

Flood Risk Assessment

PRIMROSE LANE, LIVERSEDGE

JONES HOMES

14 JUNE 2023



FLOOD RISK ASSESSMENT
PRIMROSE LANE, LIVERSEDGE
FOR
JONES HOMES



47685-001

14 June 2023

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FLOOD RISK ASSESSMENT
PRIMROSE LANE, LIVERSEDGE
FOR
JONES HOMES

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Issue 1: 07 December 2022

Issue 2: 24 March 2023 – Layout update to Rev T, FRA amended following client comments

Issue 3: 30 May 2023 – Drainage strategy updated to sewer option following CCTV survey of culvert

Issue 4: 14 June 2023 – YW sewer levels added to drainage strategy

EXECUTIVE SUMMARY

The project comprises the proposed development of a 2.94-hectare greenfield site for residential use.

The Environment Agency's Flood Map for Planning shows the site to lie within Zone 1. The site is not at significant risk of flooding from any source. In accordance with current Planning Practice Guidance 'Flood Risk and Coastal Change', sequential testing is not required.

Surface water disposal is considered in accordance with the drainage hierarchy in Building Regulations Part H 2015 and Planning Practice Guidance 'Reducing the causes and impacts of flooding', paragraph 80.

Infiltration type SuDS, such as soakaways, will not be viable due to the presence of impermeable ground across the majority of the site. Two locations corresponding to the presence of fractured sandstone at the surface recorded successful infiltration results. However, soakaways are not recommended since the sandstone forms a thin capping in this area and is underlain by mudstone bedrock. If soakaways were to be used, there would be a risk of water emergence down slope.

Further investigations have been carried out to locate and survey the existing culvert crossing the site. However, the survey was abandoned approximately 27 m downstream from the inlet due to heavy rubble blocking the route.

Based on the findings of the CCTV survey it has been determined that discharging surface water from the site to the culvert would not be a suitable means of surface water disposal given its age and poor condition.

Surface water disposal will be via gravity to the 375 mm public surface water sewer in Darley Road east of the site restricted to 3.5 l/s.

Attenuation storage will be provided for rainfall events up to the return period of 1 in 100 year plus climate change. The total estimated storage volume is 1,378 m³ subject to detailed design.

Foul effluent will discharge to the 225 mm public foul sewer in Darley Road immediately east of the site.

The drainage systems will be offered for adoption by Yorkshire Water.

1.0 THE DEVELOPMENT AND NATIONAL PLANNING POLICY

1.1 Introduction

This Flood Risk Assessment has been prepared in accordance with current National Planning Policy Framework¹ and Planning Practice Guidance 'Flood Risk and Coastal Change'² on the instruction of Jones Homes. Any other parties using the information in this report do so at their own risk, unless previously approved in writing.

The project comprises the development of a 2.94-hectare greenfield site for residential use.

1.2 Site location and description

The site is located within Liversedge, to the north-east of Huddersfield, and is centred on coordinates 419715, 424135 (Appendix 1).

The site is bounded by Primrose Lane to the west with open fields beyond, a wood to the north with a watercourse and playing field beyond, and residential dwellings to the south and east.

The site is currently occupied by a number of open fields. A wood is located at the northern end of the site and mature trees border the north-eastern edge.

The site falls from the south to north. A topographic survey is included in Appendix 2. The survey does not extend to the wooded area at the northern end of the site, however the fall across the remainder of the site is from approximately 103.7 mAOD to 84.5 mAOD at an average gradient of 1 in 10.

Proposals are for 67 household dwellings with access from Darley Road (Appendix 3).

1.3 Environment Agency - Flood Map for Planning

The Environment Agency's Flood Map for Planning (Figure 1 and Appendix 4) shows that the site lies within Zone 1 (low risk); land having a less than 1 in 1,000 annual probability of river flooding.

¹ <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

² <https://www.gov.uk/guidance/flood-risk-and-coastal-change>



Figure 1: Environment Agency's Flood Map for Planning

1.4 Kirklees Council Strategic Flood Risk Assessment

The Kirklees Council's Strategic Flood Risk Assessment flood map is based on the Environment Agency flood map and records the site to be within Flood Zone 1 (Appendix 5).

1.5 National Planning Policy Framework

The National Planning Policy Framework (July 2021) sets out the principles for assessing the suitability of sites for development, in relation to flood risk, as part of the planning process.

1.5.1 Sequential Test

Initially a Sequential Test is applied to the allocation of land suitable for development. The test is required for any development proposed in Flood Zone 2 or 3 (and occasionally also in Flood Zone 1

where there are flood risks present which are not identified on the Environment Agency's Flood Maps for Planning).

The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites, appropriate for the proposed development, in areas with a lower probability of flooding.

The site lies within Zone 1 and this report confirms that the site is not at significant risk of potential flooding from any source, therefore the sequential test is not required.

1.5.2 Climate change

An issue emphasised in the Planning Policy Guidance is the requirement to take account of potential climate change effects. New development is generally accepted as having a 100 year design life for flood risk purposes. Climate change allowances for peak rainfall intensity³ are to be selected based on the assigned values for the relevant management catchment for the relevant epoch suited to the design life of the development. For the Aire and Calder management catchment the upper end allowance of 45% should be used to assess storage requirements.

³ <https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall?mgmtcatid=3029>

2.0 FLOOD RISK

2.1 Potential sources of flooding

The Environment Agency and Strategic Flood Risk Assessment maps are intended for general guidance on flood risk and it is also necessary to consider other, more detailed, sources in relation to local factors.

2.1.1 Fluvial

The nearest watercourse is an unnamed drain, a tributary of the River Spen, located approximately 30 m north of the site. The drain joins the River Spen approximately 180 m north of the site. Two unnamed drains are located approximately 50 m west of the site. Kirklees Council SFRA mapping (Appendix 5) shows these drains cross the north-western corner of the site, possibly within culvert, to join the unnamed drain north of the site. Flood risk from this source is assessed as negligible.

2.1.2 Surface water

The Environment Agency surface water flood risk map (Figure 2 and Appendix 4) shows the majority of the site is at very low risk of surface water flooding. Very low risk corresponds to the unshaded areas of the map. There is a small area along the northern boundary of the site which is at low risk of surface water flooding. This is within the existing wooded area which is to be retained and no development is proposed here.

Very low risk refers to land having less than a 1 in 1,000 annual exceedance probability of flooding (0.1% AEP). Low risk refers to land having between a 1 in 1,000 and 1 in 100 annual exceedance probability of flooding (0.1% - 1% AEP).

Surface water ponding depths for extreme rainfall events between the 1 in 100 and 1 in 1000 year return period range are below 300 mm (Appendix 4).

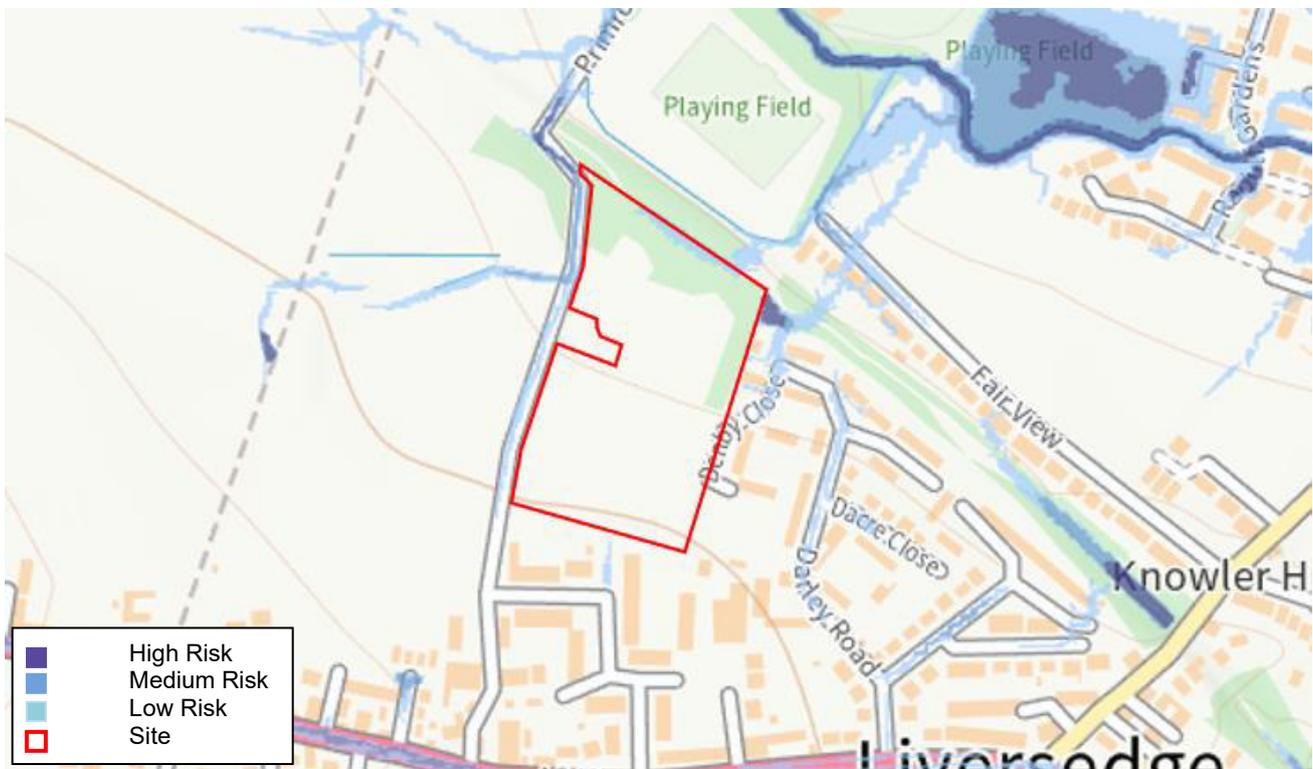


Figure 2: Environment Agency – Risk of surface water flooding map

2.1.3 Groundwater

Groundwater is a potential flood risk to areas which are low lying and on permeable ground or, occasionally, to areas of higher ground in the vicinity of springs. The Kirklees Council SFRA groundwater flood map shows the site is within an area with a less than 25% susceptibility to groundwater flooding (Appendix 5).

2.1.4 Sewerage

The surrounding public sewer network is owned and maintained by Yorkshire Water. There is no public record of any flood risk to the site associated with these sewers and the Kirklees Council SFRA historic flood map shows there are no historic Yorkshire Water sewer flooding incidents (DG5 register) within the vicinity of the site (Appendix 5).

2.2 Historic flooding

Online mapping records the site to be outside the historical flood outline.

2.3 Residual flood risk

The site is not at significant risk of flooding from any source and no flood mitigation measures are required.

3.0 DRAINAGE STRATEGY

3.1 Existing drainage

Yorkshire Water sewer records (Appendix 6) show a 225 / 375 / 450 mm diameter public surface water sewer and a 225 mm diameter public foul sewer in Darley Road immediately east of the site.

3.2 Yorkshire Water consultation

Pre-planning advice has been received from Yorkshire Water (Appendix 6); letter reference Y001558 dated 16th February 2022. The main points of the advice are summarised below.

