HYD383/HOLLINGWORTH.ROAD/NK/MB/01

15th January 2019

BETTS HYDRO
CONSULTING ENGINEERS

Mr. N. Kelly
Engineering Manager
Bloor Homes North West
2 - 4 Whiteside Business Park
Station Road
Holmes Chapel
Cheshire
CW4 8AA

Dear Norman,

HOLLINGWORTH ROAD, LITTLEBOROUGH
FLOOD RISK SCOPING & DRAINAGE MANAGEMENT STRATEGY

This letter summaries the findings of the flood risk scoping exercise undertaken for the site, to determine whether there are any significant flood risk concerns that need to be accounted for within the development proposals. This letter also considers the potential options for managing both surface and foul water in a sustainable manner in accordance with planning policy and guidance. This letter is not suitable to support a full planning application and should be used to steer the development proposals at this stage only. A full Flood Risk Assessment and Drainage Management Strategy will be required to support a full application once additional information requested is obtained.

Site Context

The proposed development area is located on land off Hollingworth Road in Littleborough. The Ordnance Survey National Grid Reference (OS NGR) for the site is E: 393361, N: 415522 and the nearest postcode is OL15 0AE (see Location Plan in ***Appendix A***). The total area being considered for development covers 17.336ha (coloured in green in ***Figure 1***).

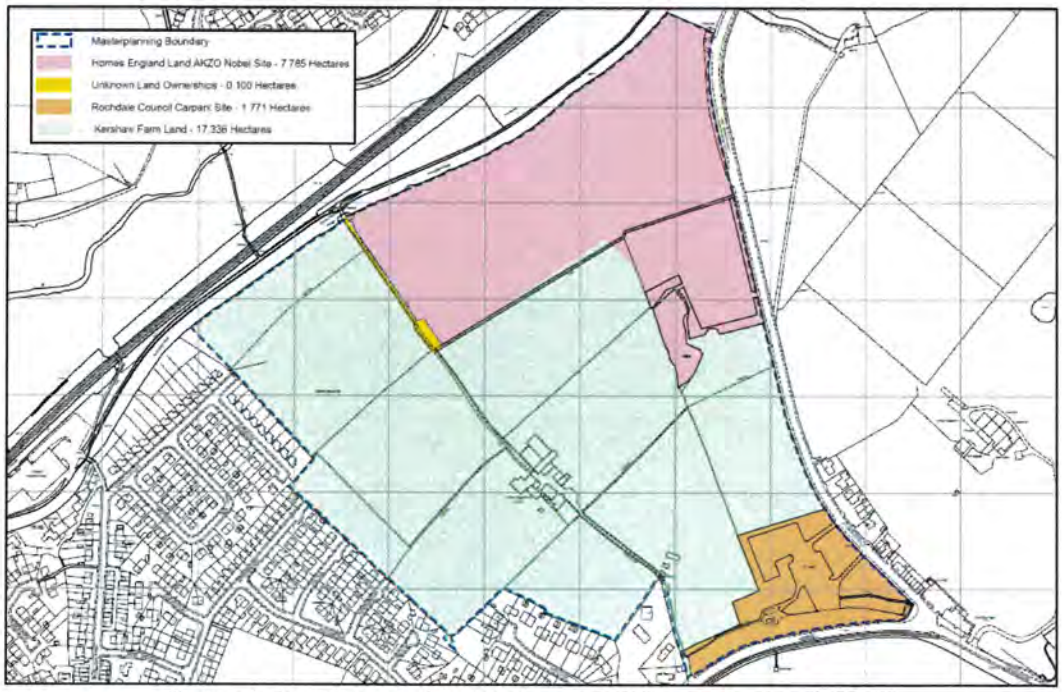

Figure 1: Landownership Masterplan (Homes England, 2018)

[1]

Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041

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The masterplan boundary however covers an overall 26.992ha, and this boundary is also shown within ***Figure 1*** by the blue dashed line. The other land within the wider masterplan boundary is under different land ownership and may already be subject to separate planning applications.

Review of the topographic survey (included in ***Appendix B***) has identified that the existing ground levels vary across the site, although there is a general fall from the south-east (179.36mAOD) to the north-west (157.65mAOD). The mapping reviewed has also identified the Rochdale Canal adjacent to the northern site boundary and beyond is a railway and the River Roch (Main River).

Development Proposals

It is understood that the development will mainly be used for residential development which is classified as 'more vulnerable' in nature in accordance within the Planning Practice Guidance (PPG). This document supports the revised National Planning Policy Framework Guidance which confirms that 'more vulnerable' development is appropriate when located within Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

Flood Risk Scoping

The key potential sources of flood risk have been reviewed as part of this scoping exercise and a summary table has been included below (**Table 1**) to confirm the findings of this initial assessment. This is not a detailed assessment but a starting point to develop an understanding of possible further work required when preparing a full flood risk assessment to support a planning application.

Table 1 – Sources of potential flood risk

Source of potential flood risk	Risk Rating		Comment
Tidal	●	Low	Over 60km to Fylde Coastline (west). Over 50km to Ribble Estuary (west).
Fluvial (watercourse)	●	Low	450m to the River Roch (north). 500m to Featherstall Brook(north).
Groundwater	●	Low	No data or records of groundwater flood risk has been identified.
Surface water run-off	●	Medium	EA mapping shows varying risk from surface water run-off within the wider site.
Reservoirs	●	High	Hollingworth Lake is located 100m to the south and the EA mapping shows high risk of reservoir flooding to site in a potential breach scenario.
Canals	●	Low	Rochdale Canal is located adjacent to the northern boundary of the site.
Sewers	●	Medium	UU have identified onsite sewers but have records of sewer flooding within the vicinity of site.

Legend: ● Very low / Low ● Medium ● High

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Surface Water Flood Risk

From review of the potential flood risk sources identified in ***Table 1***, it is considered that the site is at 'low' flood risk from fluvial/tidal sources, groundwater and canal flooding, due to the site's proximity from the original source and/or the existing onsite ground levels in comparison to the flood risk source. The development site is considered to have a higher potential of flooding associated with surface water sources and reservoirs. When surface water flood risks are considered the risk varies across the site with those areas at highest risk coinciding with natural low points within the site and/or natural conveyance routes through the site. at those areas where surface water risk is greatest the potential depths of flooding range from 300m to 900m based on the online mapping with velocities at worst 0.25m/s.

Reservoir Flood Risks

Consultations with the EA on review of the long-term flood risk maps show part of the site lies within the potential flow route associated with the failure of Hollingworth Lake Reservoir Dam. The reservoir is located less than 100m from the site and is elevated in comparison to the existing ground levels onsite. The flood risk mapping shows that part of the site would be susceptible to receiving significant flood depths and velocities of reservoir flood water should a failure occur in the structure due to its ground levels and proximity in relation to the body of water.

The maps provided by the EA (included in ***Appendix C***) were created for emergency planning purposes only as noted by the EA during consultation, this therefore shows the worst-case scenario should a reservoir failure occur and release all its water at that point. In reality if a reservoir failure were to occur it would most likely be less severe than the scenario shown on the maps. Reservoirs are regularly inspected and maintained by the asset owners and confirm to the guidelines set out in the Reservoirs Act (1975).

In the case of emergency planning the Lead Local Flood Authority are responsible for ensuring the community is well prepared. Initial enquiries with Rochdale Borough Council (RBC) and review of the Preliminary Flood Risk Assessment/Strategic Flood Risk Assessment did not identify any historic flooding of the development site related to reservoir flooding (**Appendix D**).

Furthermore, RBC have advised that Hollingworth Lake is a UU asset and that future consultation should be with them for further details. Consultations with UU have been carried out to ascertain what information on Hollingworth Lake they hold including details of maintenance schedules.

Sewer Flood Risk

Consultations with UU have identified that they are aware of historical flood issues with the existing sewer length crossing the wider site from Hollingworth Lake reservoir outfalling into Rochdale Canal. Further information has been requested on the nature and extent of flooding although at this time no response has been received (**Appendix E**). UU have however confirmed that they will require the length of sewer from the reservoir to the canal to be protected from development in the form of a 5-6m easement from either side of the centreline.

Mitigation Measures

The site is located within Flood Zone 1 and is classified as 'more vulnerable' development, it is typical to set the Finished Floor Levels (FFL) of residential dwellings in Flood Zone 1, 150mm above the existing ground levels (where practical). As some areas of the site are shown to have had a high susceptibility to other sources of flooding (surface water and reservoir), it may be beneficial

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to increase the FFL freeboard to 300mm to offer additional resilience. The proposed FFL of the dwellings onsite should also consider the potential impacts of Climate Change (CC).

Risk from surface water can be appropriately managed through development by ensuring space is made for water within the development so conveyance can be incorporated into the scheme to provide routes for surface water as close to the natural conveyance where practical. Furthermore, external areas should fall away from any proposed dwellings to assist in directing overland flows away from more vulnerable development. Finally, as part of all new development a sustainable surface water management regime is required to be implemented. This will assist in managing surface water flood risk onsite and ensure no increased flood risk will result elsewhere as a result of the development.

Additionally, for future residents to be prepared, each property should be made aware of the potential residual flood risk associated with reservoir flooding. It is advised that residents prepare a personalised Flood Plan, detailing the procedures and important measures to take in the event of a flood incident which could potentially impact the site. The flood plan might include details of important contacts such as the utility companies and insurance. It would also note procedures to be undertaken such as when to move items to safety, when to apply any temporary internal flood resilience measures and mechanisms of evacuation/ water levels monitoring.

To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).

Summary

Based on the information obtained to date and the initial enquiry responses it has been identified the site is at 'low' risk from the majority of flood sources reviewed. Surface water flooding and reservoir flooding are highlighted to be the likely sources of flooding to impact the site. It is therefore recommended that FFL are raised 300mm where practical for dwellings proposed in higher flood risk areas to offer additional resilience. The risk from these potential flood sources can be mitigated. To ensure that the proposals don't increase flood risk elsewhere the focus of the development is on the sustainable management of surface water run-off to ensure no increased run-off results from the development.

Drainage Management Strategy

A sustainable drainage management regime is required to ensure that the proposals will not increase flood risks as a result of increasing run-off generated. This section has considered the existing mechanisms and proposals for managing surface water run-off from the development in accordance with planning policy.

Pre-Development Surface Water Run-Off Rates

In the absence of a detailed drainage investigation, the pre-development drainage situation has been assumed from a desk-based study of the available information. From review of the mapping and existing topographic survey, it is understood that run-off naturally generated onsite currently runs overland with the topography and eventually outfalls into the adjacent canal to the north. The site is mostly undeveloped apart from the presence of several existing farm buildings and therefore the site is 95% permeable at present.

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The peak rates and volumes of run-off generated by the existing site have been calculated using the FEH catchment data. As a result, the greenfield rate (QBar) for the total site has been calculated to be 256.1l/s by using the FEH Statistical Method (see ***Appendix F***). This method conforms with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015).

Post-Development Surface Water Run-Off Rates

Due to the nature of the development proposed, there will be an increase in the rate and volume of run-off generated onsite compared to the existing regime. The focus for new development is to ensure that run-off post-development does not exceed that of the existing regime as this can increase flood risks elsewhere. As the site is located within a Critical Drainage Area (as identified within the SFRA); there is more of a focus on this and where practical betterment to the existing regime should be aimed for. The proposals for surface water management post-development will be to restrict the discharge from site to mimic the pre-development greenfield situation (QBar); unless a more stringent rate is identified. This approach conforms with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015).

Sustainable Drainage Hierarchy

In accordance with national and local planning policy surface water management required to consider the three key methods for managing surface water run-off generated by new development. These methods have been reviewed below in order of priority.

Suitability for infiltration drainage solutions

The Cranfield Soil and AgriFood Institute (CSAI), Soilscapes viewer identifies the soils to be slowly permeable, seasonally wet, acid, loamy and clayey soils. The British Geology Survey (BGS) mapping data indicates the main ground conditions are composed of a bedrock of Pennine Lower Coal Measures Formation with superficial deposits of till, diamicton and sandstone. Given the presence of underlying coal measures in the sub geology and the areas mining history, an infiltration-based solution is not likely to be practical due to the high potential for leaching of contaminants from the underlying coal measures.

Furthermore, given the mining history there is potential for further engineering constraints to be present onsite, restricting the location of Soakaway features within the site boundaries. The adjacent site's (11/D55085) planning permission furthermore supports that infiltration is unlikely to be practical on this site. Soakaway Testing on the adjacent site showed infiltration not to be feasible due to the underlying strata. Soakaway Testing on the development site may still be required in due course to evidence that infiltration will not work. Although, this is typically something that can be conditioned as part of a planning permission providing there are alternative.

Suitability of a surface water connection to watercourse

Assuming infiltration will not be feasible based on the information reviewed, then in accordance with the drainage hierarchy the next method to be explored is to discharge surface water run-off to a watercourse. The nearest watercourse to site is the River Roch (Main River) located approximately 450m to the north of site beyond the canal and railway.

Given the engineering constraints associated with routing to the Main River it is unlikely that a direct discharge from site to the River Roch will be achievable. The Rochdale Canal and Rochdale Railway Line form the two primary constraints to achieve this direct connection,

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routing would need to span across 450m beneath a canal structure and railway line. Due to these constraints we have considered the potential alternatives.

Suitability of a surface water connection to a canal

Given that infiltration and a connection into the River Roch is unlikely to offer a surface water management solution for the site, it is proposed that the development mimics the existing regime and continues to discharge into the canal. The Rochdale Canal is located adjacent to the northern boundary of site and as previously discussed it is understood that the site naturally drains via overland run-off into the canal. It is therefore proposed the development site mimics the existing situation and discharges at the restricted pre-development greenfield rate of 256.1l/s (QBar) to the canal (**Appendix G**).

The canal is considered to be a private asset as such consent for works to this asset will be required from the asset owners. Early consultation with the CRT has been undertaken to ascertain ownership and terms for a potential new formal connection to the canal direct from site (**Appendix H**). A response is at this time outstanding. It is understood that the CRT can accept formal surface water discharges on competitive commercial terms and they will charge accordingly for the benefits provided. An agreement for discharging into a canal usually takes the form of an initial premium and a licence with an annual commercial payment, subject to periodic review. Furthermore, as the CRT are not a statutory drainage authority, they are not obliged to accept discharges into their network, therefore it is important at this early stage to evidence all other methods of handling surface water are not feasible we have therefore reviewed other options available.

Suitability of a surface water connection into the public sewer network

If a new formal outfall into the Rochdale Canal cannot be agreed, then the alternative would be to consider discharging into the public sewer network. As previously discussed UU have identified a surface water piped network crossing the development site which feeds the canal with water from Hollingworth Lake. This piped network could provide an alternative method for discharging surface water from the development site, subject to discussion with UU at an early stage. It is likely that gravity systems could be achieved although more detailed information of the existing levels associated with this surface water pipe length will be needed to confirm.

It is not clear whether this existing pipe length has sufficient capacity to cater for the flows discharging from the development as the site naturally discharges into the canal via overland run-off at present; not within this UU surface water pipe length. Early pre-development discussion should be undertaken with UU to determine whether this UU asset crossing site would be suitable to cater for the site.

UU sewer records also identify a public combined water sewer (225mm dia.) located within Hollingworth Road to the east of site. If all other surface water outfall options are evidenced as not feasible then UU may agree to a surface water connection into their combined sewer although this is likely to be heavily restricted in terms of discharge rates (5l/s) and therefore will require significant onsite attenuation.

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Stormwater Storage Estimates

It we consider discharging to the watercourse we would likely propose a discharge rate mimicking the pre-development greenfield rate (256.1l/s); this is subject to formal consents being obtained. Restricting the rate of discharge will generate a volume of onsite attenuation required to cater for the additional stormwater storage. Based on a discharge rate of 256.1l/s and the estimated post development impermeable areas the stormwater storage figures quoted in ***Table 2*** will need to be catered for onsite.

Impermeable Area (7.80ha)	1 In 1 Year	1 In 30 Year	1 In 100 Year + 40% CC
Restricted Run-Off Rate	256.1l/s	256.1l/s	256.1l/s
Estimated Stormwater Storage Volume	248cu.m-687cu.m	1203cu.m-2002cu.m	2909cu.m-4691cu.m

Table 2: Estimated Stormwater Storage Requirements (Betts Hydro, 2018)

If a more stringent rate is applied, then the volume of attenuation will increase for example if a connection to the public combined sewer is explored and UU were to agree to a rate of discharge of 5l/s the stormwater storage estimates in ***Table 3*** would need to be catered for within the site. it is therefore important that rates and points of connection are agreed as early as possible in the planning process.

Impermeable Area (7.80ha)	1 In 1 Year	1 In 30 Year	1 In 100 Year + 40% CC
Restricted Run-Off Rate	5l/s	5l/s	5l/s
Estimated Stormwater Storage Volume	4132cu.m-6063cu.m	7741cu.m-9755cu.m	14836cu.m-16903cu.m

Table 3: Estimated Stormwater Storage Requirements (Betts Hydro, 2018)

Sustainable Drainage Solutions (SuDS)

Given the scale and nature of the proposed development, there may be the opportunity to incorporate SuDS methods such as swales and ponds to provide a degree of treatment before flows are carried offsite. It would also be recommended that permeable paving and bio-filtration be considered in non-adopted areas where at all feasible. The opportunity should also be taken to provide soft landscaping within the scheme to assist in minimising surface water run-off and to assist locally with surface water management (subject to optimum ground conditions). If infiltration is not feasible then a connection into the main drainage systems for any infiltration-based method would be needed.

There may also be the potential to utilise some SuDS features for conveyance/attenuation of surface water flows within the proposed surface water drainage strategy, opposed to the traditional below ground storage methods. Detailed design should confirm whether this site would be suitable for incorporation of SuDS following more detailed analysis of levels, ground conditions and attenuation requirements.

Foul water

UU sewer records show the nearest foul water compatible sewer to be the public combined sewer (225mm dia.) within Hollingworth Road. As there are no existing foul water connections from site a new formal surface water connection will be required. It is proposed that a new connection to the combined sewer be made, subject to formal approval and consents in due course.

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Detailed design needs to confirm whether a gravity connection from site can be achieved once a layout is drafted to consider levels and routing. It is recommended that a pre-development enquiry to UU be submitted early in the application to get their thoughts on the proposals and identify any constraints.

Summary

Overall, the site has been identified to be at 'low' risk from the majority of fluvial flood risk sources reviewed. The site is however at higher risk from surface water flooding and reservoir flooding as identified by the EA mapping. Some mitigation measures have been discussed within to reduce/mitigate the potential risks from surface e water flooding and the residual risk associated with reservoir flooding should a failure occur.

The focus of the development is on the sustainable management of surface water run-off to ensure no increased run-off results from the development and to adhere to the sustainable drainage hierarchy in accordance with national and local planning policy. Given that infiltration and a connection into the River Roch are unlikely to offer a suitable surface water management solution for the site, it is proposed that the development mimics the existing regime and discharges into Rochdale Canal either via a new connection subject to consent or via the existing through connection from Hollingworth Lake. A pre-development enquiry has been sent to the Canals and Rivers Trust to discuss points of connection and rates of discharge, however a response is currently outstanding.

I trust that the above information identifies the key flood risk information and the drainage considerations for the development site, however if you have any further queries, please do not hesitate to contact us.

