Weetwood

Development • Planning • Environment

RIBBLESDALE VIEW, CHATBURN

FLOOD RISK AND DRAINAGE ASSESSMENT

Final Report v1.0

February 2017

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Report Title:	**Ribblesdale View, Chatburn** Flood Risk and Drainage Assessment Final Report v1.0
Client:	Ingham and Yorke LLP
Date of Issue:	21 February 2017

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1 INTRODUCTION

1.1 PURPOSE OF REPORT

Weetwood Services Ltd ('Weetwood') has been instructed by Ingham and Yorke LLP to undertake a Flood Risk and Drainage Assessment (FRDA) to support an outline planning application for the development of land north of Ribblesdale View, Chatburn.

The FRA has been undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance.

1.2 STRUCTURE OF THE REPORT

The report is structured as follows:

Section 1 Introduction and report structure

Section 2 Presents national and local flood risk and drainage planning policy

Section 3 Provides background information relating to the development site, the development proposals, ground conditions and existing site access arrangements

Section 4 Assesses the potential sources of flooding to the development site

Section 5 Presents flood risk mitigation measures based on the findings of the assessment

Section 6 Addresses the effect of the proposed development on surface water runoff and presents an illustrative surface water drainage scheme to ensure that surface water runoff is sustainably managed and flood risk is not increased elsewhere.

Section 7 Presents a summary of key findings

Section 8 Presents the recommendations

2 PLANNING POLICY AND GUIDANCE

2.1 NATIONAL PLANNING POLICY

The aim of the NPPF is to ensure that flood risk is taken into account at all stages in the planning process and is appropriately addressed.

2.1.1 Sequential Test

Paragraph 100 of the NPPF states that *'inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk but where development is necessary, making it safe without increasing flood risk elsewhere*'.

This policy is implemented through the application of the flood risk Sequential Test which aims to steer new development to areas with the lowest probability of flooding.

2.2 LOCAL PLANNING POLICY AND GUIDANCE

Ribble Valley Borough Council's Core Strategy was adopted in December 2014.

Policy DME6: Water Management states:

Development will not be permitted where the proposal would be at an unacceptable risk of flooding or exacerbate flooding elsewhere.

Applications for development should include appropriate measures for the conservation, protection and management of water such that development contributes to:

1. *Preventing pollution of surface and / or groundwater*
2. *Reducing water consumption*
3. *Reducing the risk of surface water flooding (for example the use of Sustainable Drainage Systems (SuDS))*

As a part of the consideration of water management issues, and in parallel with flood management objectives, the authority will also seek the protection of the borough's water courses for their biodiversity value.

All applications for planning permission should include details for surface water drainage and means of disposal based on sustainable drainage principles. The use of the public sewerage system is the least sustainable form of surface water drainage and therefore development proposals will be expected to investigate and identify more sustainable alternatives to help reduce the risk of surface water flooding and environmental impact.

2.3 REQUIREMENTS FOR SUSTAINABLE DRAINAGE SYSTEMS

Planning applications for major developments[1] are required[2] to provide Sustainable Drainage Systems (SuDS) for the management of surface water runoff, unless demonstrated to be inappropriate[3] or disproportionately expensive.

[1] Developments of 10 dwellings or more; or equivalent non-residential or mixed development (as set out in Article

[2] Written Statement (HCWS161) made by the Secretary of State for Communities and Local Government (Mr Eric Pickles) on 18 December 2014

[3] Paragraph 082 (Reference ID: 7-082-20150323) of the Planning Practice Guidance outlines how a sustainable drainage system might be judged to be inappropriate

SuDS aim to mimic natural drainage and can achieve multiple objectives such as removing pollutants from urban runoff at source, controlling surface water runoff from developments, and ensuring that flood risk is not increased downstream. Combining water management with green space can provide amenity and biodiversity enhancement.

In considering a development that includes a sustainable drainage system, the local planning authority will want to be satisfied that the proposed minimum standards of operation are appropriate and that there are clear arrangements in place for ongoing maintenance.

Technical Standards[4] published by DEFRA advise that surface water drainage system should be designed so that:

- *Flooding does not occur on any part of the site for a 1 in 30 annual probability rainfall event, unless an area is designed to hold and/or convey water as part of the design;*
- *Flooding does not occur in any part of a building during a 1 in 100 annual probability event; and*
- *Flows resulting from rainfall in excess of a 1 in 100 annual probability rainfall event are managed in exceedance routes that minimise the risks to people and property, so far as is reasonably practicable.*
- *For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.*
- *Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event*
- *Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body, the runoff volume must be discharged at a rate that does not adversely affect flood risk.*
- *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.*
- *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.*
- *The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property*.

[4] Non-Statutory Technical Standards for Sustainable Drainage Systems, Defra, March 2015

2.4 CONSENTS

An Environmental Permit for Flood Risk Activities may be required from the Environment Agency (EA) for work:

- in, under, over or near a main river (including where the river is in a culvert)
- on or near a flood defence on a main river
- in the flood plain of a main river
- on or near a sea defence

Further information can be found by visiting the following website:
https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

Land drainage consent may be required from the lead local flood authority or internal drainage board for work to an ordinary watercourse. Undertaking activities controlled by local Byelaws (made under the Water Resources Act 1991) also requires the relevant consent.

2.5 RELEVANT DOCUMENTS

The FRA has been informed by the following documents:

- Strategic Flood Risk Assessment (SFRA) Level 1, Ribble Valley Borough Council, May 2010

3 SITE DETAILS AND PROPOSED DEVELOPMENT

3.1 SITE LOCATION

The site is located to the north of Ribblesdale View, Chatburn at Ordnance Survey National Grid Reference SD 771 443 as shown in **Figure 1**. The site is approximately 0.74 hectares (ha) in area.

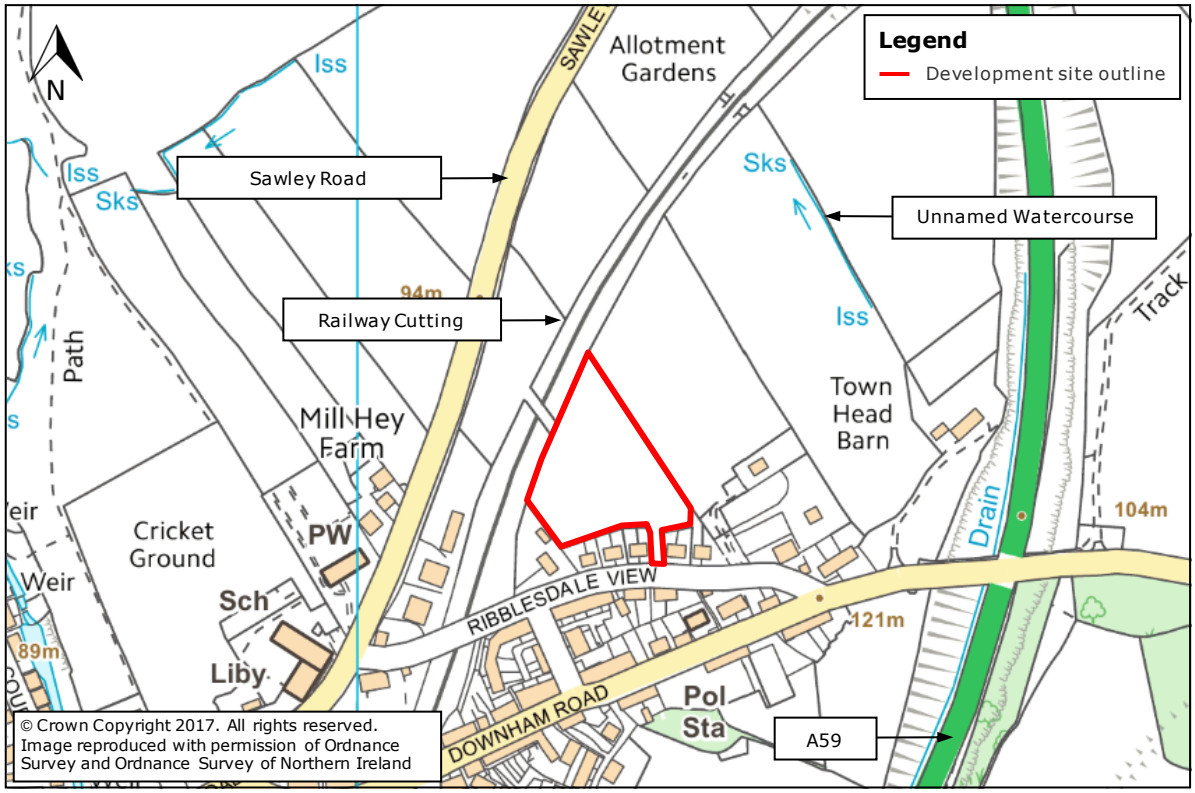


Figure 1: Site Location

3.2 EXISTING AND PROPOSED DEVELOPMENT

The site is currently un-occupied greenfield land.