- There is a 800 mm diameter public syphon sewer recorded crossing the site. No buildings or other obstructions are to be erected within 6.5 m each side of the sewer centre-line and no trees planted within 5 m of this public sewer.
- There is a 750 mm diameter public combined sewer recorded adjacent to the northern boundary of the site. No buildings or other obstructions are to be erected within 4 m each side of the sewer centre-line and no trees planted within 5 m of this public sewer.
- It may not be acceptable to raise of lower ground levels over the sewer nor to restrict access to the manholes on the sewer. This is not an issue given the proposals do not involve this area.
- Development should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.
- Foul water domestic waste can discharge to the 750 mm diameter public combined sewer recorded to the north of the site.
- Following the surface water disposal hierarchy, surface water should look to drain either to soakaway or watercourse in the first instance. It is understood that a watercourse is located to the north of the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable).

Subsequent correspondence with Yorkshire Water was received by email in March 2022 (Appendix 6). The main points of advice are summarised below:

- Foul water domestic waste can discharge to the 225 mm public foul sewer in Darley Road east of the site.
- As a last resort subject to evidence why a discharge to watercourse could not be achieved surface water could discharge to public surface water sewer in Darley Road restricted to 3.5 l/s.

3.3 Ground conditions

The British Geological Survey maps show no superficial deposits recorded at the site. Bedrock geology is recorded as mudstone, siltstone and sandstone of the Pennine Lower Coal Measures Formation for the majority of the site. Two bands of sandstone of the Pennine Lower Coal Measures Formation are recorded beneath the south-east corner and extending into the south-western quarter of the site.

The ground investigation carried out at the site in September 2021 recorded the northern part of the site is underlain by topsoil with between 1.3 and 4 m of made ground consisting of clayey sandy gravel or sandy clay beneath. The made ground is underlain by silty clay or sandy silty clay with weathered mudstone below. In the southern part of the site, topsoil overlying weathered mudstone or sandstone consisting of silty clay or gravel is present. The sandstone is less weathered at depth.

Groundwater was not encountered across the site.

3.4 Greenfield calculations

Greenfield runoff is calculated using the ReFH2.3 statistical rainfall-runoff method with FEH 2013 rainfall data using the default catchment characteristics (Appendix 7). Table 1 below summarises the runoff rates for varying return periods. These figures relate to the 2.94 ha site and runoff per unit area (hectare).

Greenfield runoff				
Catchment	Return period			
	1 in 1 yr	1 in 2 yr	1 in 30 yr	1 in 100 yr
Calder Lower	15.5 l/s	18.0 l/s	43.8 l/s	59.3 l/s
	5.3 l/s/ha	6.1 l/s/ha	14.9 l/s/ha	20.2 l/s/ha

Table 1: Greenfield runoff rates

3.5 Drainage hierarchy

Surface water disposal should be in accordance with the drainage hierarchy in Building Regulations Part H⁴ and Planning Practice Guidance 'Reducing the causes and impacts of flooding', paragraph 80 reference ID 7-080-20150323. Disposal via SuDS methods should be considered as the first option. Disposal to the public sewer should be considered only when SuDS methods and disposal to the watercourse are shown to be unsuitable.

3.5.1 Sustainable Drainage Systems (SuDS)

SuDS methods include water infiltration systems such as soakaways, basins and filter strips, together with swales, pervious pavements, detention basins, ponds and other wetland solutions. The various methods are considered in detail in The SuDS Manual (CIRIA C753).

Infiltration testing was carried out at the site in September 2021 (Appendix 7). Permeability across the majority of the site was found to be negligible due to the presence of clay and mudstone. Two locations corresponding to the presence of fractured sandstone at the surface recorded successful infiltration results. Whilst successful results were recorded, soakaways are not recommended since the sandstone forms a thin capping in this area and is underlain by mudstone bedrock. If soakaways were to be used, there would be a risk of water emergence down slope. Furthermore, it is noted that Kirklees Council do not accept soakaways as a means of surface water discharge on site with slopes in excess of 1 in 20 due to the risk of water emergence down slope. The site slopes at an average gradient of 1 in 10 and it is therefore determined that soakaway drainage will not be feasible.

Source control SuDS features, such as Type C (sealed) permeable paving, may be suitable and their use is summarised in the appended SuDS checklist (Appendix 8).

3.5.2 Watercourse

The nearest watercourse is an unnamed drain, a tributary of the River Spen, located approximately 30 m north of the site. The drain joins the River Spen approximately 180 m north of the site. Two unnamed drains are located approximately 50 m west of the site. Kirklees Council SFRA mapping (Appendix 5) shows these drains cross the north-western corner of the site, possibly within culvert, to join the unnamed drain north of the site. Discharge to the existing watercourse north of the site would require crossing third party land.

⁴https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/442889/B_R_PDF_AD_H_2015.pdf

Further investigation was carried out to locate the culvert and a CCTV survey was undertaken on the 13th April 2023 (Appendix 8). The survey was abandoned approximately 27 m downstream from the inlet due to heavy rubble blocking the route.

Based on the findings of the CCTV survey it has been determined that discharging surface water from the site to the culvert would not be a suitable means of surface water disposal given its age and poor condition.

3.5.3 Public sewer

There is a 375 mm diameter public surface water sewer in Darley Road immediately east of the site. Discharge to the sewer will require a request for a new connection but does not involve third party land.

3.6 Proposals for surface water disposal

The final disposal strategy for surface water run-off requires detailed consideration and approval during the design phase of the project. The final design will need the approval of the relevant statutory bodies but will broadly follow these principles:

- Surface water disposal will be via gravity to the 375 mm public surface water sewer in Darley Road, east of the site restricted to 3.5 l/s.
- Attenuation storage will be provided for rainfall events up to the return period of 1 in 100 year plus climate change. The total estimated storage volume is 1,378 m³ subject to detailed design. Attenuation calculations and a drainage layout are provided in Appendix 9.
- The surface water drainage system will be offered for adoption to Yorkshire Water.

3.7 Proposals for foul disposal

Foul effluent will discharge via gravity to the 225 mm public foul sewer in Darley Road immediately east of the site.

The foul drainage system may be offered for adoption to Yorkshire Water.

3.8 Residual flood risk

There is a potential flood risk to site occupiers and to others from surface water runoff as a result of developing the site. The residual risk can be managed by the general flood mitigation measures outlined in Section 3.8.

3.9 Mitigation measures

The proposed surface water drainage system is designed to current best practice and to the standards laid out in the publication 'Design and Construction Guidance for foul and surface water sewers' and Building Regulations Part H 2015.

In the event of surface water exceedance during extreme rainfall events the site is laid out so that surface water runoff is directed away from houses, including those on neighbouring streets.

4.0 CONCLUSIONS

1. The site is within Flood Zone 1 and is not at significant risk of flooding from any source.
2. Further investigations have been carried out to locate and survey the existing culvert crossing the site. However, the survey was abandoned approximately 27 m downstream from the inlet due to heavy rubble blocking the route.
3. Based on the findings of the CCTV survey it has been determined that discharging surface water from the site to the culvert would not be a suitable means of surface water disposal given its age and poor condition.
4. Surface water disposal will be via gravity to the 375 mm public surface water sewer in Darley Road east of the site restricted to 3.5 l/s.
5. Attenuation storage will be provided for rainfall events up to the return period of 1 in 100 year plus climate change. The total estimated storage volume is 1,378 m³ subject to detailed design.
6. Foul water will discharge to the 225 mm public foul sewer in Darley Road immediately east of the site.
7. The drainage systems will be offered for adoption to Yorkshire Water.
8. The level of risk and safeguards available are considered appropriate to this class of development.

APPENDICES

APPENDIX 1



APPENDIX 2

APPENDIX 3



LEGEND:

- SF10 - 1800mm HIGH TIMBER SCREEN FENCE
- SF1 - BRICK WALL & TIMBER SCREEN FENCE
- SF12 - 450mm HIGH TIMBER KNEE RAIL
- EXISTING HEDGE TO BE RETAINED
- EXISTING HEDGE REMOVED FOR NEW FOOTPATHS
- PROPOSED HEDGE
- PROPOSED TREE
- EXISTING TREES TO BE RETAINED
- EXISTING TREES TO BE REMOVED
- EXTENT OF NATURAL ENVIRONMENT AREA
- VISITOR PARKING
- REFUSE COLLECTION POINT
- COMBINED BIN STORAGE & REFUSE COLLECTION POINT
- STRUCTURED TREE PLANTING



T	13/03/23	SM	ED	TREES TO BE REMOVED AND REPLACED WITH STRUCTURED PLANTING, PLOT 67 BOUNDARY REVISED
S	02/03/23	PG	-	PLOT 56 CHANGED TO A BUCKLEY HOUSE TYPE

rev	date	initialed	inputted	content
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**PRIMROSE LANE
PROPOSED SITE LAYOUT**

client: **JONES HOMES**

client ref: []

date: **22/02/22** scale: **1:500@A1** drawn: **PG** checked: **ED**

drawing no: **3416-1-001** revision: **T**

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Schedule of Accommodation							
To be read in conjunction with drawing no. 3416-1-001 - Revision S							
Housetype	No. of Beds	Type	No. of Units	Percentage	Sq. Ft.	Total Sq. Ft.	
AP	APARTMENT	2 Bedrooms	Apartment	12	17.91	650	7800.00
KW	KESWICK	3 Bedrooms	Semi-detached/Detached	8	11.94	1009	8072.00
BA	BANBURY	4 Bedrooms	Detached	15	22.39	1354	20310.00
BE	BENTLEY	4 Bedrooms	Detached	12	17.91	1619	19428.00
BU	BUCKLEY	4 Bedrooms	Detached	6	8.96	1473	8838.00
BU(ct)	BUCKLEY CORNER TURNER	4 Bedrooms	Detached	6	8.96	1692	10152.00
LT	LATCHFORD	5 Bedrooms	Detached	8	11.94	1810	14480.00
Totals			67	100.00		89080.00	

PLANNING
 subject to structural review
 subject to accurate measured survey

DO NOT SCALE - ALL DIMENSIONS & LEVELS TO BE CHECKED ON SITE - THIS DRAWING IS COPYRIGHT

APPENDIX 4

Flood map for planning

Your reference
Liversedge

Location (easting/northing)
419702/424137

Created
23 Nov 2022 12:40

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

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

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.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>





Extent of flooding from surface water

- High
- Medium
- Low
- Very low
- + Location you selected



Surface water flood risk: water depth in a high risk scenario

Flood depth (millimetres)

- Over 900mm
- 300 to 900mm
- Below 300mm
- Location you selected



Surface water flood risk: water velocity in a high risk scenario

Flood velocity (metres/second)

- Over 0.25 m/s
- Less than 0.25 m/s
- Direction of water flow
- Location you selected



Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

- Over 900mm
- 300 to 900mm
- Below 300mm
- Location you selected



Surface water flood risk: water velocity in a medium risk scenario

Flood velocity (metres/second)