Yours sincerely,

[redacted]

Megan Berry *BSc(Hons) GradCIWEM*
Graduate Flood Risk Analyst
BETTS HYDRO LIMITED

Appendix A – Location Plan
Appendix B – Topographic Survey
Appendix C – Environment Agency
Appendix D – Rochdale Borough Council
Appendix E – United Utilities
Appendix F – Surface Water Run-Off Calculations
Appendix G – Existing & Proposed Drainage Plans
Appendix H – Canal & Rivers Trust
Appendix I – Stormwater Storage Estimates

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APPENDIX A – LOCATION PLAN

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Masterplanning Boundary

Homes England Land AKZO Nobel Site - 7.785 Hectares

Unknown Land Ownerships - 0.100 Hectares

Rochdale Council Carpark Site - 1.771 Hectares

Kershaw Farm Land - 17.336 Hectares

393200 393300 393400 393500 393600 393700 393800 393900 394000 394100

415900 415800 415700 415600 415500 415400 415300 415200 415100

Rochdale Canal

River Roch

Brown Brow Hill

Lower Cleggswood Farm

Cleggswood Hill

Higher Lakewood

Car Park

Playing Field

Paragon Industrial Estate

SMITHY BRIDGE

Homes England

Spatial Solutions
Tel: 0300 1234500
Email - spatial.solutions@homesengland.gov.uk

TITLE
Composite Plan.
HCA and Kershaw Land.
Hollingworth Road.
Littleborough.

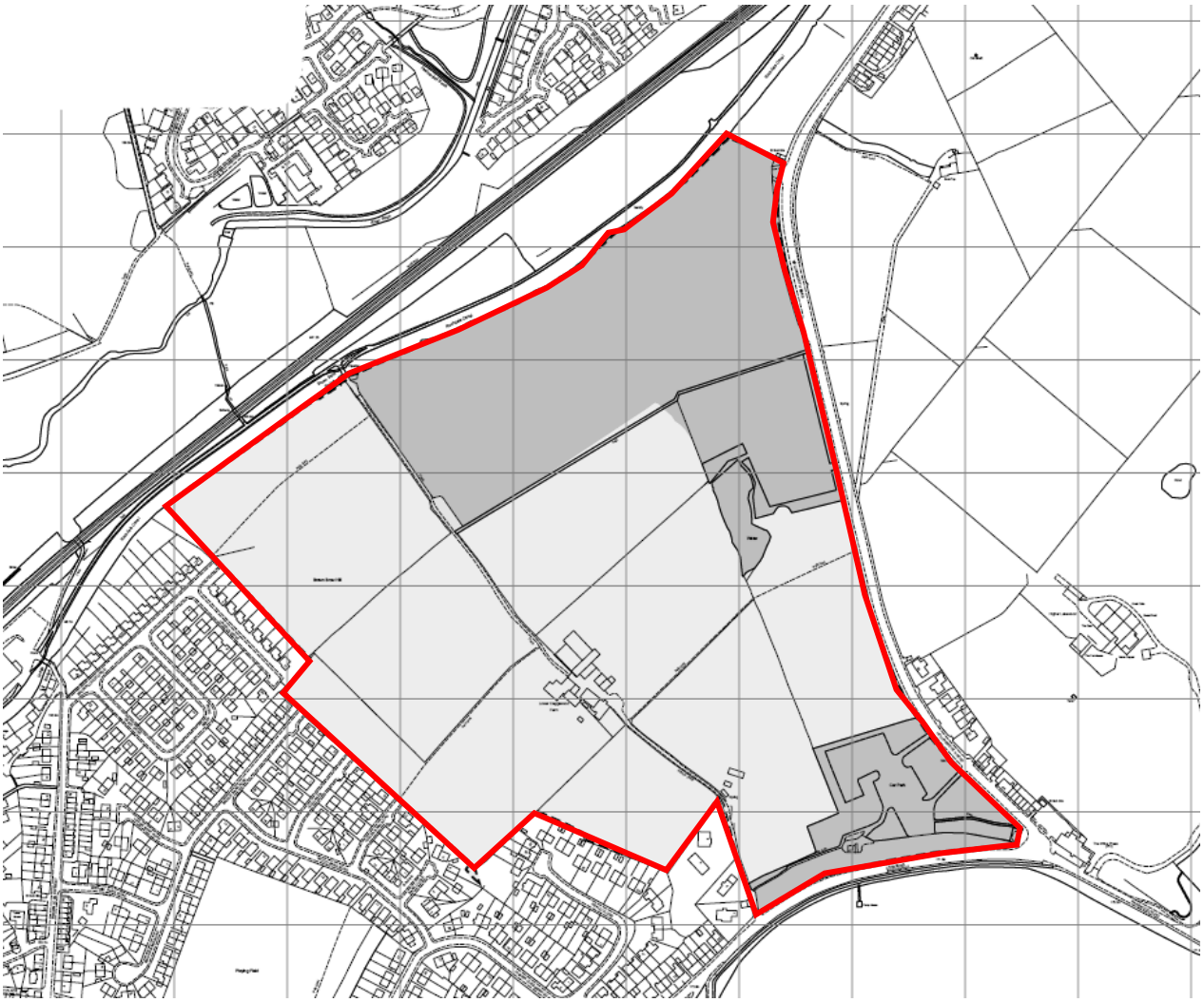
N

ITP NO	PARCEL REF		
-	17742		
DRG NO	DATE	SCALE	SIZE
KJR24715_RevA	26-01-2018	1:2500	A2

PURPOSE OF ISSUE	REV.	DATE	INITIALS

LOCATION PLAN

Hollingworth Road, Littleborough



OS X (Eastings)	393361
OS Y (Northings)	415522
Nearest Post Code	OL15 0AE
Lat (WGS84)	N53:38:10 (53.636175)
Long (WGS84)	W2:06:07 (-2.101880)
Lat,Long	53.636175,-2.101880
Nat Grid	SD933155 / SD9336115522
mX	-233980
mY	7067118

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APPENDIX B – TOPOGRAPHIC SURVEY

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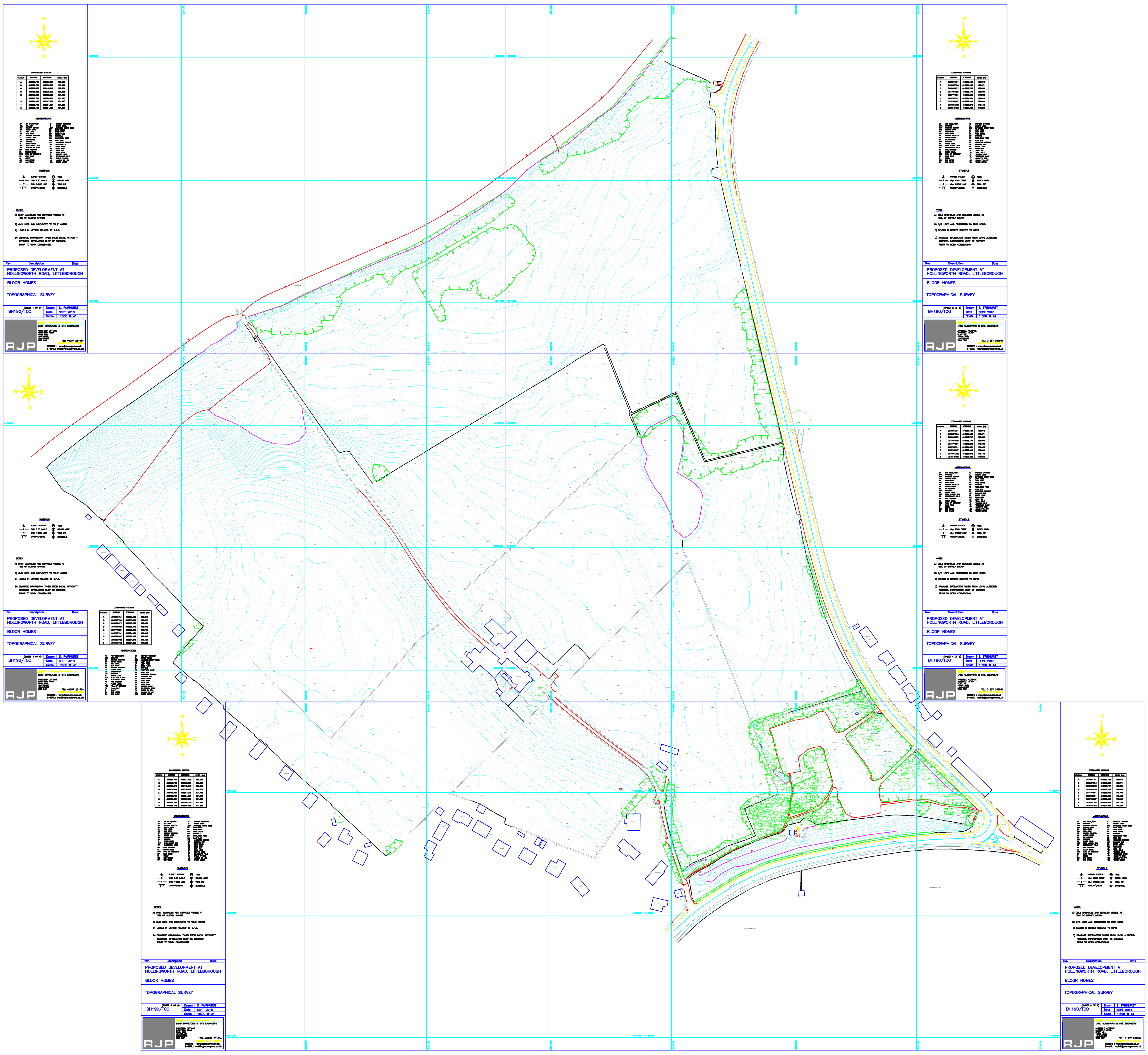
N
S
E
W
NOTES
A) ONLY MANHOLES AND SERVICES VISIBLE AT TIME OF SURVEY SHOWN
B) O/S USED AND ORIENTATED TO TRUE NORTH
C) LEVELS IN METRES RELATED TO G.P.S.
D) DRAINAGE INFORMATION TAKEN FROM LOCAL AUTHORITY RECORDS. INFORMATION MUST BE CHECKED PRIOR TO WORK COMMENCING
Rev
Description
Date
PROPOSED DEVELOPMENT AT HOLLINGWORTH ROAD, LITTLEBOROUGH
BLOOR HOMES
TOPOGRAPHICAL SURVEY
BH190/TOO
Drawn
S. FAIRHURST
Date
SEPT 2018
Scale
1:500 @ A1
LAND SURVEYORS & SITE ENGINEERS
TEL: 01257 251554
RJP

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APPENDIX C – ENVIRONMENT AGENCY

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Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041

Megan Berry

From: GMMC Info Requests <Inforequests.gmmc@environment-agency.gov.uk>
Sent: 20 December 2018 09:44
To: Megan Berry
Subject: GMMC110642AB Response attached from the Environment Agency
Attachments: GMMC110642AB_DFM.PDF; GMMC110642AB_Res.pdf; GMMC110642AB_table_P4.pdf; Reservoir Flood Map Attachment.pdf; CCA - Area External Guidance v5.pdf

Dear Megan,

Thank you for your enquiry which was received on 18/12/18.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

I enclose the data requested. We have no record of flooding affecting this site. However, this does not mean flooding has not occurred in the past or that it will not flood in future. We recommend that you also contact United Utilities and Rochdale Metropolitan District Authority who may hold additional information (the former especially in relation to sewer flooding).

There are no flood defences within the vicinity of the site.

Please be aware you can check your risk of flooding on our external website https://flood-warning-information.service.gov.uk/long-term-flood-risk/

Please also note that all current EA flood risk strategy documents can be found on our external website https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities and https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Please refer to the Open Government Licence which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind regards,

Anne Ball
Customer and Engagement Officer
Greater Manchester, Merseyside and Cheshire
External: 020 302 51232
Mobile: 07769285094
Email: Inforequests.gmmc@environment-agency.gov.uk

Megan Berry

From: Megan Berry
Sent: 18 December 2018 09:07
To: 'GMMC Info Requests'
Subject: Flood Risk Information - Product 4
Attachments: LOCATION PLAN.pdf

To whom it may concern,

Hollingworth Road, Littleborough.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues (Product 4); this would be greatly appreciated.

It is understood that the site is located within Flood Zone 1 but is surrounded by a canal, main river and a reservoir. The site is shown on the online mapping to be at risk from reservoir flooding, we are therefore seeking further information regarding the risk and what would be required when coming to prepare a full FRA in the near future and what would the EA require to be included?

If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons) GradCIWEM
Graduate Flood Risk Analyst

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Engineering Consultants
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NATIONAL FLOOD MAPPING

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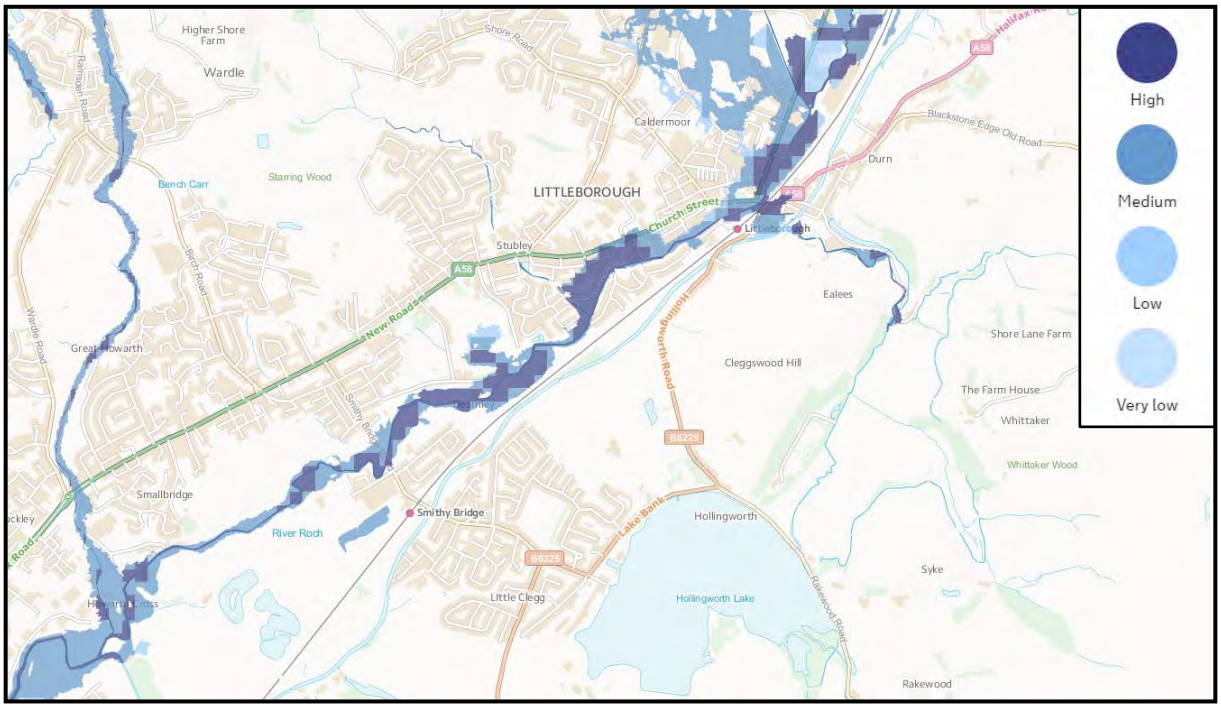
Flood Map for Planning

Long Term Flood Risk – Rivers or Sea



NATIONAL FLOOD MAPPING

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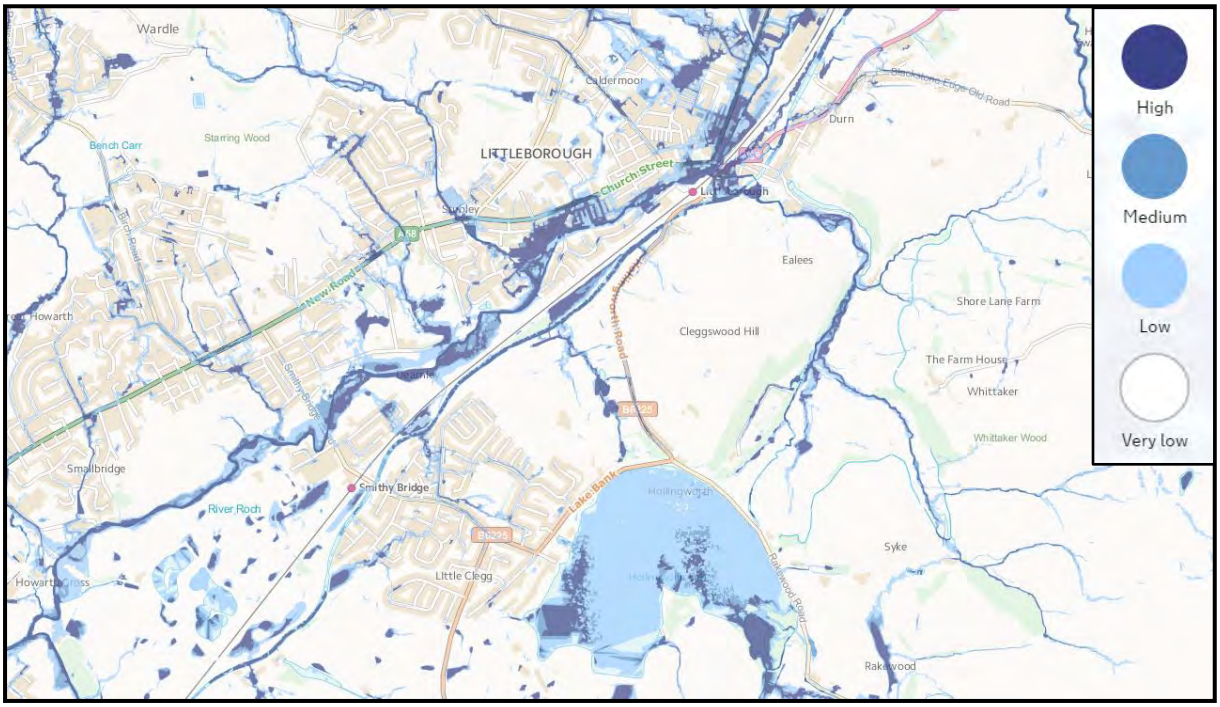
Long Term Flood Risk – Surface Water



Long Term Flood Risk - Reservoirs

Flood map for planning

Your reference	Location (easting/northing)	Created
LITTLEBOROUGH	**393369/415360**	**14 Dec 2018 11:56**

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn’t include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Environment Agency