Development proposals (refer to **Appendix A**) are for 18 residential dwellings with associated highways and parking.

The NPPF Planning Practice Guidance classifies residential development as 'More Vulnerable' land use.

3.3 WATERBODIES IN THE VICINITY OF THE SITE

A land drainage channel flows along the site's north-eastern boundary, and terminates at a field access gate in the northern corner. There is no evidence of the channel being culverted or continuing to the land beyond the railway cutting to the north-west. Any surface water attenuated in the channel is expected to infiltrate into the ground.

There is an unnamed section of open watercourse located 180m to the north-east of the site (see **Figure 1**). The mapping indicates that the watercourse sinks approximately 25m to the south of the railway line.

The River Chatburn, a 'Main River' flows in a predominately north-westerly direction 250m south-west of the site towards its confluence with the River Ribble. The River Ribble flows in a south-westerly direction 570m north of the site. Both the River Chatburn and the River Ribble are classified as 'Main Rivers'.

3.4 GROUND CONDITIONS

British Geological Survey (BGS) mapping indicates that the site is underlain by Chatburn Limestone Formation.

According to the Soilscapes maps produced by the National Soils Research Institute[5], soil conditions at the site and within the surrounding area are described as *'Slowly permeable seasonally wet clayey soils'.*

A site visit was undertaken on 04 January 2017. It was observed from the railway cutting immediately the north of the site boundary that the underlying bedrock lies at shallow depth (approximately 1.0m – 1.5m below ground level) and appears heavily fractured.

3.5 SITE LEVELS

The latest available LiDAR data has been obtained from the EA Open Survey Data website and has been utilised to develop a digital terrain model of the site and surrounding area as Illustrated in **Figure 2**.

Levels across the development platform are shown to fall in a north-westerly direction from 114.75 meters Above Ordnance Datum (m AOD) in the south-eastern corner to 103.50 m AOD in the northern corner of the site.

3.6 ACCESS AND EGRESS

The site is accessed off Ribblesdale View to the south. Levels along Ribblesdlae View are indicated to be 118.4m AOD to the south-east of the site falling in a north-westerly direction to 100.3 m AOD at the junction with Sawley Road.

[5] Soilscapes www.landis.org.uk/soilscapes/

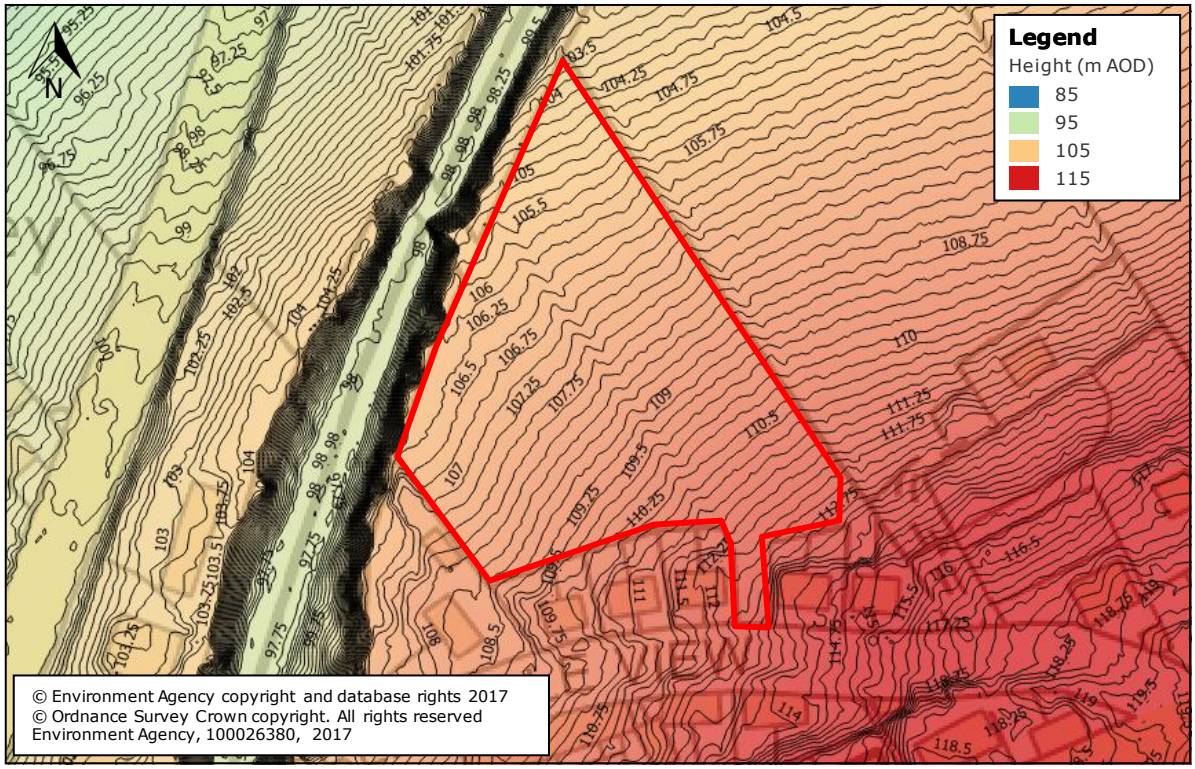


Figure 2: Digital Elevation Model

4 REVIEW OF FLOOD RISK

4.1 FLOOD ZONE DESIGNATION

Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. The NPPF Planning Practice Guidance defines Flood Zones as follows:

- Flood Zone 1 (Low Probability): Land having a less than 1 in 1,000 annual probability of river or sea flooding.
- Flood Zone 2 (Medium Probability): Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
- Flood Zone 3a (High Probability): Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
- Flood Zone 3 (Functional Floodplain): This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

The Flood Zones are shown on the EA Flood Map for Planning (Rivers and Sea). The Planning Practice Guidance states that the Zones shown on the EA Flood Map do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

According to the EA Flood Map for Planning (Rivers and Sea) (**Figure 3**) the site is located in Flood Zone 1. Map 1 of the Ribble Valley Strategic Flood Risk Assessment reaffirms the Flood Zone 1 designation.

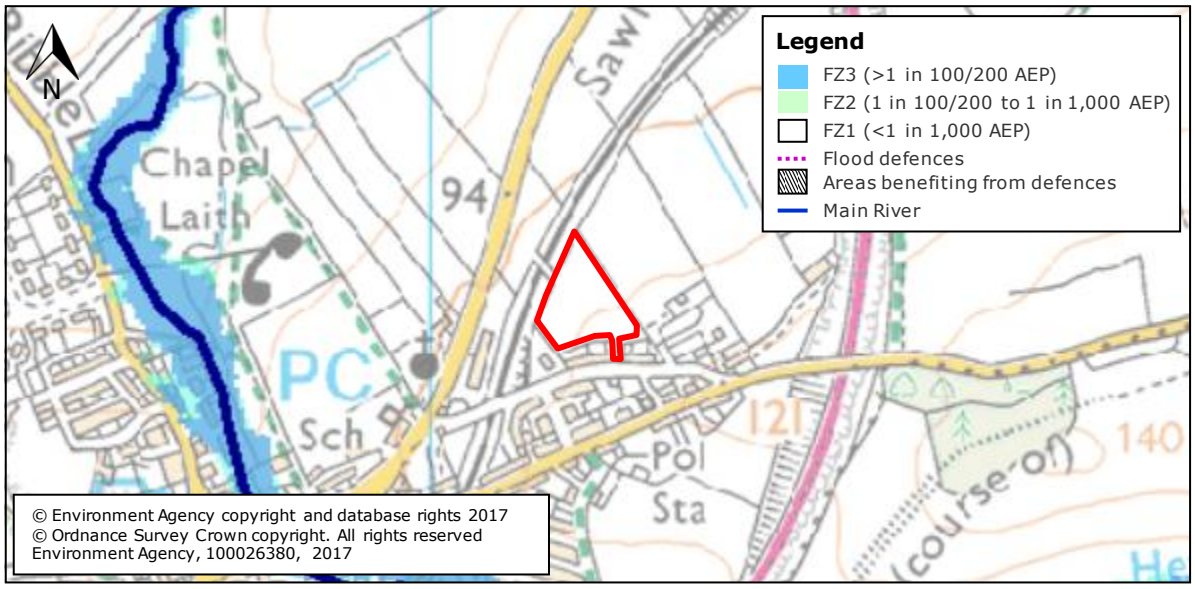


Figure 3: Environment Agency Flood Map for Planning (Rivers & Sea)
(Source: EA website)

4.2 FLUVIAL FLOOD RISK

Modelled flood levels for the minor watercourses in the vicinity of the site are not available; however, the EA's Risk of Flooding for Surface Water map (**Figure 4**) gives an indication of how watercourses are likely to respond to intense rainfall in addition to identified overland flow routes.