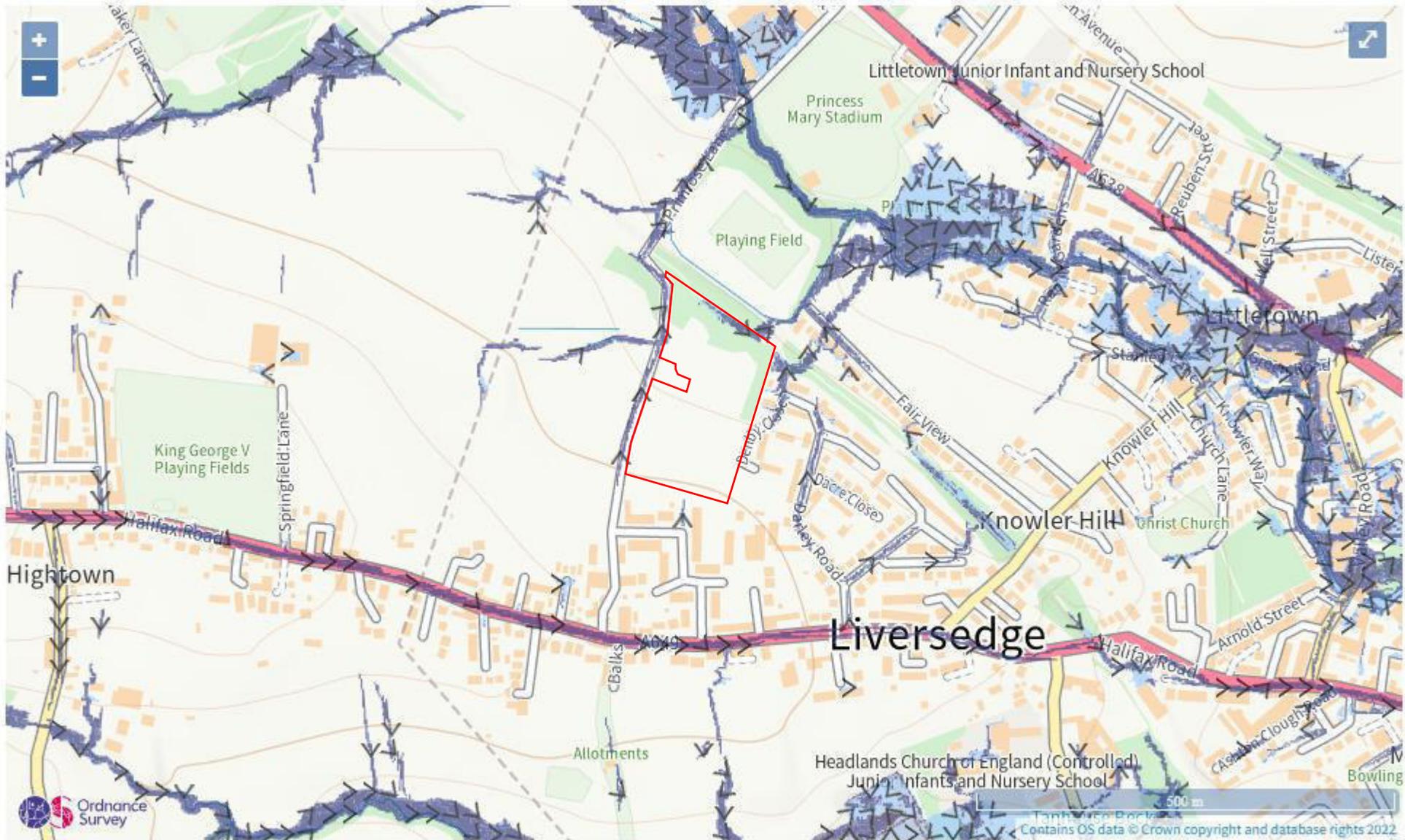
- Over 0.25 m/s
- Less than 0.25 m/s
- Direction of water flow
- Location you selected



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

- Over 900mm
- 300 to 900mm
- Below 300mm
- Location you selected

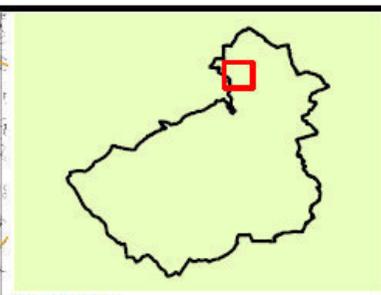
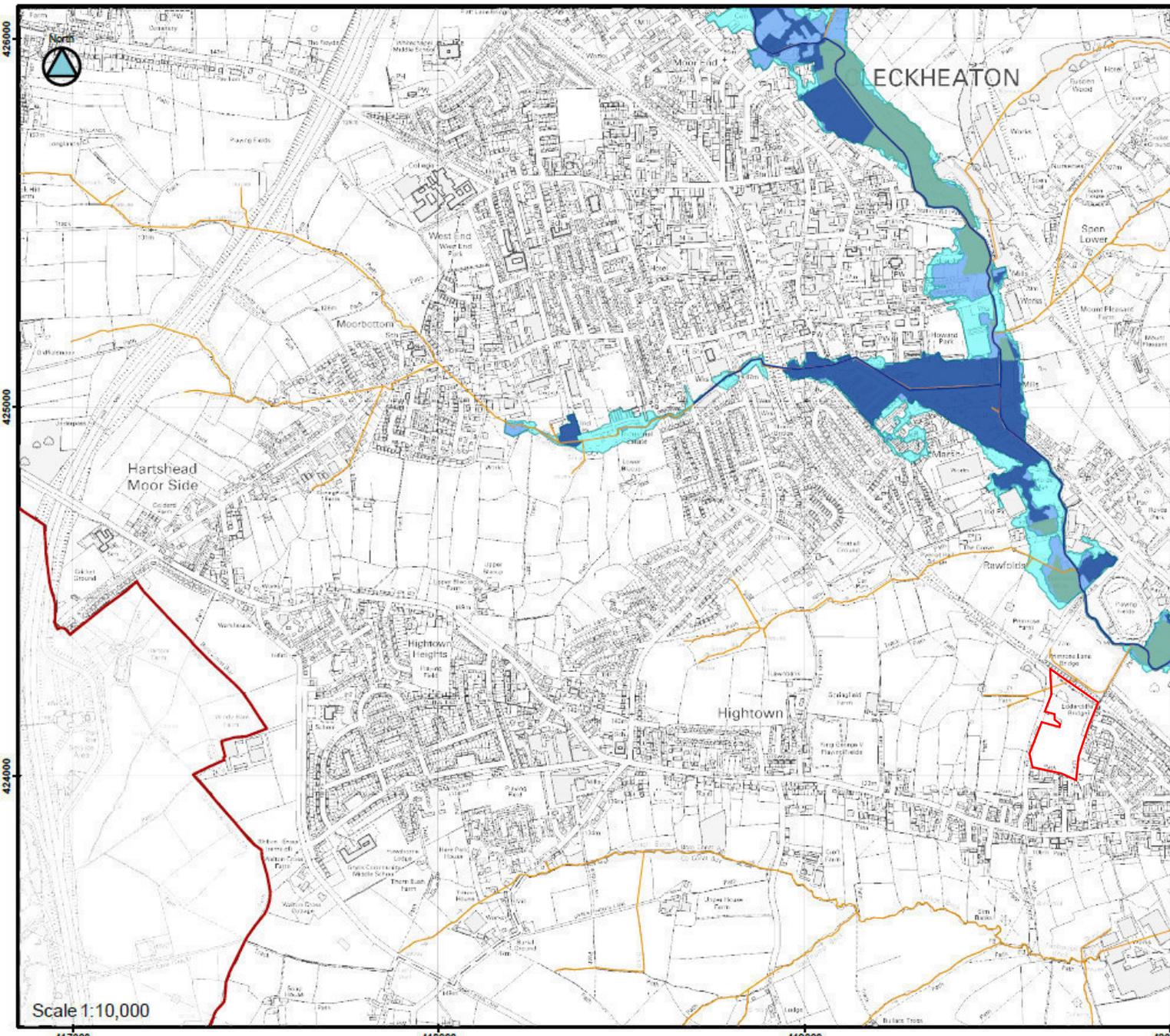


Surface water flood risk: water velocity in a low risk scenario

Flood velocity (metres/second)

● Over 0.25 m/s
 ● Less than 0.25 m/s
 ↖ Direction of water flow
 ⊕ Location you selected

APPENDIX 5



LEGEND

Choose Option

-  Council boundary
-  Main River
-  Detailed River Network
- Flood Zones**
-  Flood Zone 3b
-  Flood Zone 3ai
-  Flood Zone 3a
-  Flood Zone 2

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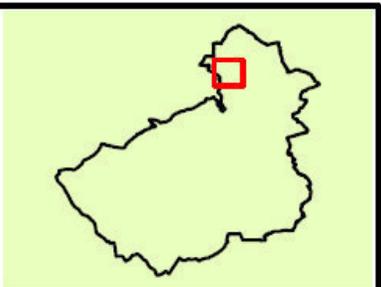
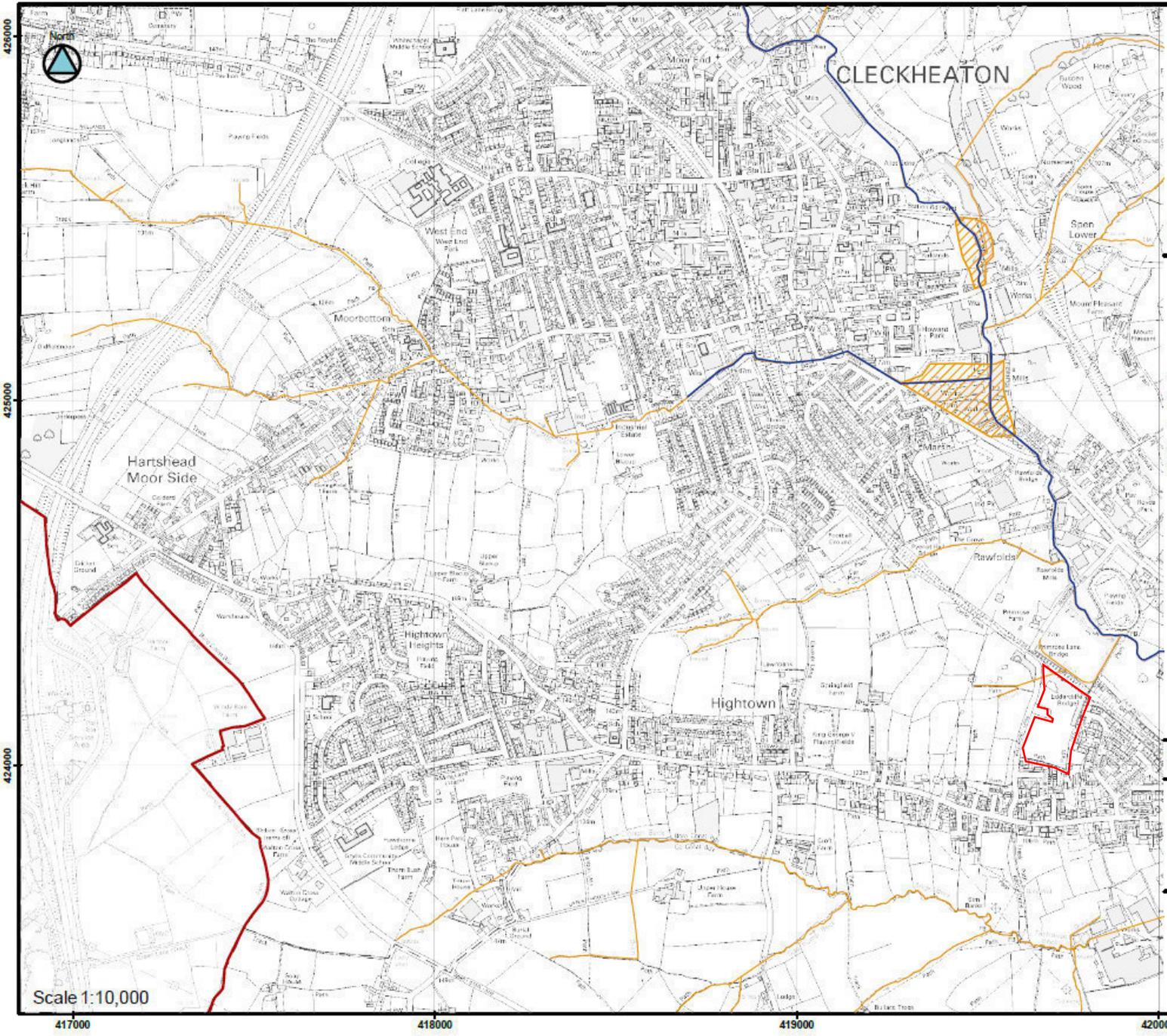


