FLOOD RISK CONSULTANCY LIMITED

NPPF Flood Risk Assessment

2No Dwelling on Whins Lane, Read

Client: Robert Edmund

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APPRAISING, MANAGING & REDUCING FLOOD RISK

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Contract

This report describes work commissioned by Robert Edmund dated 27th April 2017. Chris Vose and Donna Metcalf of The Flood Risk Consultancy carried out the work.

Disclaimer

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

Executive Summary

The planning application is for the erection of 2No residential dwellings located on land which currently comprises of the garden area of the property named Lowood.

The primary flood risk to the site is the unnamed tributary of the River Calder and the upstream culvert that passes under Whins Lane.

No flood model data is available for the watercourse as such to assess flood risk simple mathematical analysis has been used which incorporates estimating open channel and culvert capacity using Colebrook White and the Manning's Equation.

The upstream catchment of the unnamed watercourse is considered to be of a rural nature located to the north of Whins Lane, Ordnance Survey maps where used to estimate the area as 7.3 Hectares.

Catchment flows where calculated using the ICP SUDS Method for the 1 year, 30 year, 100 year, 100 year plus 35% climate change and 1000 year events as 0.043, 0.084, 0.104. 0.139 and 0.151m^3/s.

The pipe full capacity for the 450mm diameter culvert and the 300mm diameter culvert are calculated as 0.56 and 0.42m^3/s respectively.

As such it is considered that both the culverts have sufficient capacity to convey flows from the upstream catchment of the watercourse, north of Whins Lane.

An analysis of blockage within the culverts has been undertaken. The culvert headwall arrangement provides for an overflow, via a void in the stone wall, onto Whins Lane, with gullies located on the north and south of the highway to direct excess flow back into the channel downstream, resulting in a low risk to the proposed development.

Within the site the bank full capacity of the channel was calculated using Manning's as 17.0m^3/s and it is concluded that flows during the extreme 100 year plus 35% climate change and 1000 year event would remain within channel.

It is therefore concluded that the fluvial flood risk associated with the unnamed tributary of the River Calder presents a low risk, confirming that the site is located within Flood Zone 1.

Greenfield runoff rates have been calculated for the 1 year, 30 yea and 100 year events as 0.8l/s, 1.5l/s and 1.8l/s.

Following a disk top study, it was established that the underlying ground is likely to be unsuitable for infiltration methods due to the high presence of clay and the fact that the site is located on a steep hill which could result in flows migrating out of the site boundary.

Furthermore, it would be difficult to achieve a 5m easement from the properties due to the size of the site. As such it is recommended that flows should be directed to the watercourse on-site.

With the inclusion of 40% climate change there may be a requirement to attenuate flows prior to disposal to watercourse, therefore it is recommended that any areas of hardstanding are designed using permeable surfaces, this may negate the requirement for surface water storage.

If permeable surfaces are incorporated into the final design positive surface water drainage would only be required for the roof area. Furthermore, it is advised that rainwater harvesting may be used to provide an element of source control prior to disposal.

Proposed discharge rates must not exceed existing greenfield runoff rates or a minimum of 5l/s to prevent siltation of a flow control device.

Foul from the site is to be directed to the 225mm diameter combined sewer to the west of Lowood, following finalization of the layout a pumped solution may be required. It may be possible to connect to the drainage system serving Lowood, however this needs further exploration.

Recommended Mitigation Measures

- Finished floor levels are to be set to no less than 150mm above existing ground level.
- Land Drainage Consent is required if surface water is to be directed to watercourse.
- Any building should be located at least 6m from the banks of the watercourse.
- Land Drainage Consent for a surface water connection to ordinary watercourse

Contents

Figures

Tables

Appendices

1.0 Introduction

1.1 Terms of Reference

Flood Risk Consultancy Ltd has been appointed by Robert Edmund to provide a NPPF Flood Risk Assessment to support a planning application for the development of 2No residential properties on Whins Lane in Read, Lancashire.

The development is shown to be situated within Flood Zone 1 of the Environment Agency Flood Map, however an unnamed tributary of the River Calder traverses through the east of the application site.

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

1.2 Objectives

The objective of this assessment is to evaluate the following issues in regard to flood risk at the application site.

- Suitability of the proposed development in accordance with current planning policy.
- Identify the risk to both the proposed development and people from all forms of flooding.
- Provide a preliminary assessment of foul and surface water management.
- Increasing the risk of flooding elsewhere e.g. surface water flows; flood routing; and loss of floodplain storage.
- Recommendation of appropriate measures to mitigate against flooding both within the proposed development, and neighbouring land and property.

1.3 Data Sources

This assessment is based on desk-top study of information from the following sources:

- National Planning Policy Framework (Updated 2015)
- Planning Practice Guidance at www.gov.uk (April 2015)
- Building Regulations Approved Document H
- Environment Agency Flood Mapping
- Lancashire Preliminary Flood Risk Assessment 2009
- Ribble Valley Strategic Flood Risk Assessment 2010
- British Geological Society – Historic Borehole Logs
- Cranfield University's Soilscape Viewer
- CIRIA C697 The SUDS Manual
- National Standards for SUDS (2011)
- EA/DEFRA Document SC030219 Rainfall Runoff Management for New Development

2.0 Planning Policy Context

2.1 Approach to the Assessment

The project will be submitted for planning approval to Ribble Valley Borough Council and owing to its proximity to a watercourse, a detailed site specific flood risk assessment is required.

The FRA is designed to provide a qualitative appraisal of flood risk both within the application site and any potential impact that the development will have on flood risk elsewhere; and provide recommendations for mitigation measures which may be incorporated into the final design.

An initial assessment indicates that the primary flood risk at the proposed development is from the unnamed tributary of the River Calder flowing through the east of the site.

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

2.2 National Planning Policy Framework (NPPF)

The requirements for undertaking site specific flood risk assessments are generally as set out in Guidance Point 10 from the Planning Practice Guide – Flood Risk & Coastal Change (www.gov.uk).

The information provided in the flood risk assessment should be credible and fit for purpose.

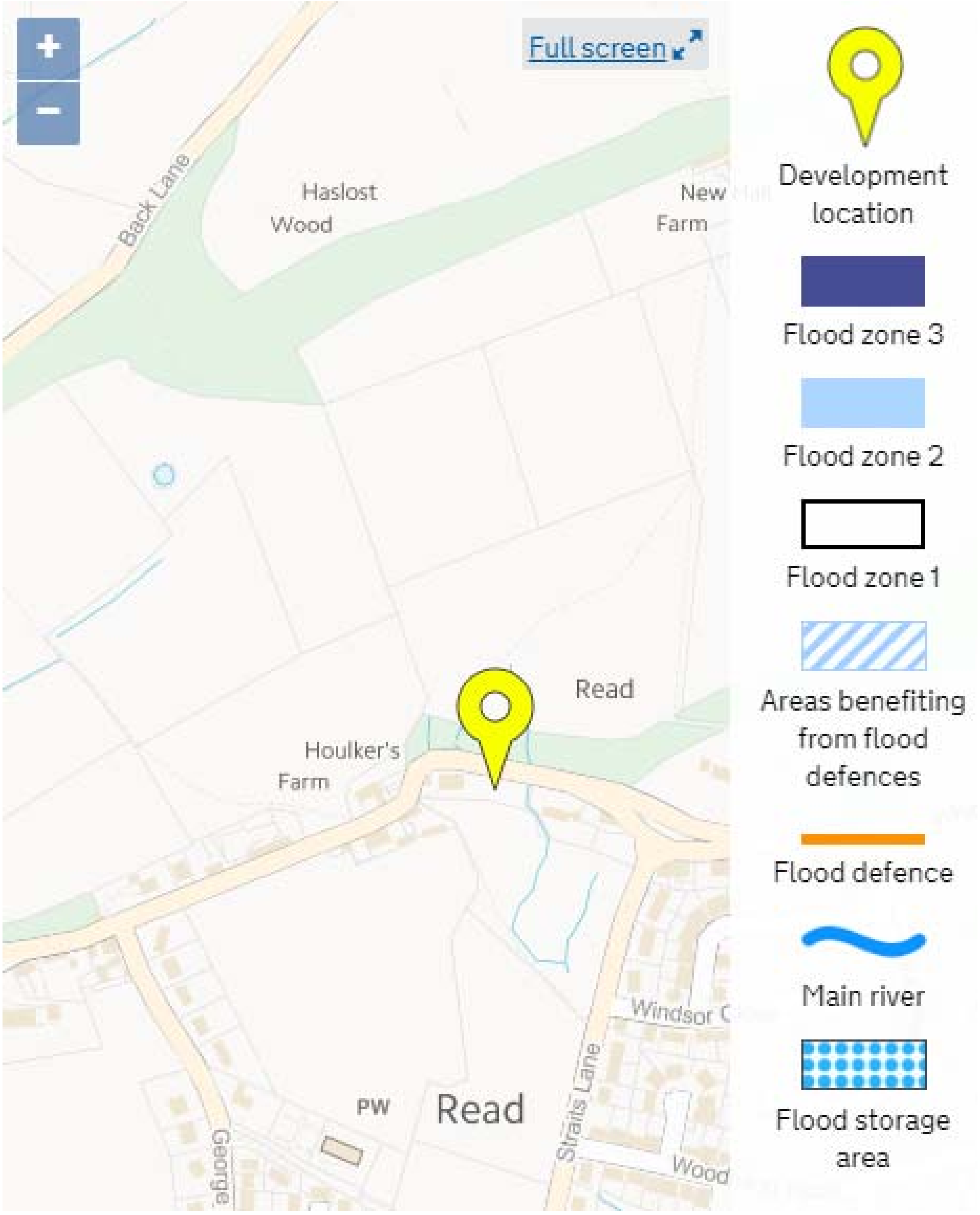
Site-specific flood risk assessments should always be proportionate to the degree of flood risk and make optimum use of information already available, including information in a Strategic Flood Risk Assessment for the area, and the interactive flood risk maps available on the Environment Agency's website.

A flood risk assessment should also be appropriate to the scale, nature and location of the development.

2.2.1 Sources of Flooding

- **Rivers (fluvial):** Flooding occurs when flow within river channels exceeds capacity; and the type of flood event experienced e.g. flash flooding; depends upon the characteristics of the river catchment.
- **The Sea (tidal):** Flooding at low lying coastline and tidal estuaries is caused by storm surges and high tides; with overtopping and breach failure of sea defences possible during extreme storm events.
- **Pluvial (surface flooding or overland flows):** Heavy rainfall, which is unable to soak away via infiltration or enter drainage systems can flow overland, resulting in localised flooding. Topography generally influences the direction and depth of flooding caused by this mechanism.
- **Groundwater:** Caused when ground water levels rise to the surface; and is most likely to occur in low lying areas underlain by aquifers.
- **Sewers and drains:** Generally occurs in more urban areas; where sewers and drains are overwhelmed by heavy rainfall or blocked pipes and gullies.
- **Artificial Sources (reservoirs, canals, lakes and ponds):** Reservoir and canal flooding may occur as a result of capacity exceedance or structural failure.

Figure 2.0: The Environment Agency Flood Map



Source: www.environment-agency.gov.uk

2.2.2 Flood Zones

- **Flood Zone 1:** Low probability (less than 1 in 1000 year (<0.1% AEP) annual probability of river or sea flooding in any year.

- **Flood Zone 2:** Medium probability (between 1 in 100 year (1.0% AEP) and 1 in 1000 year (0.1% AEP) annual probability of river flooding; or between 1 in 200 year (0.2% AEP) and 1 in 1000 year (0.1% AEP) annual probability of sea flooding in any year).
- **Flood Zone 3a:** High probability (1 in 100 year (1.0% AEP) or greater annual probability of river flooding in any year or 1 in 200 year (0.5% AEP) or greater annual probability of sea flooding in any year).
- **Flood Zone 3b:** This zone comprises land where water has to flow or be stored in times of flood. Land which would flood with an annual probability of 1 in 20 (5% AEP), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

2.2.3 Vulnerability of Different Development Types

- **Essential Infrastructure:** Transport infrastructure (railways and motorways etc…); utility infrastructure (primary sub-stations, water treatment facilities; power stations; and wind turbines).
- **Water Compatible Development:** Flood control infrastructure; water and sewage infrastructure; navigation facilities.
- **Highly Vulnerable:** Emergency services; basement dwellings; mobile home parks; industrial or other facilities requiring hazardous substance consent.
- **More Vulnerable:** Hospitals; residential dwellings; educational facilities; landfill sites caravan and camping sites.
- **Less Vulnerable:** Commercial premises; emergency services not required during a flood; agricultural land.

2.2.4 Climate Change

The NPPF requires the application of climate change over the lifetime of a development. As of 19th February 2016 the Technical Guidance for NPPF has updated the climate change allowances based on the river basin district. The climate change allowance for the North West basin district is tabulated below:

Table 1: North West Climate Change Allowances[1]

Parameter	Allowance Category	2010 - 2039	2040 - 2059	2060 - 2069	2070 - 2115
Peak Rainfall Intensity	Upper end	+ 10%	+ 20%	+ 40%	
	Central	+ 5%	+ 10%	+ 20%	
Peak River Flow	Upper end	+ 20%	+ 35%		+ 70%
	Higher Central	+ 20%	+ 30%		+ 35%
	Central	+ 15%	+ 25%		+ 30%

The selection of climate change allowance should be chosen appropriate to the expected lifespan of the proposed development.

[1] Extracted from Tables 1-4 of the Technical Guidance for flood risk assessments: Climate change allowances Document (February 2016)

Residential development is anticipated to have a lifespan approximating 100 years; and as such an additional 40% should be applied to peak rainfall intensities to assess the range of impact for this development.

Due to the development being located within close proximity to a watercourse peak river flow should be increased by 35% inline with the central climate change allowance.

2.2.5 Sustainable Urban Drainage Systems (SUDS)

The key objectives in the NPPF are to appraise, manage and where possible, reduce flood risk.

Sustainable Urban Drainage Systems (SUDS) are designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges, thereby providing a suitable way of achieving some of these objectives.

The NPPF and Building Regulations Approved Document Part H direct developers towards the use of SUDS; and the Floods and Water Management Act 2010 also reinforces the requirements for SUDS to be implemented where practicable.

Part H of the Building Regulations requires that surface water should be discharged from new development in accordance with the following hierarchy in order of preference:

- By infiltration to the ground via soakaway or other infiltration device
- To a watercourse
- To a public sewer.

