AAH planning consultants

FLOOD RISK ASSESSMENT

LAND SOUTH OF WHALEY BRIDGE

PROPOSED RESIDENTIAL DEVELOPMENT

JUNE 2016

JOB REFERENCE: 37095

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1.0 Introduction

1.1 AAH Planning Consultants have been commissioned to provide a Flood Risk Assessment (FRA) and outline drainage proposals in support of a proposed residential development on Land to the south of Whaley Bridge, Derbyshire SK23 7EU.

1.2 The National Planning Policy Framework (NPPF) identifies that FRAs should be conducted for new development proposed on the floodplains of rivers or sites at risk of coastal flooding, located within critical drainage areas or where a site is larger than one hectare in size. The site is in an area generally classified as Flood Zone 1, the low fluvial and tidal flood risk area, with a plan area of 7.0 hectares. The site is not located within a critical drainage area.

1.3 The existing site has open/agricultural use which is cited in Table 2 of the National Planning Policy Framework Technical Guidance (NPPFTG) as 'water compatible'. The proposed residential development (class use C3) is 'more vulnerable' development to flooding and constitutes an increase in the flood risk vulnerability of the site.

1.4 The site is under the jurisdiction of Derbyshire Council Local Planning Authority and High Peak Borough Council. The drainage undertaker for the area is United Utilities. Consultation has been undertaken with each of these in relation to flood risk management for the proposed development, and with the Environment Agency (EA) regarding the feasibility of residential development in flood risk and drainage terms.

1.5 This report concludes that in general terms the flood risk to the site is low and therefore no specific design restrictions should be placed on the development by the Statutory Consultees in this regard. An appraisal of the sustainable surface water drainage hierarchy contained within 'Sewers for Adoption 7th Edition' concludes that all surface water from the development will either be infiltrated in to the ground or discharged to the Tertiary Watercourse to the east of the site which is a tributary of the Randal Carr Brook at a rate equivalent to that from the existing undeveloped site.

2.0 Existing Site

2.1 The proposed housing development would be located at grid reference: X 401225, Y 380184 approximately 1.6 kilometres south of Whaley Bridge town centre, surrounded to the east, west and south by the Peak District National Park, the nearest part of it being 350m to the west. Further afield, Chapel en-le-Frith lies approximately 4km to the east and Stockport approximately 11km to the north-west. The site lies within the High Peak Borough Council administrative area.

