

BARRATT HOMES MANCHESTER

**Proposed Residential Development, Land off Manchester Road,
Chapel-en-le-Frith**

Flood Risk Assessment

July 2011

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**Flood Risk Assessment
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PREPARED BY:

E Skelley Geologist

APPROVED BY:

T Perrins Technical Director

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SSL:3745A	Topographical Survey (Survey Systems Ltd)
L.04-A	Proposed Site Layout (MCK Associates Ltd)
ST12424-002	Indicative Surface Water Management Plan (Wardell Armstrong LLP)

1 INTRODUCTION

1.1 General

1.1.1 Wardell Armstrong LLP has been commissioned on behalf of Barratt Homes to carry out a Flood Risk Assessment (FRA) in support of their outline planning application for residential development on land off Manchester Road and Crossings Road, Chapel-en-le-Frith.

1.1.2 This report sets out the findings of the FRA required by High Peak Borough Council in support of the outline planning application for this development. The assessment has been carried out in accordance with the guidance set out in Planning Policy Statement 25 – Development and Flood Risk (PPS25).

1.2 Background

1.2.1 Planning Policy Statement 25: 'Development and Flood Risk' (PPS25) was published in December 2006 by the Department for Communities and Local Government (DCLG) and was updated in March 2010. PPS25 aims to ensure that flood risk is taken into account at all stages of the planning process and to avoid inappropriate development in areas at risk of flooding.

1.2.2 PPS25 advocates the use of a risk-based 'Sequential Test' to direct development away from areas at the highest risk of flooding. Where development is exceptionally necessary in high risk areas, PPS25 aims to ensure that the development is safe without increasing flood risk and where possible, reducing flood risk overall. The different levels of flood risk are defined in Table D.1 of PPS25, and are reproduced below.

Table 1. Summary of Table D.1 PPS25 – Flood Zones	
Flood Zone Classification	Definition
Flood Zone 1 'Low Probability'	Land with an annual probability of flooding of less than 1 in 1000 years.
Flood Zone 2 'Medium Probability'	Land with an annual probability of fluvial flooding between 1 in 100 and 1 in 1000 years; or an annual probability of flooding from the sea between 1 in 200 and 1 in 1000 years.

Flood Zone 3a 'High Probability'	Land with an annual probability of fluvial flooding of 1 in 100 years or greater; or an annual probability of flooding from the sea of 1 in 200 years or greater.
Flood Zone 3b 'The Functional Floodplain'	Land where water has to flow or be stored in times of flood.

- 1.2.3 PPS25 requires that all planning applications for development covering an area of 1 hectare or greater, and all development within Flood Zones 2 and/or 3 irrespective of its size, must be supported by a Flood Risk Assessment (FRA), which should be proportional to the scale and nature of the development proposals.
- 1.2.4 Following Annex E of PPS25, the aim of a FRA is to assess the risk of flooding from all potential sources, to and from the development, now and in the future (ie taking climate change into account). The FRA should also demonstrate how any identified risks will be managed and assess the residual risk following any proposed mitigation measures.
- 1.2.5 The Flood Map, published by the Environment Agency in 2006, shows the outlines for the 1 in 100 year and 1 in 1000 year flood extents for river flooding and the 1 in 200 year extent for sea flooding (ie Flood Zones 2 and 3). The map also shows the location of defences (chiefly those that are less than 5 years old and offer a standard of protection greater than 1 in 100 years for river flooding and 1 in 200 years for sea flooding) and 'Areas Benefitting from Defences', which are areas protected by defences that would otherwise flood. The Flood Map is available on the Environment Agency's website and is updated periodically with new flood data.

1.3 Flood Risk Setting

Flood Zone Classification

- 1.3.1 The site is located within Flood Zone 1 which is land assessed as having an annual probability of flooding of 1 in 1000 years or greater as shown on an extract of the Environment Agency's Flood Map in Figure 1 below.