Flood map for planning

Your reference
LITTLEBOROUGH

Location (easting/northing)
393369/415360

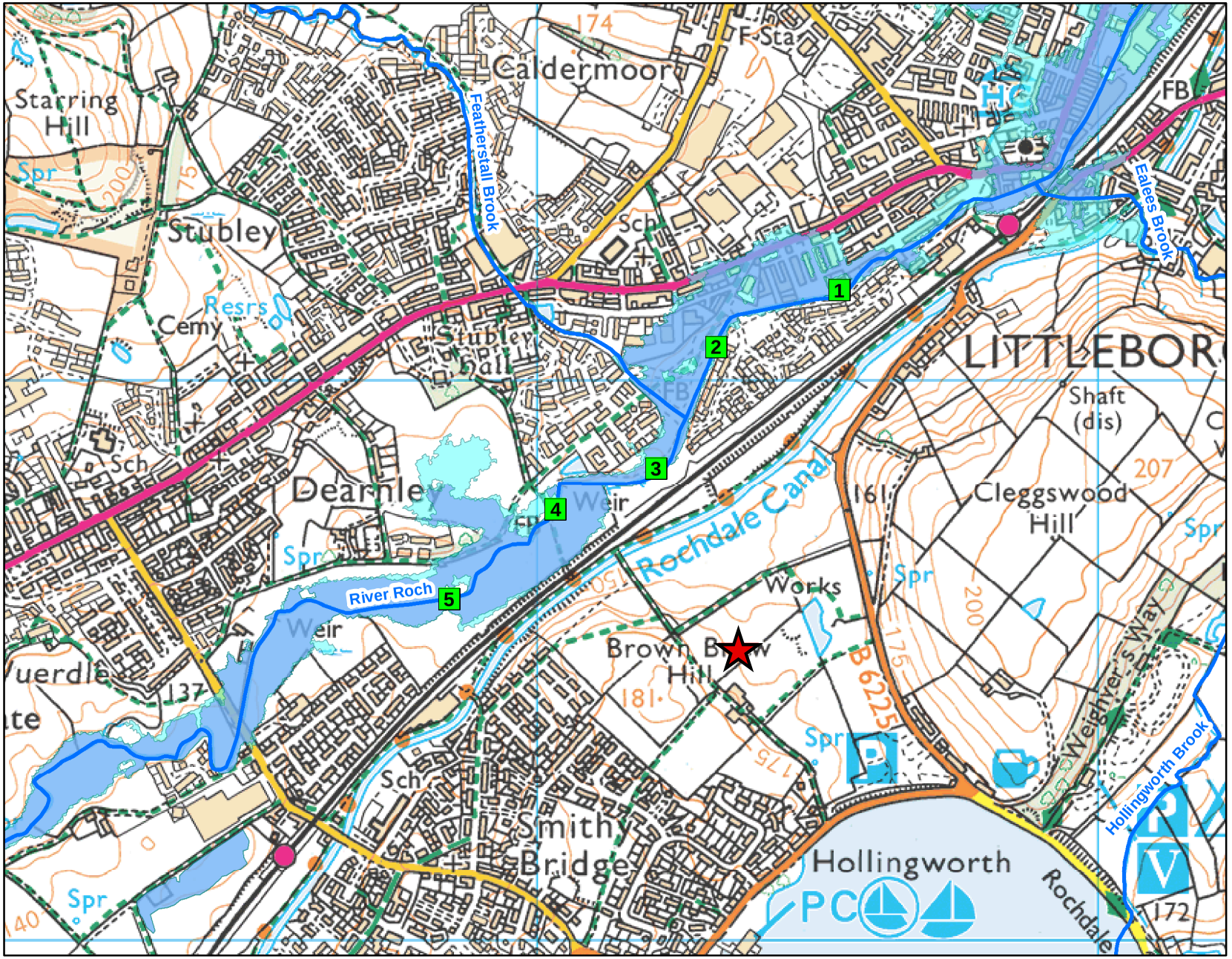
Scale
1:2500

Created
14 Dec 2018 11:56

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

Detailed Flood Map centred on land off Hollingworth Road, OL15 0AE. Created on 19/12/2018 [GMMC110642AB]



Environment Agency

1:10,001

N

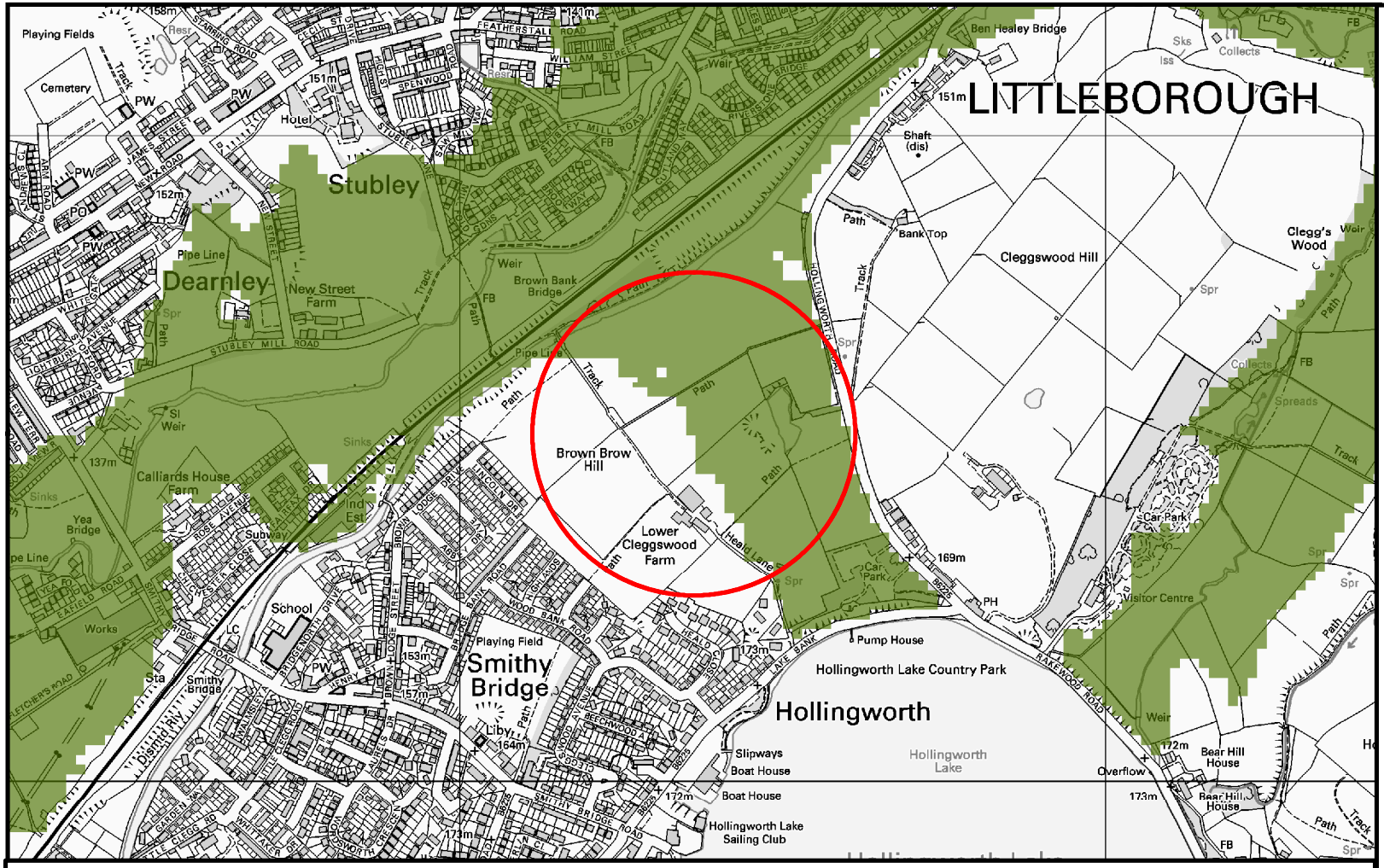
Legend

- Site Location
- Model Measurements
- Main River
- Flood Zone 3
- Flood Zone 2

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Reservoir Flood Map

Environment Agency
Asiantaeth yr Amgylchedd



The area within the red circle could be at risk of flooding from the following reservoirs:

Reservoir Name	Reservoir Owner	Location	Local Authority	Environment Agency Office
Hollingworth Lake	United Utilities Water plc	394020, 415140	Rochdale	Environment Agency - Greater Manchester, Merseysid

Note - this map provides a general indication of the largest area that might be flooded if a reservoir were to fail and release the water it holds. It is taken from a national assessment and displays a worst case scenario. The map is only intended as a guide and is not a prediction of what will happen.

Important

- This map has been produced for emergency planning purposes and displays a worst case scenario.
- It is not suitable for use at an individual property scale due to the method used.
- This map does not give any information on the likelihood of reservoir flooding or on the depth or speed of floodwaters. It also does not include any smaller reservoirs (which hold less than 25,000 cubic metres of water) or reservoirs commissioned or registered after Spring 2009.
- The information should not be interpreted as stating that the location you are interested in will or won't actually flood, but simply that it is in or not in an area that could be affected by reservoir flooding as shown on the maps.

Maximum extent of flood

1:10,000

					Undefended								Defended							
Map Reference	Model Node Reference	Easting	Northing	Data	5 % AEP (1 in 20 year)	3.33 % AEP (1 in 30 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	5 % AEP (1 in 20 year)	3.33 % AEP (1 in 30 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow
1	ea013_model_ROCH05_9085	393541	416160	Modelled Water Level (m aodN)	141.44	141.45	141.50	141.50	141.53	141.66	141.62	141.83	141.48	141.53	141.86	141.90	141.96	142.03	142.03	142.03
				Modelled Flow (cumecs)	25.20	26.85	34.77	36.00	39.50	48.26	45.48	53.77	24.16	25.26	33.93	35.21	38.35	48.52	45.89	56.95
2	ea013_model_ROCH05_8810	393321	416059	Modelled Water Level (m aodN)	139.67	139.72	139.95	139.99	140.08	140.26	140.23	140.34	139.65	139.68	139.90	139.94	139.98	140.13	140.11	140.29
				Modelled Flow (cumecs)	24.84	26.59	31.01	31.41	31.70	32.09	32.17	32.59	24.16	25.26	32.21	33.01	34.51	37.14	36.40	40.49
3	ea013_model_ROCH05_8555	393215	415842	Modelled Water Level (m aodN)	138.90	138.95	139.16	139.20	139.32	139.54	139.48	139.71	138.88	138.91	139.13	139.19	139.31	139.60	139.54	139.86
				Modelled Flow (cumecs)	15.83	16.56	19.15	19.68	21.13	29.46	27.96	33.45	15.55	16.01	18.72	19.60	23.72	30.75	29.25	36.76
4	ea013_model_ROCH05_8355	393035	415769	Modelled Water Level (m aodN)	136.81	136.83	136.92	136.94	137.00	137.14	137.11	137.23	136.81	136.82	136.93	136.96	137.02	137.18	137.15	137.32
				Modelled Flow (cumecs)	17.00	17.81	20.70	21.26	22.76	25.59	25.51	27.59	16.74	17.22	20.09	20.96	22.69	25.78	25.62	28.44
5	ea013_model_ROCH05_8055	392845	415609	Modelled Water Level (m aodN)	136.07	136.09	136.24	136.27	136.33	136.48	136.44	136.58	136.29	136.32	136.47	136.50	136.54	136.67	136.63	136.80
				Modelled Flow (cumecs)	21.85	23.03	26.86	27.56	29.39	33.81	33.03	36.79	19.90	20.57	23.99	25.08	27.42	32.86	32.26	36.64

Model data taken from Rochdale & Littleborough 2013

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Notes:

*Climate Change Scenario - 35% and 70% increases in flow calculated for the 2080's (2070 - 2115). Please see https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances for more information regarding the new climate change guidance. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any flood risk assessment.

Reservoir Flood Map

This text must be read with the extract from the Reservoir Flood Map which we have sent to you

How to use the maps

Reservoir flood maps are available to help you find out if you could be affected by reservoir flooding. Even though reservoir flooding is very unlikely it may be helpful to you to find out if you live or work in an area that could be affected. If you do, you might want to think about what you would do if an emergency did happen.

For more information on what to do if you live or work near a reservoir, including some frequently asked questions, visit our website at http://www.environment-agency.gov.uk/flood.

The maps have been prepared for emergency planning purposes and for this reason they reflect a credible worst case scenario – this means that if a reservoir failure did occur it would most likely be far less severe than the scenario shown in the maps. We've mapped a credible worst case scenario so that emergency planners have all the information they might need to increase public safety.

Reservoir safety

Reservoirs in the UK have an extremely good safety record with no failures resulting in the loss of life since 1925. Reservoirs are more carefully maintained now. This means reservoir flooding is very unlikely to happen.

The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England. All large reservoirs that we think could endanger human life must be inspected and supervised by reservoir engineers. We ensure that reservoirs are regularly inspected and essential safety work is carried out.

For more information on reservoir safety visit our website at:

https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements.

Emergency planning

Lead Local flood authorities are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared. Lead Local flood authorities work with other members of the Local Resilience Forum (LRF) to develop generic and site-specific emergency plans, depending on local circumstances and priorities.

If you want to find out about local emergency plans you should contact the responsible lead local flood authority as identified on the map.

BETTS HYDRO
CONSULTING ENGINEERS

APPENDIX D – ROCHDALE BOROUGH COUNCIL

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Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041

Megan Berry

From: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Sent: 19 December 2018 16:33
To: Megan Berry
Subject: RE: Hollingworth devl. site - Flood Risk Background Information
Attachments: Drainage Feasibility Plan 2.pdf; Rochdale Borough Council Drainage Guidance.docx

Dear Megan,

Your site plan seems to incorporate land for which another Planning Application was made: 17/01188/VRCON Former Akzo Noble Site, which in turn is a variation on an earlier application 11/D55085 (year 2011). I attach the Drainage Designer's Prelim plan. If you want to look at documents, this is available on the Planning Website. I notice that this application didn't include an FRA and a very limited Drainage Strategy. The Decision Notice requires a detailed design to be submitted for approval to RBC prior to starting work on the site.

Answering your queries:-

- historical flooding: *Andrew Eadie represents RBC's Lead Local Flood Authority and has any records – he will respond to you.*
- predicted flood water levels: *this information, if available is obtained by request to the Environment Agency.*
- current drainage issues – *this is a mix of brownfield (former Akzo site) and greenfield; I would assume that any such drainage that may have been present is no longer viable.*

It is understood that the site is located within Flood Zone 1 but is at risk from reservoir flooding, we are therefore seeking further information into what would be required to be included within an FRA to show the development proposals are not at risk during an event:- *United Utilities have information on their reservoirs; the EA also provides mapping information on reservoir flood risks.*

If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage – *I attach a standard info sheet.*

regards
Stephen McCann
Drainage & Flooding Engineer
Highways, Property & Strategic Housing

ROCHDALE BOROUGH COUNCIL

01706 924606
stephen.mccann@rochdale.gov.uk

Rochdale Borough Council
Floor 2, Number One Riverside
Smith Street, Rochdale, OL16 1XU

From: Megan Berry [mailto:meganberry@betts-associates.co.uk]
Sent: 17 December 2018 17:32
To: Stephen McCann
Subject: Flood Risk Background Information

F.A.O Flood Risk, Drainage and/or Planning department

Please forward to the correct department/ office

Good Afternoon Stephen,

Hollingworth Road, Littleborough.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated.

It is understood that the site is located within Flood Zone 1 but is at risk from reservoir flooding, we are therefore seeking further information into what would be required to be included within an FRA to show the development proposals are not at risk during an event.

If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons) GradCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO
Engineering Consultants
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER - 01244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

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SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

Megan Berry

From: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Sent: 19 December 2018 17:05
To: Megan Berry
Subject: FW: Pre Planning - Historical Flood Risk (Hollingworh Lake) request

Megan:- for your ref:

From: Andrew Eadie
Sent: 19 December 2018 16:55
To: Stephen McCann
Subject: RE: Pre Planning - Historical Flood Risk (Hollingworh Lake) request

Hi Stephen –

I've checked our database, and we don't have any record of historic flooding on this site. As far as the Boxing Day 2015 flooding is concerned, there is no record of flooding on this site but the records only really relate to properties rather than areas of land so it is possible that there was flooding on this site but it wouldn't necessarily have been recorded.

Cheers

Andrew Eadie
Principal Planning Officer
Planning

ROCHDALE BOROUGH COUNCIL

01706 924371
andrew.eadie@rochdale.gov.uk

Rochdale Borough Council
Floor 3, Number One Riverside
Smith Street, Rochdale, OL16 1XU

To access our services go to www.rochdale.gov.uk
For news and social media updates go to www.rochdale.gov.uk/news

---

From: Stephen McCann
Sent: 19 December 2018 16:06
To: Andrew Eadie
Cc: meganberry@betts-associates.co.uk
Subject: Pre Planning - Historical Flood Risk (Hollingworh Lake) request

Hello Andrew,

I received a request (see below) for any historical records of flooding to the immediate north of Hollingworth Lake. The location plan is attached.

Do you have any records?

Do you know if this area had any flooding in Dec 2015?

The EA flood risk map shows none.

regards

Stephen McCann
Drainage & Flooding Engineer
Highways, Property & Strategic Housing

ROCHDALE BOROUGH COUNCIL

01706 924606
stephen.mccann@rochdale.gov.uk

From: Megan Berry [mailto:meganberry@betts-associates.co.uk]
Sent: 17 December 2018 17:32
To: Stephen McCann
Subject: Flood Risk Background Information

F.A.O Flood Risk, Drainage and/or Planning department

Please forward to the correct department/ office

Good Afternoon Stephen,

Hollingworth Road, Littleborough.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated.

It is understood that the site is located within Flood Zone 1 but is at risk from reservoir flooding, we are therefore seeking further information into what would be required to be included within an FRA to show the development proposals are not at risk during an event.

If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons) GradCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO
Engineering Consultants
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER - 01244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

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BETTS HYDRO
CONSULTING ENGINEERS

APPENDIX E – UNITED UTILITIES

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Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041

Megan Berry

From: Dodd, Matthew <Matthew.Dodd@uuplc.co.uk>
Sent: 03 January 2019 11:31
To: Megan Berry
Cc: Wastewater Developer Services
Subject: RE: UU Historical Sewer Flooding - UU Ref 4200023559

Good Afternoon

I can confirm that we do have a current record of sewer flooding on our DG5 register within the vicinity of the proposed development. The DG5 register is a register of properties that have flooded as a result of hydraulic inadequacy of the public sewer network.

Please note that United Utilities Water Limited (UUW) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events to place on the register.

Our response does not include:

- any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which UUW has no control and not a facet of sewer capacity; or

- any historical sewer flooding events that have been removed from the register as a result of investment in our infrastructure.

As with all development sites, we recommend you liaise with our water and wastewater engineers by contacting our Developer Services team so the details of your development proposal can be considered further. Details can be found at the following link.

https://www.unitedutilities.com/services/builders-developers/

Should you require any further information please do not hesitate to contact me.'

Kind regards

Matthew Dodd
Assistant Developer Engineer
Developer Services and Planning
Network Delivery
United Utilities
T: 01925 679369 (internal 79369)
unitedutilities.com

From: Megan Berry [mailto:meganberry@betts-associates.co.uk]
Sent: 17 December 2018 17:33
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: UU Historical Sewer Flooding

F.A.O Flood Risk, Drainage and/or Planning department

Please forward to the correct department/ office

Good Afternoon Stephen,

Hollingworth Road, Littleborough.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons) GradCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO
Engineering Consultants
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER - 01244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

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Please consider the environment before printing this email.

Extract from Map of Water Mains

The position of the 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, private service pipes may be shown where a known record is available.