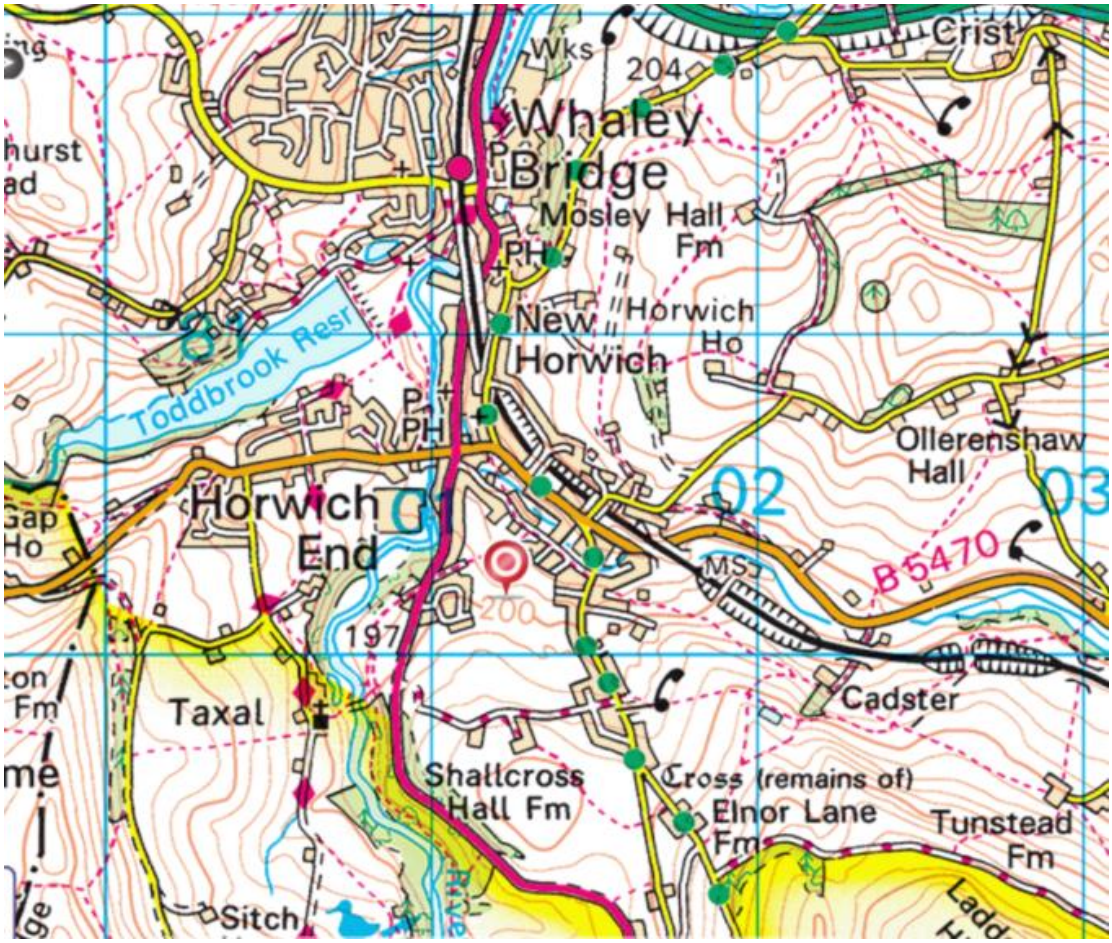

Figure 1 Site Location

2.2 As shown above the site is located on the southern edge of the settlement of Whaley Bridge which is surrounded by the Peak District National Park. Elnor Lane Farm which is associated with the application is situated approximately 740m to the south-east. The application site can be found in between residential built forms associated with Vaughan Road and Mevril Road to the west; as well as Randal Crescent and Elnor Avenue to the east. Agricultural land abuts the application site's northern and southern boundaries whilst a dismantled railway

line (known locally as Shallcross Incline) is now a footpath surrounded by trees and runs along the site's eastern edge. The wider landscape is characterised by numerous blocks of woodland around the River Goyt, the nearest being Lodge Wood and Shallcross Wood to the west; as well as a number of plantations in and around the Randal Carr Brook to the east.

2.3 No topographic survey was available at the time of writing, so the gradient of the site has been estimated from OS contours at 35m/300m, or 12%.

2.4 The existing site has open/agricultural use which is cited in Table 2 of the National Planning Policy Framework Technical Guidance (NPPFTG) as 'water compatible'. Water compatible in this instance means that there is no flood vulnerable infrastructure on the site.

3.0 Development Proposal

3.1 The proposal is to develop the 7.0 hectare site with 125 dwellings, an indicative density of 18 dwellings per hectare. This proposed density will allow for a more spacious arrangement with the necessary soft landscaping works to protect the visual amenity of the area. The proposal has a number of options for access. There is potential for the access being available from Mevril Road and Manor Road/Vaughan Road to the west. The other option is from Buxton Road and Carr Brook Close, Randal Crescent and Merv Springs Way having access to Shallcross Mill Road. All of the proposed residential dwellings would be designed so as to satisfy the council's standards for off street car parking and would satisfy National Government's Manual for Streets Design Guidance in creating streets and spaces for people rather than just for traffic. The proposed C3 class use would be 'more vulnerable' to flooding in accordance with Table 2 of the NPPFTG.

3.2 The proposed housing styles are not yet fixed, but an appraisal of surrounding housing types would suggest that a mixture of 2, 3, and 4 bedroom two storey dwellings in detached, semi-detached and terrace dwellings would form the basis of the development.

3.3 In addition to the built form of each dwelling house, there would be areas of private hardstanding utilised for driveways and pedestrian/patio hardstanding. It is probable that these areas could be constructed from pervious hardstanding materials. Highways within the development would be built to an adoptable standard and in all probability have a traditional construction, thus forming part of the site impermeable/drained catchment area. For the purposes of this assessment it is anticipated that the built development on the site would be approximately 43% of the 7.0 ha developed area which equates to 3.0 ha.

3.4 Preference would be for surface water from the development to discharge to soakaways and infiltrate in to the ground, however where this is not possible then it will be necessary for these flows to connect to the public sewer. For sewer connection the calculated Greenfield runoff rate will be used as the limiting discharge rate for the surface water sewer network design and attenuation storage estimates.