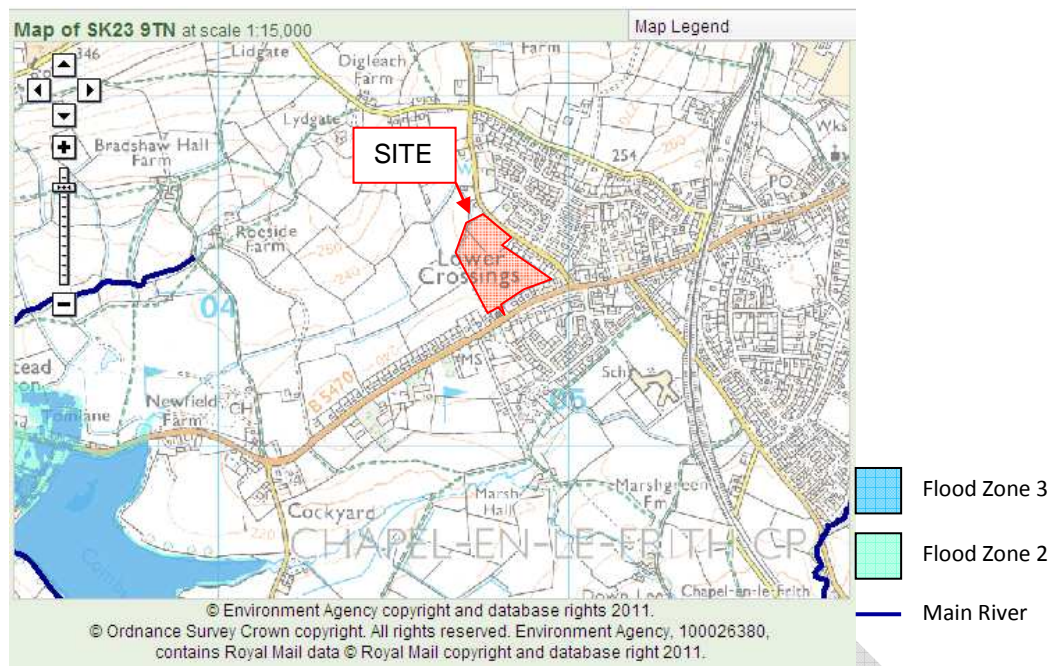


Figure 1. Extract from the Environment Agency Flood Map

Vulnerability Class

- 1.3.2 Following Table D.2 of PPS25, the proposed residential development is classed as 'More Vulnerable' and is considered to be an appropriate type of development within Flood Zone 1.

Sequential Test

- 1.3.3 As detailed in Annex D of PPS25, the Sequential Test is a risk-based approach that should be applied at all stages of the planning process. Its aim is to steer new development to areas at the lowest probability of flooding (ie Flood Zone 1).
- 1.3.4 Since the site is located within Flood Zone 1, and 'More Vulnerable' classes of development are appropriate within this zone, it is considered that the Sequential Test has been satisfied.

Exception Test

- 1.3.5 The Exception Test, as detailed in Annex D of PPS25, should be applied only after the Sequential Test has been applied and in the circumstances when 'More Vulnerable' development and 'Essential Infrastructure' cannot be located within

Flood Zones 1 or 2, or 'Highly Vulnerable' development cannot be located within Flood Zone 1.

- 1.3.6 Since the proposed development is located within Flood Zone 1, it is not necessary to apply the Exception Test (Table D.3, Annex D, PPS25).

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2 STRUCTURE OF THE REPORT

- 2.1.1 The report has been structured to follow the guidance set out in Appendix B, Flood Risk Assessment Checklist, of 'Planning Policy Statement 25: Development and Flood Risk Practice Guide' (December 2009).
- 2.1.2 The methodology for this FRA has comprised a site walkover and a desktop study including liaison with the Environment Agency and High Peak Borough Council.
- 2.1.3 Topographical survey information of the site has been made available and utilised as part of the Flood Risk Assessment.
- 2.1.4 Reference has been made to relevant plans, including United Utilities' Sewer Record Plans, historical Ordnance Survey Maps, and High Peak Borough Council's Level 1 Strategic Flood Risk Assessment (September 2008) in the compilation of this report.

3 SITE SETTING

3.1 Site Description and Location

3.1.1 The site is located on the western side of the town of Chapel-en-le-Frith in the county of Derbyshire. A summary of the site's characteristics is provided in Table 2 below.

