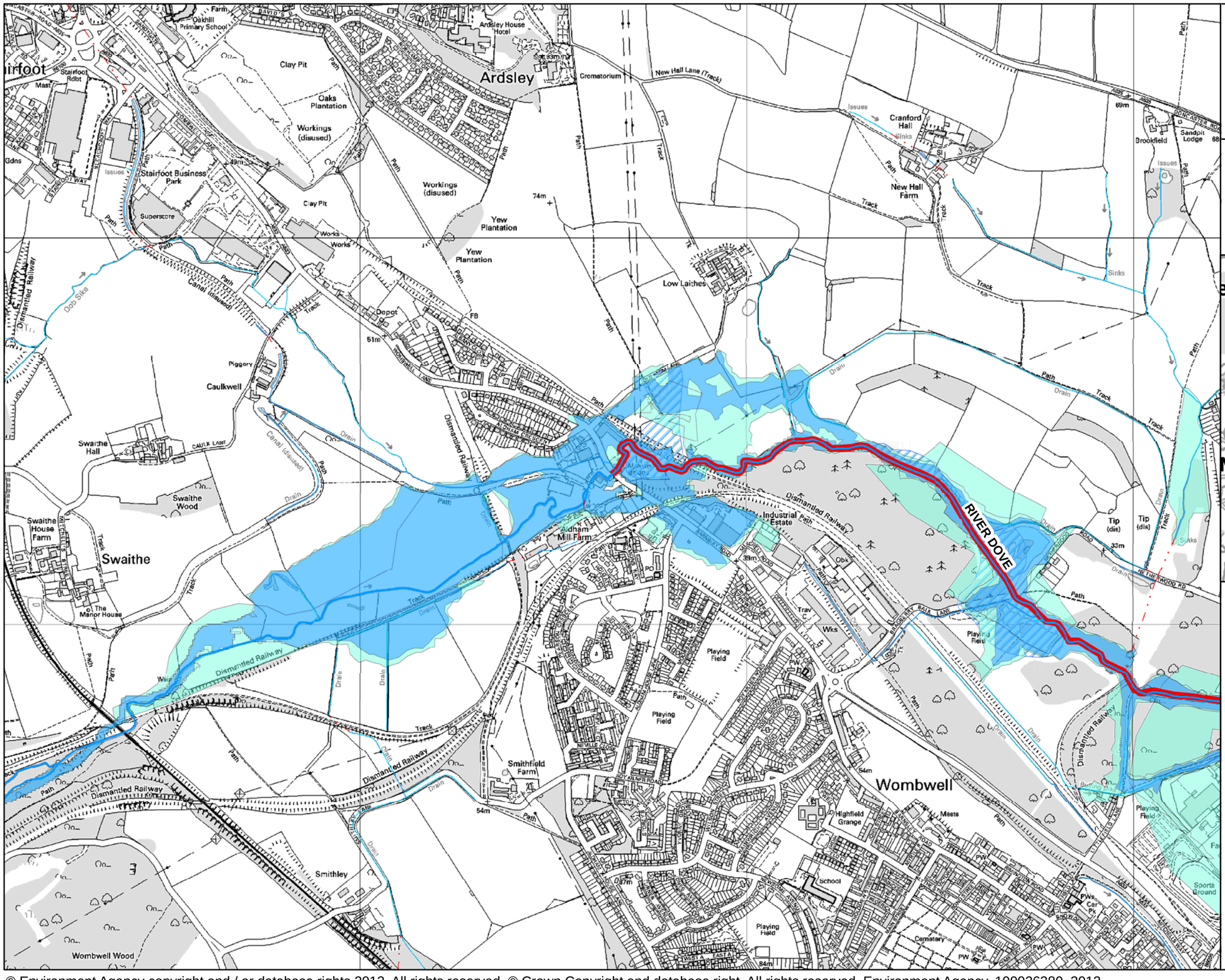
Flood Map for Alden Mill Farm, Wombwell Lane, Barnsley - Date Created: 23/01/2014 Ref: 28152



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LEGEND

- Main River

Detailed River Network

CDS_CONTEXT.DRN.RIVERTYPE

- Primary River
- Secondary River
- Tertiary River
- D/S of High Water Mark
- D/S of Seaward Extension
- Lake / Reservior
- Canal
- Extended Culvert (greater than 50m)
- Canal Tunnel
- Underground River (inferred)
- Underground River (local knowledge)
- Flood Zone 3 (FZ3)
- Flood Zone 2 (FZ2)
- Flood Storage Areas

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Appendix D: - Dove & Dearne IDB Consultation

RE: Product 4 request

January 13, 2014 at 8:47:18 pm

From: Paul Jones <Paul.Jones@shiregroup-idbs.gov.uk>

To: c.vose@floodriskconsult.com

Cc: Ian Benn <Ian.Benn@shiregroup-idbs.gov.uk>, Martin Spoor <Martin.Spoor@shiregroup-idbs.gov.uk> **(1 more)**

Dear Chris,

Thank you for the email.

The Danvm Drainage Commissioners do not hold any historic flood data but are aware of a flood risk downstream in low Valley which BMBC and the EA maybe able to advise further. Alternatively the EA have now published their river and surface water flood maps.

There site appears to lie within the IDB Drainage District near to an Ordinary Watercourse "Aldham Bridge Dike" which is currently maintained by the Commissioners. This watercourse flows into the Main River "River Dove".

Any works within 9 metres of a watercourse will require consent from the IDB as well as any new or altered surface water discharge as described in the attachments. Please also note that if any new or increased surface water discharges are required then due to the flood risk downstream evidence maybe required to demonstrate no increase in flood risk downstream as part of any consent form the IDB.

Kind regards,
For and on behalf of the Shire Group of Internal Drainage Boards,

Paul Jones BSc (Hons) MSc (Eng)
Engineer to the Board
Lead Water Level Management Engineer

From: Ian Benn
Sent: 13 January 2014 10:50
To: Paul Jones; Martin Spoor; derekbell@barnsley.gov.uk
Subject: FW: Product 4 request

Ian Benn

From: Chris Vose [mailto:c.vose@floodriskconsult.com]
Sent: 13 January 2014 10:06

To: Ian Benn

Subject: Product 4 request

The Flood Risk Consultancy have been commissioned to undertake a Flood Risk Assessment for a development at Alden Mill Farm, Wombwell Lane, Wombwell, Barnsley S73 8EL.

We are currently in the gathering information stage, if you have any flood levels, historic flooding or any information regarding flooding at the site it would be more than useful in order for us to progress the assessment further.

Please find attached a site location plan.

Kind Regards

Chris Vose

The Flood Risk Consultancy
20 Church Street
Colne
Lancashire
BB8 0LG
Office: 01282 863895
Email: <info@floodriskconsult.com>

JBA first internal send 10:49 Mon 13 Jan 2014

Attachments:

PDF LOCATION_PLAN_A1.pdf
2.8 MB
Download

PDF DEFRA approved Byelaws Danvm.pdf
5.8 MB
Download

PDF Information for Applicants.pdf
79 KB
Download

DOC - Consent Form UPDATED.doc
69 KB
Download