A more detailed review of SUDS elements which may be considered for inclusion within any redevelopment works has been incorporated within Section 6 of this report.

3.0 History of Flooding

3.1 Internet Search

The Lancashire Telegraph website revealed that following the floods of 2015 Lancashire County Council invested £6,669 on Whins Lane to elevate flooding issues, however what the work will entail is not specifically mentioned.

No more articles relating to flooding on Whins Lane within Read have been found.

3.2 Lancashire County Council PFRA

The Preliminary Flood Risk Assessment was undertaken by Lancashire County Council and completed in 2011, Section 4 Past Flood Risk does not specifically mention the area of Read as having suffered flooding in the past.

3.3 Ribble Valley Borough Council SFRA

The Strategic Flood Risk Assessment was undertaken by Ribble Valley Borough Council and completed in 2010, Section 4.4 Historic Flood Risk does mention the River Calder as flooding in the past, however it does not specifically mention Read.

3.4 Anecdotal Evidence

Following a site visit and discussions with the client it was mentioned that LCC recently constructed an overflow culvert above the existing culvert under Whins Lane to elevate flooding upstream of the site on Whins Lane itself.

4.0 Details of the Site

4.1 Site Details

Table 2: Development Location

Site Name:	2No Residential Dwellings on Whins Lane
Purpose of Development:	Residential
Existing Land Use:	Garden Area
OS NGR:	SD767350
Country:	England
County:	Lancashire
Local Planning Authority:	Ribble Valley Borough Council
Internal Drainage Board:	Not Applicable
Other Authority (e.g. British Waterways/ Harbour Authority)	Not Applicable

Location Plan:

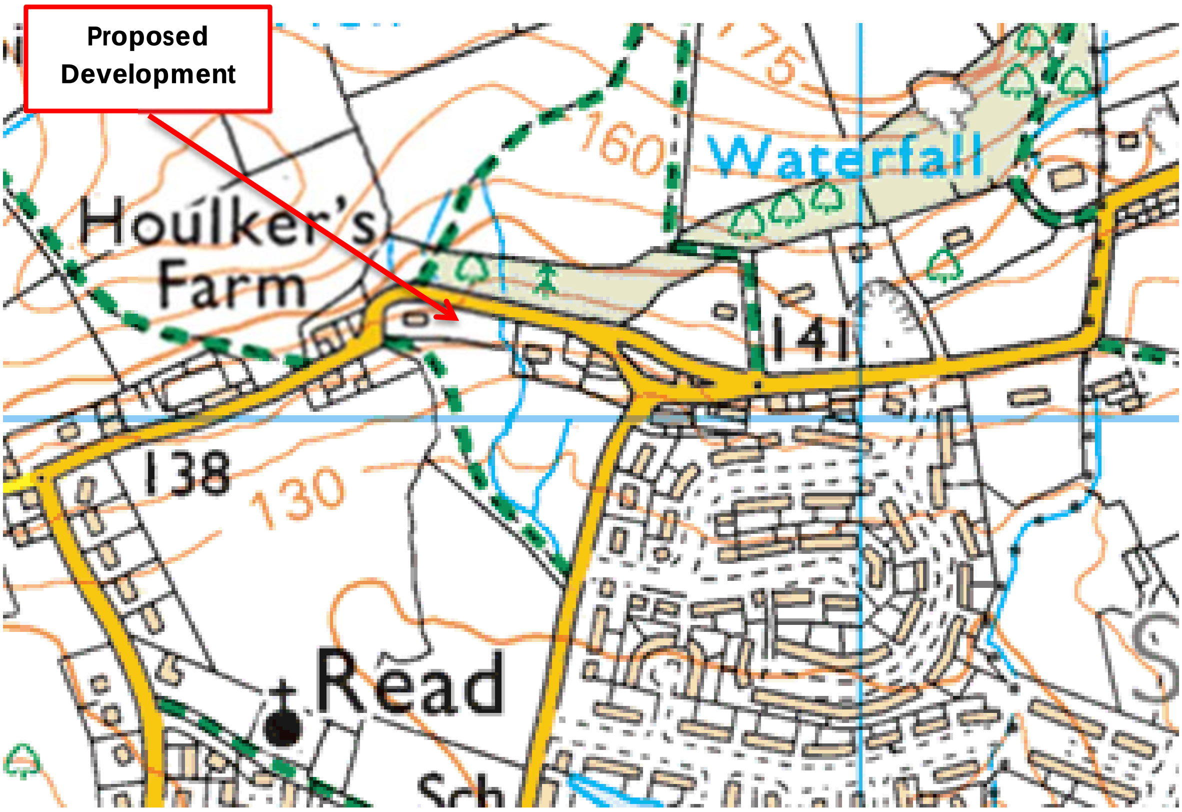
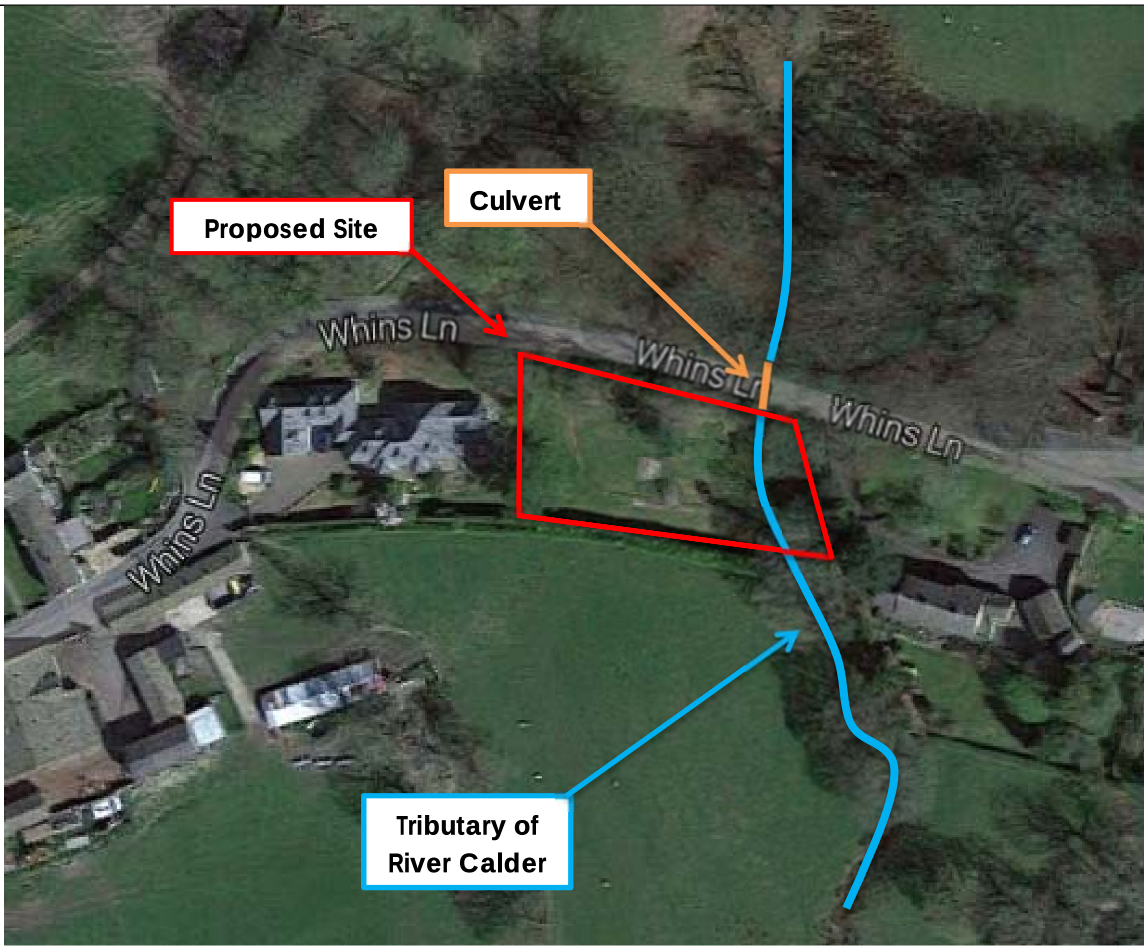


Image produced from the Ordnance Survey Get-a-map service.
Image reproduced with kind permission of Ordnance Survey and Ordnance Survey of Northern Ireland.

4.2 Site Description

Th proposed development site is located within what is currently the eastern garden area of the property named Lowood, the unnamed tributary of the River Calder flows through the east of the site from north to south.

Figure 4.1: Proposed Development Site Viewed from Above



Source: Google Maps

Table 3: Boundaries

North	Directly north of the site is Whins Lane, beyond which is an area of agricultural/woodland.
East	Directly east of the site is the garden area of a property named Woodley.
South	South of the site is a large field used for grazing with the River Calder approximately 1.5km south.
West	Directly west of the site is the existing property named Lowood and then Whins Lane.

A topographical survey provided for the site identifies that the site falls generally from north west to south east with a range of approximately 4m

The nearest watercourse to the application site is the unnamed tributary of the River Calder which flows through the east of the site.

The watercourse is culverted under Whins Lane upstream of the site where it flows within open channel, before exiting the site via the south east corner.

Figure 4.2: Application Site Viewed East from Lowood

Source: FRC

4.3 Proposed Development Details

At present, no development proposals have been developed, however it is understood that the planning application will be for 2No residential properties on land which currently comprises of garden area associated with property named Lowood on Whins Lane, Read.

5.0 Initial Evaluation of Flood Risk

5.1 The Environment Agency Flood Map

The Environment Agency Flood Map illustrated within Figure 2.1, confirms that proposed development site is located in Flood Zone 1.

The definition for each of the flood zones highlighted above is provided for reference within Section 2.2.2 of this report.

Table 4: Possible Flooding Mechanisms

Source/Pathway	Significant?	Comment/Reason
Fluvial	Yes	Tributary of River Calder
Canal	No	N/A
Tidal/Coastal	No	N/A
Reservoir	No	Site lies outside of an area liable to flood in the event of failure of a reservoir
Pluvial - Urban Drainage (On-site)	No	Site is less then 10No properties
Groundwater	No	Site located on the side of a hill
Pluvial – Surface Water Flood Routes	No	Site is located within an area shown to have a low risk from surface water flooding
Blockage	Yes	Culvert Under Whins Lane
Infrastructure failure	Yes	Culvert Under Whins Lane
Rainfall Ponding	No	Any undulations to be levelled during the construction phase.

From the initial assessment, it is concluded that the primary source of flood risk will be from the unnamed tributary of the River Calder and blockage of the associated culvert under Whins Lane.

Fluvial Sources: Unnamed Tributary of the River Calder

The source of the unnamed tributary of the River Calder starts approximately 100m north of the application site on Whins Lane within a steep agricultural/woodland setting. The watercourse flows within a winding open trapezoidal natural channel that is vegetated on either side with 2No trash screens upstream of Whins Lane.

It is culverted for a section under Whins Lane via 2No pipes, a 450mm diameter pipe and a 300mm diameter pipe (at a higher level) acting as an overflow. It was observed that 2No gullies on Whins Lane direct surface water flows from Whins Lane into the 300mm diameter overflow.

Once the culvert exists Whins Lane it flows through the east of the application site via a natural trapezoidal channel , it then exists out of the south east corner of the site unimpeded flowing through the rear garden of the neighbouring property to the east named Woodley, before flowing through the large grazing field to the south via a grassed open channel.

The unnamed tributary joins the River Calder approximately 1.5km south of the application site.

The watercourse is considered to be a minor ordinary watercourse, therefore maintenance is the responsibility of the riparian owner, furthermore it is anticipated that the culverted section under the highway will be the responsibility of Lancashire County Council.

Figure 4.3: Upstream Extent of Watercourse (North of Whins Lane)

Source: FRC

Figure 4.4: Head of Culvert Under Whins Lane

Source: FRC

Figure 4.5: Culverts Entering the Site from Whins Lane

Source: FRC

Figure 4.6: Gully discharging into 300mm Overflow Culvert on Whins Lane

Source: FRC

Due to the proximity of the watercourse to the application site the risk of fluvial flooding is quantified within more detail within Section 6 of this report.

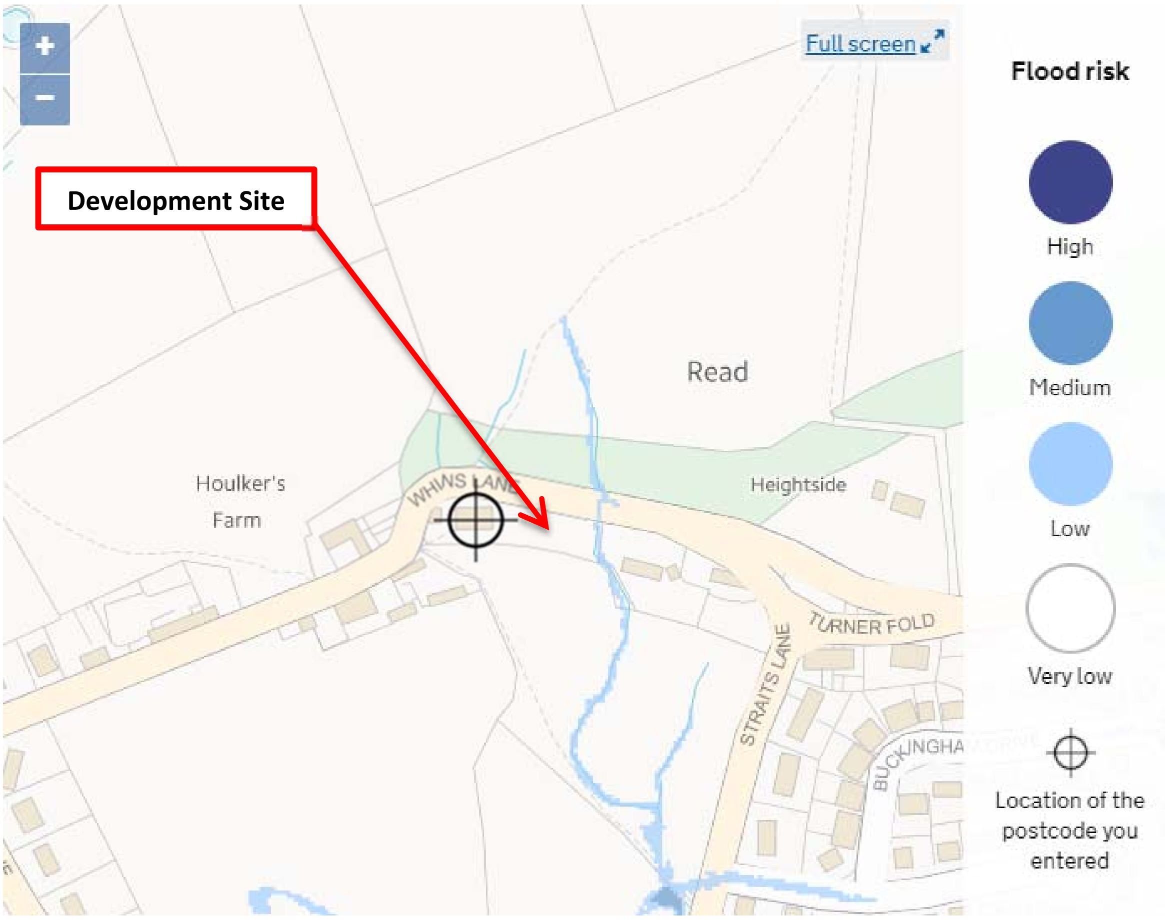
Pluvial: Surface Water Flood Routes/Ponding

The latest mapping in regard to surface water flood routes throughout the UK has been utilised to evaluate the risk of flooding at the development site; and is provided below.