Table 2. Site Summary	
Site Address	Manchester Road/Crossings Road, Chapel-en-le-Frith, Derbyshire, SK23 9TN
Site Area	3.7 hectares (approx)
National Grid Reference	404797, 380405 (approx)
Existing Land Use	Agricultural farmland
Proposed Land Use	Residential
Local Planning Authority	High Peak Borough Council
Sewerage Undertaker	United Utilities Plc

3.1.2 The site is located approximately 1.5km to the west of Chapel-en-le-Frith town centre and approximately 7km to the north of the town of Buxton as shown in Figure 2 below. These two towns are surrounded by the Peak District National Park, although not located within it.

3.1.3 The site is bounded to the north and west by field boundaries and a field drain, to the east by Crossings Road and residential properties, and to the south by Manchester Road and residential properties.

3.1.4 Manchester Road forms part of the B5470 highway which is oriented east-west connecting the towns of Whaley Bridge and Chapel-en-le-Frith.

3.1.5 The topography of the site slopes down towards the west as shown on Drawing No. SSL:3745A – Topographical Survey. Elevations range between approximately

244mAOD along the eastern site boundary adjacent to Crossings Road, to approximately 238.6mAOD along the western boundary of the site. The site is currently agricultural farm land.

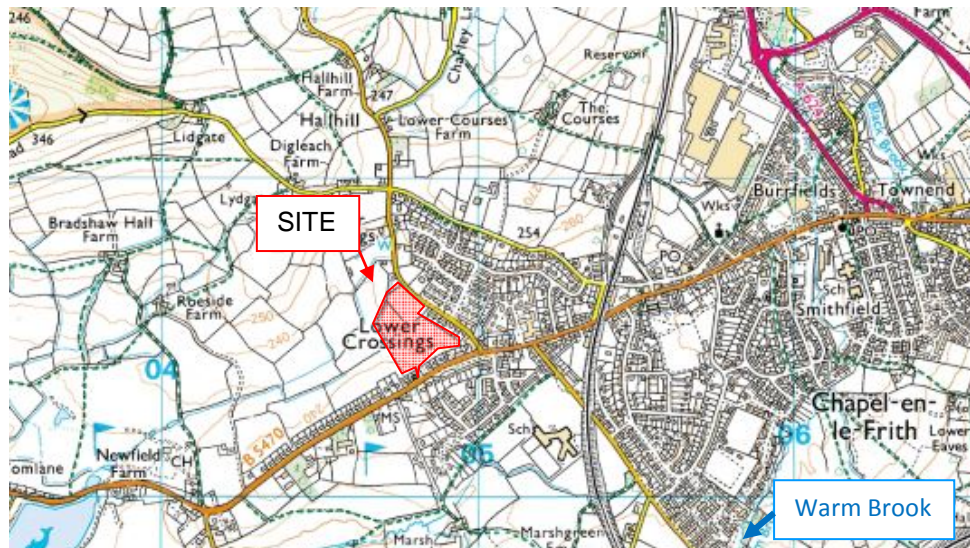


Figure 2. Site Location Plan

3.2 Water Features

- 3.2.1 The nearest named watercourse is the Warm Brook approximately 1km to the south-east of the site which runs in a north-easterly direction through Chapel-en-le-Frith town centre.
- 3.2.2 A number of minor watercourses and drainage ditches are located within the vicinity of the site as shown in Figure 3 below. These include an un-named watercourse running in a south-westerly direction through Chapel-en-le-Frith Golf Course located on the southern side of the B5470 Manchester Road, and a field drain which has its source to the west of the site, running in a south-westerly direction away from the site. These two watercourses ultimately discharge into Combs Reservoir which is located approximately 1km to the south-west of the site at its nearest point.
- 3.2.3 A field drain runs along the north-western boundary of the site. During the site walkover inspection this drainage ditch was not clearly visible or easily accessible due to tall, dense vegetation and crops. Historical OS maps (see Appendix 1) indicate that up to 1949, this drainage ditch continues to flow in a westerly direction along the field boundary immediately to the rear of the properties

fronting onto Manchester Road. The modern OS maps (from 1949 to present) as shown in Figure 3 below, indicate, however, that the drainage ditch around the site boundary is not connected to any other stream or watercourse downstream from the site. To confirm connectivity, the field boundary at the rear of the properties on Manchester Road, was investigated as part of the site walkover inspection. A swale like feature was observed within the rear gardens of the properties that front onto Manchester Road, and was found to connect into the stream shown on the modern OS maps at its downstream end. The location of this feature corresponds to the location of the drainage ditch shown on the historical OS maps.