STRATEGIC FLOOD RISK ASSESSMENT
 For
KIRKLEES COUNCIL
 MAP_Y

Scale 1:10,000

417000 418000 419000 420000

426000
425000
424000



LEGEND

Choose Option

-  Council boundary
-  Main River
-  Detailed River Network
- Historic Flooding**
-  Historic Flood Map (EA)
-  DG5 Register incident (YWS)
-  Breach (CRT)
-  Overtopping (CRT)

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STRATEGIC FLOOD RISK ASSESSMENT
 For
KIRKLEES COUNCIL
 MAP_Y

Scale 1:10,000

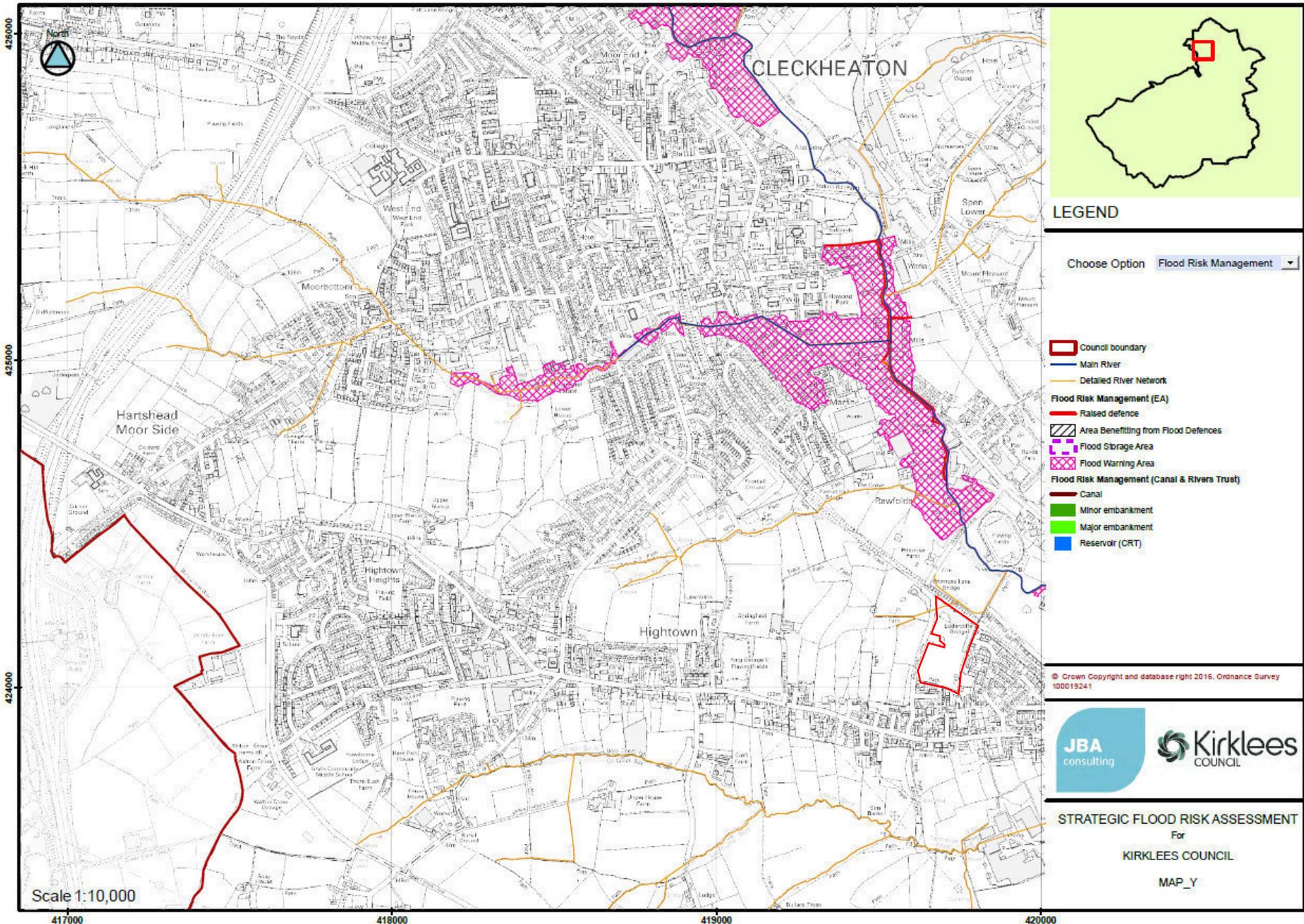
417000

418000

419000

420000

426000
425000
424000



LEGEND

Choose Option **Flood Risk Management**

-  Council boundary
-  Main River
-  Detailed River Network
- Flood Risk Management (EA)**
-  Raised defence
-  Area Benefiting from Flood Defences
-  Flood Storage Area
-  Flood Warring Area
- Flood Risk Management (Canal & Rivers Trust)**
-  Canal
-  Minor embankment
-  Major embankment
-  Reservoir (CRT)

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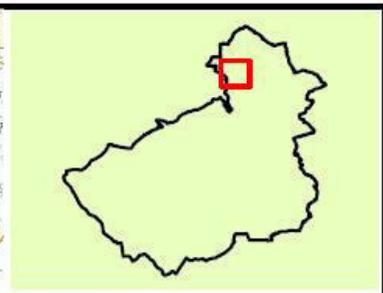
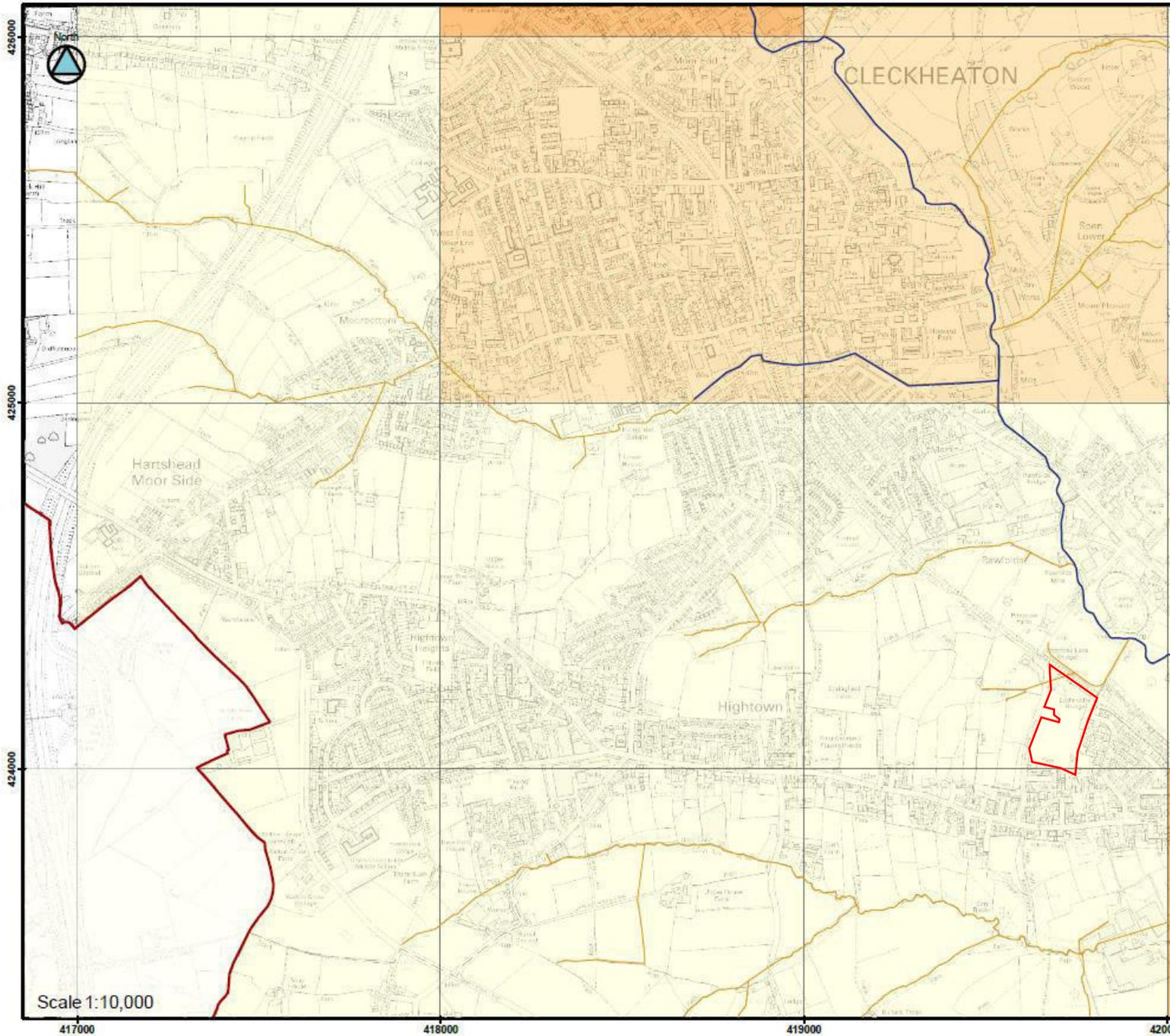


STRATEGIC FLOOD RISK ASSESSMENT
For
KIRKLEES COUNCIL
MAP_Y

Scale 1:10,000

417000 418000 419000 420000

426000
425000
424000



LEGEND

Choose Option

- Council boundary
- Main River
- Detailed River Network

**Areas Susceptible to Ground Water Flooding
Risk of Groundwater Emergence**

- >= 75%
- >= 50% < 75%
- >= 25% < 50%
- < 25%

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STRATEGIC FLOOD RISK ASSESSMENT
For
KIRKLEES COUNCIL
MAP_Y

Scale 1:10,000

417000 418000 419000 420000

426000
425000
424000

APPENDIX 6



YorkshireWater

Mr N Bridge
Bryan G Hall Ltd
15E Josephs Well
Hanover Walk
Leeds
LS3 1AB
nathanbridge@bryanghall.co.uk

Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482

Fax:

Your Ref:
Our Ref: Y001558

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

16th February 2022

Dear Mr Bridge,

**Primrose Lane off Darley Road, Liversedge, WF15 6LN – Pre-Planning
Sewerage Enquiry U546603**

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:



Existing Infrastructure

There is a 800 mm diameter public syphon sewer recorded crossing the site. No buildings, or other obstructions, are to be erected within 6.5 (six point five) metres is required at each side of the sewer centre-line, no trees planted within 5 (five) metres of this public sewer.

There is a 750 mm diameter public combined sewer recorded crossing the site. No buildings, or other obstructions, are to be erected within 4 (four) metres is required at each side of the sewer centre-line, no trees planted within 5 (five) metres of this public sewer.

It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer. If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0345 120 84 82.

Foul Water

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul water domestic waste can discharge to the 750 mm diameter public combined sewer recorded to the north of the site.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2010. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation.



You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

As the proposed site is currently undeveloped no surface water is known to have previously discharged to the public sewer network

As such, the local public sewer network does not have capacity to accept any surface water from the proposed site. If SuDS are not viable, the developer is advised to contact the Environment Agency/local Land Drainage Authority/Internal Drainage Board with a view to establishing a suitable watercourse for discharge.