United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown. Crown copyright and database rights [2016] Ordnance Survey 100022432.

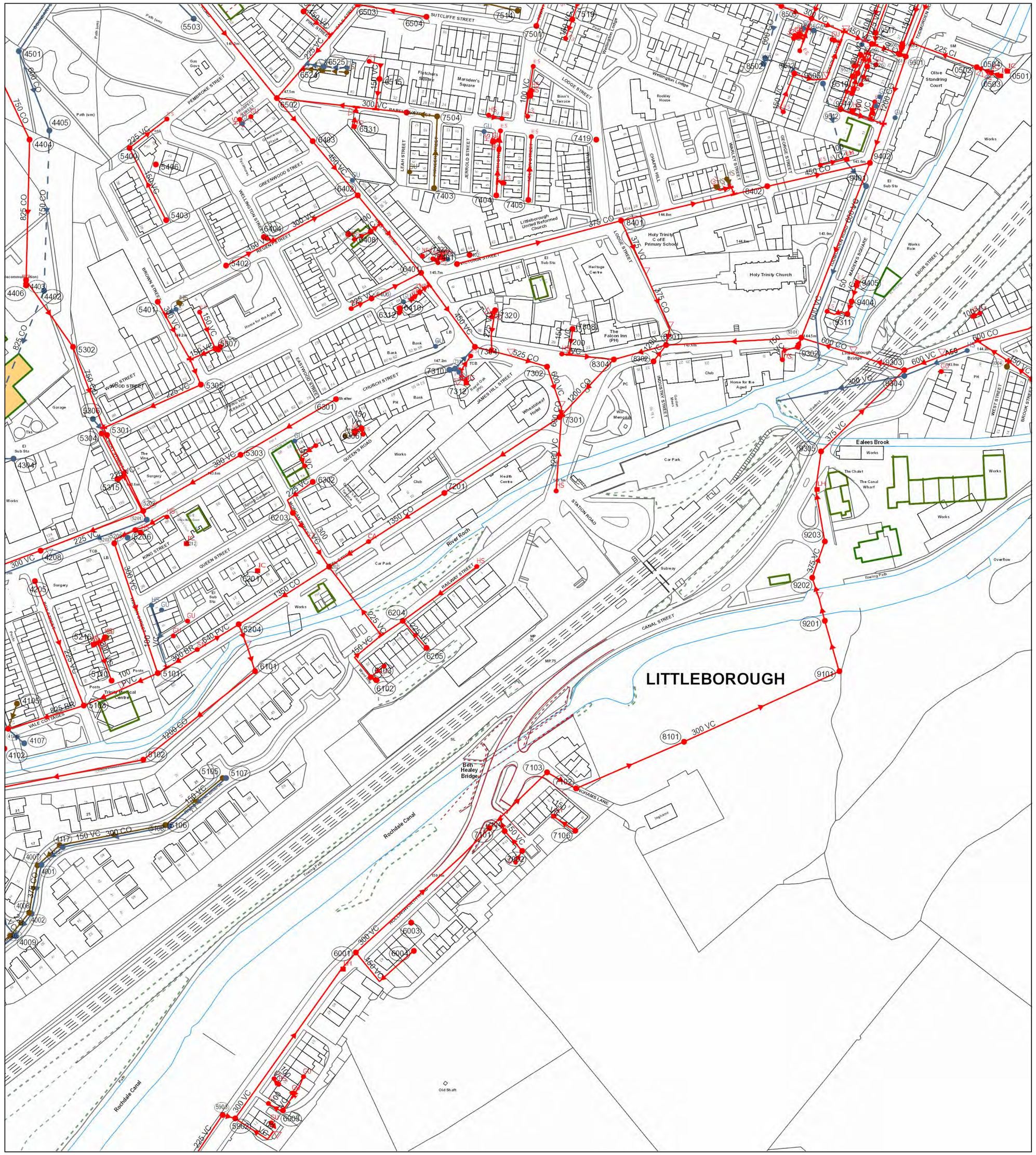
4 HEALD LANE
LITTLEBOROUGH
OL15 0DW

Printed By: Property Searches Date: 04/09/2018

DO NOT SCALE

Approximate Scale: 1:5000

United Utilities
helping life flow smoothly



The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
9305	144.27	CO	141.44	375			VC	64.3506	1 in 1287
9405		CO		150			VC	9.263441	
9303	143.82	CO	141.39	600			VC	29.41088	1 in 98
9304	145.06	FO	143.24	225			VC	3.162278	
9305	145.52	CO	143.92	150			VC	16.40122	
9502		CO		225			CI	38.8464	
9506	143.7	CO	0	375			VC	4.978068	
9504	143.72	CO	142.03	150			VC	5.792582	
9507	143.9	CO	141.71	450			VC	15.79734	
9517		CO	0	225			VC	6.813478	
9554		CO		300			VC	20.86211	
8503	144.78	CO	142.23	300			VC	18.00521	
9505	142.99	SW	141.26	600			VC	42.44997	
9512		CO	0	150			VC	25.02673	
9501	143.65	CO	140.67	1200			VC	39.31078	
9527		CO	0	150			VC	19.48969	
9510	143.83	CO	142.78	150			VC	9.101251	
8502	144.59	SW	142.28	600			CO	34.9285	1 in 35
9532		CO		150			VC	18.56718	
9509		CO		150			VC	11.14256	
9508		CO	0	150			VC	17.94165	
9526		CO		100			VC	8.843952	
9509		CO		100			VC	2.15203	
9511		CO	0	450			VC	4.452191	
8301	143.55	CO	140.01	1200			CO	39.08322	1 in 143
8302		CO	0	1200			VC	11.40175	
9301	144.43	CO	140.15	1200			CO	75.10659	1 in 578
8101	149.77	CO	0	300			VC	94.42987	
9304	143.87	SW	142.66	300			VC	71.38628	
9302		CO	0	1200			VC	5.385165	
9402	143.52	CO	140.5	1200			CO	104.1777	1 in 316
9202	145.29	CO	141.77	375			VC	21.18962	
9401	143.49	SW	0	600			VC	102.3327	
9203	144.87	CO	141.84	375			VC	50.64108	1 in 175
9201	146.98	CO	141.89	300			VC	12.38932	1 in 137
9101		CO	0	300			VC	29.12044	
9311		CO		150			VC	12.09398	
9404		CO		150			VC	7.352172	
7519		CO		150			VC	11.14947	
8401	145.42	CO	142.22	375			CO	83.19855	1 in 134
7405		CO		150			VC	35.16559	
7404		CO		150			VC	25.17756	
7403		FO		300			VC	39.98628	
7504		FO		300			VC	17.18923	
7308		CO	0	150			VC	14.53055	
7320		CO		225			VC	22.76702	
6401	145.85	CO	142.92	450			CO	50.80354	1 in 363
6312		CO		150			VC	3.094113	
8401	145.42	CO	142.2	375			VC	33.10589	
7401	145.09	CO	142.6	375			CO	94.11163	1 in 241
6205	142.45	CO	140.85	225			CO	19.84943	1 in 68
7201		CO	0	1350			CO	49.92095	
7301	144.48	CO	139.19	1200			CO	76.55064	
8304	144.14	CO	139.79	1200			CO	42.44997	
7302	145.22	CO	141.9	600			CO	24.35159	
7311		SW		0			VC	16.41806	
7304	146.8	CO	142.74	450			VC	21.82386	1 in 61
6302	144.51	CO	143.1	225			VC	24.82042	1 in 29
6203	143.75	CO	142.23	225			VC	18.02776	1 in 17
6306		CO		150			VC	3.381954	
4102	140.36	CO	138.16	375			VC	13.92839	
4102	140.36	CO	138.16	375			VC	13.92839	
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4016	142.37	SW	140.14	225			VC	18.0882	1 in 106
4016	142.37	SW	140.14	225			VC	18.0882	1 in 106
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4007	142.41	SW	139.91	375			CO	27.63531	1 in 461
4007	142.41	SW	139.91	375			CO	27.63531	1 in 461
4001	142.38	FO	139.84	150			VC	26.56269	1 in 190
4001	142.38	FO	139.84	150			VC	26.56269	1 in 190
4115	142.59	FO	139.92	150			VC	16.65077	1 in 208
4115	142.59	FO	139.92	150			VC	16.65077	1 in 208
4117	142.6	SW	140.03	300			CO	15.44415	1 in 309
4117	142.6	SW	140.03	300			CO	15.44415	1 in 309
6001	151.87	CO	148.85	300			VC	101.1962	1 in 54
6001	151.87	CO	148.85	300			VC	101.1962	1 in 54
6004		CO	0	150			VC	46.11063	
6004		CO	0	150			VC	46.11063	
7101	149.64	CO	146.94	300			VC	44.55334	1 in 35.3597927
7104		CO		150			VC	7.594159	
7002		CO		150			VC	14.67263	
7103	148.5	CO	145.61	300			VC	18.35756	1 in 141
7106		CO		150			VC	15.14159	
7102	149.2	CO	145.38	300			VC	65.39113	
5806	159.27	CO	154.8	225			VC	161.6837	1 in 38
5806	159.27	CO	154.8	225			VC	161.6837	1 in 38
5903	153.16	CO	150.55	225			VC	7.28011	1 in 146
5903	153.16	CO	150.55	225			VC	7.28011	1 in 146
5902	152.98	CO	150.36	300			VC	113.8748	1 in 79
5902	152.98	CO	150.36	300			VC	113.8748	1 in 79
6905		CO		150			VC	9.321638	
6905		CO		150			VC	9.321638	
6527		CO		150			VC	20.12484	
6515		CO		150			VC	16.72956	
4501	146.6	SW	142.29	600			CO	47.16991	
4501	146.6	SW	142.29	600			CO	47.16991	
5503	147.13	SW	142.91	450			CO	58.69412	1 in 279
6402	146.71	CO	143.57	450			VC	55.44495	1 in 89
6404	148.23	CO	146.82	150			VC	5.385165	
6408		CO		100			VC	7.002574	
6403	146.99	CO	143.58	450			VC	39.05125	
6502	147.17	CO	143.74	450			VC	31.241	1 in 223
6501	148.96	CO	147.8	300			VC	72.44309	1 in 23
6406		CO	0	225			VC	30.89092	
5402	148.58	CO	147.56	150			VC	29.52965	
4402	145.34	SW	141.92	825			CO	60.53924	1 in 85
4402	145.34	SW	141.92	825			CO	60.53924	1 in 85
4403	145.95	CO	143.75	750			CO	45.22168	1 in 32
4403	145.95	CO	143.75	750			CO	45.22168	1 in 32
4406	145.98	CO	143.71	225			VC	2	
4406	145.98	CO	143.71	225			VC	2	
4404	146.19	CO	144	825			CO	81.02469	1 in 289
4404	146.19	CO	144	825			CO	81.02469	1 in 289
4405	145.55	SW	142.32	750			CO	89.05054	1 in 330
4405	145.55	SW	142.32	750			CO	89.05054	1 in 330
5400		CO	0	225			VC	26.32918	
5400		CO	0	225			VC	26.32918	
5403		CO	0	150			VC	44.94961	
5401	147.49	CO	145.42	300			VC	36.71512	
5307	147.01	CO	146.04	150			VC	15.23155	
5305	146.45	CO	145.36	225			VC	59.09315	
5303	144.59	CO	142.19	300			VC	62.26556	1 in 22
6301	147	CO	144.21	300			VC	61.40033	1 in 31
4304	143.55	SW	142.61	100			VC	13	1 in 37
4304	143.55	SW	142.61	100			VC	13	1 in 37
5202	142.54	CO	138.85	750			CO	61.09828	1 in 46
5201	142.44	SW	140.91	225			VC	57.58472	1 in 63
5302	145.99	CO	142.31	750			CO	52.57619	1 in 24
5302	145.99	CO	142.31	750			CO	52.57619	1 in 24
5306	145.59	SW	143.33	225			VC	12.04159	1 in 4
5306	145.59	SW	143.33	225			VC	12.04159	1 in 4
5304		CO	0	225			VC	54.12024	
5304		CO	0	225			VC	54.12024	
5301	144.89	CO	139.99	750			CO	46.51881	
5301	144.89	CO	139.99	750			CO	46.51881	
5206		CO		100			VC	14.60648	
5315		CO		225			VC	4.085925	
5315		CO		225			VC	4.085925	
4208	140.87	CO	137.51	750			CO	51.26402	1 in 151
4208	140.87	CO	137.51	750			CO	51.26402	1 in 151
4205	140.54	CO	138.82	225			VC	74.09454	1 in 81
4205	140.54	CO	138.82	225			VC	74.09454	1 in 81
5203	141.67	CO	139.26	300			VC	75.89466	1 in 161
5203	141.67	CO	139.26	300			VC	75.89466	1 in 161
5101	141.5	CO	138.63	100			PVC	21.93171	1 in 53
5204	142.14	CO	136.47	1350			CO	13.92839	1 in 155
6202	142.89	CO	136.71	1350			CO	59.36329	1 in 283
6204	142.96	CO	140.28	225			VC	62.22388	1 in 59
6103		CO		150			VC	33.35395	
6102		CO		150			VC	3.727723	
4201	140.28	SW	0	825			VC	42.95346	
5108	143.46	SW	140.33	300			CO	60.0626	1 in 200
5106	143.46	FO	140.28	150			VC	59.8109	1 in 166
5107	143.47	SW	140.6	225			VC	41.40664	1 in 188
5105	143.44	FO	140.63	150			VC	40.87366	1 in 117
5102	141.48	CO	136.07	1200			CO	98.84331	1 in 194
6101	141.61	CO	136.43	1200			CO	79.02531	1 in 220
4107	140.41	SW	138.27	150			VC	12.04159	1 in 1204
4107	140.41	SW	138.27	150			VC	12.04159	1 in 1204
4104	140.43	CO	137.73	825			BR	16.15978	
4104	140.43	CO	137.73	825			BR	16.15978	
5103	140.6	CO	137.9	825			BR	43.9659	1 in 400
5103	140.6	CO	137.9	825			BR	43.9659	1 in 400
4105	140.38	FO	137.98	225			VC	14.86607	1 in 93
4105	140.38	FO	137.98	225			VC	14.86607	1 in 93
8402	144.27	CO	141.57	450			CO	58.46367	1 in 158
6503	146.93	CO	144.68	225			VC	68.76205	1 in 90
7501	147.03	CO	144.78	225			VC	59.13544	1 in 68
6504	146.98	CO	145.07	225			VC	38.63729	1 in 143

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

LEGEND

Abandoned | Foul | Surface Water | Combined

- Public Sewer
- Private Sewer
- Section 104
- Rising Main
- Sludge Main
- Overflow
- Water Course
- Highway Drain

All point assets follow the standard colour convention:
red - combined blue - surface water
brown - foul purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

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

Address or Site Reference:

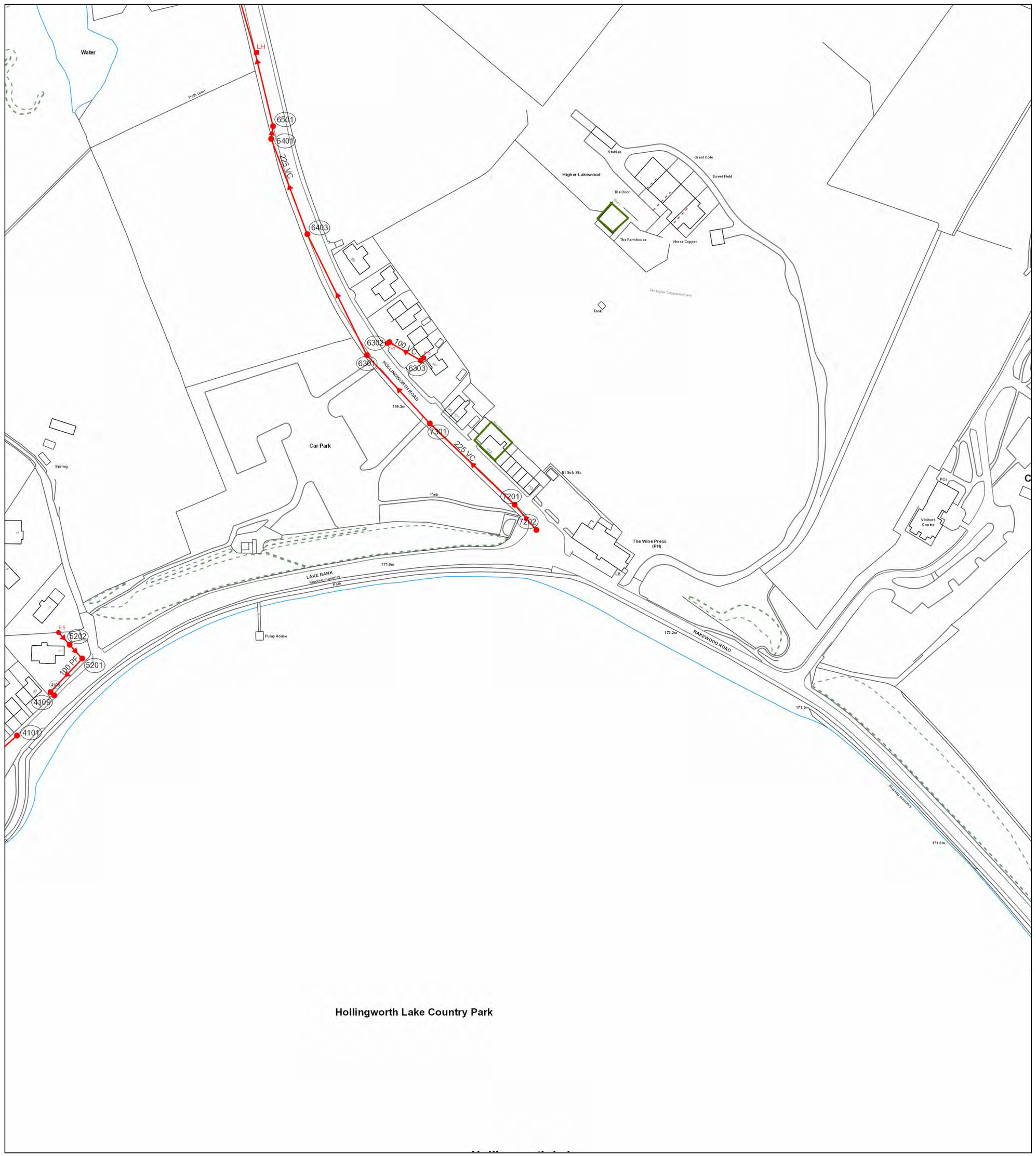
4 HEALD LANE,
LITTLEBOROUGH,
OL15 0DW

OS sheet Number: SD9316SE
Scale: 1:1250 **Date:** 04/09/2018
Nodes: 183
Sheet: 2 of 7