- 3.2.4 The condition of the swale/drainage ditch along the field boundary varied greatly. In places the surrounding land was well maintained (ie mown lawns) and the swale was in good condition. To the rear of two properties on Manchester Road the land was overgrown with dense vegetation and the swale was not well maintained.

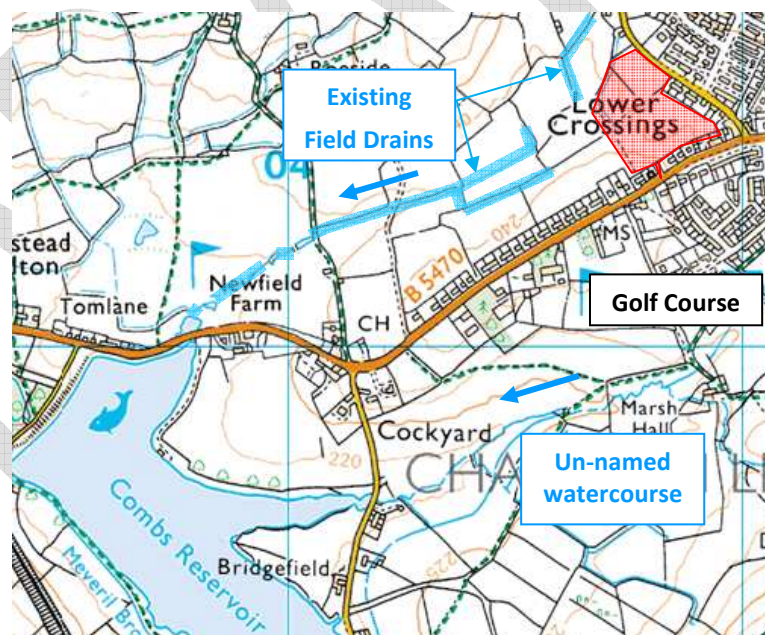


Figure 3. Location of Nearest Water Features

3.3 Existing Piped Drainage

- 3.3.1 Sewer record plans provided by United Utilities show a number of public sewers within the vicinity of the site (Appendix 2).

3.3.2 A 225mm diameter public combined sewer runs in a south-easterly direction along Crossings Road, adjacent to the site's eastern boundary. A second 225mm diameter public combined sewer is located within Manchester Road running in an easterly direction, adjacent to the southern boundary of the site. These two public combined sewers connect at the junction between Crossings Road and Manchester Road.

3.3.3 The 225mm diameter combined public sewer continues to run in an easterly direction along Manchester Road towards the town centre. A Combined Sewer Overflow (CSO) is located approximately 32m downstream from the connection between the two 225mm diameter combined sewers. The overflow connects into a 450mm diameter public surface water sewer running in a southerly direction along Frith View, and ultimately discharges into an un-named watercourse located to the south of the residential estate.

3.4 Ground Conditions

3.4.1 The underlying geology of the site is characterised by superficial deposits of Till (Diamicton) underlain by Millstone Grit comprising mudstone, siltstone and sandstone. The bedrock geology is classified as a Secondary A Aquifer which is defined as '[rock with]... *permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers*'.

3.4.2 The soil across the site is classified as '*slowly permeable, seasonally wet acid loamy and clayey*' as defined using the Soilscales map produced by Cranfield University's National Soil Resources Institute (NSRI).