Mapping indicates that overall the site has a low risk of flooding from surface water flooding.

- High - each year, the area has a chance of flooding of greater than 1 in 30 (3.3%).
- Medium - each year, the area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
- Low - each year, the area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%).
- Very low - each year, the area has a chance of flooding of less than 1 in 1000 (0.1%).

Figure 4.7: Surface Water Flood Risk



Source: www.gov.uk

Furthermore, 2No gullies direct flow from Whins Lane into the 300mm overflow culvert, therefore any accumulation upstream of the site will be directed under the road and into the watercourse.

As such the risk from surface water flow routes is considered to be very low.

6.0 Quantitative Flood Risk Assessment

6.1.1 Site Specific Flood Risk Assessment Checklist

The following checklist has been extracted from Paragraph 068 from the Flood Risk & Coastal Change Section available from www.gov.uk , updated in November 2016.

1. Development site and location

Provide a description of the site you are proposing to develop, including, or making reference to, a location map which clearly indicates the development site.

a. Where is the development site located? (e.g. postal address or national grid reference)
b. What is the current use of the site? (e.g. undeveloped land, housing, shops, offices)
c. Which Flood Zone (for river or sea flooding) is the site within? (i.e. Flood Zone 1, Flood Zone 2, Flood Zone 3). Check the Flood Map for Planning (Rivers and Sea) and the Strategic Flood Risk Assessment for the area available from the local planning authority.

2. Development proposals

Provide a general summary of the development proposals, including, or making reference to, an existing block plan and a proposed block plan, where appropriate.

a. What are the development proposal(s) for this site? Will this involve a change of use of the site and, if so, what will that change be?
b. In terms of vulnerability to flooding, what is the vulnerability classification of the proposed development?
c. What is the expected or estimated lifetime of the proposed development likely to be? (E.g. less than 20 years, 20-50 years, 50-100 years?).

3. Sequential test

For developments in flood zones 2 or 3 only.
(If the development site is wholly within flood zone 1, this section can be skipped - go to section 4).

Describe how the sequential test has been applied to the development (if required, and as set out in paragraphs 101-104 of the National Planning Policy Framework); and provide the evidence to demonstrate how the requirements of the test have been met.

See paragraph 033 of the NPPF guidance for further information. (It is recommended that the Developer or Agent contacts the LPA to confirm whether the sequential test should be applied and to ensure the appropriate level of information is provided).

a. What other locations with a lower risk of flooding have you considered for the proposed development?
b. If you have not considered any other locations, what are the reasons for this?

c. Explain why you consider the development cannot reasonably be located within an area with the lowest probability of flooding (flood zone 1); and, if your chosen site is within flood zone 3, explain why you consider the development cannot reasonably be located in flood zone 2.
d. As well as flood risk from rivers or the sea, have you taken account of the risk from any other sources of flooding in selecting the location for the development?

4. Climate Change

How is flood risk at the site likely to be affected by climate change? (The local planning authority's Strategic Flood Risk Assessment should have taken this into account). Further advice on how to take account of the impacts of climate change in flood risk assessments is available from the Environment Agency.

5. Site specific flood risk

Describe the risk of flooding to and from the proposed development over its expected lifetime, including appropriate allowances for the impacts of climate change. It would be helpful to include any evidence, such as maps and level surveys of the site, flood datasets (e.g. flood levels, depths and/or velocities) and any other relevant data, which can be acquired through consultation with the Environment Agency, the lead local flood authority for the area, or any other relevant flood risk management authority. Alternatively, you may consider undertaking or commissioning your own assessment of flood risk, using methods such as computer flood modelling.

a. What is/ are the main source(s) of flood risk to the site? (E.g. tidal/sea, fluvial or rivers, surface water, groundwater, other?). You should consider the flood mapping available from the Environment Agency, the Strategic Flood Risk Assessment for the area, historic flooding records and any other relevant and available information.
b. What is the probability of the site flooding, taking account of the maps of flood risk available from the Environment Agency, the local planning authority's Strategic Flood Risk Assessment and any further flood risk information?
c. Are you aware of any other sources of flooding that may affect the site?
d. What is the expected depth and level for the design flood? See paragraph 055 of the NPPF guidance for information on what is meant by a "design flood". If possible, flood levels should be presented in metres above Ordnance Datum (i.e., the height above average sea level).
e. Are properties expected to flood internally in the design flood and to what depth? Internal flood depths should be provided in metres.
f. How will the development be made safe from flooding and the impacts of climate change, for its lifetime? Further information can be found in paragraphs 054 and 059 (including on the use of flood resilience and resistance measures) of the NPPF guidance.
g. How will you ensure that the development and any measures to protect the site from flooding will not cause any increase in flood risk off-site and elsewhere? Have you taken into account the impacts of climate change, over the expected lifetime of the development? (e.g. providing compensatory flood storage which has been agreed with the Environment Agency).
h. Are there any opportunities offered by the development to reduce the causes and impacts of flooding?

6. Surface water management*

Describe the existing and proposed surface water management arrangements at the site using sustainable drainage systems wherever appropriate, to ensure there is no increase in flood risk to others off-site.

a. What are the existing surface water drainage arrangements for the site?
b. If known, what (approximately) are the existing rates and volumes of surface water run-off generated by the site?
c. What are the proposals for managing and discharging surface water from the site, including any measures for restricting discharge rates? For major developments (e.g. of ten or more homes or major commercial developments), and for all developments in areas at risk of flooding, sustainable drainage systems should be used, unless demonstrated to be inappropriate.
d. How will you prevent run-off from the completed development causing an impact elsewhere?
e. Where applicable, what are the plans for the ongoing operation and/or maintenance of the surface water drainage systems?

7. Occupants and users of the development

Provide a summary of the numbers of future occupants and users of the new development; the likely future pattern of occupancy and use; and proposed measures for protecting more vulnerable people from flooding.

a. Will the development proposals increase the overall number of occupants and/or people using the building or land, compared with the current use? If this is the case, by approximately how many will the number(s) increase?
b. Will the proposals change the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? If this is the case, describe the extent of the change.
c. Where appropriate, are you able to demonstrate how the occupants and users that may be more vulnerable to the impact of flooding (e.g., residents who will sleep in the building; people with health or mobility issues; etc.,) will be located primarily in the parts of the building and site that are at lowest risk of flooding? If not, are there any overriding reasons why this approach is not being followed?

8. Exception test

Provide the evidence to support certain development proposals in flood zones 2 or 3 if, following application of the sequential test, it is appropriate to apply the exception test, as set out in paragraphs 102-104 of the National Planning Policy Framework.

It is advisable to contact the local planning authority to confirm whether the exception test needs to be applied and to ensure the appropriate level of information is provided.

a. Would the proposed development provide wider sustainability benefits to the community? If so, could these benefits be considered to outweigh the flood risk to and from the proposed development?

b. How can it be demonstrated that the proposed development will remain safe over its lifetime without increasing flood risk elsewhere?
c. Will it be possible to for the development to reduce flood risk overall (e.g. through the provision of improved drainage)?

8. Residual risk

Describe any residual risks that remain after the flood risk management and mitigation measures are implemented, and to explain how these risks can be managed to keep the users of the development safe over its lifetime.

a. What flood related risks will remain after the flood risk management and mitigation measures have been implemented?
b. How, and by whom, will these risks be managed over the lifetime of the development? (e.g., putting in place flood warning and evacuation plans).

9. Flood risk assessment credentials

Provide details of the author and date of the flood risk assessment.

a. Who has undertaken the flood risk assessment?
b. When was the flood risk assessment completed?

Other considerations

*** Managing surface water**

The site-specific flood risk assessment will need to show how surface water runoff generated by the developed site will be managed. In some cases, it may be advisable to detail the surface water management for the proposed development in a separate drainage strategy or plan. You may like to discuss this approach with the lead local flood authority.

Surface water drainage elements of major planning applications (e.g., of ten or more homes) are reviewed by the lead local flood authority for the area. As a result, there may be specific issues or local policies, for example the Local Flood Risk Management Strategy or Surface Water Management Plan, that will need to be considered when assessing and managing surface water matters.

It is advisable to contact the appropriate lead local flood authority prior to completing the surface water drainage section of the flood risk assessment, to ensure that the relevant matters are covered in sufficient detail.

Proximity to Main Rivers

If the development of the site involves any activity within specified distances of main rivers, a flood risk activity permit may be required in addition to planning permission.

For non-tidal main rivers, a flood risk activity permit may be required if the development of the site is within 8 metres of a river, flood defence structure or culvert.

For tidal main rivers, a flood risk activity permit may be required if the development of the site is within 16 metres of a river, flood defence structure or culvert.

Details on obtaining a Flood Risk Activity Permit are available from the Environment Agency.

6.2 Fluvial: Unnamed Tributary of the River Calder

6.2.1 General

The watercourse is culverted upstream of the application site under Whins Lane via a 450mm diameter pipe and a 300mm diameter overflow pipe before flowing through the east of the application site (see Section 5.1).

6.2.2 Modelled Flood Data

The watercourse is classified as a minor 'Ordinary Watercourse' which is not protected by flood defences.

It is advised that there is no modelled flood levels for this location; and therefore, in order to evaluate the likelihood of flooding at the application site, an assessment of flows and capacity within the watercourse channel, within the vicinity of the site needs to be undertaken.

6.2.3 Methodology

In order to evaluate the capacity of the watercourse on-site it must first be established if the culverts have enough capacity to convey flows associated with the catchment upstream of Whins Lane during the extreme events i.e. 100 year plus climate change and 1000 year events.

Following this an assessment of blockage will be undertaken to determine the direction of any the flow routes and then finally channel capacity calculations to estimate flood levels.

6.2.4 Catchment Peak Flow Estimation

No catchment data is available from the FEH Web Service which is usually used for hydraulic calculations, therefore greenfield runoff rates have been calculated using the ICP SUDS Method for a range of return periods.

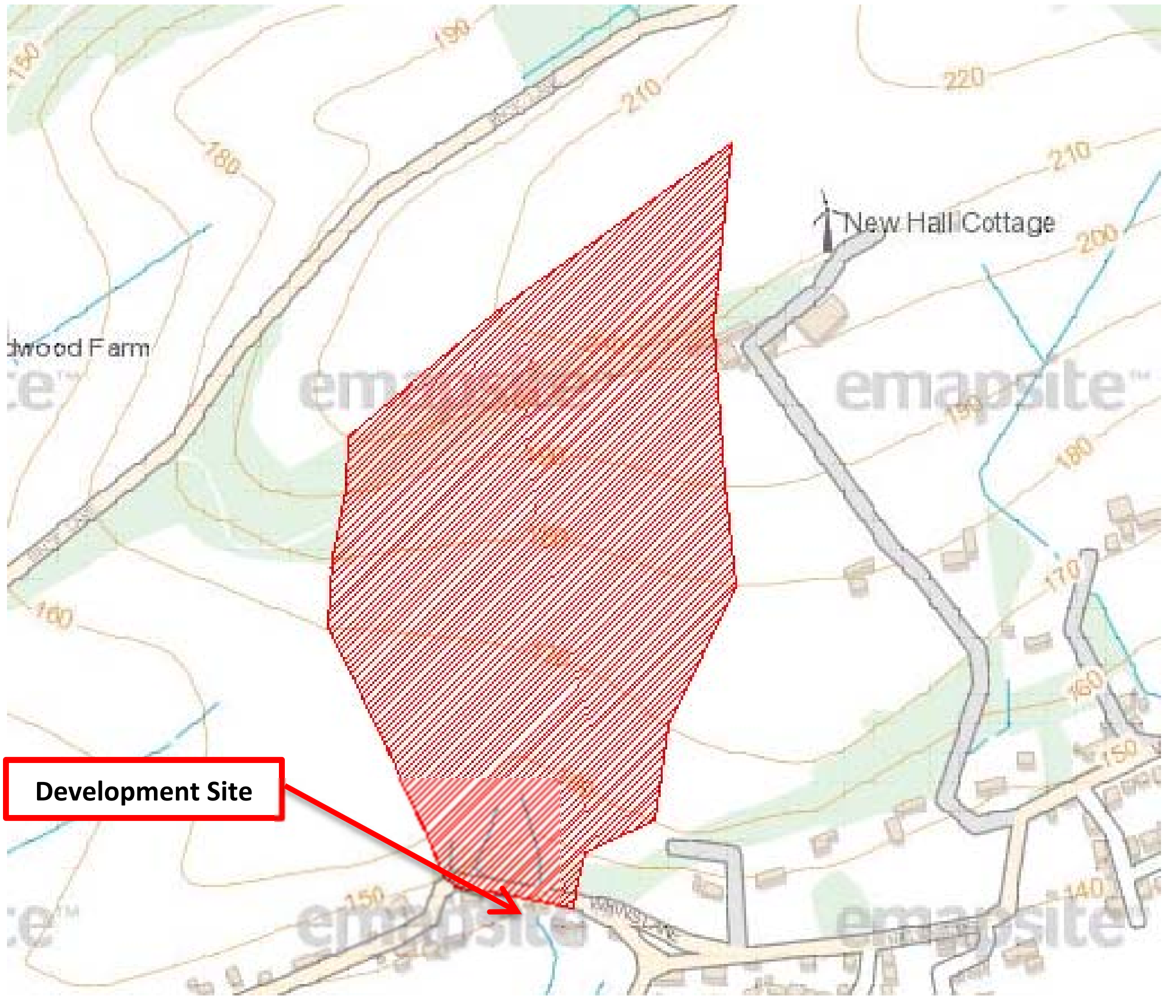
The size of the catchment has been estimated using Ordnance Survey maps and is estimate to be approximately 7.3 Hectares.