It is understood that a watercourse is located to the north of the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable). Please note Yorkshire Water cannot provide plans of culverted watercourses or highway drains. To obtain plans please contact the Lead Local Flood Authority for more details.

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority/Internal Drainage Board, with regard to surface water disposal from the site.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply on line or obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for Code for Adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.



Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the Code for Adoption 2021/22, pursuant to an agreement under Section 104 of the Water Industry Act 1991. We are happy to offer pre-development technical advice on any prospective sites that you would like to put forward for for adoption, prior to submission of your adoption application.

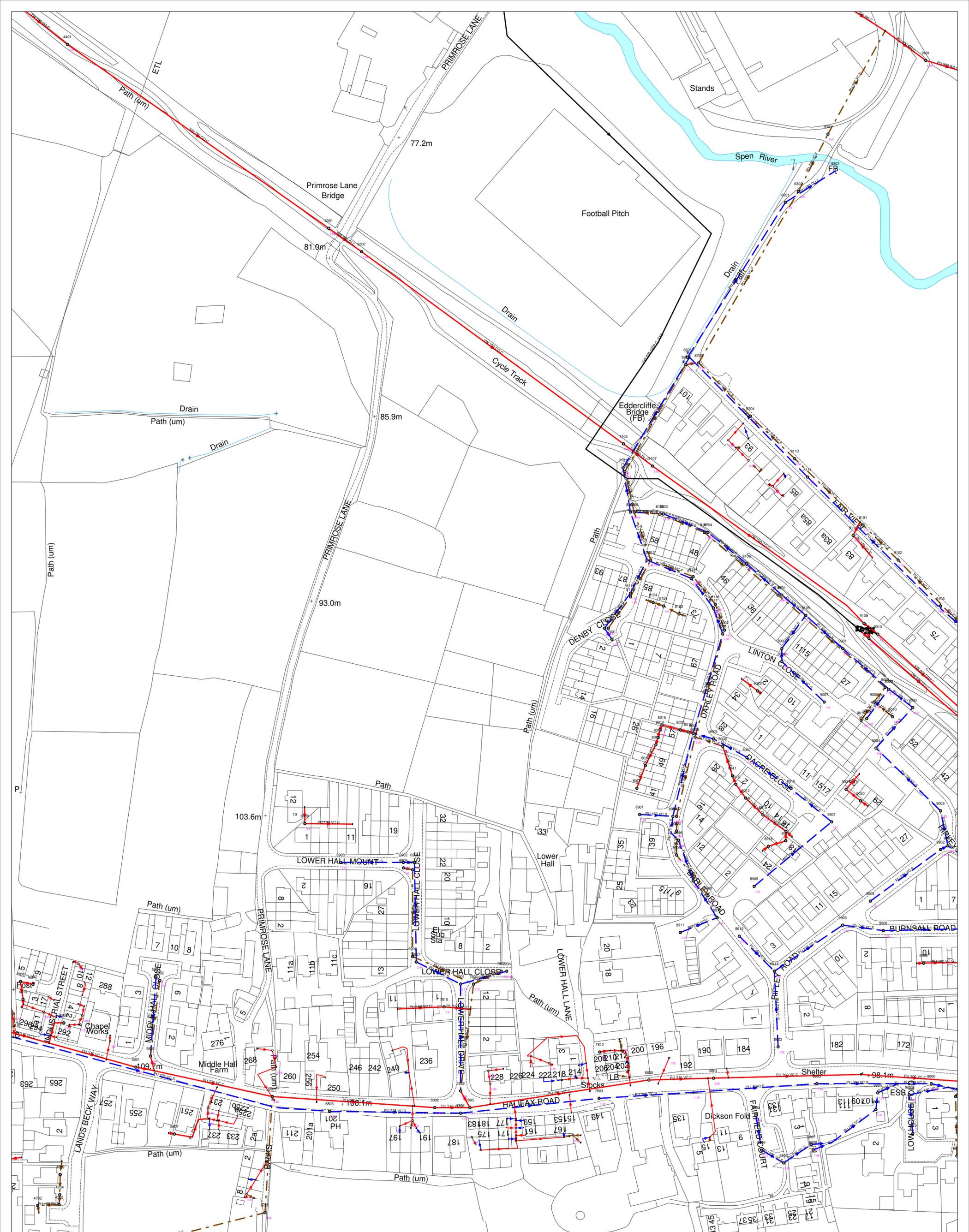
An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Sewer Adoption, Diversion and Requisition (telephone 0345 120 84 82) or email technical.sewerage@yorkshirewater.co.uk or visit - <https://www.yorkshirewater.com/developers/sewerage/sewer-adoptions/> for further information.

The site is within an area that may be affected by river, coastal or estuarine flooding. We would advise you to contact the Environment Agency for details.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

Chris Roberts
Development Services Technician



419654 : 424011

Map Name : SE1923NW

Title



Yorkshire Water,
PO Box 500,
Halifax Road,
Bradford BD6 2LZ
Contact Name :
YorMap Advisor C ROBERTS
Contact Tel : 87 2582

Notes

- Partial Key**
- Foul Sewer = F
 - Combined Sewer = C
 - Surface Water Sewer = SW
 - Trade Sewer = TD
 - Partially Separate = PS

This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.

Date Req : 16/02/2022, 10:54:39

Date Gen : 16/02/2022, 10:58:57

Source : Sewer Network Enquiry

APPENDIX 7

Preliminary Phase 2 Ground Investigation

**PRIMROSE LANE
LIVERSEDGE**

for

Jones Homes (Yorkshire) Limited

Report Number 4157

September 2021



Michael D Joyce Associates LLP

Geotechnical and Geoenvironmental Consultants

Charnock Court 6 South Parade Wakefield West Yorkshire WF1 1LR UK
T +44(0)1924 360458 E mdja@geoenvironmental.co.uk W www.geoenvironmental.co.uk

Preliminary Phase 2 Ground Investigation

PRIMROSE LANE, LIVERSEEDGE

Contents

1. Introduction
 2. Existing Information
 3. The Investigation
 4. Strata Profile
 5. In-Situ and Laboratory Testing
 6. Geoenvironmental Risk Assessment
 7. Recommendations
- Procedure Notes

Figures

- Figure 1 General Site Location
Figure 2 Site Plan with Exploratory Borehole and Trial Pit Positions
Figure 3 Northern and Southern sections of site
Figure 4 Depth of Made Ground
Figure 5 Development Proposals
Figure 6 Conceptual Site Model

Appendices

- Appendix 1 Window Sampling Records
Appendix 2 Trial Pit Records
Appendix 3 Geotechnical Laboratory Test Results
Appendix 4 Contamination Laboratory Test Results
Appendix 5 Photographs
Standard Appendices A and B

1 INTRODUCTION

1.1 At the request of Jones Homes (Yorkshire) Limited, a Phase I Geoenvironmental and Geotechnical Assessment (Desk Study) has previously been carried out Primrose Lane in Liversedge. It is proposed to redevelop the site with residential accommodation.

1.2 The purpose of the desk study was to review and assess published information on the site including geological, mining and hydrogeological data. It was also to review the past history of the site and its environmental setting. The findings were presented in Michael D Joyce Associates LLP's Report No. 4146 dated July 2021, and as such should be read in conjunction with this latest report.

1.3 Michael D Joyce Associates LLP has subsequently been instructed by Jones Homes (Yorkshire) Limited to carry out a preliminary intrusive investigation of the site. This investigation has comprised trial pitting and window sampling with associated in-situ and laboratory testing. Soakaway testing has also been carried out. Based in the initial findings, recommendations are made for the safe and economic development of the site. The study has not included checks on services on or adjacent to the site, and no structural or asbestos surveys have been carried out.

1.4 It should be noted that to date, there has been no investigation in respect of possible shallow mine workings and to locate two possible mineshafts on the site. This is planned for a future phase of investigation, which will also include the area of woodland proposed as Public Open Space. In-situ CBR testing is also proposed for a future date.

from Ground Gas in Affected Developments”, CIRIA report C665, “Assessing Risks Posed by Hazardous Ground Gases to Buildings” and NHBC Report No. 4 “Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present”. Gas monitoring is currently on-going and the results will be reported separately. However to date, two rounds of monitoring have been carried out. On the most recent visit (8th September 2021), no methane, carbon monoxide nor SVOC/VOC were detected. Carbon dioxide was low, ranging from 0.2% to 3.1% by volume, with no flows being recorded.

5.2 Soakaway Testing

5.2.1 Soakaway tests were carried out in most of the trial pits in accordance with BRE Digest 365: Soakaway Design. This involved filling the trial pit with water from a water tanker and recording the fall in water level over a period of time. From this it is possible to calculate the Soil Infiltration Rate (SIR) based on the trial pit dimensions and the rate of dissipation. The results were as follows;

Trial Pit	Effective Depth (m)	Fall in Water Level after 2 hours (cm)
TP1	1.0	<1
TP6	1.3	<1
TP7	0.8	<1
TP8	1.2	<1
TP12	2.0	2
TP13	1.7	3
TP14	2.6	2
TP15	2.6	3
TP16	0.9	Emptied in 2 minutes (3 rd run)
TP17	1.9	Emptied in 4 minutes (3 rd run)
TP19	1.8	3.5

5.2.2 Across virtually all of the site, the permeability was negligible. This is due to the presence of clays and mudstones.

5.2.3 The only two tests which were successful were in trial pits TP16 and TP17. These correspond to where fractured sandstone occurs at the surface. Trial pit TP16 emptied in approximately 2 minutes, and TP17 in 4 minutes on the third test run on each.

5.3 Geotechnical Laboratory Testing

The soil testing was carried out to BS1377:1990 Methods of Test for Soils for Civil Engineering Purposes. Testing was carried out by Chemtech Limited and Geolabs Limited to UKAS accredited procedures. The full results are presented in Appendix 3.

5.3.1 Plasticity Test

Atterberg Limits Classification tests were carried out on eight samples of the clay.