4 PROPOSED DEVELOPMENT

4.1 Description of Site Proposals

- 4.1.1 The outline development proposals comprise the construction of approximately 105 residential properties and associated infrastructure, including an area of public open space in the centre of the development site as shown on Drawing No. L.04-A – Proposed Site Layout. It should be noted, however, that this is an indicative layout which is subject to change.
- 4.1.2 The residential properties are likely to be a mix of 3, 4 and 5 bed, 2 storey detached, semi-detached and mews houses with garages and front and rear gardens. Approximately 20 of the proposed properties will be affordable housing. Based on the initial site layout, some properties will have frontages onto the proposed public open space and onto Crossings Road.
- 4.1.3 The development layout makes an allowance for buffer zones around the perimeter of the site and a stand-off zone from the proposed foul pumping station.
- 4.1.4 Access to the development will be provided from Manchester Road adjacent to the existing Police Station.

4.2 Drainage Proposals

- 4.2.1 In accordance with paragraph F6 of PPS25, surface water drainage will be designed to mimic the existing flow rates from the site. Additionally, in line with paragraph F9 of PPS25, the proposed site layout and surface water drainage system will be designed to cope with events that exceed the design capacity of the system, so that excess water can be safely stored on, or conveyed from, the site without adverse impacts.
- 4.2.2 It is proposed that surface water runoff will be directed to the field drain on the north-western site boundary and will be restricted to the existing Greenfield runoff rate (QBAR) as calculated using the Institute of Hydrology Report 124. In addition, on-site surface water attenuation will be required for rainfall events

with probabilities up to and including the 1 in 100 year event (including a 30% allowance for climate change).

- 4.2.3 The Title Deeds for the site include rights to construct drainage pipes and channels over or under a section of land in the field immediately to the west of the site that is not under the same ownership as the development site itself. It is proposed that this right of drainage connection is utilised under the development proposals to provide a surface water outfall location.
- 4.2.4 Surface water run-off will be controlled as near to its source as possible through a sustainable drainage approach to surface water management (SUDS).
- 4.2.5 Detailed drainage and surface water management proposals are provided in Section 5.3 of this report.
- 4.2.6 Foul water flows from the development will be pumped from a new pumping station to be located along the western site boundary, to the public combined sewer in Manchester Road at a rate to be agreed with United Utilities.

5 FLOOD RISK

5.1 Flood Risk – To the Development

High Peak Borough Council Strategic Flood Risk Assessment (SFRA)

- 5.1.1 High Peak Borough Council completed Level 1 of their SFRA in September 2008. The report identifies the site as being located within Flood Zone 1. In addition, the research undertaken as part of the SFRA identified that the area does not have a record of being affected by sewer flooding (ie the postcode area is not recorded on the DG5 register).
- 5.1.2 The site falls within Policy Unit 6 (Goyt) of the Upper Mersey Catchment Flood Management Plan (CFMP), which is referenced within the SFRA. Policy Option 3 has been identified as being most appropriate to the Policy Unit 6 area. Policy Option 3 is to continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline).
- 5.1.3 The site is not located within or near to any areas identified within the SFRA as being a historic flood area.

Sources of Flooding

- 5.1.4 The main sources of flooding identified from Annex C of PPS25 are from rivers, tidal waters, overland runoff, groundwater, sewers and drains, and from artificial sources such as reservoirs and canals.
- 5.1.5 The presence of a potential flooding source within the vicinity of the site does not necessarily translate into a high risk of flooding. Table 3 below summarises the potential flood sources and the related flood risk posed to the site, which are discussed in detail below. In this situation, flooding from tidal waters is discounted due to the distance from the sea.

Table 3. Sources of Flood Risk

Flood Source	Presence at Site	Potential Risk at Site	Description
Rivers (fluvial flooding)	N	Low	Field drain along north-western site boundary
Tidal	N		
Groundwater	Y	Low	Bedrock is designated Secondary A Aquifer
Overland Runoff (pluvial flooding)	Y	Low	Runoff from Crossings Road
Sewer	Y	Low	Public sewers in Crossings Road
Artificial	N		

Fluvial Flooding

5.1.6 The site lies within fluvial Flood Zone 1 and, therefore, the annual probability of flooding to the site from this source is less than 1 in 1000 years. The risk of flooding to the site from this source is, therefore, considered to be negligible.

5.1.7 The field drain along the northern site boundary is considered to be a relatively minor watercourse with an estimated catchment area of approximately 2 hectares. It is understood that the sole purpose of this drain is to accept surface water runoff from the field forming the northern part of the development site.