The map indicates that the site is at very low risk of surface water flooding and no flooding is indicated within the vicinity of the watercourses during all events up the to very low (less than 1 in 1,000 annual probability) probability events. The flood risk associated with the watercourses is therefore considered to be very low.

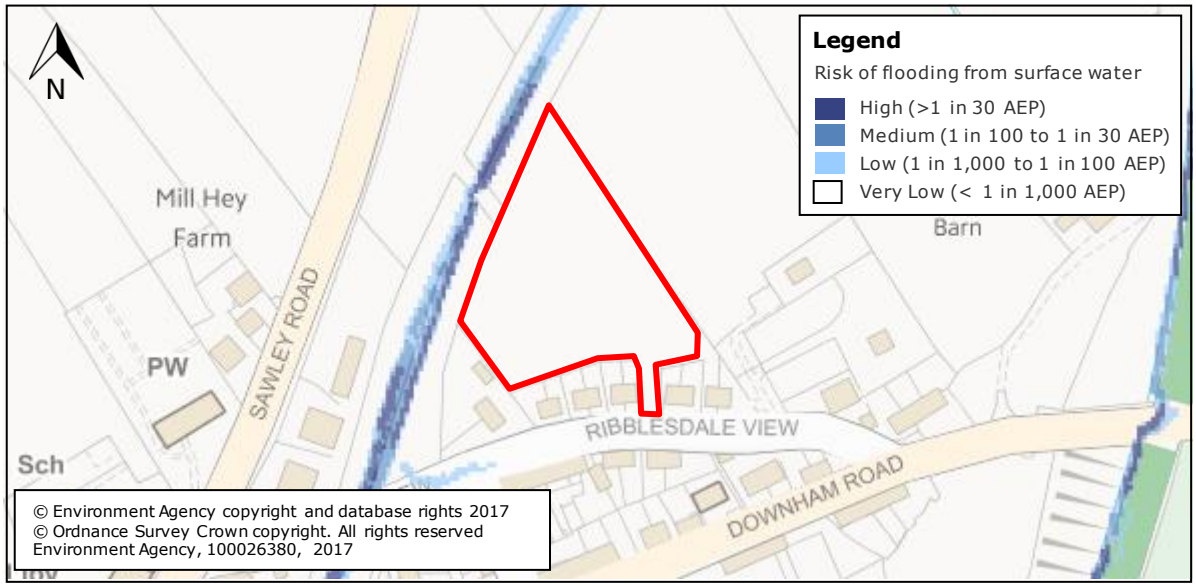


Figure 4: Environment Agency Risk of Flooding from Surface Water
(Source: EA website)

4.3 FLOOD RISK FROM RESERVOIRS, CANALS AND OTHER ARTIFICIAL SOURCES

The EA Risk of Flooding from Reservoirs map (**Figure 5**) indicates the site is not at risk of reservoir flooding.

There are no canals located within the immediate vicinity of the site. The EA Risk of Flooding from Reservoirs map indicates that the site is not at risk of flooding from such sources. The site is therefore not assessed to be at risk of flooding from reservoirs, canals or other artificial sources.

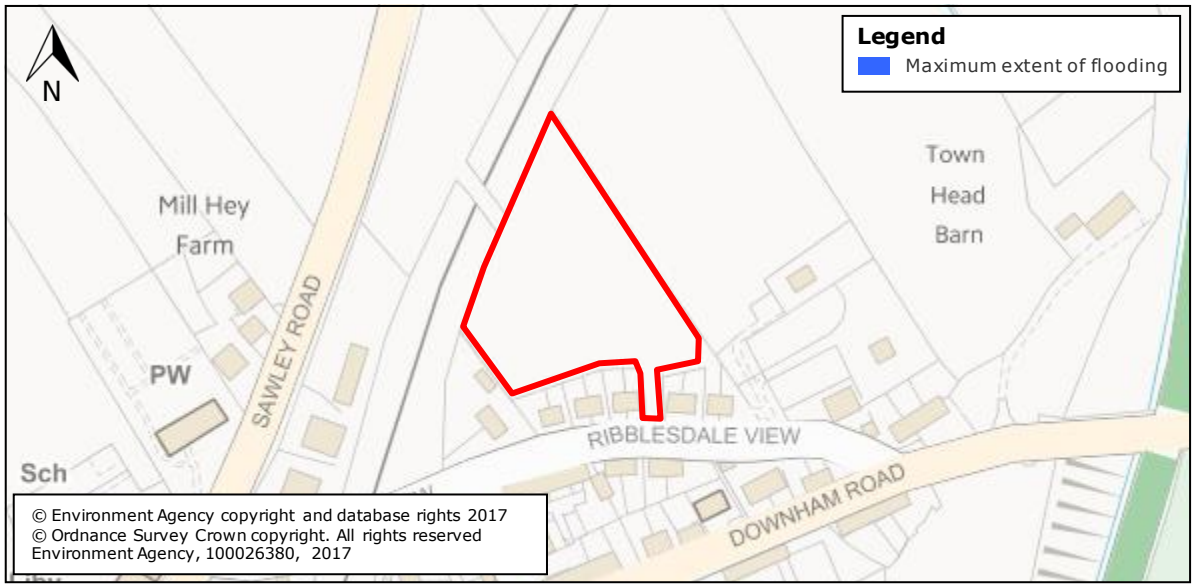


Figure 5: Environment Agency Risk of Flooding from Reservoirs Map
(Source: EA website)

4.4 FLOOD RISK FROM GROUNDWATER

Groundwater flooding generally occurs during intense, long-duration rainfall events, when infiltration of rainwater into the ground raises the level of the water table until it exceeds ground levels. It is most common in low-lying areas overlain by permeable soils and permeable geology, or in areas with a naturally high water table.

According to the British Geological Survey (BGS) Groundwater Flooding Hazard map (**Figure 6**) the susceptibility to groundwater flooding is low.

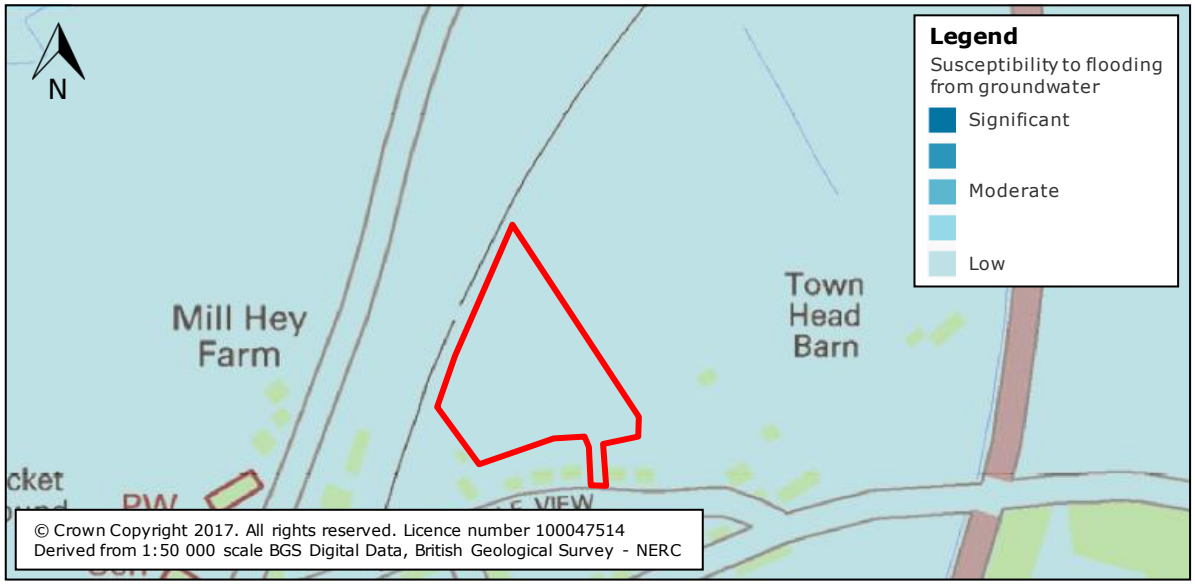


Figure 6: Groundwater Flooding Hazard Map
(Source: Findmaps)

Based on the above, the risk of groundwater flooding is assessed to be low. The residual risk of flooding from this source will be mitigated through the implementation of the measures proposed in **Section 5** of this report.