A summary of the estimated flows within the tributary is provided below.

Table 5: Flows Upstream Catchment

Return Period	Flow (l/s)	Flow (m^3/s)
1 in 1 year	43.30	0.043
1 in 30 year	84.40	0.084
1 in 100 years	103.50	0.104
1 in 100 years + 35% climate change	139.73	0.139
1 in 1000 years	151.30	0.151

Figure 6.1: Catchment Area



Source: FRC

6.2.5 Capacity of Culverts

Now that the flows for the upstream catchment have been calculated the next step is to determine if the culverts have sufficient capacity to convey the flows during the extreme events.

The Colebrook White Equation has been used to determine the maximum flow rates for each pipe.

The characteristics of the culverts under Whins Lane are described below:

450mm Dia Culvert

- Upstream Invert Level = 140.44m AOD
- Downstream Invert Level = 140.240m AOD
- Length = 6.6m
- Maximum discharge = 0.564m^3/s

300mm Dia Culvert

- Upstream Invert Level = 141.14m AOD
- Downstream Invert Level = 140.44m AOD
- Length = 6.6m
- Maximum discharge = 0.426m³/s

Following an evaluation of the maximum capacity of the culverts it is concluded that individually the 450mm dia and the 300mm dia pipes have sufficient capacity to convey the flows during the extreme event.

6.2.6 Blockage

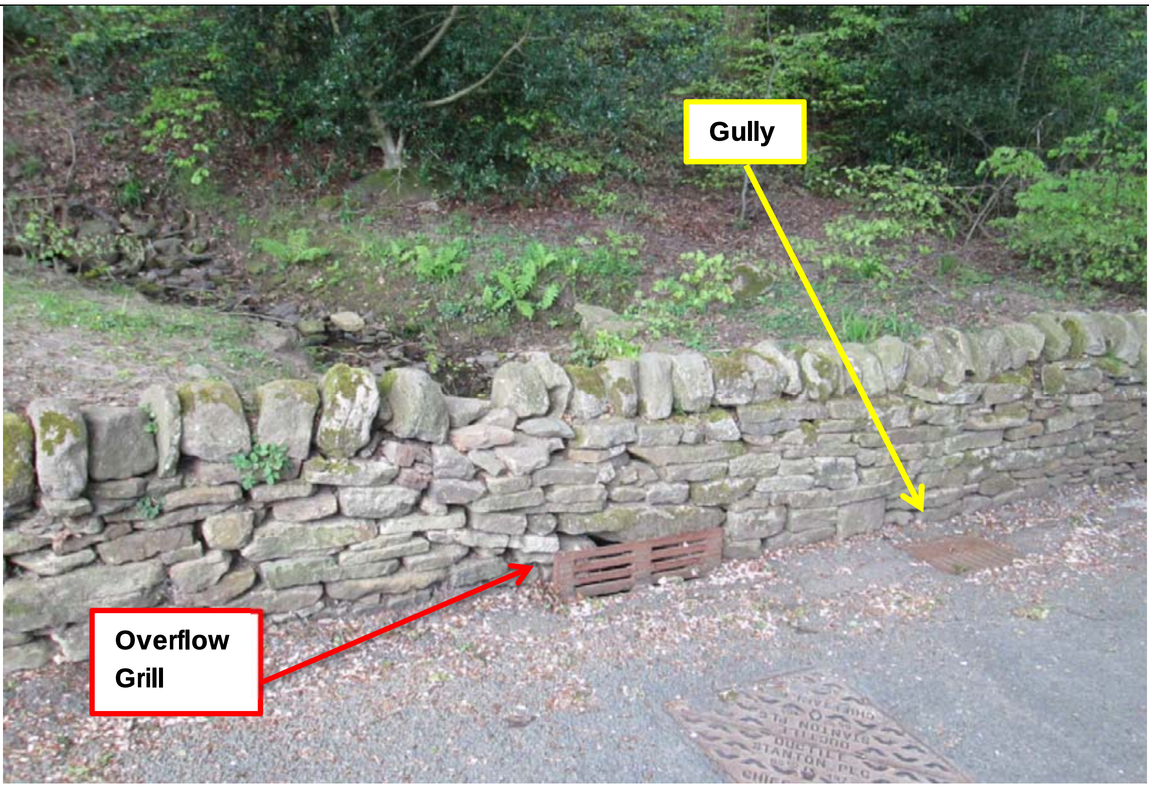
Following evaluation of the capacity of the culverts it is evident that the original 450mm diameter culvert under Whins Road could quite easily convey flows on its own during the extreme events.

Therefore, its is believed that the new 300mm dia culvert was constructed to provide an overflow arrangement in case of blockage, given the wooded location and the steep nature of the watercourse.

The onsite visit acknowledged that 2No trash screens are located on the upstream extent of the watercourse, one is part way up the natural channel the other is located on the upstream headwall under Whins Lane.

Furthermore, it was identified that the headwall incorporated a grill that allowed any flows as a result of blockage overtop onto Whins Lane.

Figure 6.2: Overflow Grill and Gully



Source: Google Maps

A second gully is located inline with the culvert, both gullys connect to the 300mm diameter overflow pipe.

Figure 6.3: Second Downstream Overflow Gully

Source: Google Maps

In the event of blockage of the 450mm diameter culvert flows would be directed to the 300mm diameter culvert firstly. Failing this flow would back up the channel until it overtopped onto the road via the grill within the wall, once flows spilled onto Whins Lane they would be picked up by either of the two gullies and directed into the 300mm diameter overflow culvert then back into the watercourse.

Taking the above into account in the event of blockage flows would have little effect on the proposed development with flow routes being confined to the original route of the watercourse.

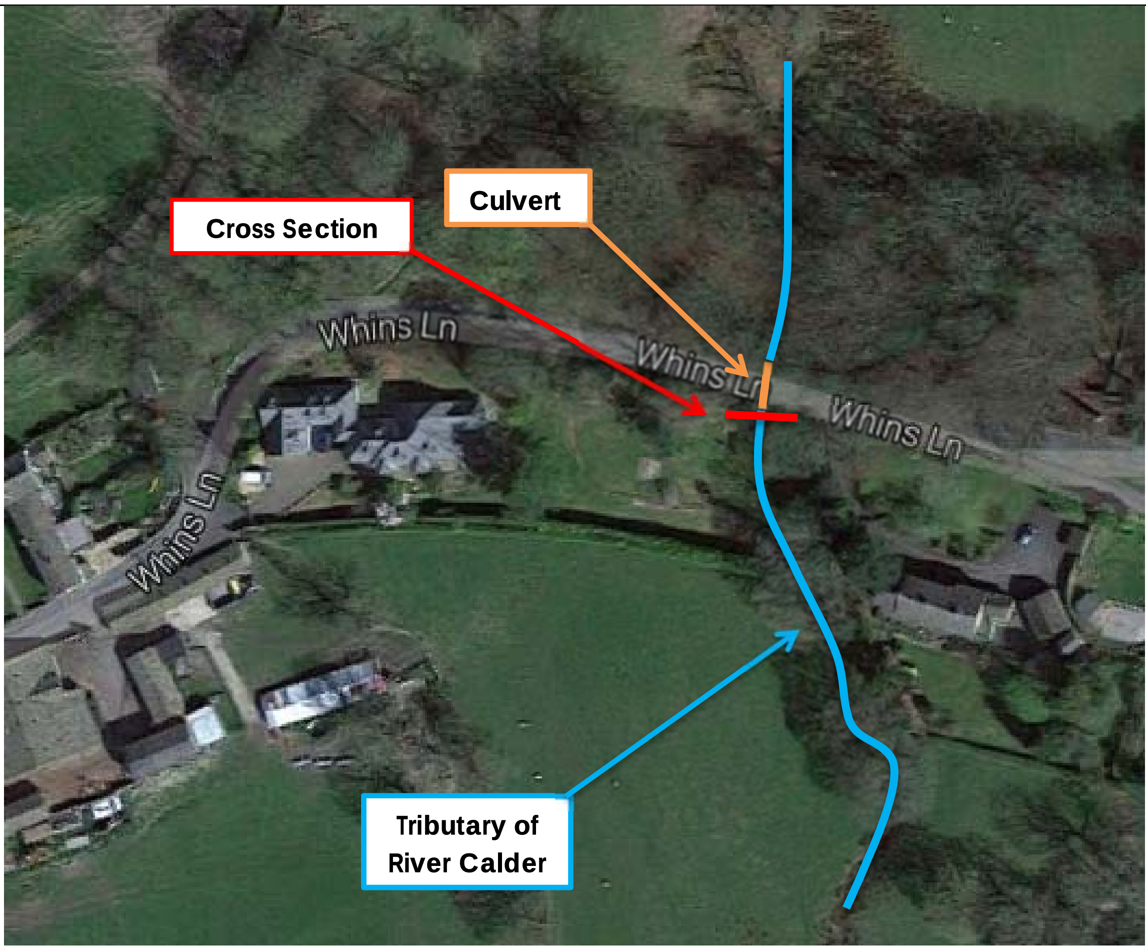
6.2.7 Bank Full Capacity

In order to determine the bank full capacity of the section of the watercourse that flows through the east of the application site Manning's calculations have been undertaken using the following cross sectional information obtained from the topographical survey and the on-site visit.

Watercourse Characteristics

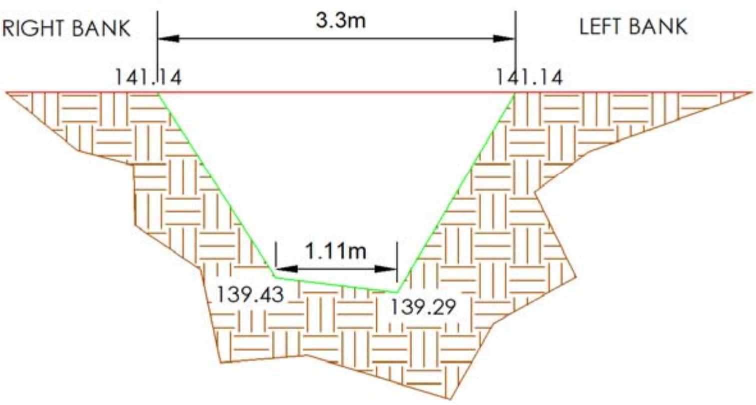
- Manning's N Value = 0.05, Channel Slope = 0.0716, Area = 3.9m^{2,} Wetted Perimeter = 5.3m

Figure 6.4: Location of Cross Section



Source: Google Maps

Figure 6.5: Channel Dimensions



Source: FRC

Figure 6.6: Channel Viewed South On-site

Source: FRC

Manning's has calculated that the bank full capacity of the channel is approximately **17m³/s.**

Taking the above into account the 100 year plus 35% climate change and the 1000 year flows are 0.139m³/s and 0.151m³/s.

It is therefore concluded that flows during the extreme events associated with the unnamed tributary of the River Calder will remain well within channel, furthermore the watercourse exists the site unimpeded into the neighbor's garden before changing direction into the grazing field south of the site.

As such the risk associated with fluvial flooding is considered low and the application site is located within Flood Zone 1.

6.3 Surface Water Runoff

6.3.1 General

The site is considered to be a greenfield with a gross area of approximately 0.12 Hectares, the topographical survey identifies the site falls from north west to south east with no positive drainage infrastructure

6.3.2 Existing Public Drainage System

Untied Utilities sewer records identify that there is a 225mm diameter public combined sewer to the west of Lowood within Whins Lane flowing from east to west.

No other sewers are located within the local of the development.

A copy of the United Utilities sewer records can be found within the appendix of this report.

6.3.3 Surface Water Runoff Calculation: Existing Site (Greenfield Runoff).

Greenfield runoff rates have been calculated using the ICP SUDS Method on Windes Micro Drainage for a range of return periods as:

Table 6: Greenfield Runoff Rates (0.12Hectares)

Return Period	Discharge Rates (l/s)
1 in 1 year	0.8
1 in 100 year	1.5
1 in 1000 year	1.8

6.3.4 Proposed Drainage Regime

The hierarchy for disposal of surface water from new developments is outlined within The Building Regulations Approved Document H and specifies the following methods in order of preference:

- Infiltration via soakaway or other suitable infiltration device
- Discharge to watercourse
- Discharge to public surface water sewer
- Discharge to public combined sewer

Infiltration

At the time of writing the site investigation report was not available and therefore in order to determine if the surface water from the proposed development can be disposed of via infiltration a desk top study has been undertaken.

Information from the National Soil Resource Institute: www.landis.org.uk/soilscapes shows the development area as being situated in an area that has slowly permeable seasonally wet acid loamy and clayey soils

Borehole logs taken from the surrounding area suggest that the underlying ground conditions comprise mainly of clay and rock.

The site is located on a steep hill which could result in flows migrating out of the site boundary if soakaways are to be implemented.

Furthermore it would be difficult to achieve a 5m easement from the properties due to the size of the site.

In conclusion, the information gathered indicates that the site will not be suitable for infiltration methods due to the underlying ground conditions, however a percolation test in compliance with BRE Digest 365 may be required to provide suitable evidence for justifying disposal to watercourse or sewer as appropriate.

Watercourse

The nearest watercourse is the unnamed tributary of the River Calder located within the east of the application site, as the desk top study suggests that disposal to ground may not be possible, it is therefore recommended that the next point of disposal is into the watercourse on site.

6.3.5 Restricted Discharge Rate

During final design drainage systems should be designed in accordance with Sewers for Adoption 7th Edition; Building Regulations Approved Document H and other statutory requirements, as appropriate.

As the existing site is classified as greenfield, surface water discharged from the proposed development should be restricted to greenfield runoff rates or a minimum of 5l/s to prevent siltation of the flow control device.

There is also a requirement to include an addition of 40% to rainfall intensity to account for climate change over the lifetime of residential developments.

6.3.6 Attenuation Requirements

In order to negate the requirement for attenuation (surface water storage) it is recommended that the developer keeps the proposed areas of hardstanding's to a minimum, therefore positive drainage will only be required to serve the roof area.

If hardstanding's are to be included within the final design i.e. driveways paths etc it is suggested that gravel, resin bound gravel or eco grid (permeable surface) are incorporated into the design to eliminate the requirement of attenuation.