5.1.8 It is considered that due to the relative levels of the site and the surrounding topography, the field drain will not pose a risk of flooding to the development.

Pluvial Flooding

5.1.9 Pluvial flooding often occurs during heavy rainfall when water is unable to soak into the ground because it is already saturated, or flow into surcharged or blocked drainage systems.

- 5.1.10 The main source that could pose a risk of pluvial flooding to the development is Crossings Road which lies at a slightly higher elevation than the site itself along the eastern boundary.
- 5.1.11 Crossings Road is positively drained via a series of gullies. The overall fall of the road is to the south-east and, therefore, it is considered that in the event of a blockage within the drainage system, flood water would flow overland in a south-easterly direction contained within the kerblin.
- 5.1.12 In addition the southern half of the eastern site boundary is characterised by a series of residential properties and associated front and rear gardens. It is considered that in a pluvial flood event these properties would act as a barrier to flow onto the proposed development site.
- 5.1.13 There are no other known sources that could pose a risk of pluvial flooding to the site. The risk of pluvial flooding is, therefore, considered to be low.

Groundwater Flooding

- 5.1.14 Flooding can occur when prolonged periods of rainfall cause the groundwater table to rise to the point where it affects development on a site. This is particularly a problem where buildings have basements.
- 5.1.15 High Peak Borough Council's SFRA highlights that there are no known problems with respect to groundwater flooding, except possibly in areas overlain by peat. The superficial and bedrock geology across the site are not known to contain any peat deposits.
- 5.1.16 Since none of the proposed residential properties will have basements, and due to the overall impermeability associated with the superficial Till deposits, it is considered that the risk of flooding to the development from this source is low.

Sewer Flooding

- 5.1.17 Flooding could theoretically occur from localised, high intensity storms of relatively short duration that might exceed the capacity of the local drainage network.

5.1.18 The main source of sewer flooding to the site is from the public sewer in Crossings Road. It is considered, however, that any flows that exceed the capacity of the drainage network would be routed in a south-easterly direction along Crossings Road, contained within the kerbline. The risk of flooding to the site is, therefore, considered to be low.

5.2 Flood Risk – From the Development

5.2.1 New development often poses a risk of flooding to neighbouring properties and areas downstream of the site, often as a result of an increase in impermeable area which has the effect of increasing the rate and volume of surface water runoff.

5.2.2 Flood risk can also be increased as a result of new development if the development reduces the floodplain storage area or alters flood flow paths, ultimately displacing floodwaters and resulting in an increased risk to the surrounding area. It is, therefore, imperative that these factors are considered when planning a new development.

Surface Water Runoff

5.2.3 The development site is currently greenfield land and, therefore, the development will result in an increase in the impermeable area of the site. The effect of this on surface water runoff rates and volumes must be managed effectively so that flood risk is not increased in the surrounding area for the lifetime of the development. This requires consideration of the effects of climate change, particularly with respect to rainfall intensity and peak river flows.

5.2.4 The Masterplan for the site proposes approximately 105 dwellings with associated roads, driveways, parking areas and footpaths. Of the total 3.7 hectares it is estimated that the impermeable area, ie the houses, roads, parking and footpaths, is approximately 1.5 hectares.

5.2.5 In order to prevent an increase in flood risk due to increased surface water runoff rates, flows will be restricted to the existing QBAR Rural runoff rate and attenuated on site up to the 1 in 100 year storm event including an allowance for climate change. Detailed surface water management proposals are provided in Section 5.3 of this report.

- 5.2.6 The risk of flooding to the surrounding area from the development is, therefore, considered to be high without any flood risk management measures in place. Proposals for flood risk management are discussed in Section 5.3 below.

5.3 Proposed Flood Risk Management Measures

Compensatory Floodplain Storage

- 5.3.1 Since the site is located within Flood Zone 1, ie outside of the floodplain, there will be no floodwater displaced from the site. The risk of flooding from the development is, therefore, considered to be low.