Printed by: Property Searches

SEWER RECORDS

United Utilities — helping life flow smoothly



Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
4108		CO		100			VC	2.919922	
4108		CO		100			VC	2.919922	
5201		CO		100			PF	25.58064	
5201		CO		100			PF	25.58064	
5202		CO		100			PF	10.52534	
5202		CO		100			PF	10.52534	
6501	168.39	CO	165.27	225			VC	74.48192	1 in 79
6501	168.39	CO	165.27	225			VC	74.48192	1 in 79
6401	168.27	CO	165.19	225			VC	7.071068	
6401	168.27	CO	165.19	225			VC	7.071068	
6403	168.59	CO	165.96	225			VC	56.64804	1 in 78
6403	168.59	CO	165.96	225			VC	56.64804	1 in 78
6301	169.01	CO	166.73	225			VC	74.68601	1 in 98
7301	169.54	CO	167.29	225			VC	51.66236	1 in 92
6302		CO		100			VC	1.347226	
6303		CO		100			VC	20.06107	
7201	171.23	CO	168.09	225			VC	65.06919	1 in 86
7202	171.46	CO	0	225			VC	18.43909	
4101	172.66	CO	171.45	225			VC	102.4744	1 in 149
4101	172.66	CO	171.45	225			VC	102.4744	1 in 149

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

LEGEND

Abandoned	Foul	Surface Water	Combined	
				Public Sewer
				Private Sewer
				Section 104
				Rising Main
				Sludge Main
				Overflow
				Water Course
				Highway Drain

All point assets follow the standard colour convention:
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- Extent of Survey
- Rodding Eye
- Inlet
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- Vortex
- Penstock
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- Valve
- Air Valve
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- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO	Foul
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OV	Overflow

SEWER SHAPE

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PSC	Plastic / Steel Composite
GRC	Glass Reinforecd Plastic
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PVC	Polyvinyl Chloride
CI	Cast Iron
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
PP	Polypropylene
PF	Pitch Fibre
MAC	Masonry, Coursed
MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

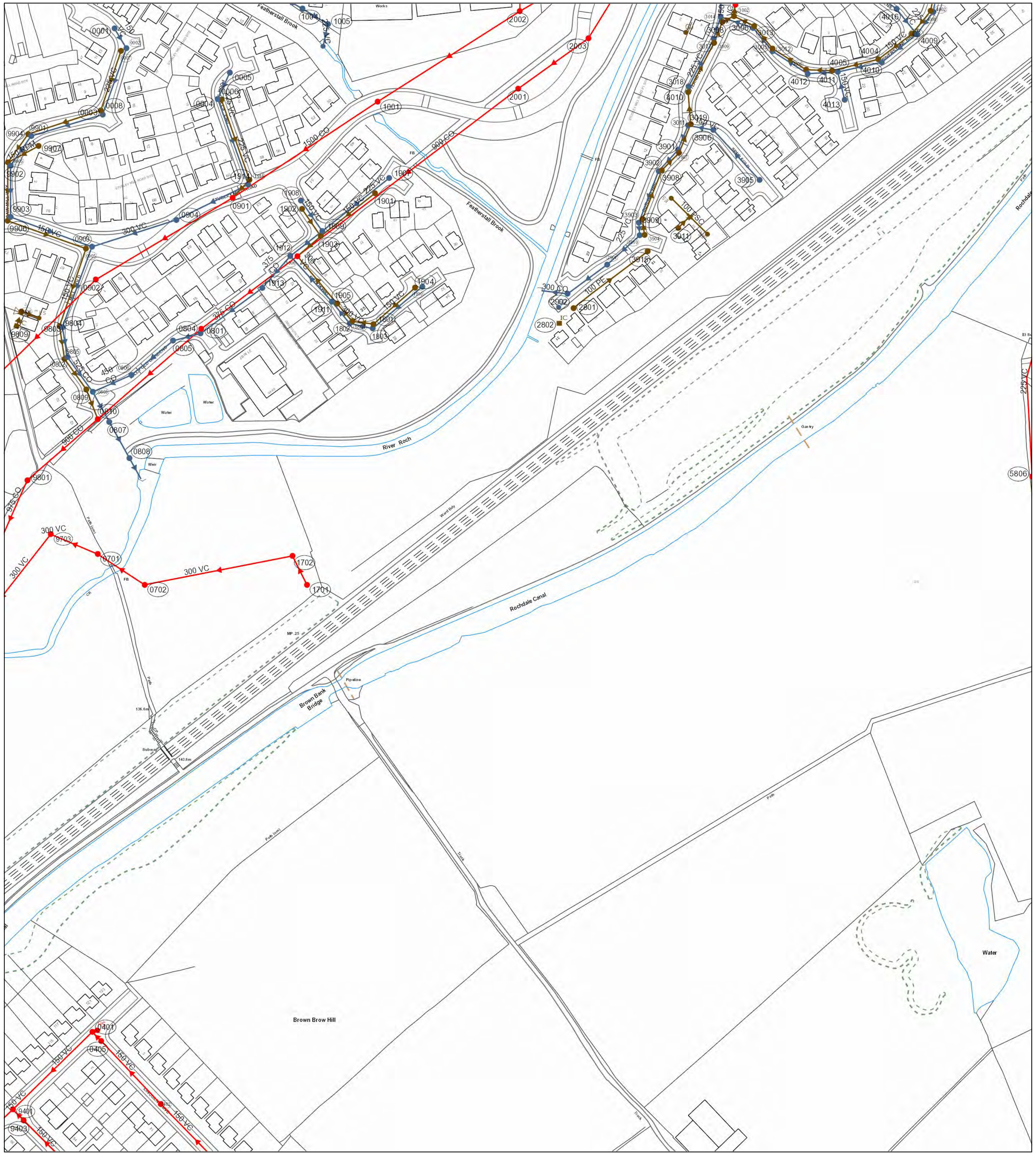
4 HEALD LANE,
LITTLEBOROUGH,
OL15 0DW

OS sheet Number: SD9315SE
Scale: 1:1250 **Date:** 04/09/2018
Nodes: 20
Sheet: 3 of 7

Printed by: Property Searches

SEWER RECORDS

United Utilities
helping life flow smoothly



The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
1003		SW	0	225			VC	10.98465	
3014	141.39	SW	138.24	525			CO	24.40502	1 in 488
3014	141.39	SW	138.24	525			CO	24.40502	1 in 488
4110	140.2	CO	135.55	1200			CO	97.17583	
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4016	142.37	SW	140.14	225			VC	18.0882	1 in 106
4016	142.37	SW	140.14	225			VC	18.0882	1 in 106
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4007	142.41	SW	139.91	375			CO	27.63531	1 in 461
4007	142.41	SW	139.91	375			CO	27.63531	1 in 461
4001	142.38	FO	139.84	150			VC	26.56269	1 in 190
4001	142.38	FO	139.84	150			VC	26.56269	1 in 190
4012	142.13	SW	139.53	450			CO	23.05786	1 in 576
4012	142.13	SW	139.53	450			CO	23.05786	1 in 576
4004	142.51	FO	139.31	150			VC	26.35481	1 in 155
4004	142.51	FO	139.31	150			VC	26.35481	1 in 155
4006	142.15	FO	139.05	150			VC	21.84187	1 in 146
4006	142.15	FO	139.05	150			VC	21.84187	1 in 146
3012	141.9	SW	139.49	450			CO	16.76657	1 in 335
3012	141.9	SW	139.49	450			CO	16.76657	1 in 335
3005	141.91	FO	138.9	150			VC	16.29342	1 in 163
3005	141.91	FO	138.9	150			VC	16.29342	1 in 163
3009	141.27	FO	137.51	150			VC	12.40049	1 in 155
3009	141.27	FO	137.51	150			VC	12.40049	1 in 155
3017	141.28	SW	138.61	225			VC	12.67285	1 in 44
3017	141.28	SW	138.61	225			VC	12.67285	1 in 44
3013	141.63	SW	139.44	450			CO	19.16408	1 in 21
3013	141.63	SW	139.44	450			CO	19.16408	1 in 21
3006	141.62	FO	138.8	150			VC	12.40514	1 in 9
3006	141.62	FO	138.8	150			VC	12.40514	1 in 9
3008	141.47	FO	137.47	150			VC	7.205953	1 in 360
3008	141.47	FO	137.47	150			VC	7.205953	1 in 360
3007	141.42	FO	137.45	150			VC	6.434973	
3007	141.42	FO	137.45	150			VC	6.434973	
4015	142.17	SW	140.21	225			VC	17.35061	1 in 248
2003	138.86	CO	136.37	900			CO	48.01041	1 in 369
2003	138.86	CO	136.37	900			CO	48.01041	1 in 369
2101	140.24	CO	137.82	300			VC	66.00758	1 in 76
3112	139.42	CO	134.64	1500			CO	70.83079	1 in 169
3003	139.46	CO	136.42	900			CO	55.22681	1 in 1381
3002	141.36	CO	0	1350			CO	68.20181	
3002	141.36	CO	0	1350			CO	68.20181	
3010	141.3	FO	137.8	150			VC	30.99622	1 in 107
3010	141.3	FO	137.8	150			VC	30.99622	1 in 107
3018	141.24	SW	138.73	225			VC	30.00246	1 in 250
3018	141.24	SW	138.73	225			VC	30.00246	1 in 250
2002	138.98	CO	134.21	1500			CO	93.52532	1 in 1559
2002	138.98	CO	134.21	1500			CO	93.52532	1 in 1559
0002	143.71	SW	142.33	225			VC	39.02977	1 in 74
0002	143.71	SW	142.33	225			VC	39.02977	1 in 74
0002	143.71	SW	142.33	225			VC	39.02977	1 in 74
0007	143.73	FO	142.1	150			VC	35.00375	1 in 140
0007	143.73	FO	142.1	150			VC	35.00375	1 in 140
0007	143.73	FO	142.1	150			VC	35.00375	1 in 140
0005	141.4	SW	139.88	225			VC	15.96905	1 in 177
0005	141.4	SW	139.88	225			VC	15.96905	1 in 177
0001	144.47	SW	143	150			VC	12.95591	1 in 19
0001	144.47	SW	143	150			VC	12.95591	1 in 19
0001	144.47	SW	143	150			VC	12.95591	1 in 19
1001	139.47	CO	134.14	1500			CO	96.3587	1 in 688
1001	139.47	CO	134.14	1500			CO	96.3587	1 in 688
1908		SW	0	150			VC	20.59152	
1908		SW	0	150			VC	20.59152	
1902		FO	0	150			VC	18.40137	
1902		FO	0	150			VC	18.40137	
1004		SW	0	225			VC	16.52904	
1004		SW	0	225			VC	16.52904	
1005		SW	0	225			VC	12.55714	
1005		SW	0	225			VC	12.55714	
3905	142.21	SW	140.86	150			VC	37.55473	1 in 89
3905	142.21	SW	140.86	150			VC	37.55473	1 in 89
4005	142.39	FO	139.14	150			VC	14.44736	1 in 161
4005	142.39	FO	139.14	150			VC	14.44736	1 in 161
3910	141.18	SW	139.67	225			VC	24.12947	1 in 172
3910	141.18	SW	139.67	225			VC	24.12947	1 in 172
3909	141.24	SW	139.72	225			VC	7.127414	1 in 143
3909	141.24	SW	139.72	225			VC	7.127414	1 in 143
3908	141.54	SW	139.91	225			VC	30.60122	1 in 161
3908	141.54	SW	139.91	225			VC	30.60122	1 in 161
3904	141.15	FO	138.3	150			VC	8.766454	1 in 146
3904	141.15	FO	138.3	150			VC	8.766454	1 in 146
3903	141.27	FO	138.24	150			VC	29.19772	1 in 154
3903	141.27	FO	138.24	150			VC	29.19772	1 in 154
3907	141.73	SW	140.14	150			VC	15.96725	1 in 69
3907	141.73	SW	140.14	150			VC	15.96725	1 in 69
3902	141.58	FO	138.05	150			VC	13.47817	1 in 150
3902	141.58	FO	138.05	150			VC	13.47817	1 in 150
3019	141.71	SW	140.29	150			VC	14.63807	1 in 98
3019	141.71	SW	140.29	150			VC	14.63807	1 in 98
3911		FO		100			PSC	9.051835	
3911		FO		100			PSC	9.051835	
3901	141.72	FO	137.96	150			VC	17.22285	1 in 144
3901	141.72	FO	137.96	150			VC	17.22285	1 in 144
3906	141.79	SW	140.44	150			VC	14.29027	1 in 95
3906	141.79	SW	140.44	150			VC	14.29027	1 in 95
3011	141.66	FO	137.84	150			VC	17.76315	1 in 444
3011	141.66	FO	137.84	150			VC	17.76315	1 in 444
0901	141.72	CO	133.99	1500			CO	88.33363	1 in 1262
0901	141.72	CO	133.99	1500			CO	88.33363	1 in 1262
0904	140.27	SW	137.76	300			VC	49.10095	1 in 78
0904	140.27	SW	137.76	300			VC	49.10095	1 in 78
1914	141.62	SW	138.04	300			VC	44.42737	1 in 159
1914	141.62	SW	138.04	300			VC	44.42737	1 in 159
1915	141.56	FO	137.6	150			VC	13.67585	1 in 4
1915	141.56	FO	137.6	150			VC	13.67585	1 in 4
0004	141.69	SW	139.79	225			VC	50.38143	1 in 29
0004	141.69	SW	139.79	225			VC	50.38143	1 in 29
0006	141.68	FO	139.53	225			VC	46.98414	1 in 24
0006	141.68	FO	139.53	225			VC	46.98414	1 in 24
0003	143.67	SW	141.8	225			VC	41.4235	1 in 94
0003	143.67	SW	141.8	225			VC	41.4235	1 in 94
0003	143.67	SW	141.8	225			VC	41.4235	1 in 94
0008	143.68	FO	141.85	150			VC	42.29123	1 in 98
0008	143.68	FO	141.85	150			VC	42.29123	1 in 98
0008	143.68	FO	141.85	150			VC	42.29123	1 in 98
2001	138.46	CO	136.24	900			CO	153.4864	
2001	138.46	CO	136.24	900			CO	153.4864	
1901		FO	0	150			VC	38.2817	
1901		FO	0	150			VC	38.2817	
1907		SW	0	225			VC	47.27895	
1907		SW	0	225			VC	47.27895	
1906		CO	0	900			CO	66.79356	
0903	139.28	SW	137.13	525			CO	47.51059	1 in 432
0903	139.28	SW	137.13	525			CO	47.51059	1 in 432
0903	139.28	SW	137.13	525			CO	47.51059	1 in 432
0905	139.32	FO	137.09	150			VC	45.45024	1 in 134
0905	139.32	FO	137.09	150			VC	45.45024	1 in 134
0905	139.32	FO	137.09	150			VC	45.45024	1 in 134
1905		FO	0	150			VC	34.22938	
1911		SW	0	300			VC	34.17716	
1912		SW	0	375			CO	23.68153	
1903		FO	0	150			VC	16.99976	
1903		FO	0	150			VC	16.99976	
1909		SW	0	225			VC	22.41856	
1909		SW	0	225			VC	22.41856	
1803		SW	0	300			VC	13.06147	
1910		SW	0	300			VC	36.01485	
1801		FO	0	150			VC	11.86647	
1904		FO	0	150			VC	30.63552	
1802		FO	0	150			VC	13.01599	
2801		FO		100			PE	51.64019	
2901	140.75	SW	139.53	225			VC	27.36276	1 in 36
2902	139.97	SW	138.77	300			CO	14.60972	1 in 183
1701	137.21	CO	0	300			VC	17.88854	
0702	137.52	CO	135.55	300			VC	31.06445	1 in 444
1702	137.46	CO	0	300			VC	83.54639	
0701	136.98	CO	135.42	300			VC	28.23119	
0701	136.98	CO	135.42	300			VC	28.23119	
0810	138.32	CO	135.67	900			CO	51.70123	1 in 739
0810	138.32	CO	135.67	900			CO	51.70123	1 in 739
0808	137.39	SW	135.71	625			CO	13.21514	1 in 441
0808	137.39	SW	135.71	625			CO	13.21514	1 in 441
0807	138.34	SW	136.57	525			CO	22.91584	1 in 27
0807	138.34	SW	136.57	525			CO	22.91584	1 in 27
0803	138.49	SW	136.85	525			CO	19.03802	1 in 68
0803	138.49	SW	136.85	525			CO	19.03802	1 in 68
0809	138.49	FO	136.49	150			VC	17.66443	1 in 22
0809	138.49	FO	136.49	150			VC	17.66443	1 in 22
0801	141.25	CO	135.74	900			CO	76.15795	1 in 1088
0806	139.24	SW	137	450			CO	23.43866	1 in 156
0802	138.43	SW	136.91	525			CO	23.91631	1 in 399
0802	138.43	SW	136.91	525			CO	23.91631	1 in 399
9805	138.41	FO	136.62	150			VC	20.70396	1 in 159
9805	138.41	FO	136.62	150			VC	20.70396	1 in 159
0805	140.69	SW	137.07	450			CO	29.86626	1 in 427
9804	138.59	FO	136.75	150			VC	18.39238	1 in 141
9804	138.59	FO	136.75	150			VC	18.39238	1 in 141
9803	138.59	SW	137.02	525			CO	16.75341	1 in 152
9803	138.59	SW	137.02	525			CO	16.75341	1 in 152
0804	140.88	SW	137.26	375			CO	15.74968	1 in 83
1913	141.33	SW	137.43	375			CO	42.41285	1 in 249
1804		SW	0	300			VC	15.55868	
9703		CO	0	300			VC	87.61849	
9703		CO	0	300			VC	87.61849	
0902	137.94	CO	133.9	1500			CO	92.05155	1 in 614
0902	137.94	CO	133.9	1500			CO	92.05155	1 in 614
9801	137.24	CO	135.59	975			CO	47.01064	1 in 80
9801	137.24	CO	135.59	975			CO	47.01064	1 in 80
9906	140.84	FO	138.96	150			VC	46.09197	1 in 25
9906	140.84	FO	138.96	150			VC	46.09197	1 in 25
9906	140.84	FO	138.96	150			VC	46.09197	1 in 25
9905	143.16	FO	141.25	150			VC	32.29613	1 in 14
9905	143.16	FO	141.25	150			VC	32.29613	1 in 14
9905	143.16	FO	141.25	150			VC	32.29613	1 in 14
9904	143.95	FO	141.42	150			VC	19.39697	1 in 114
9904	143.95	FO	141.42	150			VC	19.39697	1 in 114
9904	143.95	FO	141.42	150			VC	19.39697	1 in 114