4.5 FLOOD RISK FROM SURFACE WATER

Surface water flooding comprises pluvial flooding and flooding from sewers and highway drains and gullies.

4.5.1 Risk of Pluvial Flooding

Pluvial flooding results from rainfall-generated overland flow, before the runoff enters any watercourse or sewer, or where the sewerage/drainage systems and watercourses are overwhelmed and therefore unable to accept surface water.

Pluvial flooding is usually associated with high intensity rainfall events but may also occur with lower intensity rainfall where the ground is saturated, developed or otherwise has low permeability resulting in overland flow and ponding within depressions in the topography.

Flooding of land and/or property can also occur when the capacity of the sewer/drainage system is overwhelmed by heavy rainfall, becomes blocked or is of inadequate capacity or where the normal discharge of sewers and drains through outfalls is impeded by high water levels in receiving waters.

The EA Risk of Flooding from Surface Water map (**Figure 4**) indicates that the railway cutting has the potential to convey surface water in extreme events. The railway cutting is approximately 6m below the site level and the consequently the entire site is shown to be at risk at very low risk of surface water flooding. However, the residual flood risk from this source will be addressed through the mitigation measures as detailed in **Section 5** and the surface water drainage strategy in **Section 6.**

5 FLOOD RISK MITIGATION MEASURES

5.1 FLOOD MITIGATION

The very low residual risk of flooding from surface water and groundwater flooding will be mitigated though the implementation of the measures proposed within the following section of this report.

5.1.1 Finished Floor Levels

Finished floor levels should be set at a minimum of 0.15 m above adjacent ground levels following reprofiling of the site.

This will enable any potential overland flows to be conveyed safely across the site without affecting property in accordance with the approach promoted by government policy[6].

[6] Making Space for Water, Taking forward a new Government strategy for flood and coastal erosion risk management in England, March 2005, Dept for Environment, Food and Rural Affairs

6 SURFACE WATER MANAGEMENT

6.1 EXISTING INFRASTRUCTURE AND DRAINAGE

6.1.1 United Utilities Sewers

The local public sewer network is owned and operated by United Utilities (UU). An extract of UU asset records is provided in **Figure 7** (refer to **Appendix B** for full record).

The position of the UU apparatus shown by the sewer records indicates the general position and nature of their apparatus. The accuracy of this information cannot be guaranteed.

Details of existing apparatus within the immediate vicinity of the site, based upon the public sewer records, are as follows:

- A 150 mm diameter combined sewer is located to the south within Ribblesdale View, with the head of system shown to be within the development site boundary. During the site visit the location of the inspection chamber was confirmed to be within the site boundary.

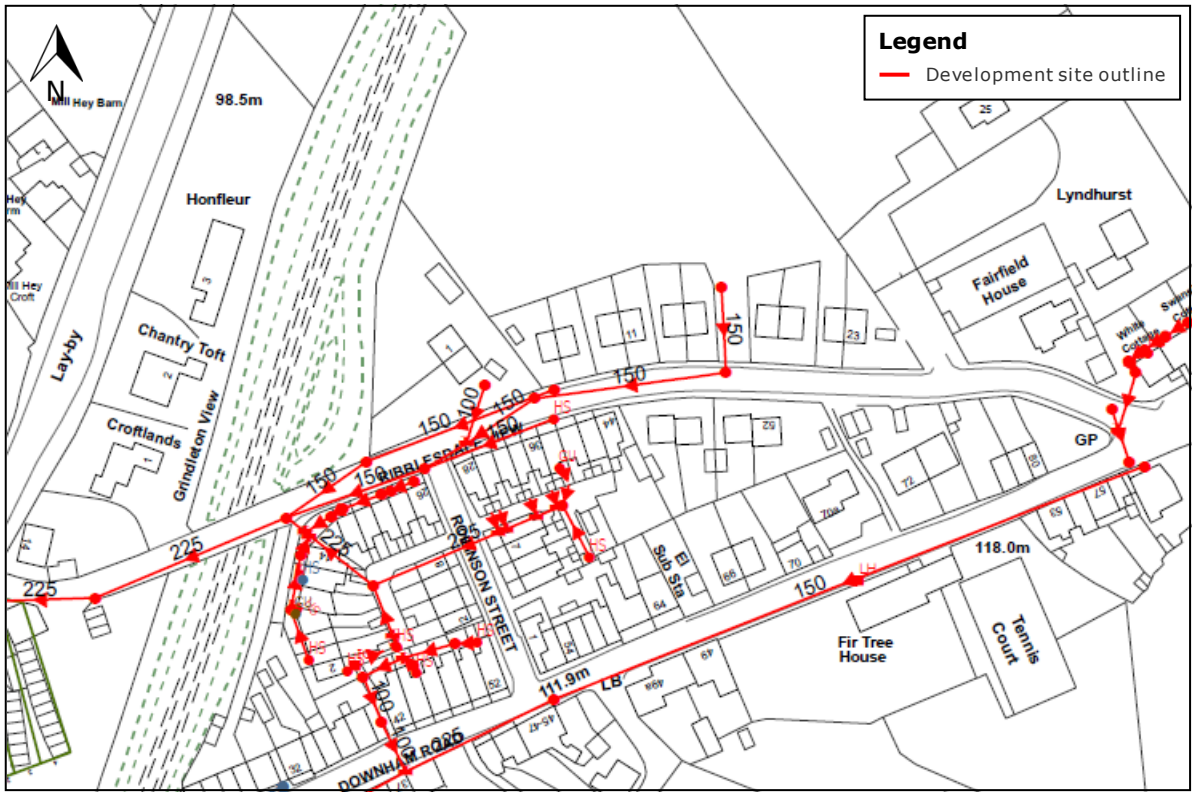


Figure 7: United Utilities Public Sewer Network

6.2 DISPOSAL OF SURFACE WATER

In accordance with the NPPF PPG[7], surface water runoff should be disposed of according to the following hierarchy: Into the ground (infiltration); To a surface water body; To a surface water sewer, highway drain, or another drainage system; To a combined sewer.

6.2.1 Infiltration

Following redevelopment, impermeable areas have been calculated to be 0.43ha based on development proposals presented in **Appendix A**.

The disposal of surface water by infiltration may be feasible, although this would need to be investigated further by undertaking on site compliant percolation testing[8]. Furthermore there is also a risk where bedrock is shallow and fractured, that infiltration into the bedrock would simply emerge in railway cut and would not be acceptable to Network Rail. However, for the purposes of this assessment, an assessment of an attenuation structure with infiltration has been prepared.

Using the Detailed Design module of MicroDrainage Source Control, the volume required to store the 1 in 100 annual probability rainfall event including a 30% increase in rainfall intensity[9] has been estimated to be 272.6m^3. Micro Drainage outputs are presented in **Appendix C.**

It should be noted that an infiltration rate of 0.1 m/hr or greater would be required in order for the half drain time to be less than 24 hours. If percolation testing during the detailed drainage design stage indicates that an infiltration rate of 0.1m/hr cannot be achieved, or that water emerges in the railway cutting, an alternative strategy is presented in **Section 6.3**.

6.2.2 Surface Water Body

The nearest watercourse is located 180m to the north east of the site. Precise site levels and levels of the watercourse have been established. A connection to the watercourse would be suitable should a detailed topographic survey and detailed drainage design confirm that a pipeline of sufficient gradient to provide a self cleansing velocity (1m/s) to be achieved via gravity. A strategy based on the 1 in 1 greenfield runoff rate is presented in **Section 6.3**.

6.2.3 Surface Water Sewer – Highway Drain or other Drainage System

There are no public surface water sewers in the vicinity of the site (refer to United Utilities public sewer map in **Appendix B**).

6.2.4 Combined Sewer

In the event that disposal of surface water by infiltration and to the watercourse is demonstrated to not be feasible (See **Sections 6.2.1** and **6.2.2** above), it is proposed that the site drains to the public combined sewer network via a pumped surface water drainage system based on the 1 in 1 greenfield runoff rate as presented in **Section 6.3**.

[7] Paragraph 080, Reference ID: 7-080-20150323
[8] BRE Digest 365: Soakaway Design
[9] To allow for climate change in accordance with EA guidance Flood Risk Assessments: climate change allowances (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances)

6.3 PEAK FLOW CONTROL

Paragraph 4 of DEFRA's Technical Guidance states that '*for greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.'*

The greenfield surface water runoff rate has been calculated using the ICP SUDS method within MicroDrainage (**Appendix D** and **Table 1**).