3.5 Large areas of the site which do not form part of the drained catchment would comprise private gardens and open community amenity space. At this stage it is anticipated that there will be some opportunities for the use of soft open Sustainable Drainage Systems (SuDS) on amenity space which would be most likely to comprise the lowest areas of the plot on the northern site extents.

4.0 Flood Risk Assessment

Fluvial Flooding

4.1 An appraisal of the Environment Agency (EA) flood map shows that the site is designated at a strategic level as Flood Zone 1 and is therefore considered to be at a low risk of flooding from rivers and the sea. The annual probability of flooding (APF) to the site from fluvial and tidal flooding is quantified as less than 1 in 1000 years / 0.1%.

4.2 The EA flood map show that the entire site lies in Flood Zone 1. The site is formed by high ground, with the River Goyt to the west and north, and Randal Carr Brook to the east. Ground levels fall from south to north, and Shallcross Road to the south would intercept any overland flows from this direction. Any flows able to bypass Shallcross Road would naturally be guided by topography to Buxton Road to the west, rather than to the site.

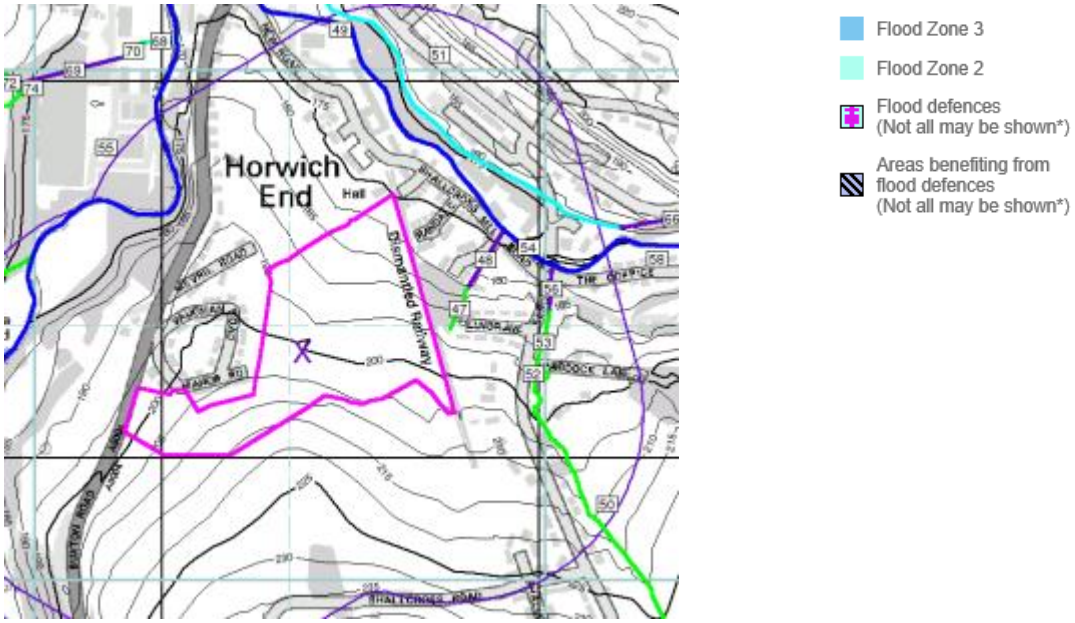

Figure 2 Environment Agency Flood Zone Map

Static/Artificial Watercourse Flood Risk

4.3 The Environment Agency 'Risk of Flooding from Reservoirs' map indicates areas where peoples' lives would be in danger as a result of an uncontrolled release of water from a reservoir. In terms of the probability of occurrence, the Environment Agency acknowledges in their flood map annotations that reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925 with all large reservoirs inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensures that reservoirs are inspected regularly and essential safety work is carried out.

4.4 The EA Risk of flooding from Reservoirs map suggests that a small part of the east of the site could be at risk if Coombs Reservoir were to fail catastrophically and overflow along Randal Carr Brook. However, this is over 2.5km from the site and the flow route is partially blocked by the Stockport to Buxton Railway, therefore this is considered extremely unlikely.

Groundwater Flooding

4.5 Groundwater flooding is most commonly caused by rainfall which causes the groundwater table beneath a site to rise and to eventually exceed ground level. Groundwater flooding can also occur where the water table is sufficiently close to the site surface that it inundates

subterranean development. Like other sources of flooding, groundwater flooding will be affected by increased rainfall attributable to climate change.