Surface Water Management

- 5.3.2 In order to prevent an increase in flood risk to the surrounding area from the development, it is proposed that SUDS techniques will be utilised within the development to reduce the rate and volume of runoff and also provide water quality treatment and amenity benefit.
- 5.3.3 It is proposed that surface water runoff will be managed in a sustainable manner through the use of SUDS such as detention basins and swales. Based on the initial site layout, it is estimated that approximately 685m³ of storage will be required to cater for events up to and including the 1 in 100 year return period including a 30% allowance for climate change (see Drawing No. ST12424-002 – Indicative Surface Water Management Plan).
- 5.3.4 Surface water runoff will be discharged at a restricted rate equivalent to the existing QBAR runoff rate into the existing swale/drainage ditch running along the rear boundary to the properties on Manchester Road. This has been estimated following the IH124 report method in the Source Control module of the Windes MicroDrainage software suite. The estimated QBAR runoff is 40 litres/second for the whole site (see Appendix 3).
- 5.3.5 A flow control device such as a weir or orifice plate will be installed to ensure that discharge rates do not exceed 40 litres/second. Peak flows within the field drain will not be increased and, therefore, the risk of flooding from the development will not be increased.

- 5.3.6 As part of the development it will be necessary to carry out remediation and maintenance works to the existing swale/ditch to ensure connectivity from the site to the downstream watercourse and to ensure that flood risk is not increased. This will be considered further at the detailed design and planning stage.
- 5.3.7 The development layout will be designed so that any flows that exceed the design capacity of the system will be routed away from residential properties, along roads within the kerbline, to safe areas of storage such as the public open space.
- 5.3.8 All proposed adoptable surface water and foul water drainage will be designed and built in accordance with the latest edition of Sewers for Adoption, and to comply with the requirements of Building Regulations Approved Document H '*Drainage and Waste Disposal*' (2002).

6 RESIDUAL RISKS

6.1 Surface Water Drainage

- 6.1.1 There is always a possibility of a storm event that exceeds the design standards of the proposed flood risk management measures for new developments. This is a particular issue for storm events with an annual probability of occurrence greater than 1 in 30 years when the on-site sewer system may be exceeded.
- 6.1.2 Sewers for Adoption, Edition 6, requires that sewer systems are designed so that no flooding occurs above ground level during storm events with a return period of up to 1 in 30 years. Additionally, PPS25 requires that no properties are flooded during storm events with a return period of 1 in 100 years.
- 6.1.3 To manage the residual flood risk associated with exceedance of the sewer system, the design of the roads within the development will be such that they are able to act as conveyance routes for flood water for storm events that exceed 1 in 30 years. Floodwater will be directed along the roads, contained within the kerblines, to areas where it can soakaway or be stored safely, away from buildings.
- 6.1.4 The residual flood risk associated with the development from this source is, therefore, considered to be low.

7 CONCLUSIONS

- 7.1.1 This report gives details of the Flood Risk Assessment, which has been carried out in relation to the proposed site in accordance with Planning Policy Statement 25 – ‘Development and Flood Risk’.
- 7.1.2 The site is located within fluvial Flood Zone 1, as defined in Table D.1 of PPS25 ie the annual probability of flooding at the site is less than 1 in 1000 years (<0.1%).
- 7.1.3 The proposals are for residential development which is classified as a ‘More Vulnerable’ development type in Table D.2 of PPS25. More Vulnerable development is an appropriate development type within Flood Zone 1 and, therefore, the Sequential Test is satisfied.
- 7.1.4 The site is not at risk of flooding from the sea or artificial sources such as reservoirs and canals. The risk of flooding from groundwater sources, sewers, drains and overland flow is considered to be low.
- 7.1.5 Flood risk management measures will be implemented within the development to manage surface water runoff rates and volumes. This will include the use of SUDS to attenuate surface water runoff up to the 1 in 100 year return period including an allowance for climate change.
- 7.1.6 Mitigation measures will be implemented to ensure that there is no residual risk of flooding associated with exceedance of the drainage system.
- 7.1.7 Discharge rates for surface water runoff from the development will be restricted to the pre-development Greenfield runoff rates (QBAR) and will not, therefore, pose an increased risk of flooding to the surrounding area.
- 7.1.8 The site is considered to be suitable for the type of development proposed.