Table 1: Greenfield Runoff Rate

Annual probability of rainfall event	Greenfield Runoff Rate for 0.74 ha Site (l/s)
1 in 1	6.2
1 in 100	14.7

6.4 MANAGING SURFACE WATER WITHIN THE DEVELOPMENT

Using the Detailed Design Module of Micro Drainage Source Control, the volume required to store the 1 in 100 annual probability rainfall event including a 30% increase in rainfall intensity[10] for the allowable runoff rate of 6.2 l/s has been estimated to be 280.1m^3. Micro Drainage outputs are presented in (**Appendix E**).

It should be noted that:

1. The estimated storage volume does not take into account the storage that would be provided within the on-site surface water conveyance system (i.e. sewer pipes and manholes). The actual volume required would be expected to reduce once the drainage system has been designed in detail
2. The way in which the required storage is provided will be confirmed when the system is designed in detail (e.g. to discharge a planning condition).
3. In practice, the decision may be not to store all runoff below ground. For example, it may be possible for runoff arising from events exceeding the 1 in 30 annual probability rainfall event to be contained on-site by landscaped features.
4. Peak runoff to the public sewer network would be restricted by an appropriate outlet control device (in this case the pump capacity)
5. Positively drained car parking areas of 800 sq m or 50 car parking spaces or more require an interceptor/separator.

As mentioned in **Section 3.2**, this report has been prepared to support an outline application with all maters reserved. As such the layout is yet to be finalised and will drive a change in where the storage attenuation is likely to be located. This report has assessed all methods for disposing of surface water in accordance with the discharge hierarchy set out in paragraph 80 of the PPG.

[10] To allow for climate change in accordance with EA guidance Flood Risk Assessments: climate change allowances (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances)

6.5 MAINTENANCE OF SUDS

The on-site drainage system may be offered for adoption although this will be confirmed at the detailed design stage when the development proposals are finalised. If the drainage system is not adopted, the on-site drainage system will be maintained by a private management company. An indicative maintenance schedule for geo-cellular storage and infiltration storage is presented in **Table 2**.

Table 2: Maintenance Requirements

Schedule	Required Action	Frequency
Geo-cellular Storage		
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove sediment from pre-treatment structures and/or internal forbays	Annually, or as required
Remedial Action	Repair/rehabilitate inlets, outlets and vents	Annually, or as required
Monitoring	Inspect/check all inlets, outlets and vents	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years, or as required
Infiltration Systems		
Regular Maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually, or as required based on inspections
	Trimming of any roots that may be causing blockages	Annually, or as required
	Remove sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside concrete manhole rings	As required, based on inspections
Remedial Actions	Replacement of clogged geotextile (will require reconstruction of structure)	As required
	Reconstruction of structure if performance deteriorates or failure occurs	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check to ensure emptying is occurring	Annually

6.6 SUMMARY

The purpose of this FRA is to demonstrate that a surface water drainage strategy is feasible for the site given the development proposals and the land available. The proposals provide the opportunity for the inclusion of SuDS elements, ensuring that there will be no increase in surface water runoff from the proposed development. The storage calculations may be refined at the detailed design stage and a final decision made on the types of storage to be provided.

7 SUMMARY

This FRDA has been prepared on behalf Ingham and Yorke LLP of and relates to the proposed development of land north of Ribblesdale View, Chatburn.

According to the EA Flood Map for Planning (Rivers and Sea) the proposed development is located outside of the 1 in 1,000 annual probability flood outline and is therefore defined by the NPPF as being situated within Flood Zone 1.

As the site is in Flood Zone 1, the flood risk Sequential Test is deemed to have been addressed and the Exception Test need not be addressed.

The fluvial flood risk is considered negligible, the risk of surface water flooding is considered very low and groundwater flood risk low.

In order to mitigate against any residual risk of flooding, finished flood levels should be set 150 mm above adjacent ground levels.

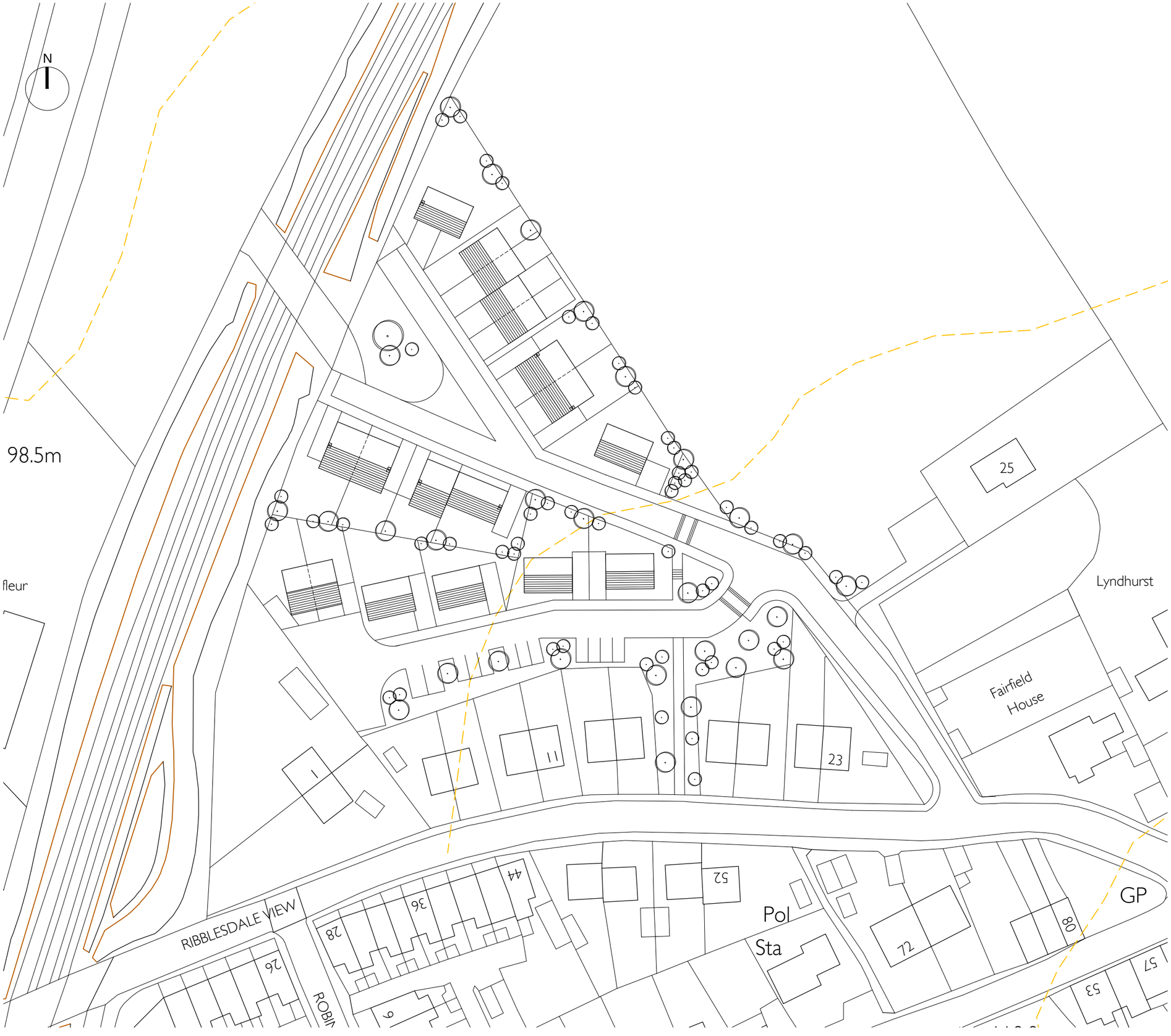
Surface water runoff from the developed site can be sustainably managed in accordance with the NPPF and local policy.

8 RECOMMENDATIONS

This FRA has demonstrated that the proposed development may be completed without conflicting with the requirements of the NPPF subject to the following:

- Finished floor levels to be set 150 mm above adjacent ground levels
- The detailed drainage design, developed in accordance with the principles set down in this FRA, should be submitted to and approved by the local planning authority prior to the commencement of development.

APPENDIX A:	Development Proposals



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GENERAL NOTES

THESE PLANS HAVE BEEN PREPARED FOR SUBMISSION TO THE LOCAL AUTHORITY FOR TOWN & COUNTRY PLANNING AND/OR BUILDING REGULATION PURPOSES ONLY AND DO NOT CONSTITUTE FULL WORKING DRAWINGS.