6.3.7 Sustainable Urban Drainage Systems (SUDS)

Due to the scale of the development it has already been suggested that permeable surfaces are incorporated into the design.

Furthermore, it is recommended that rainwater harvesting could also be implemented acting as a source control measure reducing the time of concentration of surface water entering into the positive drainage system.

Rainwater Harvesting

Rainwater harvesting provides a source of non-potable water, for purposes such as car washing; and watering gardens etc…

This SUDS solution, like green roof technology, is also designed to provide interception storage i.e. acts to reduce the volume of surface water leaving the proposed development; thereby helping to alleviate the current pressures on the receiving field drain system or public sewer.

6.3.8 Surface Water Drainage Design Criteria

The following criteria for designing surface water drainage systems for new development have been extracted from the Joint DEFRA/EA R&D Technical Report 'Preliminary Rainfall Runoff Management for Developments' (W5-074/A/TR/1) published in January 2012.

1. 1 in 1 year Design Event

The 1 in 1 year event is the highest probability event to be specifically considered to ensure that flows to the watercourse are tightly controlled for frequent events to provide good morphological conditions.

2. 1 in 30 year Design Event

The 1 in 30 year event is of importance because of its linkage with the level of service requirement of Sewers for Adoption 7th Edition, which requires that surface water sewers should be capable of carrying the 1 in 30 year flows generated by a development within the system without causing flooding to any part of the site.

3. 1 in 100 year Design Event

The 1 in 100 year event has been selected since it represents the boundary between high and medium risks of fluvial flooding defined by the National Planning Policy Framework (2012) and also recognises that it is not practicable to fully limit flows for the most extreme events. Also Sewers for Adoption 7th Edition recognises that, during extreme wet weather, the capacity of surface water sewers may be inadequate.

Sewers for Adoption 7th Edition requires that the site layout should be such that internal property flooding does not result, by demonstrating safe above ground flow paths.

The return period for this analysis is not specified, but it is recommended that 1% annual probability event (i.e. an event with a return period of 100 years) is used.

4. Flood Flows

Runoff up to the 1 in 100 year return period should preferably be managed within the site at designated temporary storage locations unless it can be shown to have no material impact by leaving the site in terms of nuisance or damage, or increase river flow during periods of fluvial flooding. Analysis for overland flood flows within the site will need to use appropriate duration events which may be different to critical events for designing surface water control storage structures.

5. Surface Water Runoff Volume

Theoretically the surface water runoff volume from a site should be limited to the greenfield runoff volume for all event frequencies.

However this is technically extremely difficult to achieve and therefore compliance to two criteria on runoff volume is required.

a. Interception: Where possible, infiltration or other techniques are to be used to try and achieve zero discharge to receiving waters for rainfall depths up to 5mm.

b. Additional Runoff Due to Development: The difference in runoff volume pre- and post-development for the 100 year 6 hour event, (the additional runoff generated) should be disposed of by way of infiltration, or if this is not feasible directed to watercourse and then public sewer as close to greenfield runoff as possible.

6. Climate Change

In accordance with the revised climate change guidance from the www.gov.uk website identifies that a 20% increase to rainfall intensities should be applied for development with a lifetime up to 2085; and 40% for development with a prospective lifetime beyond this date.

7. Urban Creep

The Local Planning Authority may require that an additional 10% is applied to drained areas to account for extensions etc over the lifetime of the development.

6.3.9 Residual Flood Risk

The proposed drainage system should be designed such that attenuation will be provided to accommodate surface water runoff for storms with a return period of up to the 1 in 30 year event with no surface water flooding. Minor flooding is allowed during the 1 in 100 year plus climate change event as long as it does not ingress the proposed buildings or migrate beyond the site boundary.

6.3.10 Domestic Foul Flows

Foul flows from the site are to be directed to the 225mm diameter public combined sewer located within Whins Lane west of Lowood, due to the development site being lower than the Whins Lane at this location a pumped solution may be required.

It may be possible to connect to the drainage system serving Lowood, however this needs further exploration.

Prior to any connection into the sewer United Utilities must first be consulted and a connection agreed.

7.0 Mitigation Measures

7.1 Finished Development Levels

Due to the development being located within Flood Zone 1 it is recommended that finished floor levels are set no less than 150mm above existing ground levels onsite.

7.2 Land Drainage Consent

If surface water from the properties is to be directed to the watercourse Land Drainage Consent from Lancashire County Council will be required.

7.3 Easements

It is recommended that any building is located at least 6m away from the banks of the watercourse to allow for an maintence works to be undertaken and to reduce the risk of flooding of the properties.

8.0 Conclusions & Recommendations

The planning application is for the erection of 2No residential dwellings located on land which currently comprises of the garden area of the property named Lowood.

The primary flood risk to the site is the unnamed tributary of the River Calder and the upstream culvert that passes under Whins Lane.

No flood model data is available for the watercourse as such to assess flood risk simple mathematical analysis has been used which incorporates estimating culvert capacity using Colebrook White and flood levels by using Manning's Equation.

It was concluded that he fluvial flood risk associated with the unnamed tributary of the River Calder presents a low risk, furthermore the site is located within Flood Zone 1.

Greenfield runoff rates have been calculated for the 1 year, 30 yea and 100 year events as 0.8l/s, 1.5l/s and 1.8l/s.

Following a disk top study, it was established that the underlying ground is likely to be unsuitable for infiltration methods, therefore flows should be directed to the watercourse on-site.

With the inclusion of 40% climate change there may be a requirement to attenuate flows prior to disposal, therefore it is recommended that any areas of hardstanding are designed using permeable surfaces, this may negate the requirement for surface water storage.

If permeable surfaces are incorporated into the final design positive surface water drainage would only be required for the roof area. Furthermore, it is advised that rainwater harvesting may be used to provide an element of source control prior to disposal.

Proposed discharge rates must not exceed existing greenfield runoff rates or a minimum of 5l/s to prevent siltation of a flow control device.

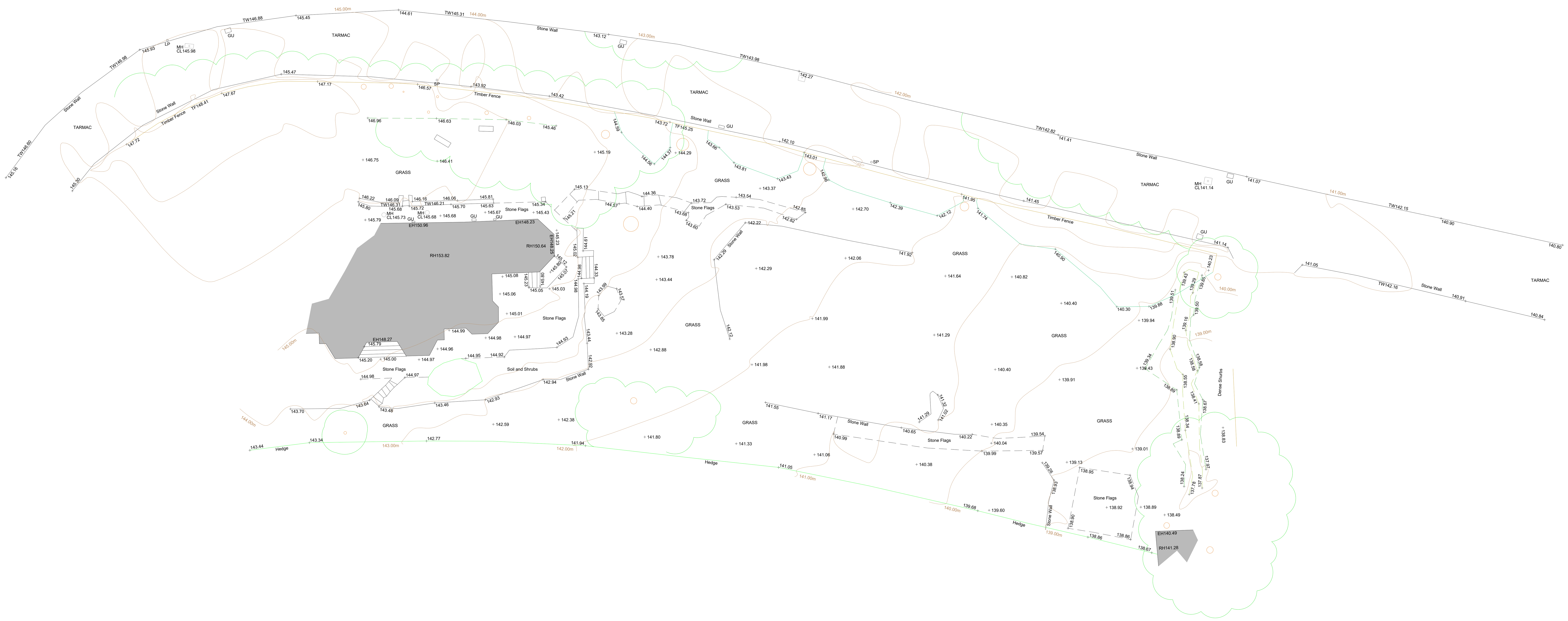
Foul from the site is to be directed to the 225mm diameter combined sewer within Whins Lane west of Lowood, it may be possible to connect to the drainage system serving Lowood, however this needs further exploration.

Recommended Mitigation Measures

- Finished floor levels are to be set to no less than 150mm above existing ground level.
- Land Drainage Consent is required if surface water is to be directed to watercourse.
- Any building should be located at least 6m from the banks of the watercourse.

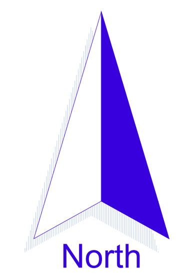
APPENDICES

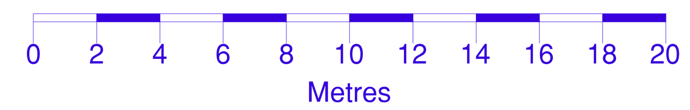
Appendix A: -Topographical Survey



Notes

All Dimensions to be checked on site. Walls shown on plans are not to be assumed to be solid & should be checked for thickness, construction, load bearing capacity & stability.





ABBREVIATIONS

CL	Cover Level
EH	Eves Height
GU	Gully
MH	Man Hole
RH	Ridge/Roof Height
SP	Sign Post
TF	Top of Fence
TW	Top of Wall

NOTE

All levels and coordinates relate to OSGB36(15) using GNSS data

Levels defining edge of carriageway are observed at channel (bottom of kerb).

Rev.0 Description. Issued

TriCAD Solutions Ltd.
BUILDING & LAND SURVEYORS
2 Berkshire Close | Wilpshire | Blackburn | Lancashire | BB1 9NG
tel 01254 614055 fax 01254 209754 e-mail sales@tricadsolutions.co.uk

Site Address

Lowood, Whins Lane
Read
BB12 7RB

Project Description

Site Survey

Drawing Title

Existing Site Layout

Scale	Date	Drawn By
1:200@A1	27/03/2017	SN

Drawing Number

TRI-1949-01

Appendix B: - Colebrook White Culvert Analysis

COLEBROOK WHITE: EXISTING 300mm DIAMETER SURFACE WATER SEWER

Roughness	0.6	mm	**U/S level**	140.44	m	
Diam(mm)	450	mm	**D/S level**	140.24	m	
Length	6.6	m	**Gradient**	0.03030303		33

PROPOR'N DEPTH	WETTED PERIMETER	AREA OF FLOW	HYDRAULIC MEAN DEPTH	VELOCITY (m/s)	DISCHARGE (l/s)	DEPTH (mm)	SURFACE WIDTH _(mm)__
FULL	1.41371669	0.159043128	0.1125000	3.54	563.65	450	
0.01	0.09015068	0.000269189	0.0029860	0.30	0.08	5	90
0.02	0.12770735	0.000759077	0.0059439	0.50	0.38	9	126
0.03	0.15667471	0.001390266	0.0088736	0.66	0.92	14	154
0.04	0.18122213	0.002133892	0.0117750	0.81	1.72	18	176
0.05	0.20296207	0.002972999	0.0146481	0.94	2.79	23	196
0.1	0.2895755	0.008277244	0.0285841	1.47	12.15	45	270
0.15	0.35792947	0.014959629	0.0417949	1.88	28.15	68	321
0.2	0.41728285	0.02264432	0.0542661	2.23	50.45	90	360
0.25	0.4712389	0.031093108	0.0659816	2.53	78.54	113	390
0.3	0.52167577	0.040129092	0.0769234	2.79	111.80	135	412
0.35	0.56974665	0.049608547	0.0870712	3.01	149.52	158	429
0.4	0.61624728	0.059407386	0.0964019	3.22	190.99	180	441
0.45	0.66178301	0.069413464	0.1048886	3.39	235.38	203	448
0.5	0.70685835	0.079521564	0.1125000	3.54	281.82	225	450
0.55	0.75193369	0.089629664	0.1191989	3.68	329.39	248	448
0.6	0.79746941	0.099635742	0.1249399	3.79	377.12	270	441
0.65	0.84397004	0.109434581	0.1296664	3.87	423.95	293	429
0.7	0.89204093	0.118914036	0.1333056	3.94	468.76	315	412
0.75	0.9424778	0.12795002	0.1357592	3.99	510.14	338	390
0.8	0.99643385	0.136398808	0.1368870	4.01	546.69	360	360
0.85	1.05578722	0.144083499	0.1364702	4.00	576.33	383	321
0.9	1.1241412	0.150765884	0.1341165	3.96	596.58	405	270
0.95	1.21075463	0.156070129	0.1289032	3.86	602.43	428	196
1	1.41371669	0.159043128	0.1125000	3.54	563.65	450	0

COLEBROOK WHITE: EXISTING 300mm DIAMETER SURFACE WATER SEWER

Roughness	0.6	mm	**U/S level**	141.4	m	
Diam(mm)	300	mm	**D/S level**	140.44	m	
Length	6.6	m	**Gradient**	0.14545455		6.875