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
9907		FO		150			RPM	19.37782	
9907		FO		150			RPM	19.37782	
9907		FO		150			RPM	19.37782	
9902	143.12	SW	140.8	225			VC	28.431	1 in 17
9902	143.12	SW	140.8	225			VC	28.431	1 in 17
9902	143.12	SW	140.8	225			VC	28.431	1 in 17
9903	140.86	SW	139.13	300			VC	48.02058	1 in 24
9903	140.86	SW	139.13	300			VC	48.02058	1 in 24
9903	140.86	SW	139.13	300			VC	48.02058	1 in 24
9901	143.95	SW	141.36	225			VC	20.02204	1 in 36
9901	143.95	SW	141.36	225			VC	20.02204	1 in 36
9901	143.95	SW	141.36	225			VC	20.02204	1 in 36
4011	142.45	SW	139.58	450			CO	16.77444	1 in 335
4011	142.45	SW	139.58	450			CO	16.77444	1 in 335
4010	142.51	SW	139.65	450			CO	24.98929	1 in 357
4010	142.51	SW	139.65	450			CO	24.98929	1 in 357
4013	142.47	SW	140.02	150			VC	15.81575	1 in 99
4013	142.47	SW	140.02	150			VC	15.81575	1 in 99
5806	159.27	CO	154.8	225			VC	161.6837	1 in 38
5806	159.27	CO	154.8	225			VC	161.6837	1 in 38
5704	160.77	CO	157.32	225			VC	38.27532	1 in 61
0403	170.77	CO	169.05	150			VC	57.28001	
0402	168.58	CO	0	150			VC	48.10405	
0402	168.58	CO	0	150			VC	48.10405	
0405	166.97	CO	165.59	150			VC	7.071068	1 in 29
0405	166.97	CO	165.59	150			VC	7.071068	1 in 29
0405	166.97	CO	165.59	150			VC	7.071068	1 in 29
9401	160.43	CO	159.03	150			VC	60.1415	1 in 10
9401	160.43	CO	159.03	150			VC	60.1415	1 in 10
9401	160.43	CO	159.03	150			VC	60.1415	1 in 10
0406	162.1	CO	160.69	150			VC	35.35534	1 in 28
9403	160.64	CO	159.41	150			VC	8.485281	1 in 27
9403	160.64	CO	159.41	150			VC	8.485281	1 in 27
9403	160.64	CO	159.41	150			VC	8.485281	1 in 27
0401	166.75	CO	165.24	150			VC	61.52235	1 in 10
0401	166.75	CO	165.24	150			VC	61.52235	1 in 10
0401	166.75	CO	165.24	150			VC	61.52235	1 in 10

LEGEND

Abandoned | Foul | Surface Water | Combined

- Public Sewer
- Private Sewer
- Section 104
- Rising Main
- Sludge Main
- Overflow
- Water Course
- Highway Drain

All point assets follow the standard colour convention:
red - combined, blue - surface water, brown - foul, purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

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

Address or Site Reference:

4 HEALD LANE,
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OS sheet Number: SD9315NW
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Nodes: 238
Sheet: 5 of 7

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SEWER RECORDS

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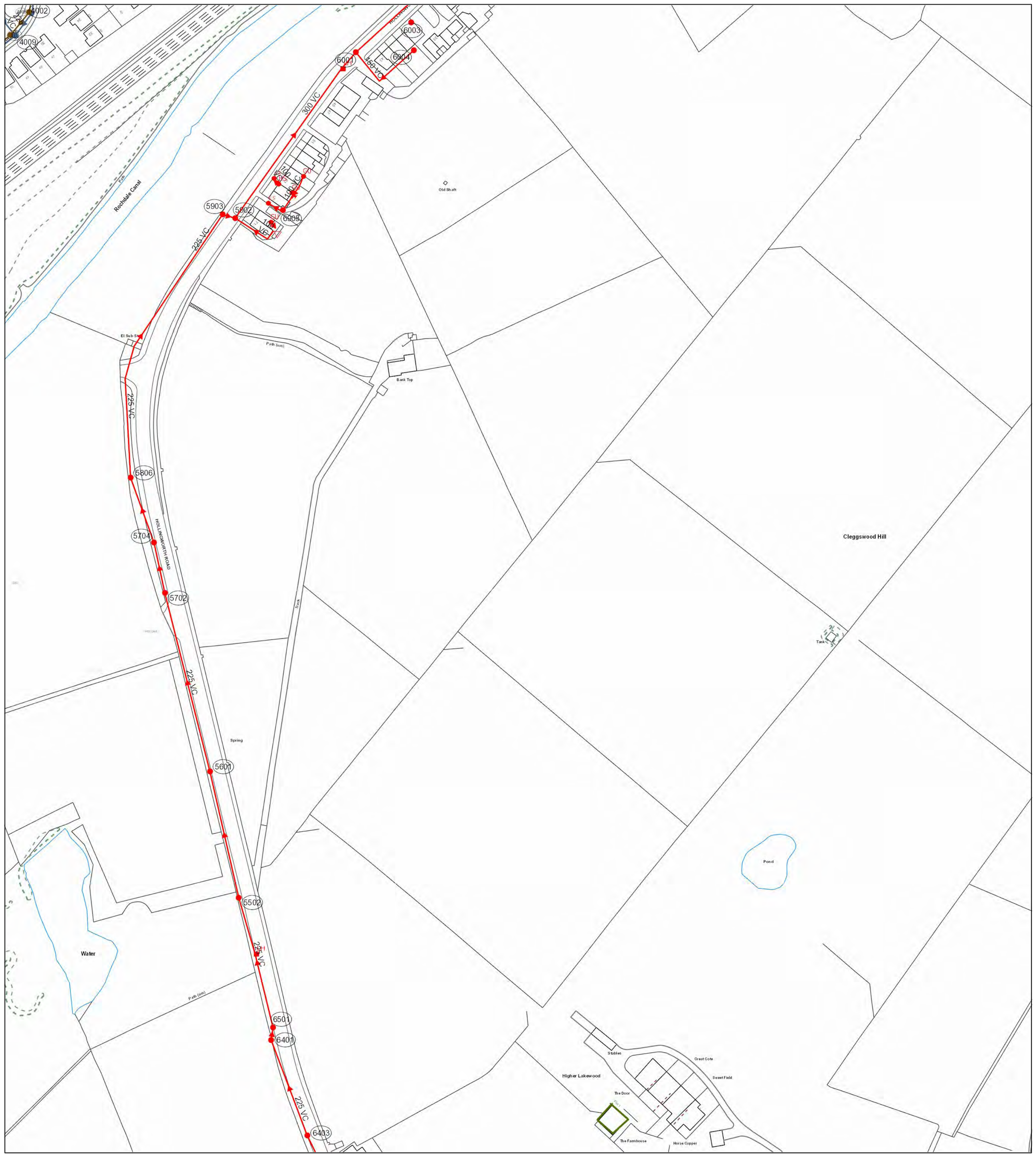

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4009	142.66	SW	139.72	450			CO	24.85896	1 in 355
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4003	142.64	FO	139.6	150			VC	23.4577	1 in 81
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4008	142.71	SW	139.85	375			CO	15.2964	1 in 382
4016	142.37	SW	140.14	225			VC	18.0882	1 in 106
4016	142.37	SW	140.14	225			VC	18.0882	1 in 106
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4002	142.73	FO	139.7	150			VC	16.37983	1 in 164
4007	142.41	SW	139.91	375			CO	27.63531	1 in 461
4007	142.41	SW	139.91	375			CO	27.63531	1 in 461
4001	142.38	FO	139.84	150			VC	26.56289	1 in 190
4001	142.38	FO	139.84	150			VC	26.56289	1 in 190
6001	151.87	CO	148.85	300			VC	101.1962	1 in 54
6001	151.87	CO	148.85	300			VC	101.1962	1 in 54
6004		CO	0	150			VC	46.11063	
6004		CO	0	150			VC	46.11063	
5806	159.27	CO	154.8	225			VC	161.6837	1 in 38
5806	159.27	CO	154.8	225			VC	161.6837	1 in 38
5704	160.77	CO	157.32	225			VC	38.27532	1 in 61
5702	162.5	CO	159.79	225			VC	28.63564	1 in 29
5601	165.65	CO	162.47	225			VC	102.1078	1 in 69
5903	153.16	CO	150.55	225			VC	7.28011	1 in 146
5903	153.16	CO	150.55	225			VC	7.28011	1 in 146
5902	152.98	CO	150.36	300			VC	113.8748	1 in 79
5902	152.98	CO	150.36	300			VC	113.8748	1 in 79
6905		CO	0	150			VC	9.321638	
6905		CO	0	150			VC	9.321638	
5502	167.41	CO	164.02	225			VC	71.80529	1 in 74
6501	168.39	CO	165.27	225			VC	74.48192	1 in 79
6501	168.39	CO	165.27	225			VC	74.48192	1 in 79
6401	168.27	CO	165.19	225			VC	7.071068	
6401	168.27	CO	165.19	225			VC	7.071068	
6403	168.59	CO	165.96	225			VC	56.64804	1 in 78
6403	168.59	CO	165.96	225			VC	56.64804	1 in 78
6301	169.01	CO	166.73	225			VC	74.68601	1 in 98

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

LEGEND

Abandoned | Foul | Surface Water | Combined

- Public Sewer
- Private Sewer
- Section 104
- Rising Main
- Sludge Main
- Overflow
- Water Course
- Highway Drain

All point assets follow the standard colour convention:
red - combined blue - surface water
brown - foul purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

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

Address or Site Reference:

4 HEALD LANE,
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OL15 0DW

OS sheet Number: SD9315NE
Scale: 1:1250 **Date:** 04/09/2018
Nodes: 45
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SEWER RECORDS

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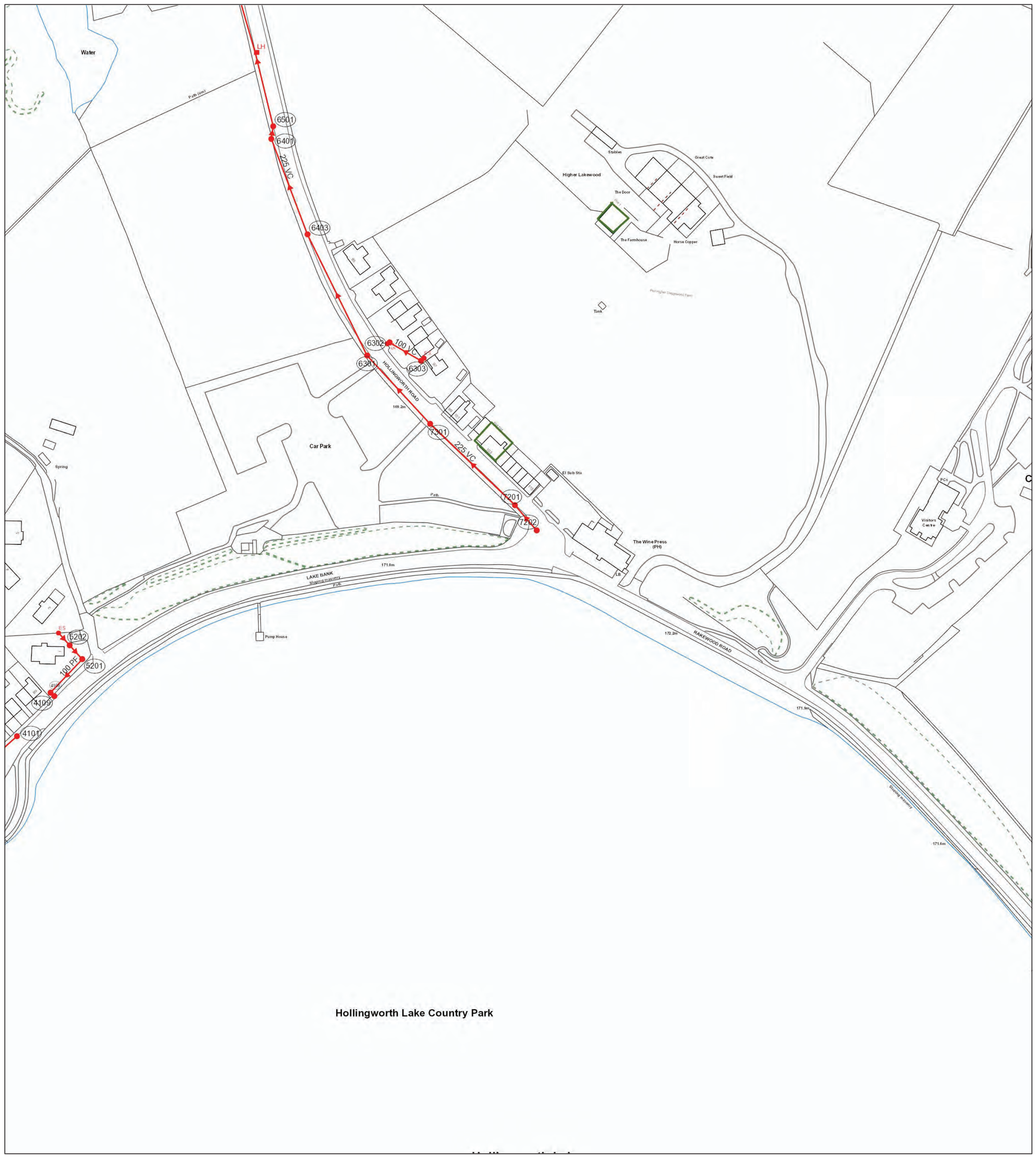

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
4108		CO		100			VC	2.919922	
4108		CO		100			VC	2.919922	
5201		CO		100			PF	25.58064	
5201		CO		100			PF	25.58064	
5202		CO		100			PF	10.52534	
5202		CO		100			PF	10.52534	
6501	168.39	CO	165.27	225			VC	74.48192	1 in 79
6501	168.39	CO	165.27	225			VC	74.48192	1 in 79
6401	168.27	CO	165.19	225			VC	7.071068	
6401	168.27	CO	165.19	225			VC	7.071068	
6403	168.59	CO	165.96	225			VC	56.64804	1 in 78
6403	168.59	CO	165.96	225			VC	56.64804	1 in 78
6301	169.01	CO	166.73	225			VC	74.68601	1 in 98
7301	169.54	CO	167.29	225			VC	51.66236	1 in 92
6302		CO		100			VC	1.347226	
6303		CO		100			VC	20.06107	
7201	171.23	CO	168.09	225			VC	65.06919	1 in 86
7202	171.46	CO	0	225			VC	18.43909	
4101	172.66	CO	171.45	225			VC	102.4744	1 in 149
4101	172.66	CO	171.45	225			VC	102.4744	1 in 149

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

LEGEND

Abandoned | Foul | Surface Water | Combined

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- Air Valve
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- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
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- Valve Chamber
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DI	Ductile Iron
PVC	Polyvinyl Chloride
CI	Cast Iron
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
PP	Polypropylene
PF	Pitch Fibre
MAC	Masonry, Coursed
MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

4 HEALD LANE,
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OL15 0DW

OS sheet Number: SD9315SE
Scale: 1:1250 **Date:** 04/09/2018
Nodes: 20
Sheet: 3 of 7

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SEWER RECORDS

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BETTS HYDRO
CONSULTING ENGINEERS

APPENDIX F – SURFACE WATER RUN-OFF CALCULATIONS

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Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Megan Berry
Site name:	HOLLINGWORTH ROAD
Site location:	LITTLEBOROUGH

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	53.63614° N
Longitude:	2.10171° W

Reference:	6512492
Date:	2019-01-04T13:54:01

Methodology	FEH Statistical

Site characteristics

Total site area (ha)	17.336

Methodology

Qmed estimation method	Calculate from BFI and SAAR
BFI and SPR estimation method	Specify BFI manually
HOST class	21
BFI / BFIHOST	0.36
Qmed (l/s)	248.68
Qbar / Qmed Conversion Factor	1.08

Hydrological characteristics

	Default	Edited
SAAR (mm)	1246	1246
Hydrological region	10	10
Growth curve factor: 1 year	0.87	0.87
Growth curve factor: 30 year	1.7	1.7
Growth curve factor: 100 year	2.08	2.08

Notes:

(1) Is Q_{BAR} < 2.0 l/s/ha?

(2) Are flow rates < 5.0 l/s?

(3) Is SPR/SPRHOST ≤ 0.3?

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	267.33	256.05
1 in 1 year (l/s)	232.58	222.77
1 in 30 years (l/s)	454.46	435.29
1 in 100 years (l/s)	556.05	532.59

SURFACE WATER RUN-OFF CALCULATION SHEET

Development	HOLLINGWORTH ROAD, LITTLEBOROGH
Project No.	HYD383

Revision	0.0	**Completed by**	MB
Date	04.01.19	**Checked by**	KW

BETTS HYDRO
CONSULTING ENGINEERS

Areas			**Catchment Charateristics**		
Total Site	17.336	ha	SAAR	1209	mm
Development Area (for SW Strategy)	17.336	ha	BFI	0.36	
Existing Impermeable	0.867	ha	i_1	18.4	mm/hr
Existing Impermeable (for SW Strategy)	0.867	ha	i_{30}	34.5	mm/hr
Existing Pervious	16.469	ha	i_{100}	44.5	mm/hr
Existing Pervious (for SW Strategy)	16.469	ha	d_1	22.81	mm
Proposed Impermeable (total)	7.800	ha	d_{100}	68.16	mm
Proposed Impermeable (domestic only)	7.800	ha			

Run-off Rates

Pre-development

Impermeable	1yr	44.3	l/s
	30yr	83.1	l/s
	100yr	107.3	l/s
	50mm/hr	120.4	l/s
Pervious	1yr	222.8	l/s
	30yr	435.3	l/s
	100yr	532.6	l/s
	QBar	256.1	l/s
Total	1yr	267.0	l/s
	30yr	518.4	l/s
	100yr	639.8	l/s

Post-development

Impermeable (total)	1yr	398.2	l/s
	30yr	747.8	l/s
	100yr+CC	1254.4	l/s

Volumes

Pre-development

Impermeable	1yr	197.8	cu.m
	100yr	590.9	cu.m
Pervious	1yr	2107.4	cu.m
	100yr	6410.6	cu.m
Total	1yr	2305.1	cu.m
	100yr	7001.5	cu.m

Post-development

Impermeable (total)	1yr	1779.2	cu.m
	100yr+CC	6911.4	cu.m

Quick storage Estimates

		low	high	mean	Imp. Area (ha)	Max. Discharge (l/s)	Rainfall	CC
Return Period	1yr	248	687	467.5	7.800	256.1	FEH	0
Return Period	30yr	1203	2002	1603	7.800	256.1	FEH	0
Return Period	100yr+CC	2374	3756	3065	7.800	256.1	FEH	20%
Return Period	100yr+CC	2909	4691	3800	7.800	256.1	FEH	40%

Greenfield Runoff Volume

FSR Data

Return Period (years)	1
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.000
Ratio R	0.253
Areal Reduction Factor	1.00
Area (ha)	17.336
SAAR (mm)	1206
CWI	123.833
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	46.71
Greenfield Runoff Volume (m^3)	2107.376

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.000
Ratio R	0.253
Areal Reduction Factor	1.00
Area (ha)	17.336
SAAR (mm)	1206
CWI	123.833
Urban	0.000
SPR	47.000