INFORMATION NOTED ON THE PLANS OR ACCOMPANYING DOCUMENTS / DETAILS IS NOT EXHAUSTIVE, AND CONTRACTOR TO CHECK WITH CLIENT AS TO ANY ADDITIONAL WORK NOT SPECIFICALLY NOTED OR IMPLIED

SITE AREA = 0.73 hectares / 1.8 acres

Rural Solutions
The Nationwide Planning and Development Specialists

Canalside House,
Brewery Lane,
Skipton,
North Yorkshire,
BD23 1DR

tel: 01756 797501
e-mail: info@ruralsolutions.co.uk
web: www.ruralsolutions.co.uk

Client
Mr Ralph Assheton

Project
Land off Ribblesdale View
Chatburn

Title
Proposed Site Plan Plan
Option 1

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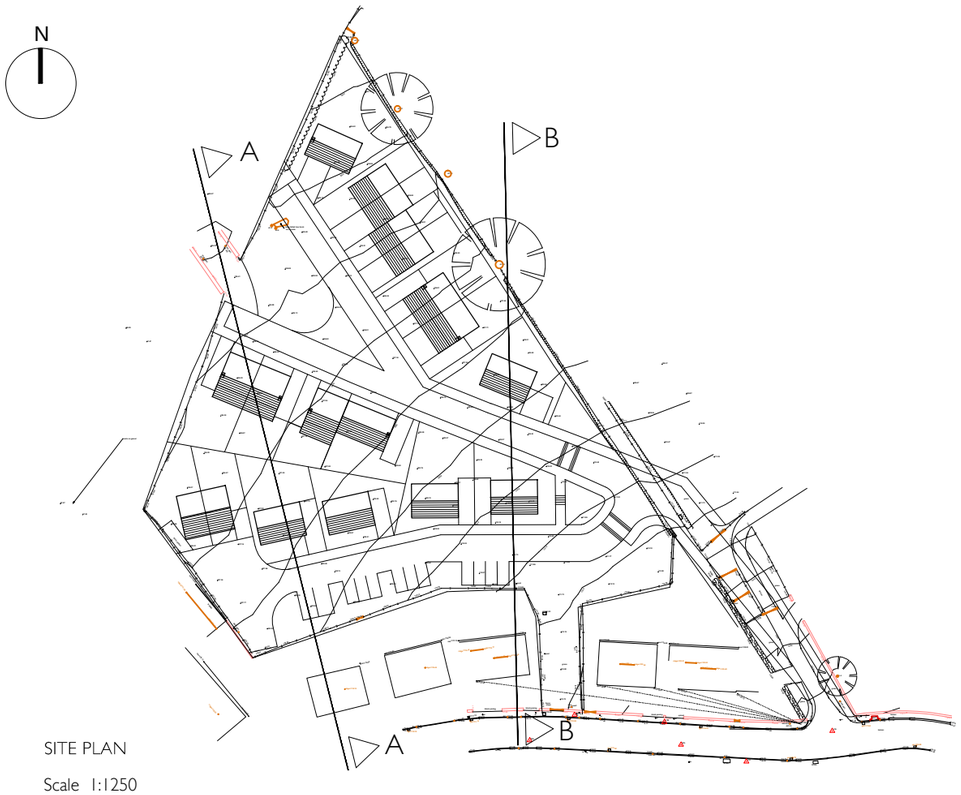

SITE PLAN

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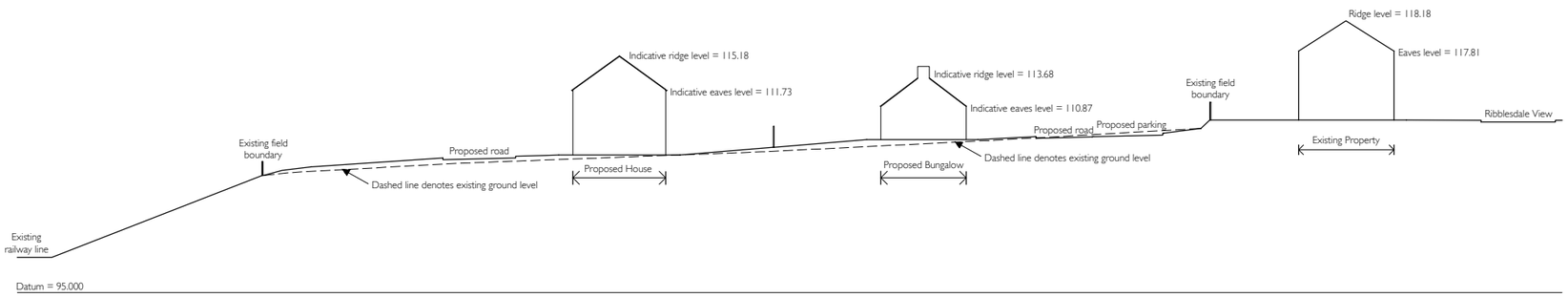
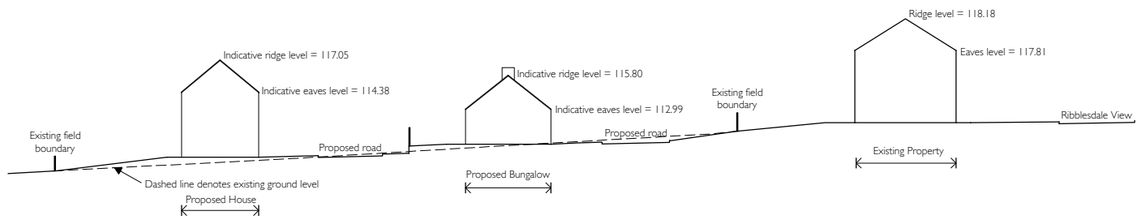


SECTION A-A



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0 5 10 15 20 25 Meters

GENERAL NOTES

THESE PLANS HAVE BEEN PREPARED FOR SUBMISSION TO THE LOCAL AUTHORITY FOR TOWN & COUNTRY PLANNING AND/OR BUILDING REGULATION PURPOSES ONLY AND DO NOT CONSTITUTE FULL WORKING DRAWINGS.

INFORMATION NOTED ON THE PLANS OR ACCOMPANYING DOCUMENTS / DETAILS IS NOT EXHAUSTIVE, AND CONTRACTOR TO CHECK WITH CLIENT AS TO ANY ADDITIONAL WORK NOT SPECIFICALLY NOTED OR IMPLIED

Rural Solutions
The Nationwide Planning and Development Specialists

Canalside House,
Brewery Lane,
Skipton,
North Yorkshire,
BD23 1DR

tel: 01756 797501
e-mail: info@ruralsolutions.co.uk
web: www.ruralsolutions.co.uk

Client
Mr Ralph Assheaton

Project
Land off Ribblesdale View
Chatburn

Title
Proposed site sections

Scale	Date
1:1250 & 1:500	23-05-16

Drawn	Checked
AGF	

Drawing Number	Revision
GA_09	

APPENDIX B:	United Utilities Sewer Records

Model Details

Storage is Online Cover Level (m) 2.000

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.10000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.10000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	400.0	400.0	0.800	400.0	480.0
0.400	400.0	440.0	0.801	0.1	480.0

United Utilites Water Limited
Property Searches
Ground Floor Grasmere House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP
DX 715568 Warrington
Telephone 0370 751 0101

Property.searches@uuplc.co.uk

Your Ref: 3671
Our Ref: 16/ 1265630
Date: 2/2/2017

Weetwood
Suite 1 Park House, Broncoed Business Park
Wrexham Road

Mold
CH7 1HP

FAO: **Tara Galloway**

Dear Sirs

Location: **Ribblesdale View Chatburn BB7 4BB**

I acknowledge with thanks your request dated 31/01/17 for information on the location of our services.

Please find enclosed plans showing the approximate position of our apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read our access statement before you start work to check how it will affect our network.
http://www.unitedutilities.com/work-near-asset.aspx.

I trust the above meets with you requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please telephone us on 0370 7510101.

Yours Faithfully,

Karen McCormack
Property Searches Manager

United Utilities Water Limited
Registered in England & Wales No. 2366678
Registered Office: Haweswater House,
Lingley Mere Business Park, Lingley Green Avenue,
Great Sankey, Warrington, WA5 3LP

TERMS AND CONDITIONS - WASTERWATER & WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self-construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

1. This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
2. This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
3. In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only and given in accordance with the best information available. The nature of the relevant system and/or its actual position may be different from that shown on the plan and UUWL is not liable for any damage caused by incorrect information provided save as stated in section 199 of the Water Industry Act 1991. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
4. The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
5. The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
6. This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
7. No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
8. If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
9. This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

Extract from Map of Public Sewers

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.