4.6 A desktop survey of mapped geological records has been undertaken as part of the Flood Risk Assessment process. Evaluation of the British Geological Survey (BGS) Geology of Britain Viewer shows the site has a Bedrock of Pennine Lower Coal Measures Formation - Mudstone, Siltstone and Sandstone, with superficial Devensian Till Deposits. No intrusive investigation has been undertaken for this study, but borehole records suggest (BGS ID: 193152) a 6m layer of brown fine and medium sand, slightly silty in parts with traces of fine and medium quartzite gravel. Beneath this there is soft grey brown sandy clay containing varying amounts of fine to coarse quartzite gravel.

4.7 The site is generally at or around 180-215m above Ordnance Datum, with ground levels falling from south to north. This difference in elevation combined with the free draining nature of the subsoils suggest that the groundwater table beneath the site will be relatively deep and stable and will not pose a risk of flooding to the site. It is possible that infiltration to groundwater is an appropriate means of disposal of surface water runoff.

Pluvial Flooding

4.8 Intense rainfall, particularly in urban areas, can create runoff which temporarily overwhelms the capacity of the local drainage systems. Under these conditions, localised 'flash' flooding can occur. In addition, surface water sewers can flood into foul sewers and overload both the surface water and combined sewer networks. This type of flooding is especially problematic when these systems become overloaded simultaneously.

4.9 The EA flood map for surface water (FMfSW) divides England and Wales in to areas with a very low, low, medium and high risk of surface water flooding. 'Very low' means that each year this area has a chance of flooding of less than 1 in 1000 (0.1%). 'Low' means that each year this area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%), 'Medium' means that each year this area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%) and 'High' means that each year this area has a chance of flooding of greater than 1 in 30 (3.3%).

4.10 Due to the low resolution of the FMfSW, it is not possible to accurately describe the extents of the denoted flood outlines in detail. In addition to this, it is also noted that this resource has significant inaccuracies due to the coarse nature of the topographic data upon which it is

based. In general terms, the surface water flood map alone should not be used to assess flood risk on an individual site basis but used to consider catchment wide surface water flows (which will also be indicative of catchment wide pluvial flow), the surface water flood map does comprise a useful tool in determining the generalised flood risk to an area.

4.11 A rough appraisal of the flood map for surface water appears to show the site of the dwellings as being predominantly at a very low risk of surface water flooding (> 1000 year return). The topography of the site suggests that rainfall will be shed to the south so ponding and channelling will be restricted to localised depressions and creases within the site.

4.12 With development of the site the standard percentage of rainfall runoff will increase. Although a comprehensive surface water drainage system will form part of the proposal to reduce and prevent overland flow, it should be noted that failure of such infrastructure could again see greater rates off of the site. Drainage system failure could be attributable to system blockage or following overwhelming rainfall which exceeds the finite design capacity of the system. Drainage system failure should be factored in to the detailed surface water drainage design for the site.