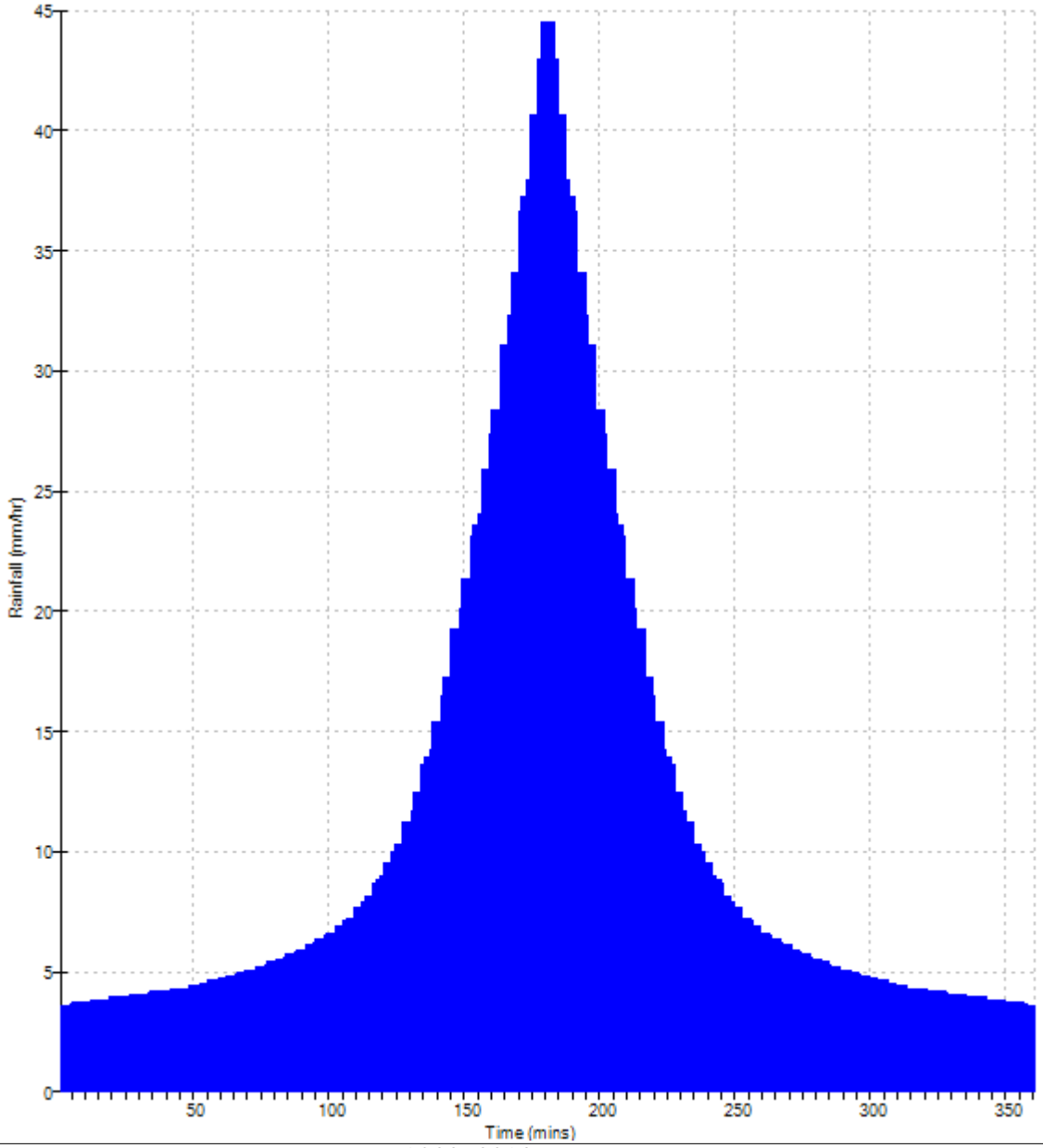
Results

Percentage Runoff (%)	51.74
Greenfield Runoff Volume (m^3)	6410.598

Rainfall profile

Storm duration (mins) 360

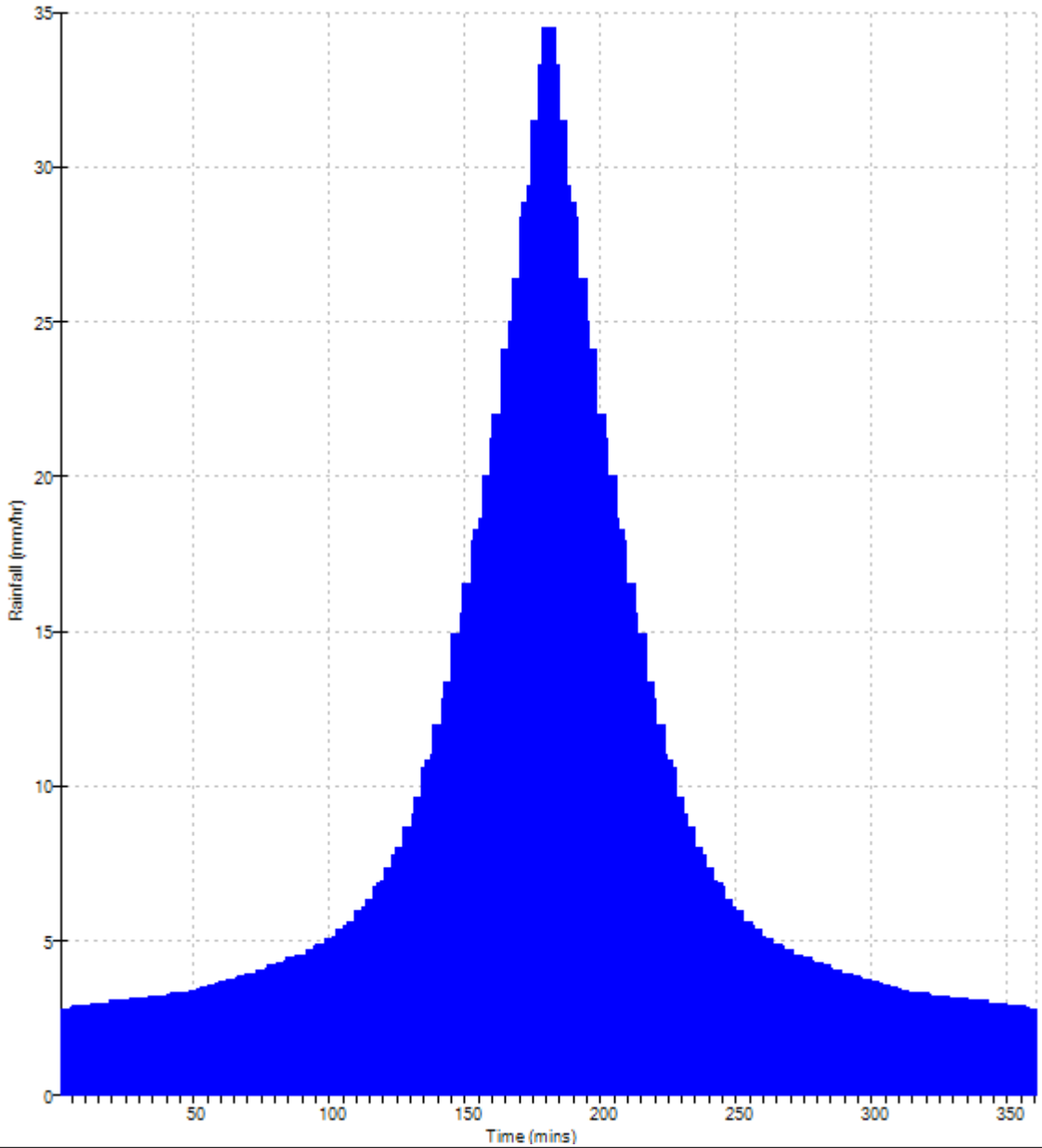
FEH Data	
FEH Rainfall Version	2013
Site Location GB	392867 415636
Data Type	Point
Peak Intensity (mm/hr)	44.534
Ave. Intensity (mm/hr)	11.361
Return Period (years)	100.0



Rainfall profile

Storm duration (mins) 360

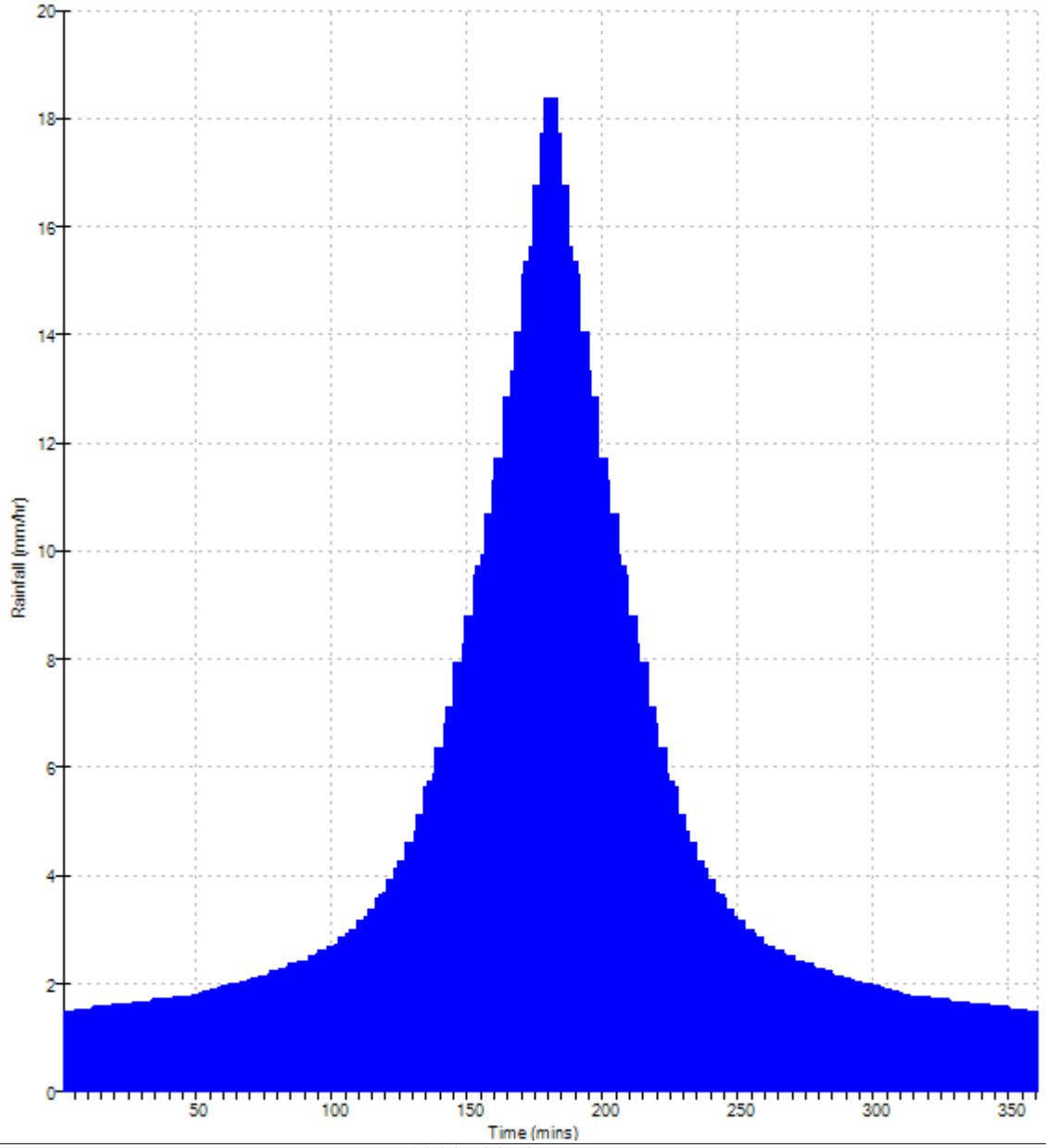
FEH Data	
FEH Rainfall Version	2013
Site Location GB	392867 415636
Data Type	Point
Peak Intensity (mm/hr)	34.515
Ave. Intensity (mm/hr)	8.805
Return Period (years)	30.0



Rainfall profile

Storm duration (mins) 360

FEH Data	
FEH Rainfall Version	2013
Site Location GB	392867 415636
Data Type	Point
Peak Intensity (mm/hr)	18.377
Ave. Intensity (mm/hr)	4.688
Return Period (years)	2.0



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CONSULTING ENGINEERS

APPENDIX G – EXISTING AND PROPOSED DRAINAGE PLANS

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Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041

SITE: Hollingworth Road, Littleborough
REF: HYD383
REV: 0
DATE: 03/01/2019

BETTS HYDRO CONSULTING ENGINEERS

EXISTING DRAINAGE SITUATION

N

FEATHERSTALL BROOK
RIVER ROCH
ROCHDALE CANAL
HOLLINGWORTH ROAD
LITTLEBORO
(P)
SMITHY BRIDGE
LAKE BANK
HOLLINGWORTH LAKE

LEGEND

- Masterplan Boundary
- Site Extents
- AKZO Nobel Site
- Rochdale Council Carpark
- Railway Line
- Gas Main and Easement

Existing Drainage Features

- Topography
- Man River
- Canal
- Reservoir
- (P) Pond

Existing Sewer Networks

- Public Combined Sewer
- Public Foul Water Sewer
- Lake to Canal Pipeline and Easement

FURTHER NOTES:

This drawing is not a drainage 'design' it is a preliminary drainage strategy showing key existing sewer locations (see sewer records for full details).

No hydraulic simulation or assessment of these proposals has been undertaken.

Proposed points of connection to the existing watercourse and sewer require invert levels to be accurately established. Refer to proposed drainage plan.

Surcharging of the proposed outfall will require modelling to satisfy the requirements of united utilities along with full hydraulic analysis.

SITE: Hollingworth Road, Littleborough
REF: HYD383
REV: 0
DATE: 03/01/2019

BETTS HYDRO CONSULTING ENGINEERS

PRELIMINARY DRAINAGE STRATEGY PLAN

N

FEATHERSTALL BROOK
RIVER ROCH
ROCHDALE CANAL
HOLLINGWORTH ROAD
LITTLEBORO
(P)
1
2
3
SMITHY BRIDGE
LAKE BANK
HOLLINGWORTH LAKE

LEGEND

- Masterplan Boundary
- Site Extents
- AKZO Nobel Site
- Rochdale Council Carpark
- Railway Line
- Gas Main and Easement

Existing Drainage Features

- Main River
- Canal
- Reservoir
- (P) Pond

Existing Sewer Networks

- Public Combined Sewer
- Public Foul Water Sewer
- Lake to Canal Pipeline and Easement

Proposed Drainage Connections

- Surface Water Drainage Connection(s)
- Foul Water Drainage Connection(s)
- Proposed Point of Connection

FURTHER NOTES:

This drawing is not a drainage 'design' it is a preliminary drainage strategy showing key existing sewer locations (see sewer records for full details).

No hydraulic simulation or assessment of these proposals has been undertaken.

Proposed points of connection to the existing watercourse and sewer require invert levels to be accurately established. Refer to proposed drainage plan.

Surcharging of the proposed outfall will require modelling to satisfy the requirements of united utilities along with full hydraulic analysis.

*1 **SURFACE WATER CONNECTION INTO A WATERCOURSE:**

Assuming infiltration will not be feasible based on the information reviewed, then in accordance with the drainage hierarchy the next method to be explored is to discharge surface water run-off to a watercourse. The nearest watercourse to site is the River Roch (Main River) located approximately 450m to the north of site beyond the canal and railway. Given the engineering constraints associated with routing to the Main River it is unlikely that a direct discharge from site to the River Roch will be achievable as routing would need to span across 450m beneath a canal structure and railway line.

*2 **SURFACE WATER CONNECTION INTO A CANAL:**

Given that infiltration and a connection into the River Roch is unlikely to offer a surface water management solution for the site, it is therefore proposed the development site mimics the existing situation and discharges at the restricted pre-development greenfield rate of 256.1l/s (QBar) to the canal. The canal is a private asset as such consent for works to this asset will be required from the CRT. An enquiry has been sent to the CRT however a response is at this time outstanding. It is understood that the CRT can accept formal surface water discharges on competitive commercial terms and they will charge accordingly for the benefits provided. It should also be noted as the CRT are not a statutory drainage authority, they are not obliged to accept discharges into their network, therefore it is important at this early stage to evidence all other methods of handling surface water are not feasible we have therefore reviewed other options available.

*3 **SURFACE WATER CONNECTION INTO A SURFACE WATER PIPE:**

If a new formal outfall into the Rochdale Canal cannot be agreed, then the alternative would be to consider discharging into the public sewer network. UU have identified a surface water piped network crossing the development site which feeds the canal with water from Hollingworth Lake. This piped network could provide an alternative method for discharging surface water from the development site. Early pre-development discussion should be undertaken with UU to determine whether this UU asset crossing site would be suitable to cater for the site.

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APPENDIX H – CANAL & RIVERS TRUST

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Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041

Megan Berry

From: Mark Heath <Mark.Heath@canalrivertrust.org.uk>
Sent: 19 December 2018 10:58
To: Megan Berry
Cc: Ken Fowler; Customer Services
Subject: RE: Historical Canal Flooding
Attachments: Appendix A.PDF

Dear Megan,

RE:- Historical Canal Flooding: Hollingworth Road, Littleborough, Rochdale Canal

Further to your enquiry received 17 December 2018, Canal & River Trust can confirm the following:-

The Trust are not aware of any breach or overtopping events in the vicinity.

The Trust also add that whilst Hollingworth Reservoir provides a feed to the Rochdale Canal, this is not under the jurisdiction of the Trust, as is owned and maintained by United Utilities.

Further, please note that the canal pound (lock to lock) adjacent to the site identified is approximately 5.75km in length, with an average width of 14m.

Please be aware that we are unable to comment on the flood risk to individual properties or developments and interpretation of the information provided in this e-mail is your responsibility.

For further advice on flood risk from canals we have included some generic guidance, please refer to Appendix A attached.

We trust this is satisfactory, however if you do require any further information please do not hesitate to contact the undersigned.

Kind regards

Mark
Mark Heath
Water Engineer, Water Management Team
(North West, Yorkshire & the North East, East Midlands Regions)

Canal & River Trust **I Red Bull Yard I** Congleton Road South **I Church Lawton I** Stoke-on-Trent **I ST7 3AP**

From: Ken Fowler
Sent: 18 December 2018 14:08
To: Mark Heath <Mark.Heath@canalrivertrust.org.uk>
Cc: Customer Services <Customer.Services@canalrivertrust.org.uk>; Megan Berry <meganberry@betts-associates.co.uk>
Subject: RE: Historical Canal Flooding

Mark, you know this area a lot better than I do; please can you research and reply.