The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.

United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

RIBBLESDALE VIEW CHATBURN BB7 4BB

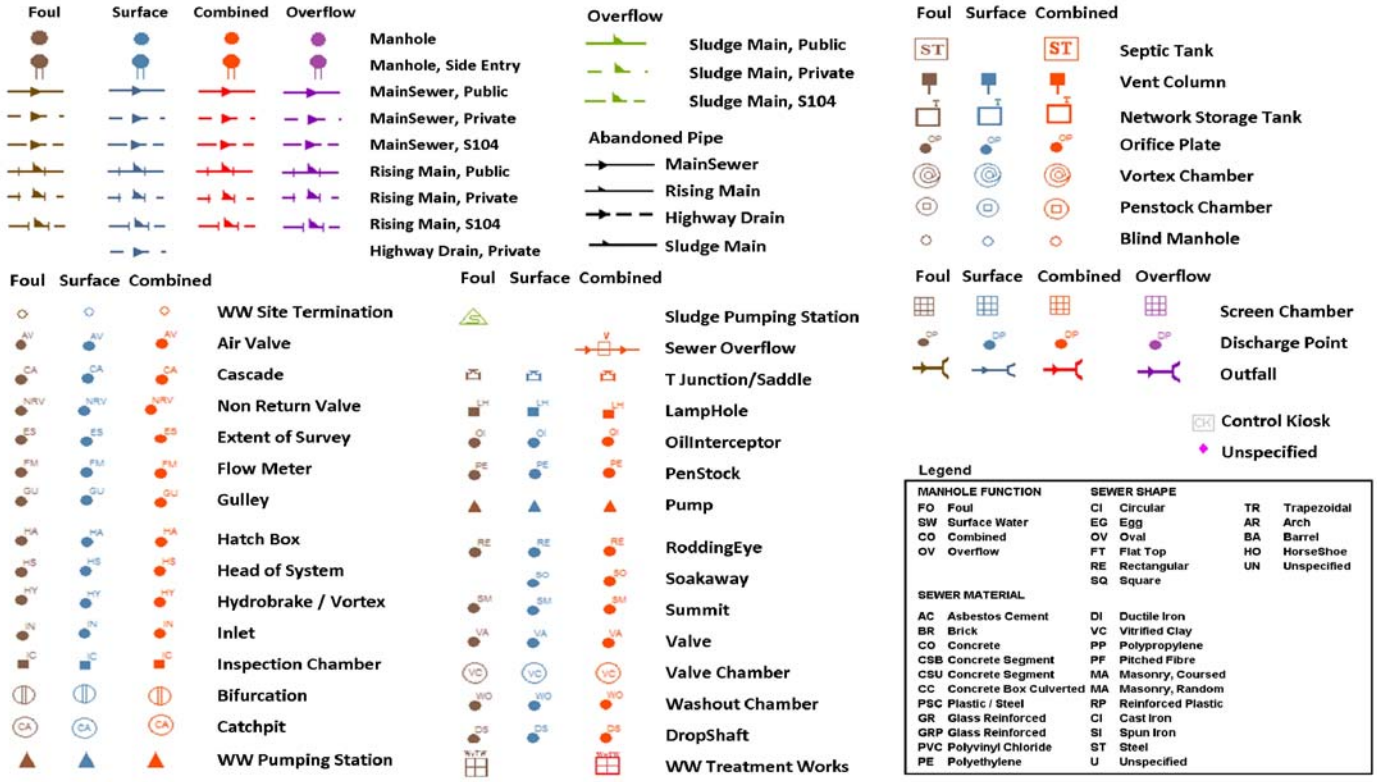
Printed By: Property Searches Date: 02/02/2017

DO NOT SCALE

Approximate Scale: 1:1250

United Utilities
helping life flow smoothly

WASTE WATER SYMBOLOGY



Legend

MANHOLE FUNCTION		SEWER SHAPE			
FO	Foul	CI	Circular	TR	Trapezoidal
SW	Surface Water	EG	Egg	AR	Arch
CO	Combined	OV	Oval	BA	Barrel
OV	Overflow	FT	Flat Top	HO	HorseShoe
		RE	Rectangular	UN	Unspecified
		SQ	Square		

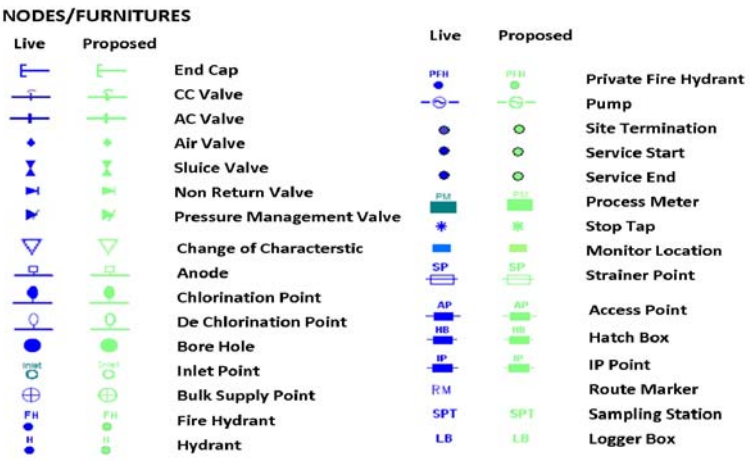
SEWER MATERIAL			
AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	VC	Vitrified Clay
CO	Concrete	PP	Polypropylene
CSB	Concrete Segment	PF	Pitched Fibre
CSU	Concrete Segment	MA	Masonry, Coursed
CC	Concrete Box Culverted	MA	Masonry, Random
PSC	Plastic / Steel	RP	Reinforced Plastic
GR	Glass Reinforced	CI	Cast Iron
GRP	Glass Reinforced	SI	Spun Iron
PVC	Polyvinyl Chloride	ST	Steel
PE	Polyethylene	U	Unspecified

CLEAN WATER SYMBOLOGY

PIPE WORK

ABANDONED PIPE

NODES/FURNITURES



PROPERTY TYPES

Legend

MATERIAL TYPES		LINING TYPES	
AC	ASBESTOS CEMENT	CL	CEMENT LINING
CI	CAST IRON	TB	TAR OR BITUMEN
CU	COPPER	ERL	EPOXY RESIN
CO	CONCRETE		
DI	DUCTILE IRON	INSERTION TYPES	
GI	GALVANISED IRON		
GR	GREY IRON	DD	DIE DRAWN
OT	OTHERS	DR	DIRECTIONAL DRILLING
PB	LEAD	MO	MOLING
PV	uPVC	PI	PIPELINE
SI	SPUN IRON	SL	SLIP LINED
ST	STEEL		
UN	UNKONWN		
PE	POLYETHYLENE		

TERMS AND CONDITIONS - WASTERWATER & WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self-construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

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2. This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.

3. In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.

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8. If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.

9. This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

APPENDIX C:	Surface Water Attenuation – Infiltration Storage Volume Calculations

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 362 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.197	0.197	5.8	74.9	O K
30 min Summer	0.288	0.288	6.0	109.6	O K
60 min Summer	0.396	0.396	6.1	150.5	O K
120 min Summer	0.502	0.502	6.3	190.7	O K
180 min Summer	0.549	0.549	6.3	208.7	O K
240 min Summer	0.577	0.577	6.4	219.1	O K
360 min Summer	0.602	0.602	6.4	228.7	O K
480 min Summer	0.613	0.613	6.4	232.8	O K
600 min Summer	0.616	0.616	6.4	234.1	O K
720 min Summer	0.615	0.615	6.4	233.8	O K
960 min Summer	0.607	0.607	6.4	230.6	O K
1440 min Summer	0.576	0.576	6.4	219.0	O K
2160 min Summer	0.523	0.523	6.3	198.6	O K
2880 min Summer	0.467	0.467	6.2	177.4	O K
4320 min Summer	0.365	0.365	6.1	138.6	O K
5760 min Summer	0.282	0.282	5.9	107.0	O K
7200 min Summer	0.215	0.215	5.9	81.7	O K
8640 min Summer	0.160	0.160	5.8	60.7	O K
10080 min Summer	0.116	0.116	5.7	44.2	O K
15 min Winter	0.222	0.222	5.9	84.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	100.646	0.0	25
30 min Summer	74.363	0.0	39
60 min Summer	52.662	0.0	68
120 min Summer	35.497	0.0	124
180 min Summer	27.508	0.0	182
240 min Summer	22.929	0.0	240
360 min Summer	17.658	0.0	312
480 min Summer	14.625	0.0	380
600 min Summer	12.613	0.0	444
720 min Summer	11.163	0.0	514
960 min Summer	9.187	0.0	654
1440 min Summer	6.965	0.0	930
2160 min Summer	5.294	0.0	1344
2880 min Summer	4.365	0.0	1736
4320 min Summer	3.346	0.0	2508
5760 min Summer	2.792	0.0	3232
7200 min Summer	2.438	0.0	3960
8640 min Summer	2.180	0.0	4664
10080 min Summer	1.984	0.0	5344
15 min Winter	100.646	0.0	25