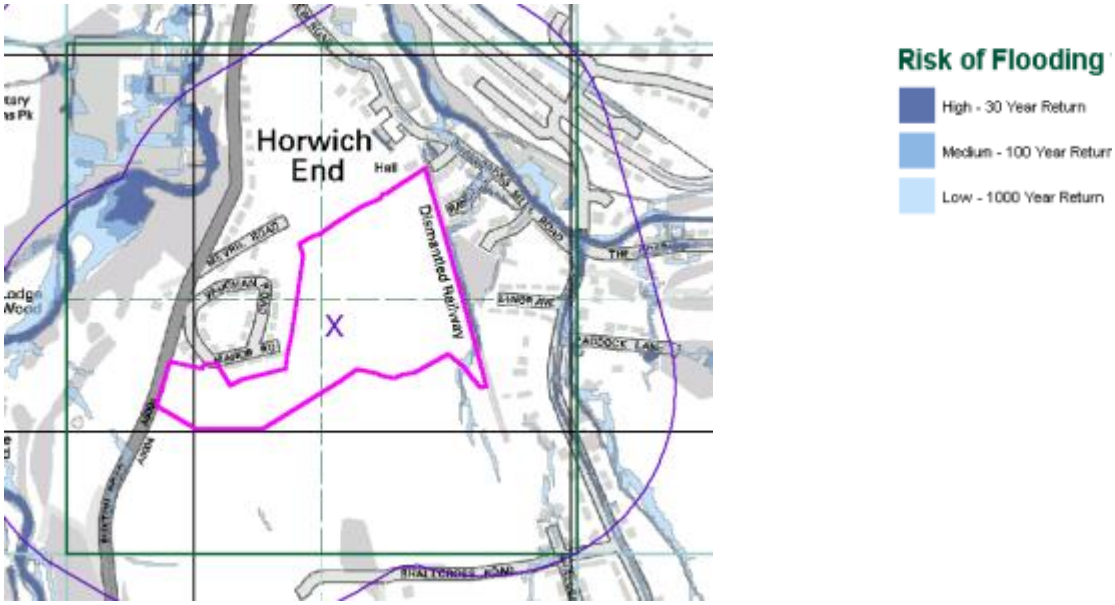

Figure 3 Environment Agency flood map for Surface Water

4.13 The site is bound to the west by the River Goyt and to the east and north by the Randal Carr Brook. Ground levels fall to the north, and the site is protected to the south by Shallcross Road, so the site is not at risk from overland flow from any direction. Therefore the infiltration/attenuation system will be located in the northeast corner for discharge to

groundwater or to the drain and culvert system to the west of the site. Provision should also be made for notional sewer exceedance overland flow routes, perhaps along internal roadways.

5.0 Surface Water Drainage

5.1 At this stage the exact footprint of buildings on the site in the pre and post development stages remains unknown; however, it is accepted that there will be a significant increase in impermeable area, estimated as 43% of the developed area. An increase in built footprint means that the sustainable management of surface water from the new dwelling is a fundamental point for consideration by the Lead Local Flood Authority during the planning consultation process.

5.2 In accordance with sustainable drainage principles, preference is for source control of runoff, this is where rainfall is captured at source and prevented from leaving a site by measures such as permeable pavements, rainwater harvesting systems and green roofs. Where rainfall cannot be entirely managed using source control measures the next most sustainable measures are for use of soakaways serving the entire positively drained site catchment, and then for discharge of surface water to a watercourse or public sewer in that order of preference.

Source Control; Pervious Pavements

5.3 There may be opportunities in the development to use pervious pavements as a means of surface water source control. It is anticipated that private driveways and parking areas will be created alongside and to the rear of the built units. Use of permeable block paving would be a practical, attractive and sustainable means of surfacing external hardstanding areas and would reduce the footprint of positively drained surfaces within the proposed development.

Soakaways

5.4 A desktop survey of mapped geological records has been undertaken as part of the Flood Risk Assessment process. Evaluation of the British Geological Survey (BGS) Geology of Britain Viewer shows the site has a Bedrock of Pennine Lower Coal Measures Formation - Mudstone, Siltstone and Sandstone, with superficial Devensian Till Deposits. No intrusive investigation has been undertaken for this study, but borehole records suggest (BGS ID: 193152) a 6m layer of brown fine and medium sand, slightly silty in parts with traces of fine

and medium quartzite gravel. Beneath this there is soft grey brown sandy clay containing varying amounts of fine to coarse quartzite gravel.

5.5 Based on the published geology of the site it is likely that infiltration will be feasible. However, before the use of infiltration can be accepted, it will be necessary for onsite percolation testing to be undertaken to determine ground permeability. The commission of percolation tests, to be undertaken in accordance with the BRE365 design methodology should be placed as a condition of consent on the planning decision notice.

Discharge to a Watercourse/Sewer

5.6 If percolation testing shows that the use of infiltration is not a viable means of surface water drainage then discharge to a watercourse will be the next most sustainable option. At this stage it is anticipated that connection of surface water to the watercourse will be viable with attenuation to limit outflows to the current greenfield runoff rate. Greenfield runoff and attenuation volumes are calculated in s5.12, and this matter will be investigated further as part of the reserved matters planning application subject to the grant of outline planning consent.

5.7 Where discharge to a watercourse is not viable, the next preference would be for connection to the public sewer. Within the site, separate foul and surface water sewers for adoption would be constructed. The separate systems will remain separate where existing independent foul and surface water sewers are available or would combine at the last inspection chamber on the site and outfall to a public combined water sewer as a last resort.