PROPOR'N DEPTH	**WETTED PERIMETER**	**AREA OF FLOW**	**HYDRAULIC MEAN DEPTH**	**VELOCITY (m/s)**	**DISCHARGE (l/s)**	**DEPTH (mm)**	**SURFACE WIDTH _(mm)__**
FULL	0.9424778	0.070685835	0.0750000	6.03	426.02	300	
0.01	0.06010045	0.000119639	0.0019907	0.49	0.06	3	60
0.02	0.08513823	0.000337367	0.0039626	0.83	0.28	6	84
0.03	0.10444981	0.000617896	0.0059157	1.11	0.68	9	102
0.04	0.12081475	0.000948396	0.0078500	1.35	1.28	12	118
0.05	0.13530804	0.001321333	0.0097654	1.57	2.08	15	131
0.1	0.19305033	0.003678775	0.0190560	2.47	9.10	30	180
0.15	0.23861965	0.006648724	0.0278633	3.18	21.16	45	214
0.2	0.27818857	0.010064142	0.0361774	3.77	37.98	60	240
0.25	0.31415927	0.013819159	0.0439877	4.28	59.19	75	260
0.3	0.34778384	0.017835152	0.0512823	4.73	84.32	90	275
0.35	0.3798311	0.022048243	0.0580475	5.12	112.86	105	286
0.4	0.41083152	0.026403283	0.0642679	5.46	144.24	120	294
0.45	0.44118867	0.030850429	0.0699257	5.77	177.85	135	298
0.5	0.4712389	0.035342917	0.0750000	6.03	213.01	150	300
0.55	0.50128912	0.039835406	0.0794659	6.25	249.05	165	298
0.6	0.53164627	0.044282552	0.0832933	6.44	285.27	180	294
0.65	0.56264669	0.048637592	0.0864443	6.60	320.76	195	286
0.7	0.59469395	0.052850683	0.0888704	6.71	354.68	210	275
0.75	0.62831853	0.056866676	0.0905061	6.79	386.07	225	260
0.8	0.66428923	0.060621692	0.0912580	6.82	413.68	240	240
0.85	0.70385815	0.064037111	0.0909801	6.81	436.16	255	214
0.9	0.74942746	0.06700706	0.0894110	6.74	451.43	270	180
0.95	0.80716975	0.069364502	0.0859355	6.57	455.72	285	131
1	0.9424778	0.070685835	0.0750000	6.03	426.02	300	0

Appendix C: - Manning's Equation Channel Capacity

Manning's Channel Capacity

Click to Calculate

k = 1.0

Solve for:

Velocity and Discharge ▼

Select units:

Use meters and seconds units ▼

http://www.LMNOeng.com

Area, A (m^2):	3.9
Wetted Perimeter, P (m):	5.3
Channel Slope, S (m/m):	0.0716
Manning n:	0.05
Velocity, V (m/s):	4.3619331
Discharge, Q (m^3/s):	17.011539

Units in Manning calculator: ft=foot, m=meter, s=second.

Appendix D: - Borehole Logs and Soilscape Maps

SD73 [redacted] NE 1

(*11932) Wt.30370/0370 10,000 9/39 A.& B.W.Ltd. Gp.685

Record of Shaft or Bore for Minerals

Name and Number of Shaft or Bore given by Geological Survey: Bore in Badger Plantation, new Lower Trap

Name and Number given by owner (if different from above):

Town or Village Simonstone Date of sinking

Exact site

A sketch-map or tracing from a large-scale map is desirable.

Purpose for which made Coal

Level at which bore commenced relative to O.D. If not down bore, state if horizontal or up

Made by for Messrs. Hargreaves Collieries

Information from Hargreaves Collieries Date received 1946

Specimens Dip of strata

~~c. 7796 3539~~ 7798 3528

County Lancs

6″ Quarter Sheet 55 SE

1″ N.S. Geol. Map 68

1″ O.S. Geol. Map

Whether Confidential

c ~~7796 3539~~

County Lancs

6″ Quarter Sheet ~~SE~~ SD73NE

Geological Classification	Description	Thickness		Depth: Correction for dip 50°	Depth		Thickness metric		Depth metric	
	Soft ground	12	0		12	0	3	66	3	66
	Coal	3	3		15	3	0	99	4	65
	Fireclay	2	6		17	9	0	76	5	41
	Rock	2	9		20	6	0	84	6	25
	Grey bind	10	6		31	0	3	20	9	45
	Dark blue shale	41	6		72	6	12	65	22	10
	Black shale	5	6		78	0	1	67	23	77
	Coal		2	52′	78	2	0	03	23	80
	Fireclay	5	6		83	8	1	70	25	50
	Blue shale	16	10		100	6	5	13	30	63
	Strong black shale	13	6		114	0	4	12	34	75
	Coal	1	0	76	115	0	0	30	35	05
	Fireclay	3	6		118	6	1	07	36	12
	Black shale	13	6		132	0	4	11	40	23
	Blue shale	23	0		155	0	7	01	47	24
	Black shale	33	0		188	0	10	06	57	30
	Light blue shale	5	6		193	6	1	68	58	98
	Coal	3	4	131	196	10	1	02	60	00
	Fireclay	2	6		199	4	0	76	60	76

Geological Survey and Museum, South Kensington, London, S.W.7.

G.S.M. Office File No.	Site marked on 6″ Map by	Site marked on 1″ Map by

Appendix E: - Sewer Records

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

THE FLOOD RISK CONSULTANCY

c54 Northbridge House
Elm Street Burnley
Lancashire
BB10 1PD

Your Ref: READ01
Our Ref: 1292135
Date: 18/5/2017

FAO: Donna Metcalf

Dear Sirs

Location: site at Whins Lane Whins lane Read BB12 7RB

I acknowledge with thanks your request dated 12/05/17 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

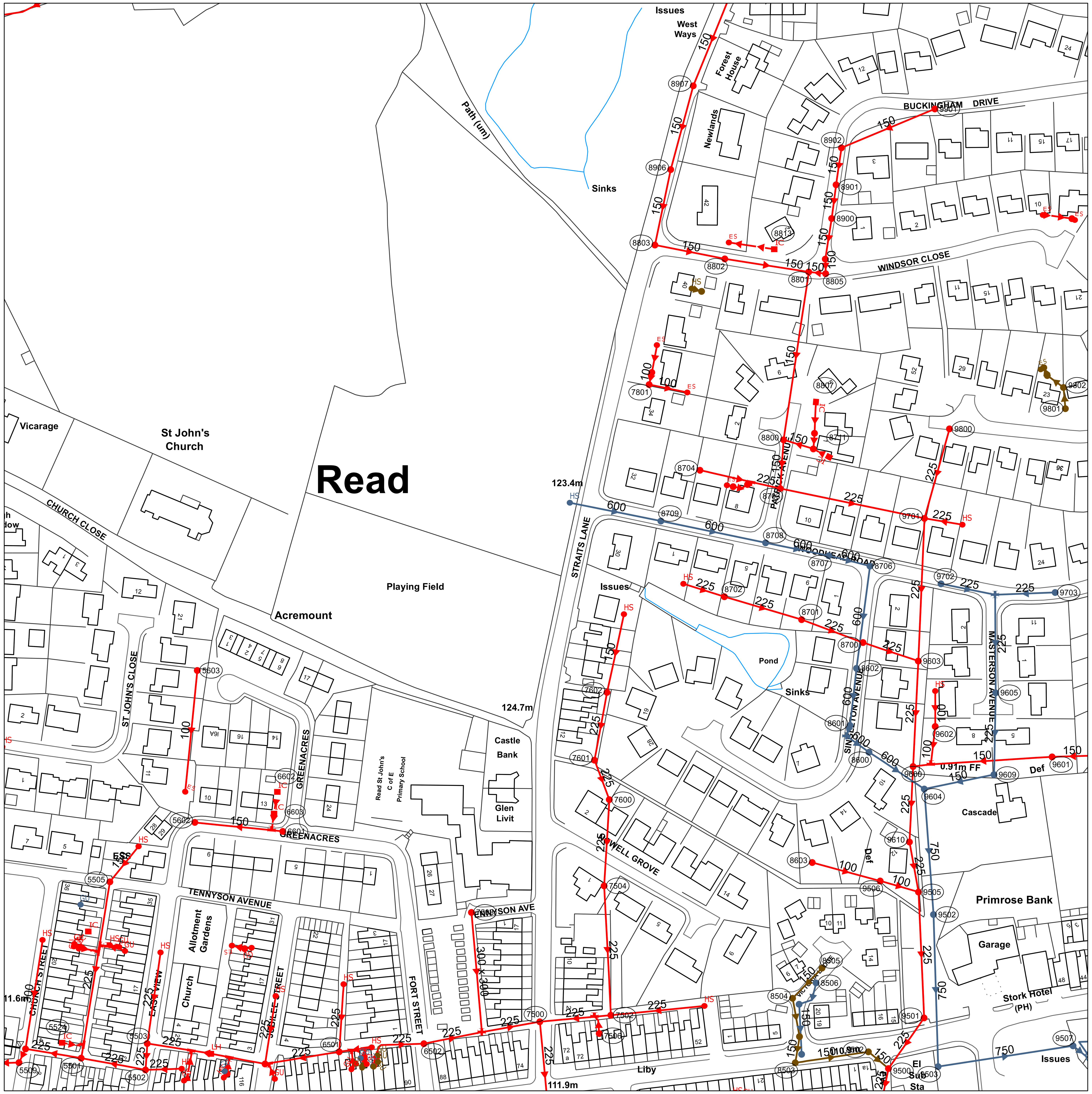
United Utilities Water Limited
Registered in England & Wales No. 2366678
Registered Office: Haweswater House,
Lingley Mere Business Park, Lingley Green Avenue,
Great Sankey, Warrington, WA5 3LP

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.



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Matl	Length	Grad
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5501	111.37	CO	109.36	225		CI	VC	26.08	59
5502	111.78	CO							
5503	112.45	CO	110.22	225		CI	VC	12.17	58
5505	116.24	CO							
5509	110.83	CO	108.3	300		CI	VC	12.77	17
5510		CO							
5520		CO							
5524		CO							
5602		CO							
5603		CO		100		CI	VC	56.29	
6500	113.23	CO							
6501	113.52	CO	112.11	225		CI	VC	34.68	39
6502	113.63	CO	111.83	225		CI	VC	27.29	
6512		CO		100		CI	VC	6.11	
6522		CO							
6523		CO							
6530		CO		100		CI	VC	7.69	
6601		CO							
6602		CO							
6603		CO							
7500	113.4	CO							
7502	113.57	CO							
7503	119.67	CO							
7504		CO	0	225		CI	VC	59.78	
7506		CO		100		CI	VC	8.53	
7600	123.33	CO							
7601	124.31	CO							
7602	124.36	CO	123.25	225		CI	VC	31.76	88
7801		CO		100		CI	VC	18.11	
7802		CO		100		CI	VC	5.69	
8502		FO	0	150		CI	VC	12.06	
8503	111.13	FO	0	150		CI	VC	34.14	
8504	112.91	FO	110.29	150		CI	VC	18.02	82
8505	114.01	FO	111.7	150		CI	VC	19.47	14
8506	113.65	SW	111.45	150		CI	VC	14.27	16
8507	112.87	SW	110.48	150		CI	VC	23.09	
8508		SW							
8510	111.57	FO							
8600	118.91	SW							
8601	119.39	SW							
8602	121.11	SW	117.96	600		CI	CO	26.53	14
8603		CO							
8700	121.84	CO	119.86	225		CI	VC	26.88	41
8701	121.4	CO							
8702	121.44	CO							
8703	124.29	CO	122.56	225		CI	VC	67.91	36
8704	124.32	CO	122.7	225		CI	VC	38.07	272
8705		CO		150		CI	VC	14.38	
8706	123.47	SW							
8707	123.47	SW	121.32	600		CI	CO	19.55	41
8708	123.49	SW							
8709	123.44	SW	121.64	600		CI	CO	49.36	494
8711		CO							
8712		CO							
8713		CO							
8800	124.94	CO							
8801	128.28	CO	124.84	150		CI	VC	78.3	44
8802	127.73	CO	125.42	150		CI	VC	39.18	77
8803	127.37	CO							
8804		CO		150		CI	VC	7.23	
8805	128.5	CO	126.96	150		CI	VC	7.84	12
8806	128.65	CO	127.15	150		CI	VC	6.79	36
8807		CO							
8811		FO							
8813		CO							
8900	129.8	CO							
8901	130.88	CO	129.26	150		CI	VC	15.71	16
8902	132.11	CO	130.27	150		CI	VC	17.27	17
8906	129.11	CO	127.99	150		CI	VC	35.53	18
8907	131.87	CO	130.36	150		CI	VC	40.03	17
9500	110.69	CO	108.64	225		CI	VC	14.75	18
9501	111.72	CO	109.66	225		CI	VC	28.59	30
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9503		SW							
9505	115.59	CO							
9506		CO							
9507	107.71	SW							
9600	116.6	CO	114.25	225		CI	VC	34.85	
9601	118.88	CO	117.58	150		CI	VC	64.34	21
9602	119.31	CO	117.66	100		CI	VC	17.63	
9603	121.45	CO							
9604	115.65	SW							
9605	120.82	SW	118.58	225		CI	VC	37.82	
9609		SW	0	150		CI	VC	32.84	
9610		CO							
9701	123.28	CO							
9702	123.35	SW	121.7	225		CI	VC	25.52	
9703		SW	0	225		CI	VC	27.7	
9800	124.9	CO	123.33	225		CI	VC	42.86	16
9801		FO		100		CI	VC	9.81	
9802		FO							
9803		FO							
9804		FO		100		CI	VC	1.57	
9901	133.61	CO	132.11	150		CI	VC	46.63	25
9902		CO		100		CI	VC	1.55	
5506		CO	0	225		CI	VC	42.49	
5507		CO	0	300		CI	VC	50.83	
5508		CO	0	225		CI	VC	16.7	
5512		CO							
5513		CO		100		CI	VC	12.13	
5515		CO							
5517		CO							
5518		CO							
5519		CO		100		CI	VC	12.32	
5521		CO							
5526		CO							
5527		CO		100		CI	VC	9.94	
5529		CO							
5530		SW							
5601		CO	0	150		CI	VC	21	
6503		CO	0	225		CI	VC	31.82	
6504		CO	0	225		CI	VC	31.25	
6505		CO	0	225		CI	VC	15.14	
6506		CO							
6507		CO		100		CI	VC	9	
6508		CO							
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6515		CO		100		CI	VC	7.67	
6516		FO							
6517		CO							
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6519		FO							
6520		FO							
6521		SW		100		CI	VC	0.39	
6524		FO							
6531		SW		100		CI	VC	1.56	
6532		CO		100		CI	VC	2.21	
6605		CO							
7703		CO	0	150		CI	VC	36.91	
7708		SW	0	600		CI	CO	42.91	
8501		CO	0	225		CI	VC	43.32	
8710		CO	0	225		CI	VC	19.82	
8808		CO							
8812		FO							
8815		CO							
9608		CO	0	100		CI	VC	16.36	
9704		CO	0	225		CI	VC	17.75	
9904		CO							
5504		CO							
5511		CO							
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5525		CO							
5528		CO							
6509		CO							
6510		CO							
6514		CO							