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.326	0.326	6.0	123.9	O K
60 min Winter	0.449	0.449	6.2	170.7	O K
120 min Winter	0.574	0.574	6.4	218.2	O K
180 min Winter	0.634	0.634	6.4	240.8	O K
240 min Winter	0.670	0.670	6.5	254.7	O K
360 min Winter	0.705	0.705	6.5	268.0	O K
480 min Winter	0.714	0.714	6.5	271.3	O K
600 min Winter	0.717	0.717	6.6	272.6	O K
720 min Winter	0.714	0.714	6.5	271.4	O K
960 min Winter	0.696	0.696	6.5	264.5	O K
1440 min Winter	0.640	0.640	6.4	243.2	O K
2160 min Winter	0.545	0.545	6.3	207.2	O K
2880 min Winter	0.452	0.452	6.2	171.7	O K
4320 min Winter	0.290	0.290	6.0	110.2	O K
5760 min Winter	0.168	0.168	5.8	63.8	O K
7200 min Winter	0.084	0.084	5.7	32.0	O K
8640 min Winter	0.049	0.049	5.5	18.6	O K
10080 min Winter	0.045	0.045	5.0	16.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	74.363	0.0	39
60 min Winter	52.662	0.0	66
120 min Winter	35.497	0.0	124
180 min Winter	27.508	0.0	180
240 min Winter	22.929	0.0	236
360 min Winter	17.658	0.0	344
480 min Winter	14.625	0.0	410
600 min Winter	12.613	0.0	476
720 min Winter	11.163	0.0	554
960 min Winter	9.187	0.0	710
1440 min Winter	6.965	0.0	1014
2160 min Winter	5.294	0.0	1448
2880 min Winter	4.365	0.0	1852
4320 min Winter	3.346	0.0	2636
5760 min Winter	2.792	0.0	3336
7200 min Winter	2.438	0.0	3904
8640 min Winter	2.180	0.0	4384
10080 min Winter	1.984	0.0	5120

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.200	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.430

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.143	4	8	0.143	8	12	0.143

APPENDIX D:	Greenfield Runoff Rates

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.470
Area (ha)	0.740	Urban	0.000
SAAR (mm)	1257	Region Number	Region 10

Results l/s

QBAR Rural	7.1
QBAR Urban	7.1
Q100 years	14.7
Q1 year	6.2
Q30 years	12.0
Q100 years	14.7

APPENDIX E:	Surface Water Attenuation – Pumped Storage Volume Calculations

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 382 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.211	0.211	0.0	6.2	6.2	75.0	O K
30 min Summer	0.309	0.309	0.0	6.2	6.2	109.9	O K
60 min Summer	0.425	0.425	0.0	6.2	6.2	151.4	O K
120 min Summer	0.541	0.541	0.0	6.2	6.2	192.8	O K
180 min Summer	0.595	0.595	0.0	6.2	6.2	211.9	O K
240 min Summer	0.627	0.627	0.0	6.2	6.2	223.4	O K
360 min Summer	0.658	0.658	0.0	6.2	6.2	234.5	O K
480 min Summer	0.673	0.673	0.0	6.2	6.2	239.6	O K
600 min Summer	0.678	0.678	0.0	6.2	6.2	241.5	O K
720 min Summer	0.678	0.678	0.0	6.2	6.2	241.6	O K
960 min Summer	0.669	0.669	0.0	6.2	6.2	238.3	O K
1440 min Summer	0.634	0.634	0.0	6.2	6.2	225.8	O K
2160 min Summer	0.571	0.571	0.0	6.2	6.2	203.6	O K
2880 min Summer	0.507	0.507	0.0	6.2	6.2	180.5	O K
4320 min Summer	0.388	0.388	0.0	6.2	6.2	138.3	O K
5760 min Summer	0.294	0.294	0.0	6.2	6.2	104.8	O K
7200 min Summer	0.222	0.222	0.0	6.2	6.2	79.1	O K
8640 min Summer	0.166	0.166	0.0	6.2	6.2	59.1	O K
10080 min Summer	0.127	0.127	0.0	6.2	6.2	45.2	O K
15 min Winter	0.238	0.238	0.0	6.2	6.2	84.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	100.646	0.0	81.0	25
30 min Summer	74.363	0.0	119.7	39
60 min Summer	52.662	0.0	169.7	68
120 min Summer	35.497	0.0	228.8	126
180 min Summer	27.508	0.0	266.0	182
240 min Summer	22.929	0.0	295.6	242
360 min Summer	17.658	0.0	341.5	316
480 min Summer	14.625	0.0	377.1	384
600 min Summer	12.613	0.0	406.6	450
720 min Summer	11.163	0.0	431.8	518
960 min Summer	9.187	0.0	473.9	658
1440 min Summer	6.965	0.0	538.9	934
2160 min Summer	5.294	0.0	614.4	1344
2880 min Summer	4.365	0.0	675.5	1736
4320 min Summer	3.346	0.0	776.7	2504
5760 min Summer	2.792	0.0	864.4	3224
7200 min Summer	2.438	0.0	943.2	3896
8640 min Summer	2.180	0.0	1012.4	4584
10080 min Summer	1.984	0.0	1074.5	5248
15 min Winter	100.646	0.0	90.7	25

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.348	0.348	0.0	6.2	6.2	124.1	O K
60 min Winter	0.481	0.481	0.0	6.2	6.2	171.5	O K
120 min Winter	0.618	0.618	0.0	6.2	6.2	220.0	O K
180 min Winter	0.684	0.684	0.0	6.2	6.2	243.6	O K
240 min Winter	0.726	0.726	0.0	6.2	6.2	258.7	O K
360 min Winter	0.769	0.769	0.0	6.2	6.2	274.0	O K
480 min Winter	0.783	0.783	0.0	6.2	6.2	278.8	O K
600 min Winter	0.786	0.786	0.0	6.2	6.2	280.1	O K
720 min Winter	0.784	0.784	0.0	6.2	6.2	279.3	O K
960 min Winter	0.765	0.765	0.0	6.2	6.2	272.6	O K
1440 min Winter	0.701	0.701	0.0	6.2	6.2	249.8	O K
2160 min Winter	0.591	0.591	0.0	6.2	6.2	210.5	O K
2880 min Winter	0.481	0.481	0.0	6.2	6.2	171.2	O K
4320 min Winter	0.291	0.291	0.0	6.2	6.2	103.6	O K
5760 min Winter	0.158	0.158	0.0	6.2	6.2	56.4	O K
7200 min Winter	0.099	0.099	0.0	6.2	6.2	35.3	O K
8640 min Winter	0.089	0.089	0.0	5.5	5.5	31.6	O K
10080 min Winter	0.081	0.081	0.0	5.0	5.0	28.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	74.363	0.0	134.1	39
60 min Winter	52.662	0.0	190.0	66
120 min Winter	35.497	0.0	256.3	124
180 min Winter	27.508	0.0	297.9	180
240 min Winter	22.929	0.0	331.1	238
360 min Winter	17.658	0.0	382.5	346
480 min Winter	14.625	0.0	422.4	446
600 min Winter	12.613	0.0	455.4	482
720 min Winter	11.163	0.0	483.7	560
960 min Winter	9.187	0.0	530.8	716
1440 min Winter	6.965	0.0	603.6	1020
2160 min Winter	5.294	0.0	688.2	1452
2880 min Winter	4.365	0.0	756.6	1852
4320 min Winter	3.346	0.0	870.1	2596
5760 min Winter	2.792	0.0	968.0	3232
7200 min Winter	2.438	0.0	1056.4	3680
8640 min Winter	2.180	0.0	1133.9	4408
10080 min Winter	1.984	0.0	1203.5	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.200	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.430

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.143	4	8	0.143	8	12	0.143

Model Details

Storage is Online Cover Level (m) 2.000

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	375.0	0.0	0.800	375.0	0.0
0.400	375.0	0.0	0.801	0.1	0.0

Pump Outflow Control

Invert Level (m) 0.000

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.2000	0.300	6.2000	0.500	6.2000	0.700	6.2000
0.200	6.2000	0.400	6.2000	0.600	6.2000	0.800	6.2000

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