Preliminary Drainage Proposals

5.8 Preliminary assessments of the requirements for storm drainage have been based on the following criteria:

Application Site Area (ha):	7.0
Impermeable Area (ha):	3.0
Sewer flood protection:	1 in 30 years
Fluvial / Development flood protection:	1 in 100 years

M5-60	19.2mm	**SAAR**	1200
Ratio r	0.30	**WRAP**	2

Minimum cover to sewers (m):	1.2

Minimum velocity (m/s):	1.0
Pipe ks value (mm):	0.6mm
Allowance for Climate Change:	30%

Table 1 Impermeable and Permeable Areas (ha)

Areas (m^2)	Impermeable	Pervious	Totals
Before	0	7.0	7.0
After	3.0	4.0	7.0

Soakaway Design

5.9 Table 4.7 of the SuDS Manual identifies typical infiltration coefficients for a range of soil types and defines typical infiltration coefficients for sand to range between 0.1-100 m/hour. A conservative infiltration estimate of 0.5m/hr has therefore been assumed. This figure should be verified by field testing and the results amended accordingly prior to development.

5.10 Soakaway sizing calculations have been undertaken in accordance with the BRE 365 Digest calculation procedure for the 1 in 100 year storm event, with a 30% allowance increase in rainfall intensities attributable to climate change (equivalent to a return period of 1 in 393).

5.11 Calculations demonstrate that the size of soakaway required to drain the proposed development during the critical 1 in 100 plus climate change event storm is 150m x 26m x 1.6m, providing a storage volume of 1872m^3. The summary calculations are contained in the Appendices. The soakaway should be located in order to maintain the 5m minimum distance from buildings required in s3.25 of Building Regulations 2010, approved document H.

Attenuation Storage Requirements

5.12 If percolation testing shows that use of infiltration is not a viable means of surface water drainage then discharge to a watercourse will be the next most sustainable option. The allowable runoff, QBAR, has been calculated as 10.3 l/s for the areas above, based on the principles laid down in IoH124 (Supporting calculations are in Appendix B1). Runoff is calculated from:

QBAR(urban) = QBAR(rural) (1 + URBAN) 2NC [1 + URBAN{(21/CIND) -0.3}]

5.13 Assuming a limiting discharge of 24.0 l/s, and areas of 3.0ha impermeable and 4.0ha permeable, the 1 in 100 year plus 30% climate change storage volume is 2022 m^3, and the 1 in 30 year plus 30% climate change storage volume is 1477 m^3 (supporting calculations can be found in Appendix B).

Development Catchment

Total Developed Area (ha):	7.0
Total Impermeable Area (ha):	3.0
Design Flood	1 in 100 year +CC

Attenuation Storage

Allowable Runoff (l/s)	20.9
Approx. Storage Volume (m^3):	2022
Dimensions (m)	50 x 30 x 1.4

5.14 The surface water discharge from the site will require attenuation by a flow control structure such as an orifice plate or vortex control device. Storm water storage will discharge to the tertiary watercourse 35m to the west of the site, which discharges in turn to the Randal Carr Brook. Detailed drainage design will determine the precise arrangement which will be fixed by reserved matters planning application, subject to approval of outline planning consent.

6.0 Conclusions

6.1 The proposal is to develop the 7.0 hectare site with 125 dwellings, an indicative density of 18 dwellings per hectare. The proposed C3 class use would be 'more vulnerable' to flooding in accordance with Table 2 of the NPPFTG.

6.2 The proposed development site is restricted to Flood Zone 1, the low fluvial and tidal flood risk area. Following an appraisal of topographic and geological records, and additional flood mapping resources, the site is also considered to have a low risk of flooding from surface water, sewers, groundwater and reservoirs. Since the footprint of the site is over 1 hectare, the proposal is subject to Flood Risk Assessment in accordance with the National Planning Policy Framework.

6.3 Preference would be for infiltration of surface water from the proposed development to the ground via private soakaways or infiltration sustainable drainage measures serving the entire site. Where this is not viable, preference would be for connection to a local watercourse, or public sewer in that order of preference. For this development, it is considered that infiltration is likely to be viable. The final drainage proposals will be agreed with United Utilities at the detailed design stage when site layout and positively drained catchment area is fixed.

6.4 The proposed development is considered to accord with the flood risk and sustainable drainage principles of the National Planning Policy Framework and should therefore be deemed suitable by the Local Authority in this regard.

APPENDIX A:

EXISTING SITE PLAN