Trial Pit/ Borehole No.	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TP7	1.70	20	43	23	20
TP11	1.10	23	60	26	34
TP12	0.80	26	53	25	28
TP12	0.90	24	48	22	26
TP19	1.10	15	38	21	17
WS7	0.90	23	38	21	17
WS12	1.00	15	33	18	15
WS14	1.00	14	35	20	15

APPENDIX 8

Project

Project Name: GR59319_CCTV
Project Description: Cleansing & CCTV Inspection
Project Number: LD3343
Project Status: Complete
Project Date: 13/04/2023
Inspection Standard: MSCC5 Sewers & Drainage GB (SRM5 Scoring)



**CCTV
DRAINAGE
SURVEYS**

**THE UK'S LEADING
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SURVEY SPECIALISTS**

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Table of Contents

Project Name	Project Number	Project Date
GR59319 CCTV	LD3343	13/04/2023

Project Information	P-1
Scoring Summary	P-3
Section Item 1: INLET > OUTLET (INLETX)	1



Project Information

Project Name	Project Number	Project Date
GR59319 CCTV	LD3343	13/04/2023

Client

Company: Wardell Armstrong LLP
Contact: Elliott Heatherington
Department: Senior Environmental Geologist
Street: Northspring, 36 Park Row
Town or City: Leeds
County: West Yorkshire
Post Code: LS1 5JL
Phone: 0113 8315533
Mobile: 07826 958532
Email: eheatherington@wardell-armstrong.com



Site

Company: Wardell Armstrong - Primrose Lane
Contact: Andrew Dunhill
Department: Site Contact
Street: Primrose Lane
Town or City: Liversedge
County: West Yorkshire
Post Code: WF15 6NS

Contractor

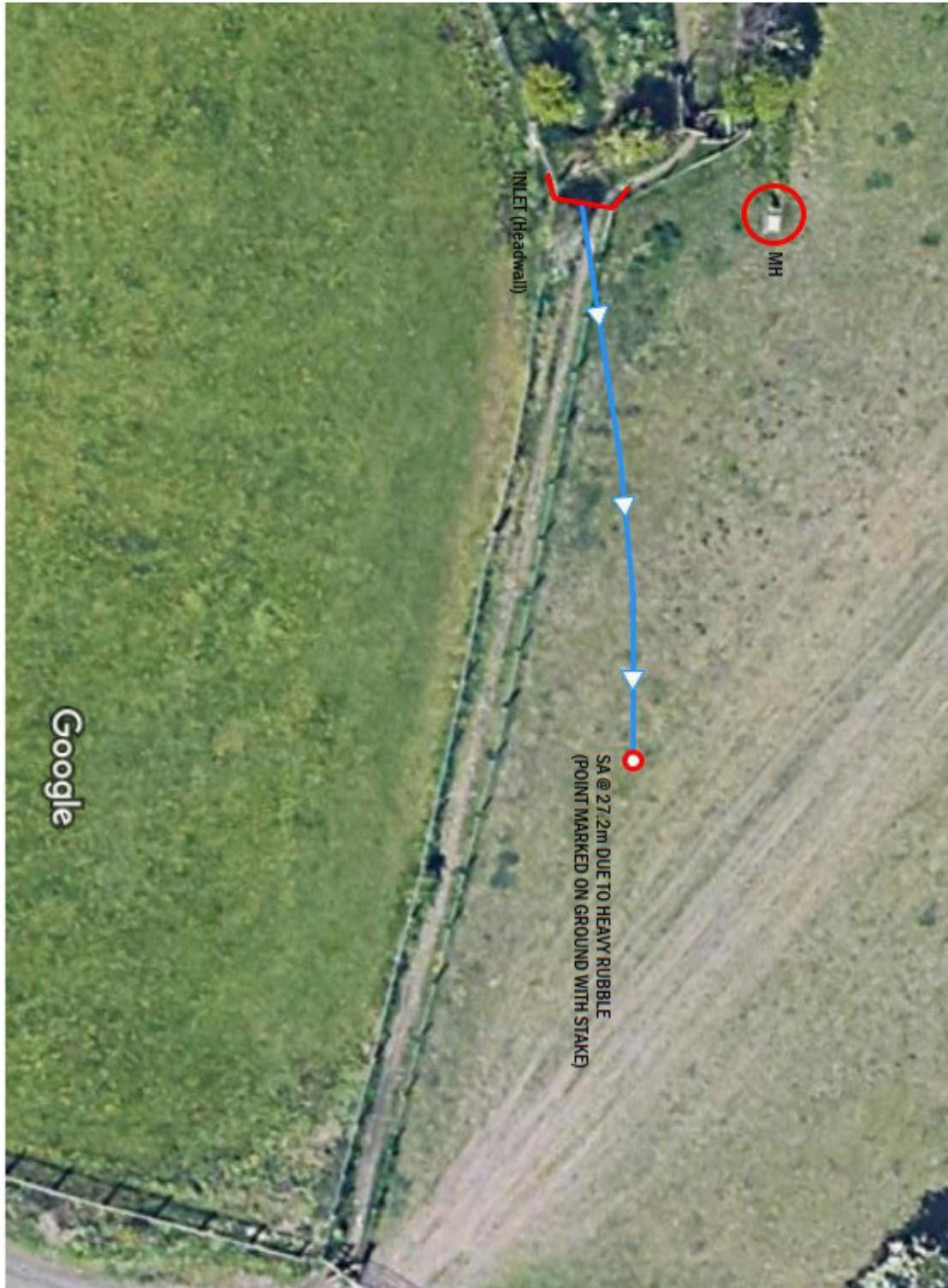
Company: Subscan UDS Limited
Description: Subscan House
Contact: Ross Holmes
Department: CCTV Processing Manager
Street: 126 Whitehall Road
Town or City: Leeds
County: West Yorkshire
Post Code: LS12 1AE
Phone: 0344 499 5220
Email: ross.holmes@subscan.com



Project Information

Project Name GR59319 CCTV	Project Number LD3343	Project Date 13/04/2023
-------------------------------------	---------------------------------	-----------------------------------

Project Drawing, Page 'GR59319_CCTV'





Scoring Summary

Project Name
GR59319_CCTV

Project Number
LD3343

Project Date
13/04/2023

Structural Defects

- Grade 3: Best practice suggests consideration should be given to repairs in the medium term.
- Grade 4: Best practice suggests consideration should be given to repairs to avoid a potential collapse.
- Grade 5: Best practice suggests that this pipe is at risk of collapse at any time. Urgent consideration should be given to repairs to avoid total failure.

Section	PLR	Grade	Description
1	INLETX	5	Missing bricks from 2 o'clock to 6 o'clock

Service / Operational Condition

- Grade 3: Best practice suggests consideration should be given to maintenance activities in the medium term.
- Grade 4: Best practice suggests consideration should be given to maintenance activity to avoid potential blockages.
- Grade 5: Best practice suggests that this pipe is at a high risk of backing up or causing flooding.

Section	PLR	Grade	Description
1	INLETX	5	Multiple defects

Information

These scoring summaries are based on the SRM grading from the WRc.

Section Inspection - 03/04/2023 - INLETX

Item No. 1	Insp. No. 1	Date 03/04/23	Time 18:25	Client's Job Ref LD3343	Weather No Rain Or Snow	Pre Cleaned Yes	PLR INLETX
Operator SS-JM		Vehicle VEHICLE 1		Camera Camera 1	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village: Road: Location: Surface Type:	Liversedge Primrose Lane	Inspection Direction: Inspected Length: Total Length: Joint Length:	Downstream 27.20 m 27.20 m	Upstream Node: Upstream Pipe Depth: Downstream Node: Downstream Pipe Depth:	INLET OUTLET
Use: Type of Pipe: Flow Control: Year Constructed: Inspection Purpose:	Culverted watercourse Gravity drain/sewer No flow control Not Specified Sample condition survey		Pipe Shape: Dia/Height: Pipe Material: Lining Type: Lining Material:	Rectangular 600 mm Width: 400 mm Masonry (regular) No Lining No Lining	

Comments:
Recommendations:

Scale:	1:110	Position [m]	Code	Observation	MPEG	Photo	Grade
		Depth: m					
		INLET					
		0.00	OF	Start node, outfall, reference: INLET	00:00:00	INLETX_2 d58e4d7-d bf2-46d5-a	
		0.00	WL	Water level, 10% of the vertical dimension	00:00:02		
		0.60	OBB	Other obstacles, brick or masonry in invert from 6 o'clock to 8 o'clock, 20% cross-sectional area loss	00:00:03	INLETX_9f 78300f-6fb 7-4566-a2	5
		0.60	ID	Infiltration, dripping at 12 o'clock	00:00:09		
		1.60	MB	Missing bricks from 2 o'clock to 6 o'clock	00:00:17	INLETX_b a08ec4c-b 706-4b28-	5
		1.60	OBB	Other obstacles, brick or masonry in invert from 3 o'clock to 6 o'clock, 20% cross-sectional area loss: BRICKS FROM RIGHT SIDE WALL	00:00:18		5
		2.00	GP	General photograph taken at this point	00:00:22	INLETX_7 858ef46-1 1cb-4f5c-9	
		4.00	S01	DES Settled deposits, fine, 10% cross-sectional area loss, start	00:00:43	INLETX_3 66e8b24-8 f40-4756-8	
		6.20	RM	Roots, mass, 20% cross-sectional area loss	00:00:57	INLETX_a 58c74ac-5 e61-48b3-	5
		7.20	F01	DES Settled deposits, fine, 10% cross-sectional area loss, finish	00:01:00		3
		7.20	S02	DEE Attached deposits, encrustation from 4 o'clock to 8 o'clock, 10% cross-sectional area loss, start	00:01:04	INLETX_b 16131f7-5 5db-4285-	
		10.60	S03	DES Settled deposits, fine, 10% cross-sectional area loss, start	00:01:23	INLETX_9 e0fd96f-cd 17-4dc5-8	
		11.40	LR	Line deviates right: SLIGHT	00:01:27		
		12.20	REM	General remark: STEP DOWN IN CULVERT	00:01:32		
		12.60	S04	RF Roots, fine, start	00:01:35	INLETX_8f 576402-9d 74-4ce4-8	

Section Inspection - 03/04/2023 - INLETX

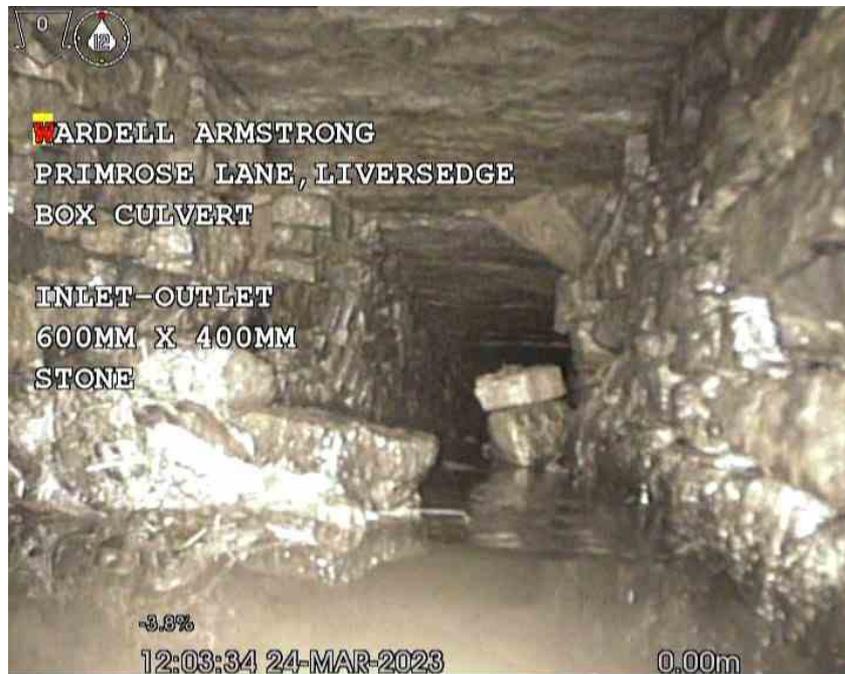
Item No. 1	Insp. No. 1	Date 03/04/23	Time 18:25	Client's Job Ref LD3343	Weather No Rain Or Snow	Pre Cleaned Yes	PLR INLETX
Operator SS-JM		Vehicle VEHICLE 1		Camera Camera 1	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Scale:	1:110	Position [m]	Code	Observation	MPEG	Photo	Grade
		12.80	ID	Infiltration, dripping at 12 o'clock	00:02:46		
		13.60	LR	Line deviates right	00:01:40		
		14.60	LR	Line deviates right: SLIGHT	00:01:46		
		14.80	F04 RF	Roots, fine, finish	00:01:47		2
		14.80	S05 RM	Roots, mass, 10% cross-sectional area loss, start	00:01:48	INLETX_0 2414660-e fa7-4421-8	
		19.60	F05 RM	Roots, mass, 10% cross-sectional area loss, finish	00:02:22		3
		22.40	LL	Line deviates left: SLIGHT	00:02:32		
		23.20	FL	Fracture, longitudinal at 12 o'clock: IN SLAB ROOF	00:02:41	INLETX_4 bbee24-4 d52-4136-	4 / 2
		23.20	ID	Infiltration, dripping at 12 o'clock	00:02:42	INLETX_5 14801fb-8 12b-4bb8-	
		26.20	DER	Settled deposits, coarse, 30% cross-sectional area loss	00:03:08	INLETX_d 9eb86ad-a 977-44ca-	4
		27.20	ID	Infiltration, dripping at 12 o'clock	00:03:25		
		27.20	F03 DES	Settled deposits, fine, 10% cross-sectional area loss, finish	00:06:09		3
		27.20	F02 DEE	Attached deposits, encrustation from 4 o'clock to 8 o'clock, 10% cross-sectional area loss, finish	00:06:10		3
		27.20	SA	Survey abandoned: DUE TO HEAVY RUBBLE / STONE OBSTRUCTING	00:06:12		