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Matl	Length	Grad
6525		CO							
6526		CO							
6527		CO							
6528		CO							
6529		CO							
6604		CO							
7501		CO							
7505		CO							
8604		SW	0	600		CI	CO	12.79	
8715		CO							
9606		CO							
9705		SW							
5510		CO							

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SD7634NE
Scale: 1:1250 Date: 18/05/2017
163 Nodes
Sheet 1 of 1

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SEWER RECORDS

OS Sheet No: SD7634NE

Scale: 1:1250 Date: 18/05/2017

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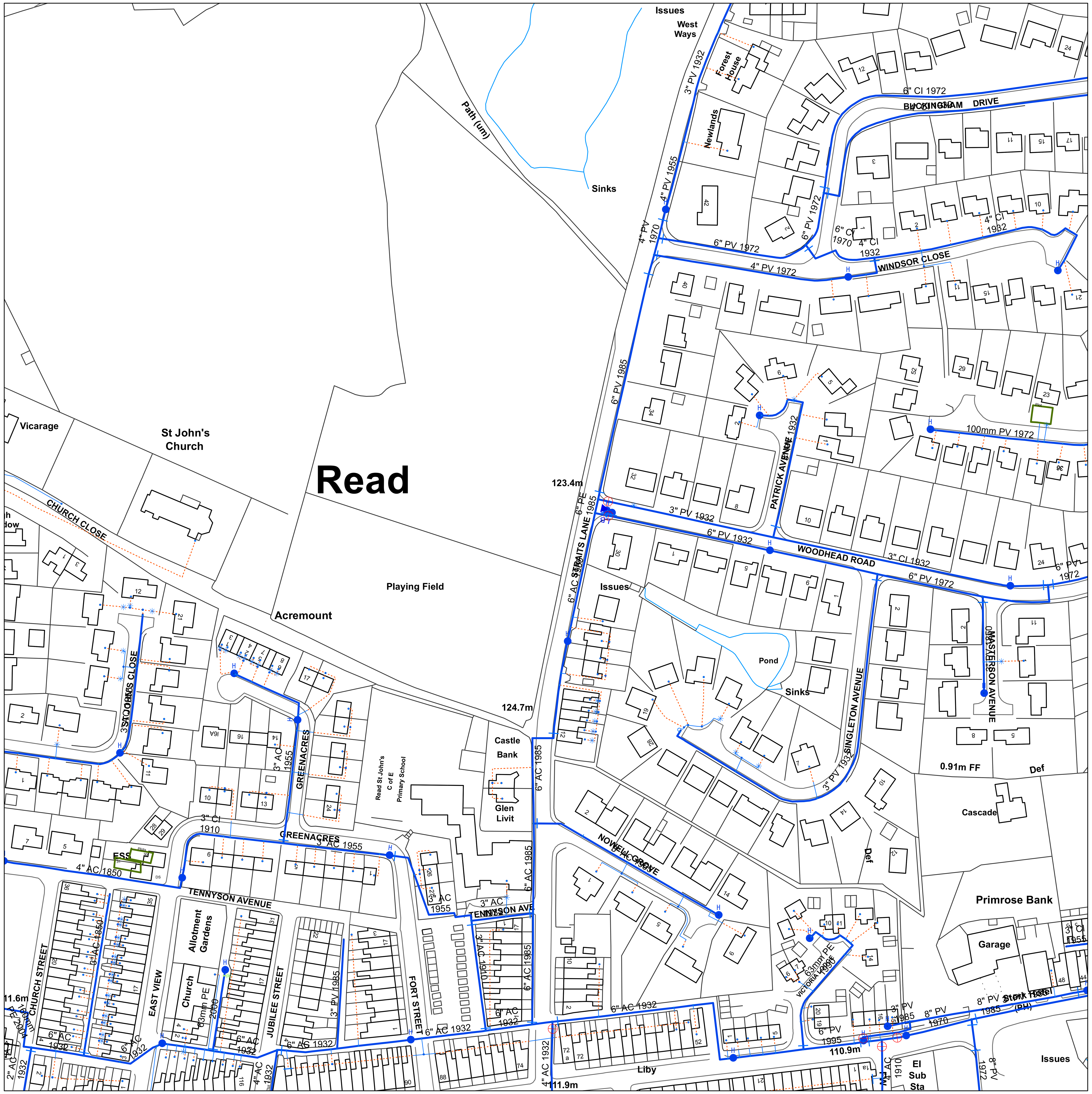

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OS Sheet No: SD7634NE

Scale: 1: 1250

Date: 18/05/2017

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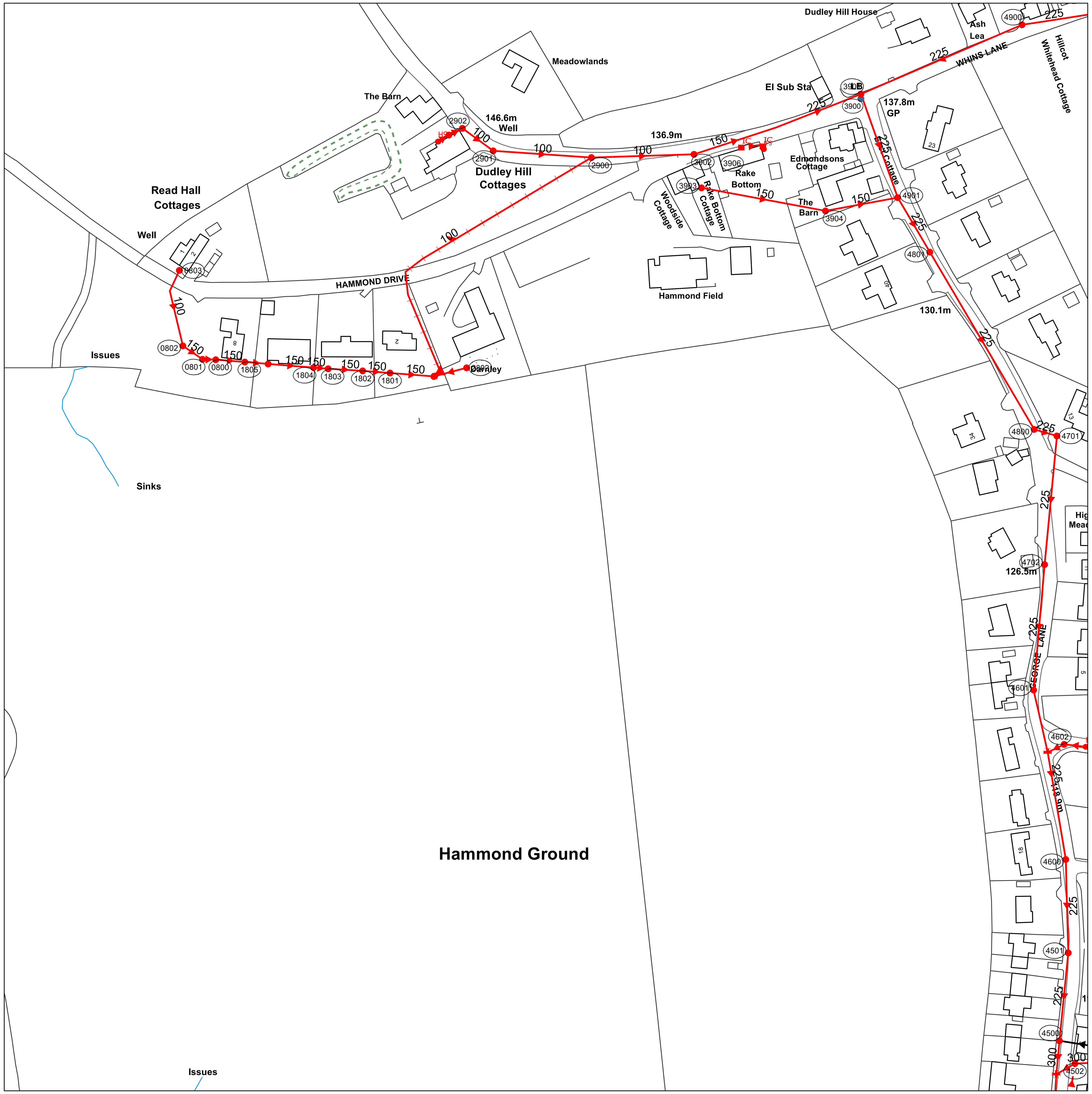
WATER MAIN RECORDS

Printed By: Property Searches

OS Sheet No: SD7634NE

Scale: 1: 1250 Date: 18/05/2017



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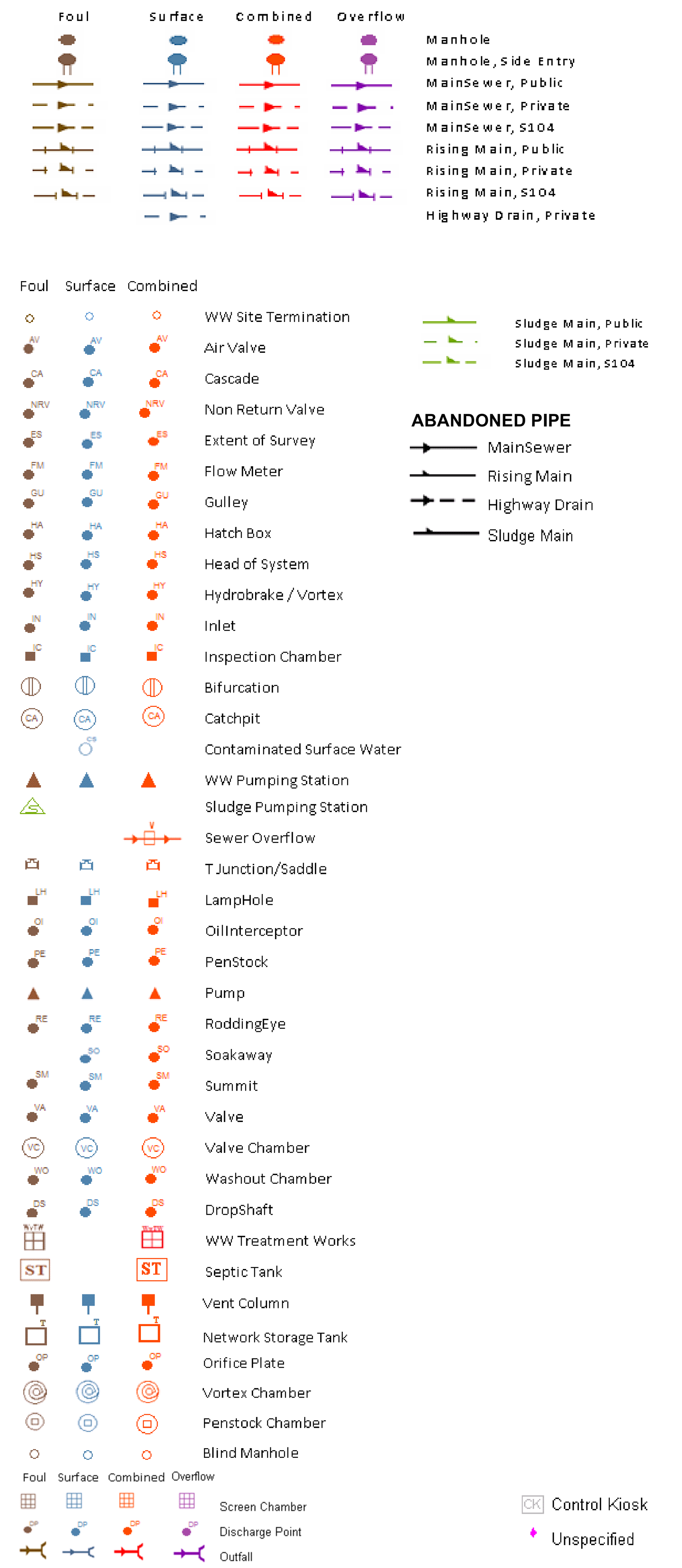
0800	128.44	CO		150		CI	VC	13.48
0801	128.81	CO	128.07	150		CI	VC	6.13
0802	131.66	CO	131.08	150		CI	VC	10.97	4
0803		CO		100		CI	VC	36.5
1800	126.34	CO	0	150		CI	VC	3.74
1801	126.7	CO	0	150		CI	VC	20.29
1802	126.64	CO	125.76	150		CI	VC	12.69
1803	126.61	CO	0	150		CI	VC	15.97
1804	126.39	CO	126	150		CI	VC	6.76
1805		CO						
1806		CO						
2802		CO						
2900	138	CO						
2901	143.31	CO	142.54	100		CI	VC	45.44	8
2902	145.63	CO	144.66	100		CI	VC	17.59	8
2904		CO						
3900	137.91	SW						
3901	137.98	CO	135.69	225		CI	VC	50.66	15
3902	137.13	CO						
3903	135.13	CO	0	150		CI	VC	58.14
3904		CO						
3906		CO						
3907		CO						
4500	110.27	CO	108.07	300		CI	VC	15.59	15
4501	112.54	CO	110.51	225		CI	VC	40.76	17
4502	110.25	CO						
4600	114.86	CO	113.04	225		CI	VC	43.11	17
4601	126.88	CO	124.68	225		CI	VC	79.6	7
4602	119.73	CO						
4701		CO						
4702		CO	0	225		CI	VC	58.18
4800	127.91	CO	125.83	225		CI	VC	10.99
4801	129.13	CO	127.25	225		CI	VC	94.91	69
4900	141.13	CO	0	225		CI	VC	80.87
4901	134.39	CO	132.12	225		CI	VC	29.19	6
2903		CO	0	150		CI	VC	5.88
3905		CO						
4604		CO						
4503		CO	107.05	300		CI	VC	38.25	17
4603		CO						
2801		CO	0	100		CI	CI	149.84

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Matl	Length	Grad

WASTE WATER SYMBOLOGY



LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SD7634NW
Scale: 1:1250 Date: 18/05/2017
41 Nodes
Sheet 1 of 1