Thanks

Ken Fowler MICE, CEng
Principal Water Engineer
Water Management Team
Yorkshire & North East, East Midlands and North West Regions

T 0113 2816875

M 07710 175461
E Ken.Fowler@canalrivertrust.org.uk
W canalrivertrust.org.uk
Canal & River Trust, Fearns Wharf, Neptune Street, Leeds, LS9 8PB

From: Megan Berry <meganberry@betts-associates.co.uk>
Sent: 17 December 2018 17:38
To: Ken Fowler <Ken.Fowler@canalrivertrust.org.uk>
Cc: Customer Services <Customer.Services@canalrivertrust.org.uk>
Subject: Historical Canal Flooding

F.A.O Flood Risk, Drainage and/or Planning department

Please forward to the correct department/ office

Good Afternoon Ken,

Hollingworth Road, Littleborough.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons) GradCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO
Engineering Consultants
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CHESTER - 01244 289041
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CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

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CONSULTING ENGINEERS

APPENDIX H – STORMWATER STORAGE ESTIMATES

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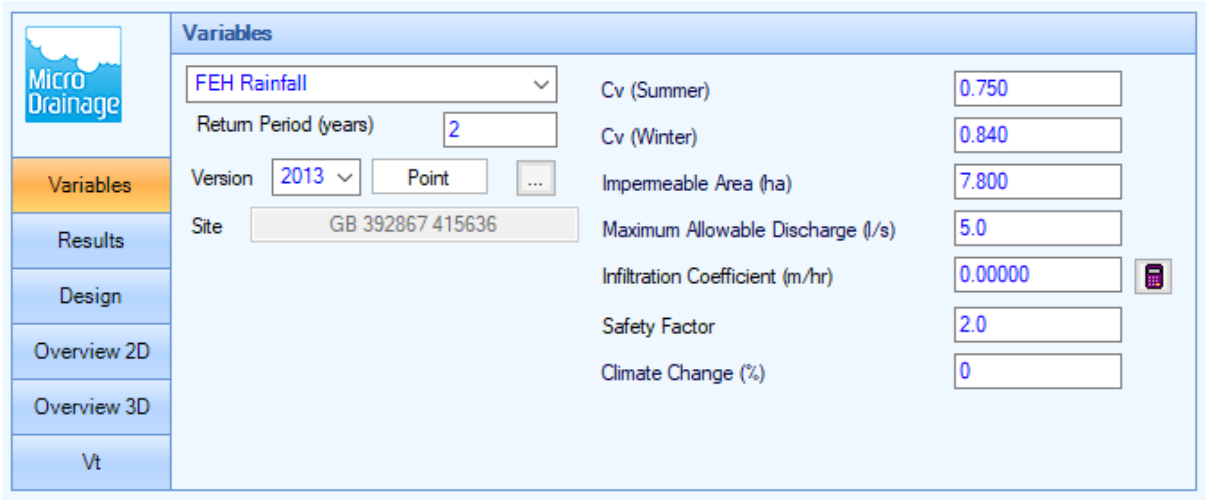
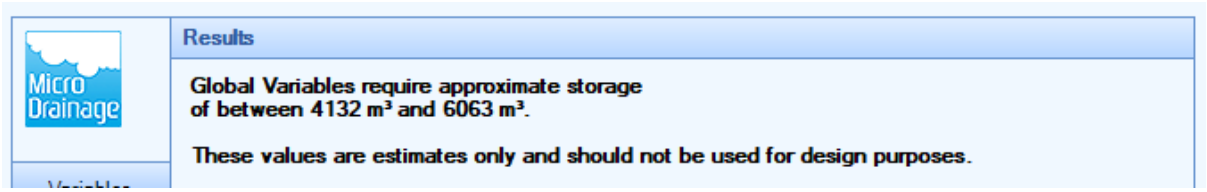
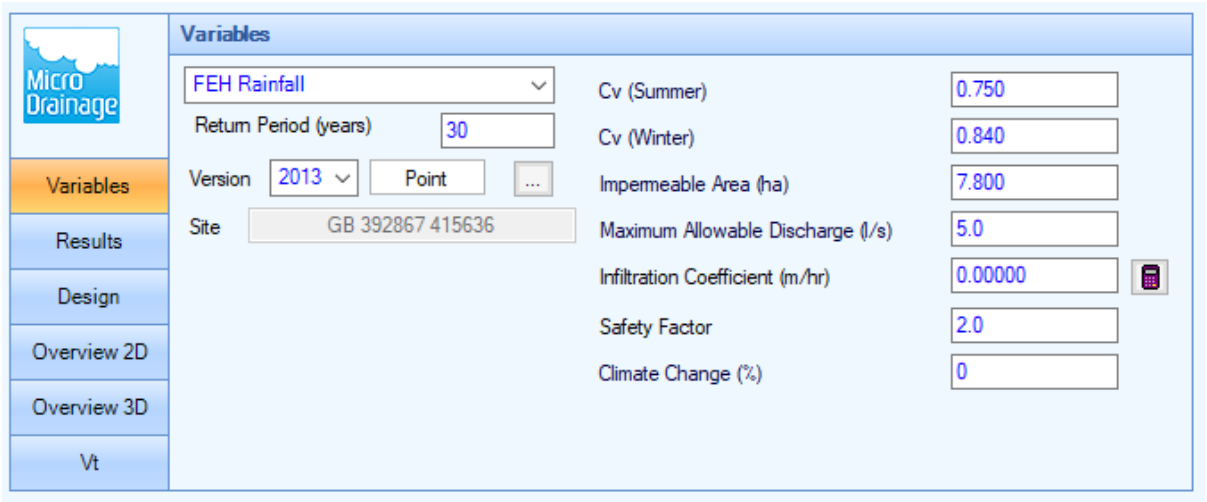
Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041

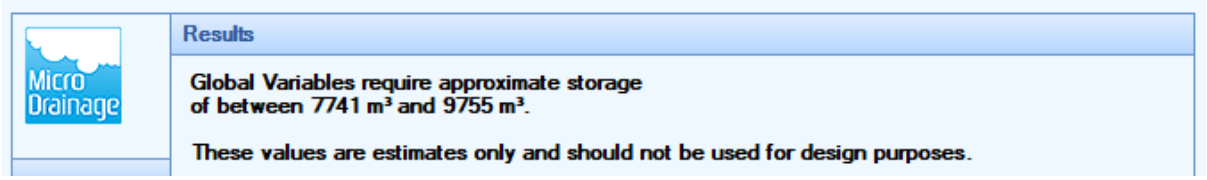
1 YEAR RETURN PERIOD STORM EVENT



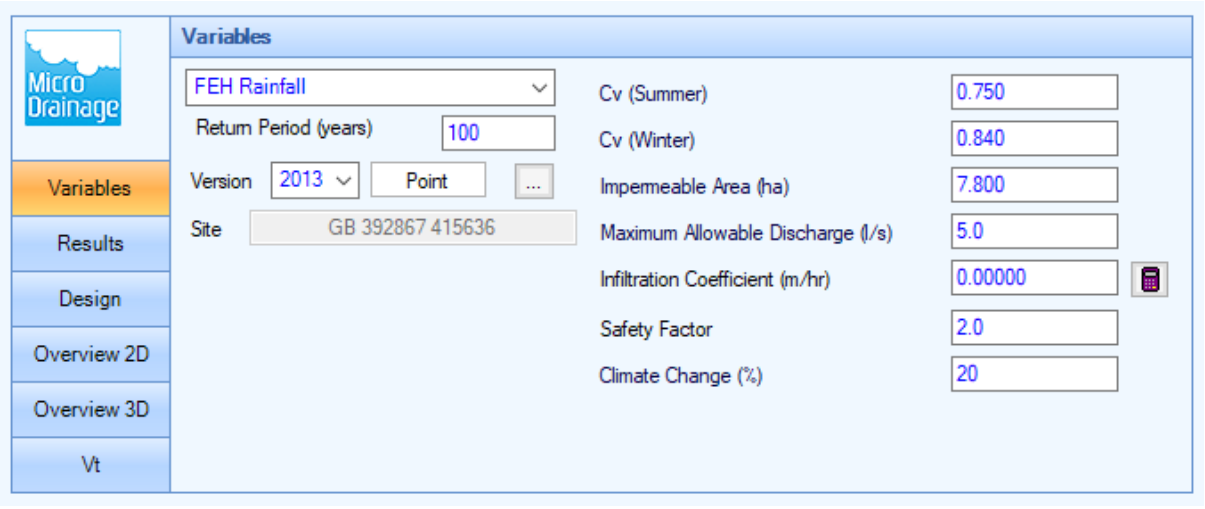


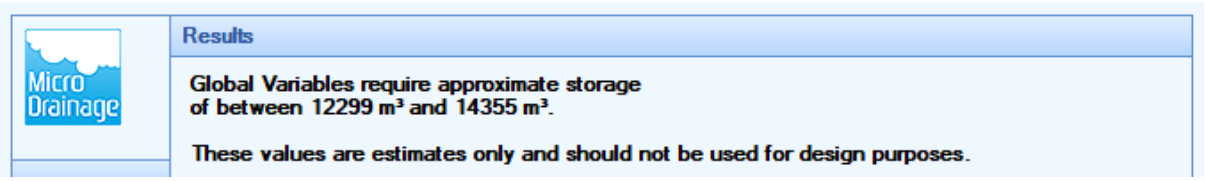
30 YEAR RETURN PERIOD STORM EVENT



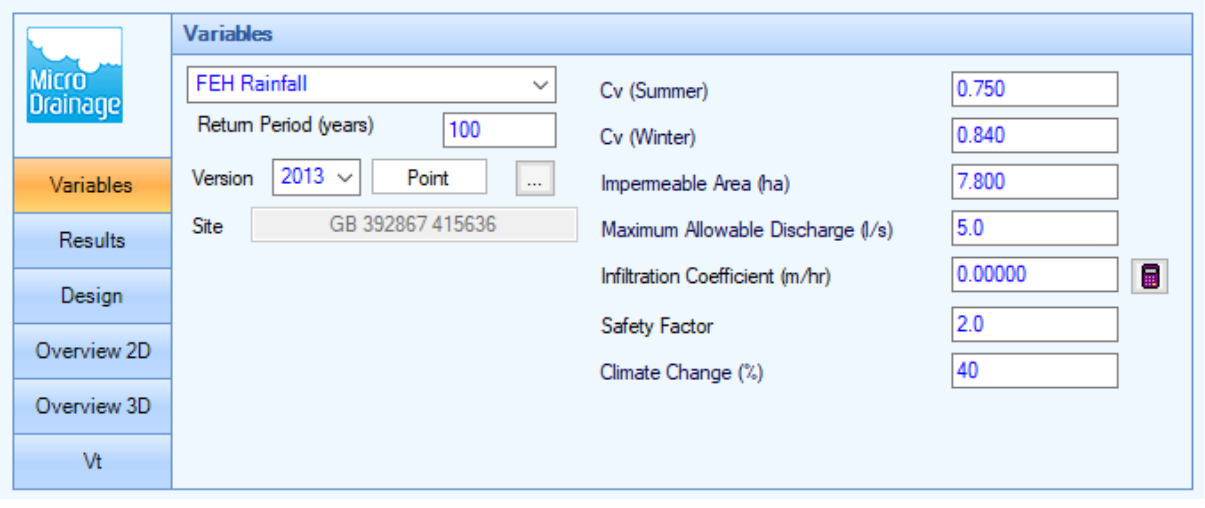


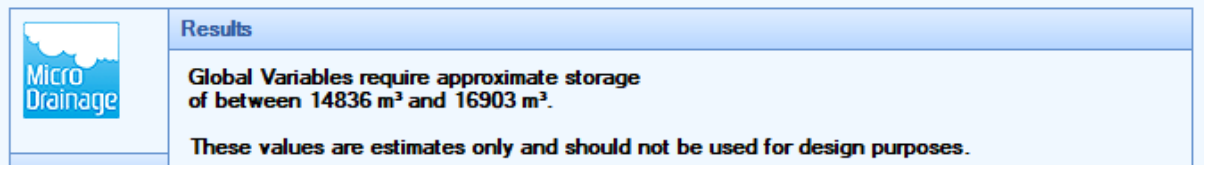
100 YEAR RETURN PERIOD STORM EVENT + 20% CLIMATE CHANGE





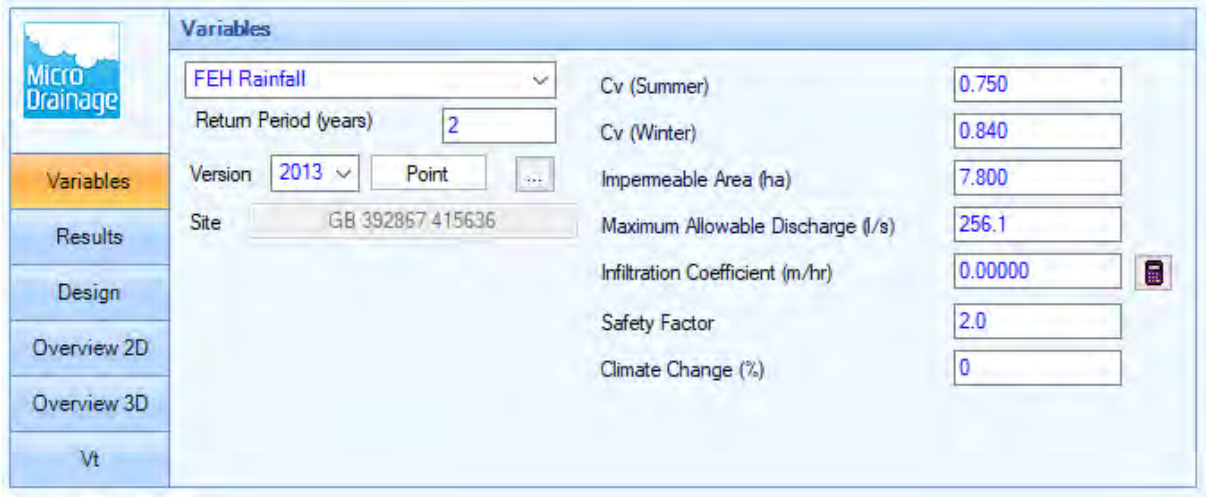
100 YEAR RETURN PERIOD STORM EVENT + 40% CLIMATE CHANGE

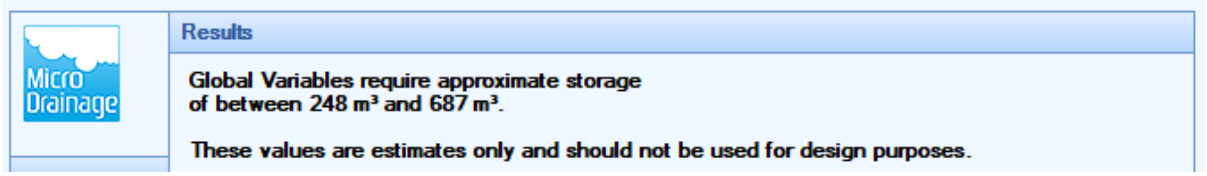




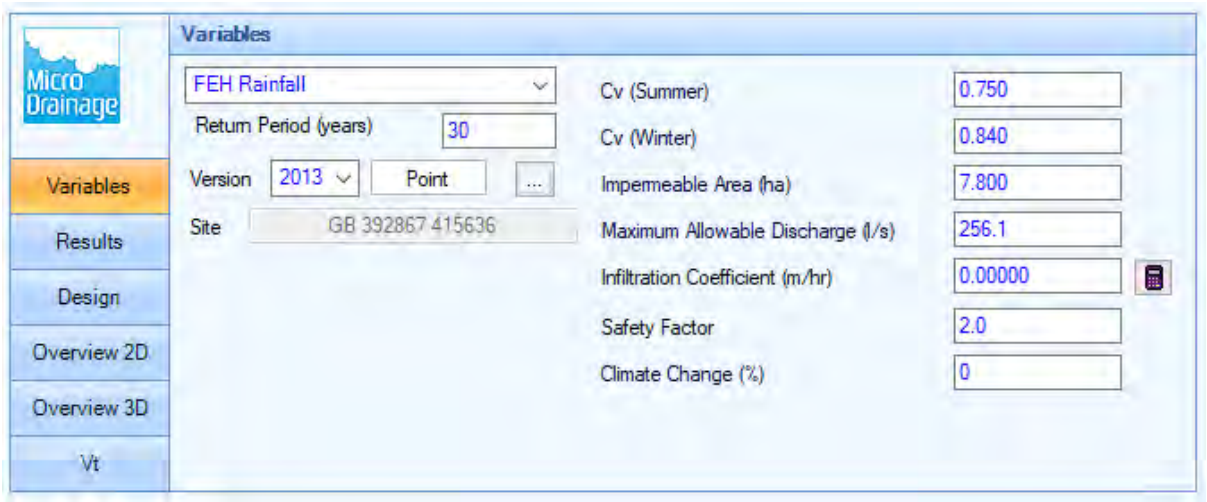
QUICK STORAGE ESTIMATES HOLLINGWORTH ROAD, LITTLEBOROUGH

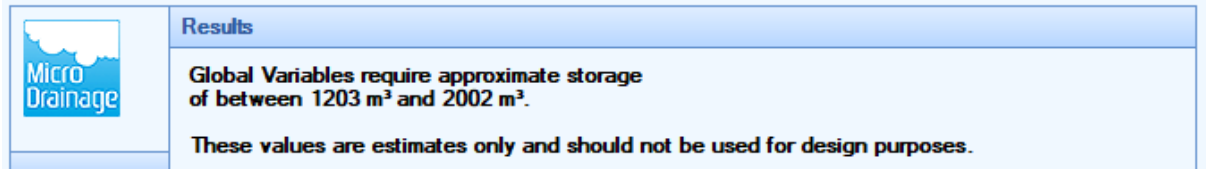
1 YEAR RETURN PERIOD STORM EVENT



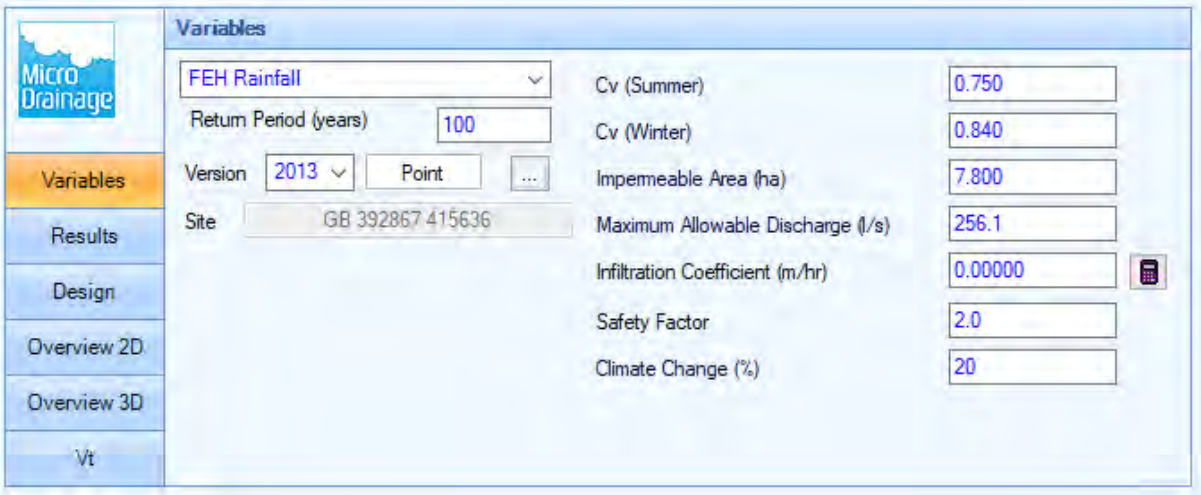


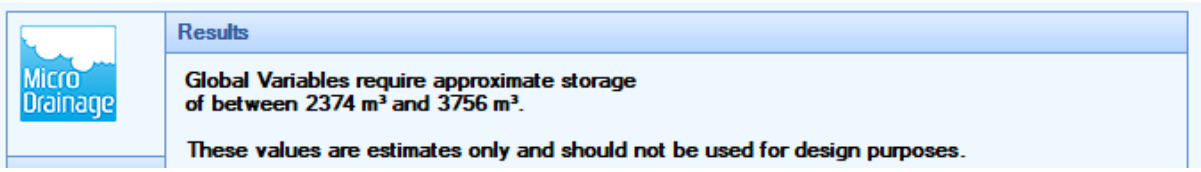
30 YEAR RETURN PERIOD STORM EVENT





100 YEAR RETURN PERIOD STORM EVENT + 20% CLIMATE CHANGE





100 YEAR RETURN PERIOD STORM EVENT + 40% CLIMATE CHANGE