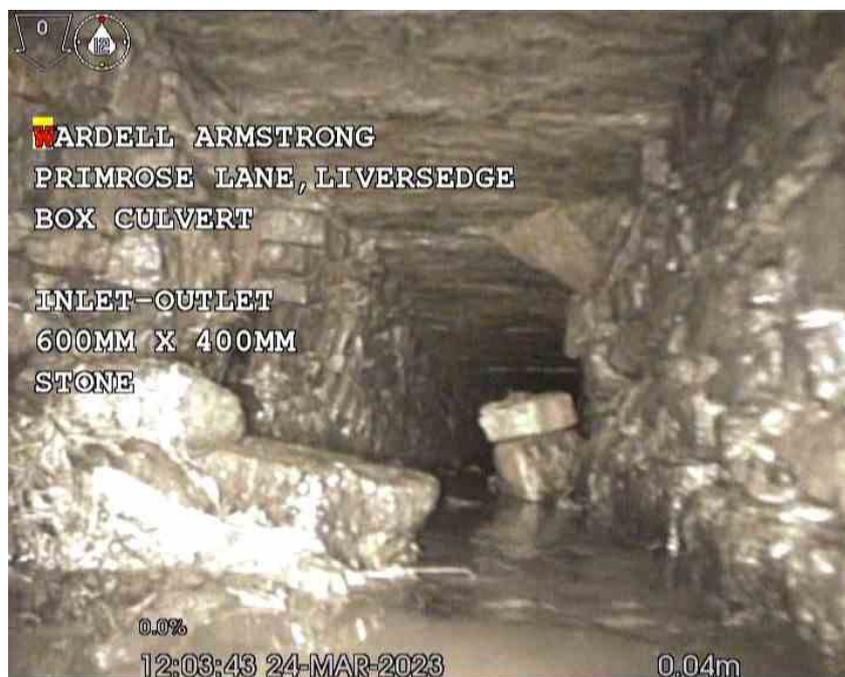
Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
2	165.0	10.5	285.0	5.0	10	12.0	5.2	141.0	5.0

Section Pictures - 03/04/2023 - INLETX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	INLETX	LD3343	GR59319



INLETX_2d58e4d7-dbf2-46d5-ac07-e8bf6d919684_20230413_122258_347.jpg, 00:00:00, 0.00 m
 Start node, outfall, reference: INLET



INLETX_9f78300f-6fb7-4566-a267-c3bfc4870626_20230413_122340_815.jpg, 00:00:03, 0.60 m
 Other obstacles, brick or masonry in invert from 6 o'clock to 8 o'clock, 20% cross-sectional area loss

Section Pictures - 03/04/2023 - INLETX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	INLETX	LD3343	GR59319



INLETX_ba08ec4c-b706-4b28-9ed8-2d1ae77371a2_20230413_122440_757.jpg, 00:00:17, 1.60 m

Missing bricks from 2 o'clock to 6 o'clock

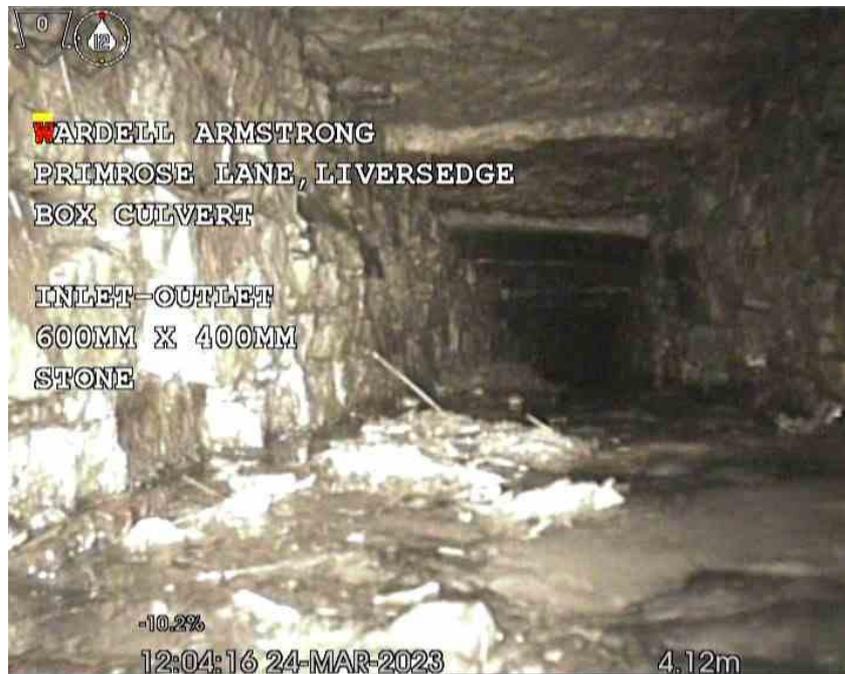


INLETX_7858ef46-11cb-4f5c-9496-9c78f45dc5f5_20230413_122542_642.jpg, 00:00:22, 2.00 m

General photograph taken at this point

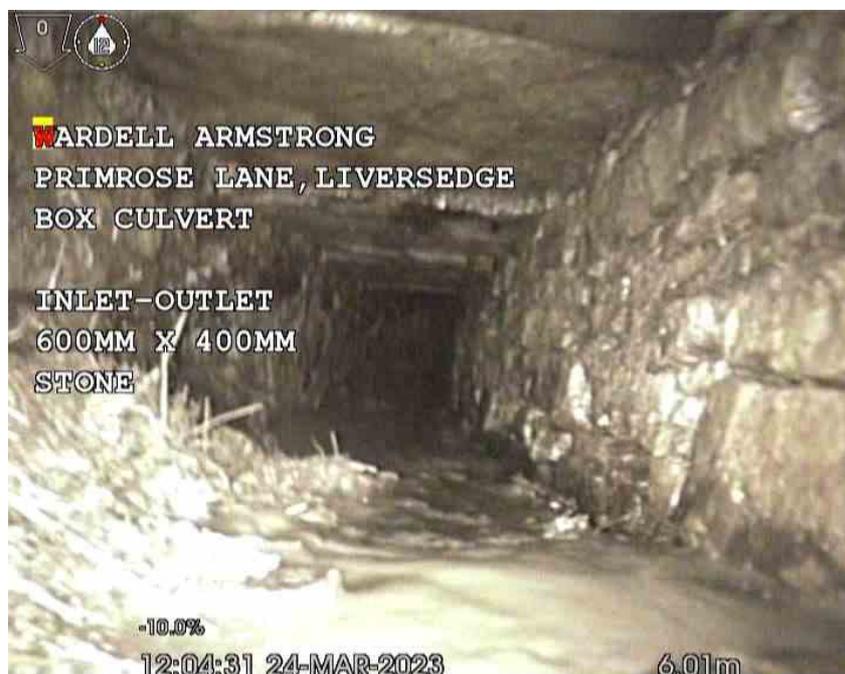
Section Pictures - 03/04/2023 - INLETX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	INLETX	LD3343	GR59319



INLETX_366e8b24-8f40-4756-8f1d-8a400c775727_20230413_123226_467.jpg, 00:00:43, 4.00 m

Settled deposits, fine, 10% cross-sectional area loss, start



INLETX_a58c74ac-5e61-48b3-924d-87f870bad9b0_20230413_125241_912.jpg, 00:00:57, 6.20 m

Roots, mass, 20% cross-sectional area loss

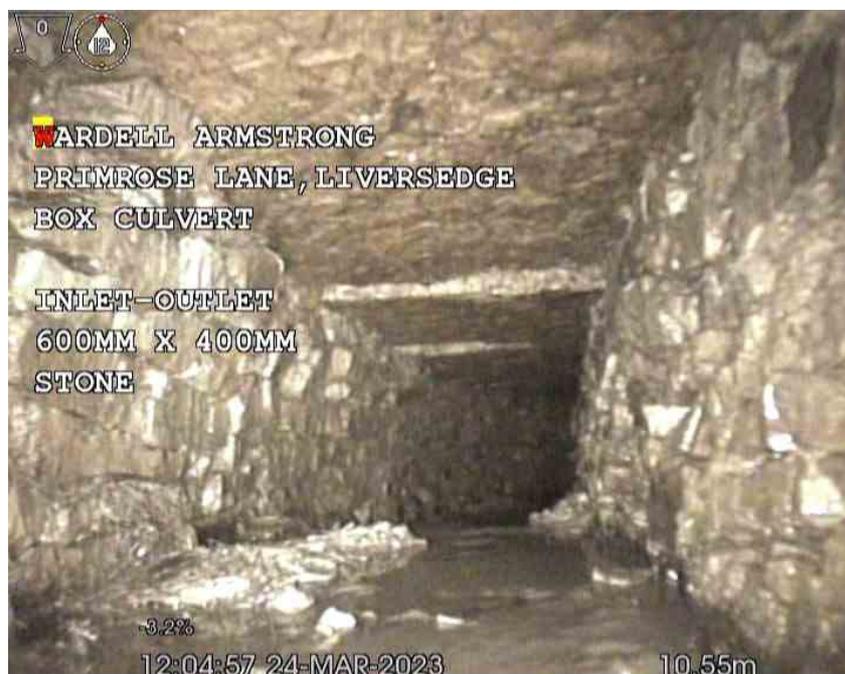
Section Pictures - 03/04/2023 - INLETX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	INLETX	LD3343	GR59319



INLETX_b16131f7-55db-4285-a439-65eca4f8a9b5_20230413_131434_453.jpg, 00:01:04,
 7.20 m

Attached deposits, encrustation from 4 o'clock to 8 o'clock, 10% cross-sectional area loss, start