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SEWER RECORDS

OS Sheet No: SD7634NW

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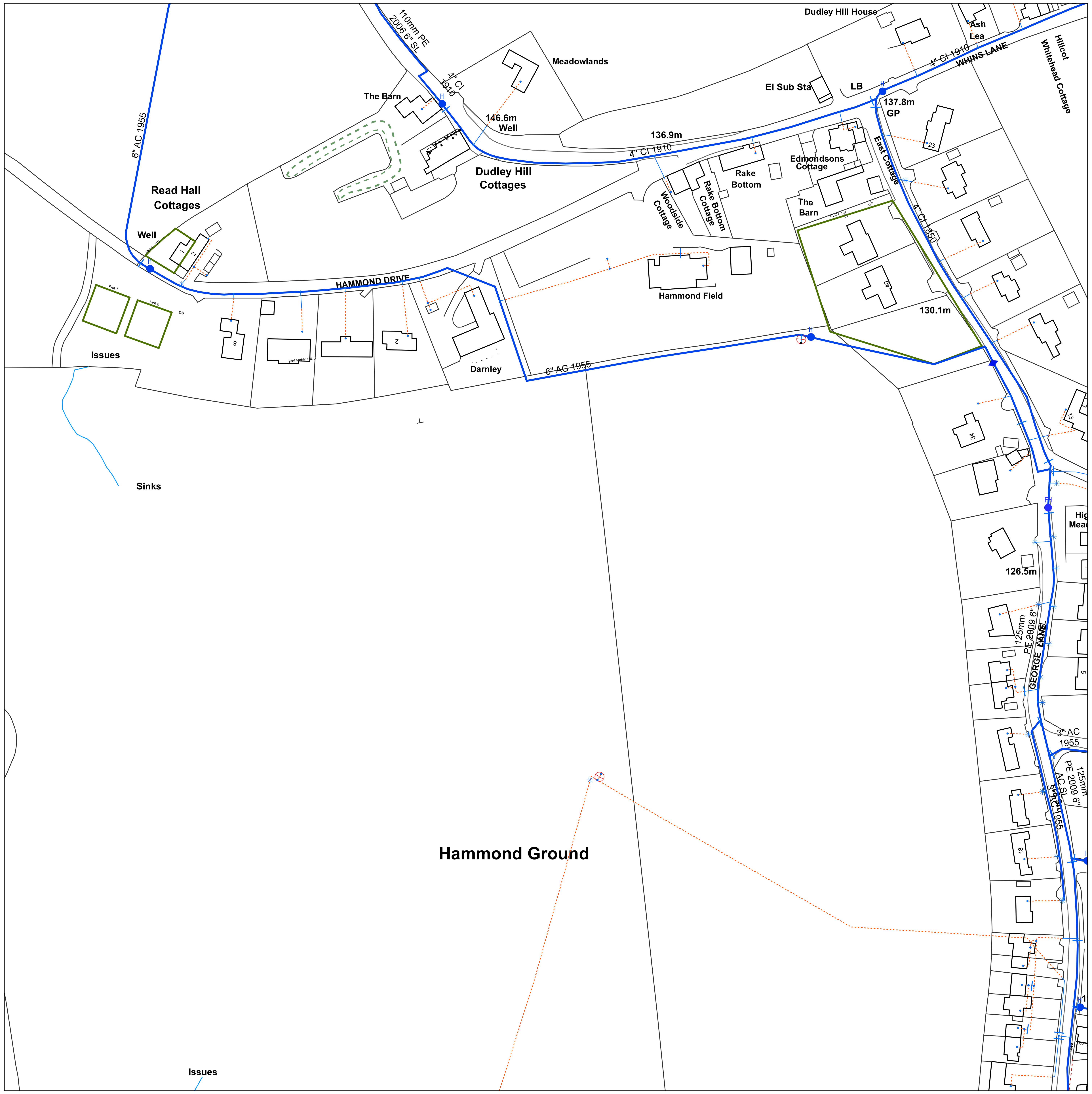
Scale: 1:1250 Date: 18/05/2017



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OS Sheet No: SD7634NW

Scale: 1: 1250

Date: 18/05/2017

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WATER MAIN RECORDS

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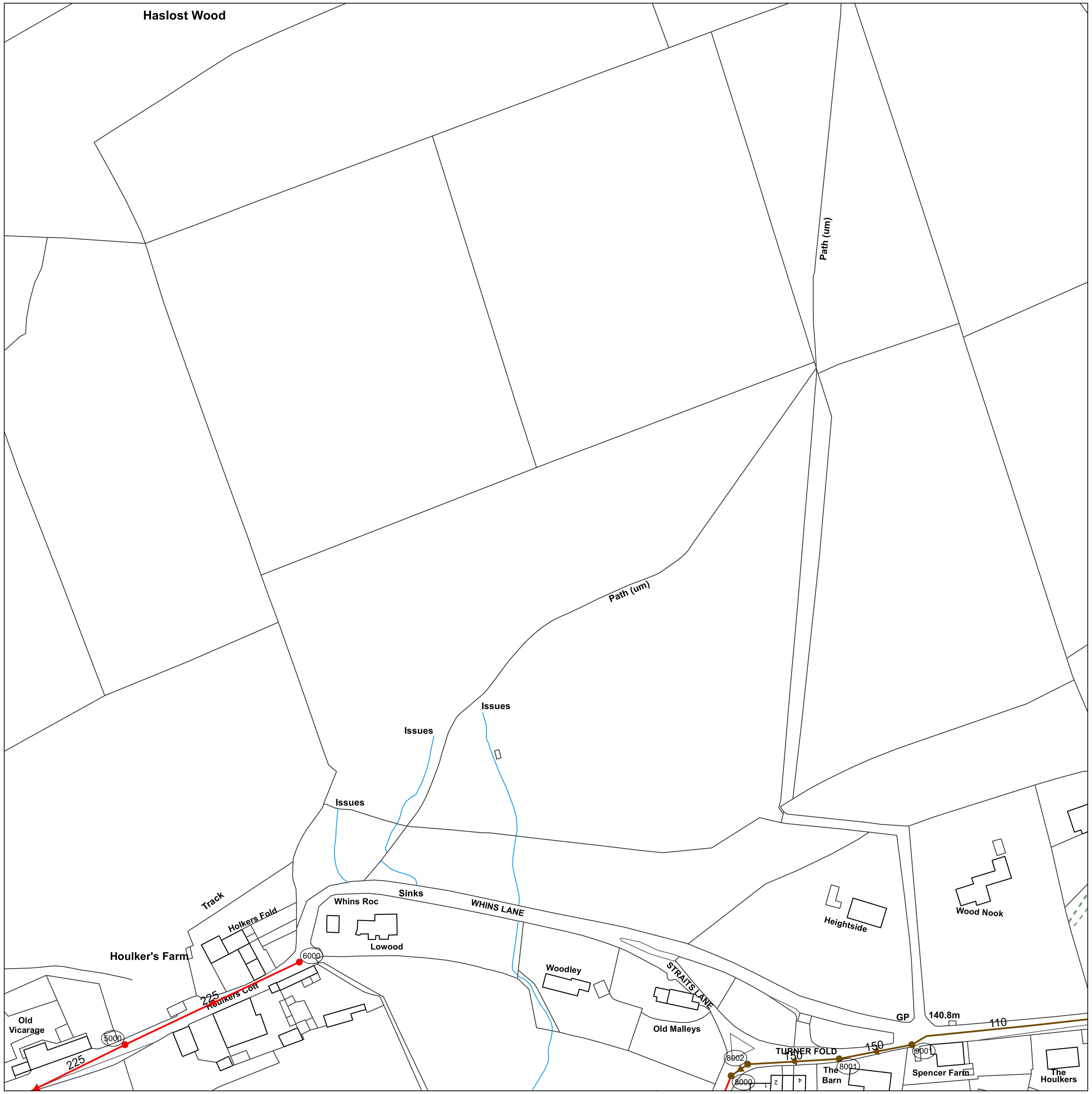
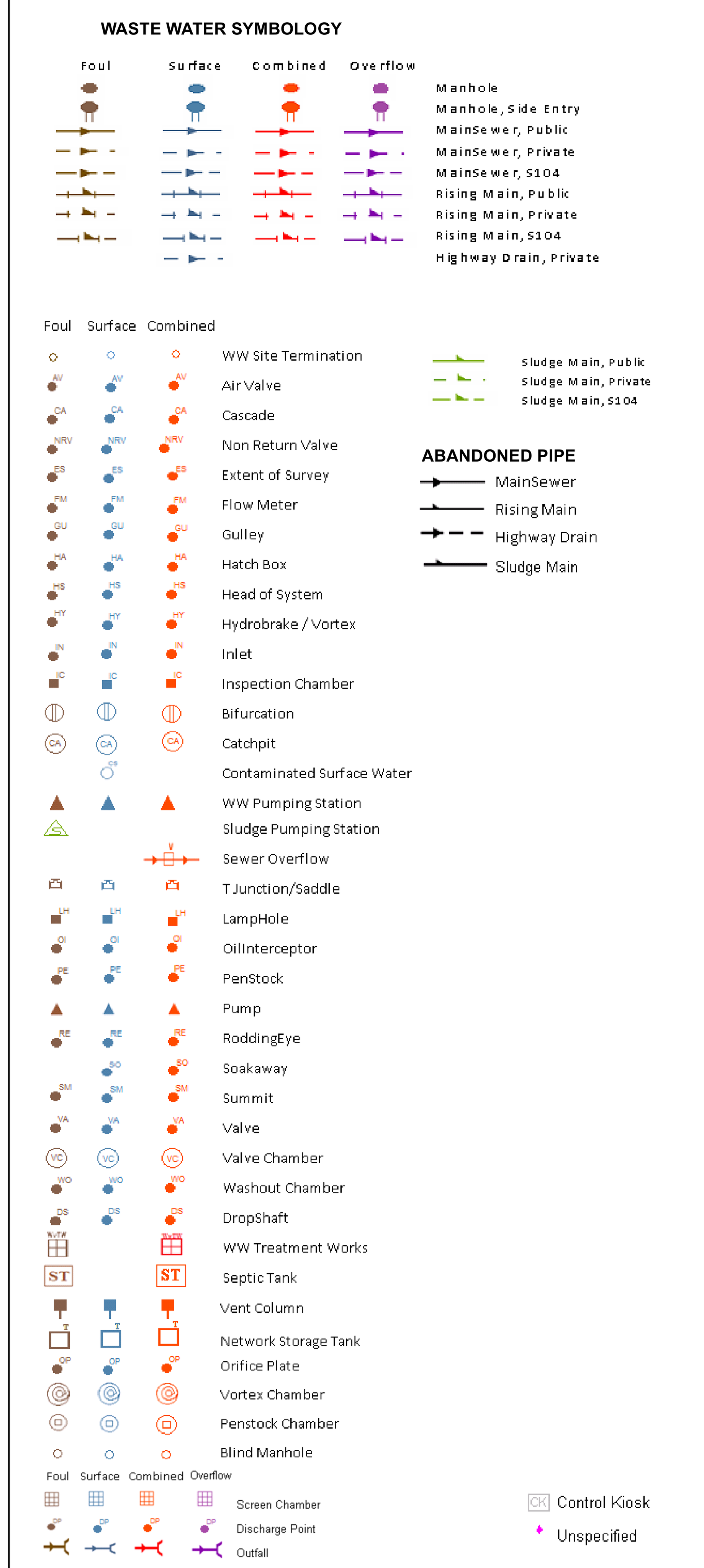
OS Sheet No: SD7634NW

Scale: 1: 1250 Date: 18/05/2017



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Matl	Length	Grad
5000	143.04	CO	0	225		CI	VC	92.02	
6000	144.27	CO	0	225		CI	VC	89.04	
8000	134.99	FO	133.22	150		CI	VC	46.56	16
8001	138.38	FO	136.4	150		CI	VC	42.33	16
8002	135.31	FO	133.69	150		CI	VC	9.24	20
9001	140.65	FO	138.64	150		CI	VC	34.06	15

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Matl	Length	Grad



LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SD7635SE

Scale: 1:1250 Date: 18/05/2017

6 Nodes

Sheet 1 of 1

United Utilities

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SEWER RECORDS

OS Sheet No: SD7635SE

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Scale: 1:1250 Date: 18/05/2017

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OS Sheet No: SD7635SE

Scale: 1: 1250

Date: 18/05/2017

United Utilities
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WATER MAIN RECORDS

Printed By: Property Searches

OS Sheet No: SD7635SE

Scale: 1: 1250 Date: 18/05/2017

Cleanwater Symbology

Pipework

Live	Proposed	
		Distribution Main - Pressurised Main
		LDTM Treated Water Distribution - Pressurised main
		LDTM Treated Water Distribution - Gravity main
		Trunk Main - Pressurised main
		Raw Water Aqueduct - Pressurised Main
		Raw Water Aqueduct - Gravity Main
		LDTM Raw Water Distribution - Pressurised main
		LDTM Raw Water Distribution - Gravity main
		Private Pipe
		Comms Pipe
		Concessionary Service

Abandoned

- LDTM Treated Water Distribution
- Trunk Main
- Raw Water Aqueduct
- LDTM Raw Water Distribution
- Distribution main
- Private Pipe
- Comms Pipe
- Concessionary Service

Property Types

Live	Proposed	
		Condition Report
		Pumping Station
		Water Treatment Works
		Valve House
		Water Tower
		Service Reservoir
		Supply Reservoir
		Pipe Bridges

Nodes

Live	Proposed	
		End Cap
		CC Valve open
		CC Valve closed
		AC Valve open
		AC Valve closed
		Air Valve
		Sluice Valve
		Non Return Valve
		Pressure Management Valve
		Change of Characterisitcs
		Anode
		Chlorination Point
		De Chlorination Point
		Bore Hole
		Inlet Point
		Bulk Supply Point
		Fire Hydrant
		Hydrant
		Pump
		Site Termination
		Service Start
		Service End
		Commercial Meter
		Domestic Meter
		Strainer Point
		Access Point
		Hatch Box
		IP Point
		Sampling Station
		Logger Box
		Stop Tap

Matertial Types

AC	Asbestos Cement
CI	Cast Iron
CU	Copper
CO	Concrete
DI	Ductile Iron
GI	Galvanised Iron
GR	Grey Iron
OT	Others
PB	Lead
PV	uPVC
SI	Spun Iron
ST	Steel
UN	Unknown
PE	Ployethelene

Lining Types

CL	Cement Lining
TB	Tar or Bitumen
ERL	Epoxy Resin

Insertion Types

DD	Die Drawn
DR	Directional Drilling
MO	Moling
PI	Pipeline
SL	Slip Lined