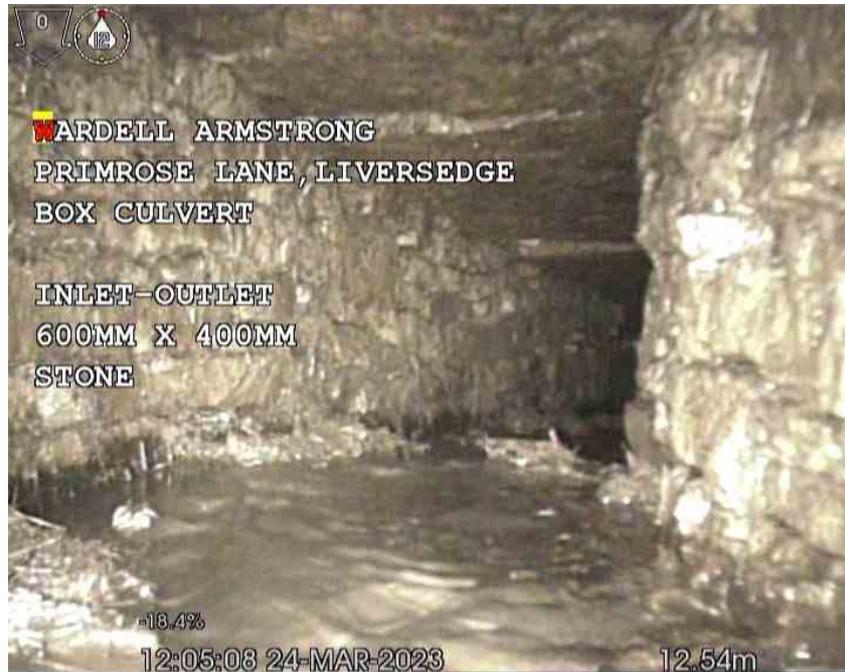


INLETX_9e0fd96f-cd17-4dc5-82b3-10ed61b54c5a_20230413_131718_398.jpg, 00:01:23,
 10.60 m

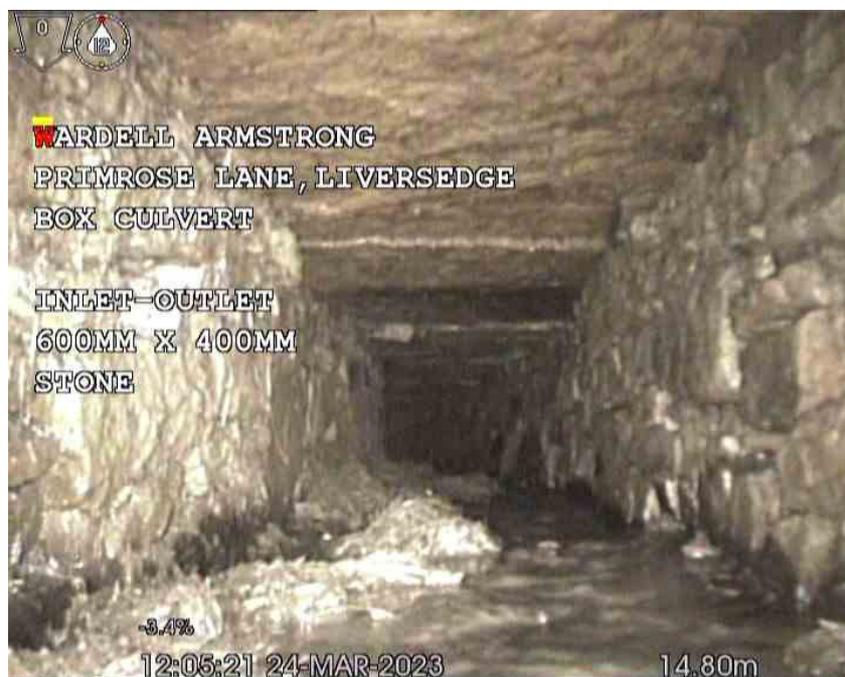
Settled deposits, fine, 10% cross-sectional area loss, start

Section Pictures - 03/04/2023 - INLETX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	INLETX	LD3343	GR59319



INLETX_8f576402-9d74-4ce4-8169-42e7e440d2ad_20230413_131813_654.jpg, 00:01:35,
 12.60 m
 Roots, fine, start



INLETX_02414660-efa7-4421-86e9-3ca8b8a67cd0_20230413_131907_642.jpg, 00:01:48,
 14.80 m
 Roots, mass, 10% cross-sectional area loss, start

Section Pictures - 03/04/2023 - INLETX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	INLETX	LD3343	GR59319



INLETX_4bbeee24-4d52-4136-b1a2-7a8f517cc68a_20230413_132441_646.jpg, 00:02:41,
 23.20 m
 Fracture, longitudinal at 12 o'clock, IN SLAB ROOF



INLETX_514801fb-812b-4bb8-b93c-206e5e6af684_20230413_132509_005.jpg, 00:02:42,
 23.20 m
 Infiltration, dripping at 12 o'clock

Section Pictures - 03/04/2023 - INLETX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	INLETX	LD3343	GR59319



INLETX_d9eb86ad-a977-44ca-aacf-b5a1f700284d_20230413_134915_933.jpg, 00:03:08, 26.20 m

Settled deposits, coarse, 30% cross-sectional area loss

APPENDIX 9

WOODLAND / P.O.S.

UNDERGROUND DRAINAGE TANK

-  Roads = 4,942m²
 -  Roofs = 5,734m²
 -  Drives / parking = 2,121m²
- Total Impermeable area = 12,797m²

REV	DESCRIPTION	SIG	CHK	DATE
P01	First Issue	RS	IH	24.11.2022
P02	Updated to Layout Rev T	IH	CAT	24.03.2023

JONES HOMES

PRIMROSE LANE, LIVERSEDE

IMPERMEABLE AREAS

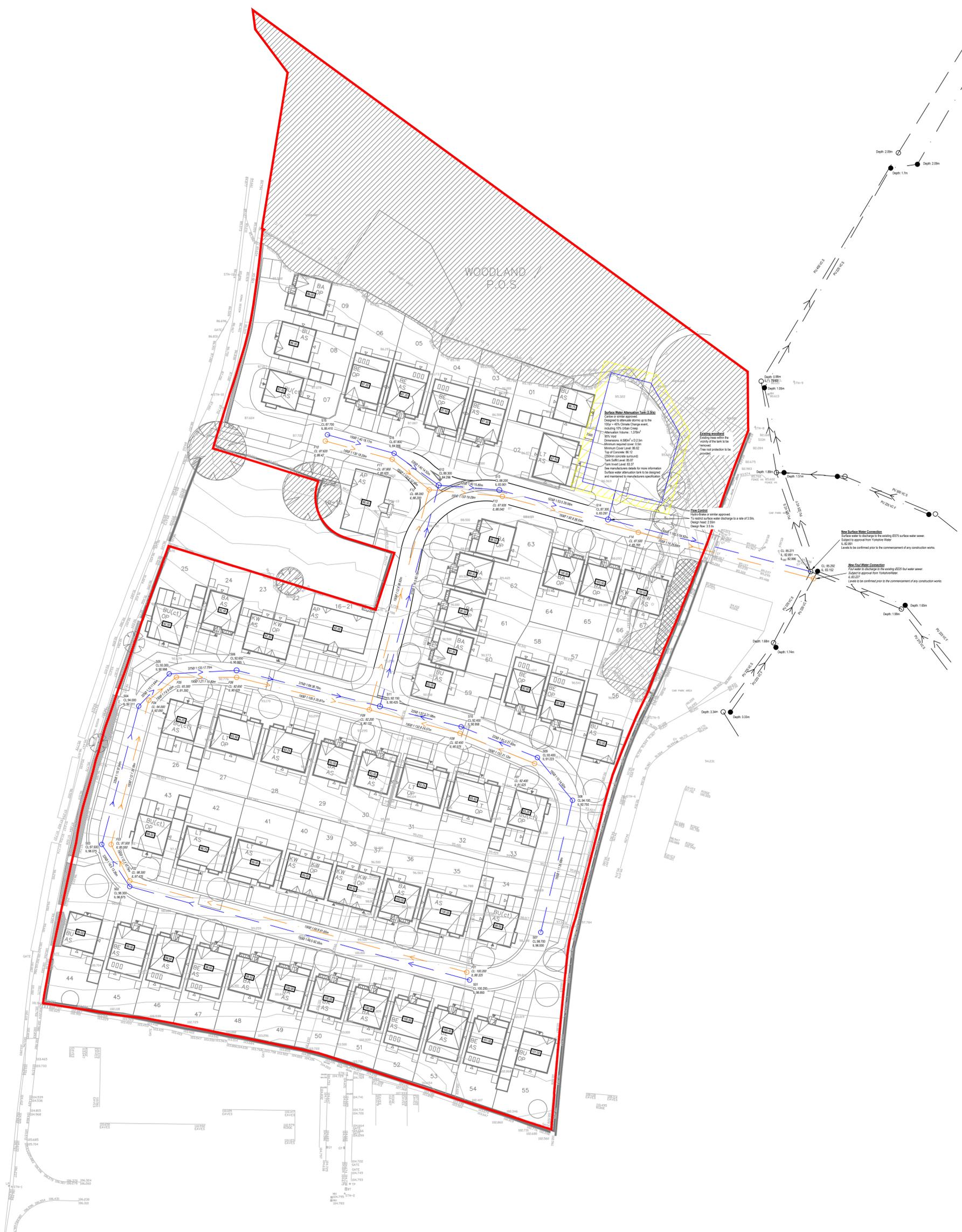


ECE PROJECT No	SCALE AT A0	STATUS	SUITABLE FOR
47685	1:250	S0	Initial

DRAWING NUMBER		REV
47685 - ECE - XX - XX - DR - C - 0001	P02	

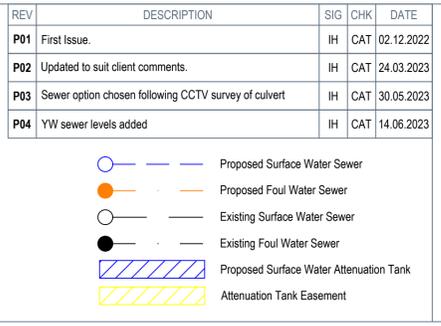
Project Originator Zone Level Type Rate Number

SUDS Type	SUDS Technique	Description	Suitable	Comments
Source Control	Green roof	Vegetated roof that reduces runoff volume and rate	No	Expected planning requirement for traditional pitched roofs to match neighbouring housing.
	Rainwater harvesting/rainwater butts	Rainwater is stored and re-used	Possible	Individual storage tank capacity unlikely to meet volume required. Individual water butts can be used for garden watering.
	Permeable paving	Paving which allows inflow of rainwater into underlying construction/soil	Possible	May be suitable for private drives. Type C (sealed) permeable paving areas could provide limited infiltration within the underlying construction material.
Infiltration	Soakaway	Pit or trench which stores and disposes of water to the ground	No	Presence of impermeable ground across majority of the site. Fractured sandstone present at two location however steep slopes on site would lead to groundwater emergence down slope.
	Filter Drain	Trench which conveys and/or disposes of water to the ground.	No	
	Infiltration Basin	Shallow basin which stores and disposes of water to the ground	No	
Conveyance	Swale	Shallow vegetated depression which conducts and retains water	No	Difficulties of adoption and lack of space.
Detention	Subsurface storage	Traditional underground pipes, tank storage, or modular systems	Yes	Area available within POS for an attenuation tank.
	Detention Basin	Normally dry but may have small permanent water pools at the inlet and outlet. They can function as POS	No	Poor infiltration rate due to clay resulting in residual water and siltation in the basin. Inefficient use of POS.
	Pond	Permanent body of water	No	Lack of suitable public open space.
	Wetland	Permanent body of shallow water or marsh	No	



- NOTES**
- All pipes to be either vitrified clay in accordance with BS EN 295, and having a crushing strength of 40kN/m², or class 120 concrete (54kN/m²) to BS 5911, bedded on a class B granular bed and haunch, or Osma Wavin Ultra-Rib uPVC or similar bedded on a class S granular bed and surround. Where pipes are in the public highway they are to be bedded on a class S granular bed and surround.
 - All cover levels are indicative and to be confirmed at detailed drainage design.
 - Minimum required cover: 900mm in pedestrian areas, 1.2m in trafficked areas.
 - If the cover to the pipe is less than 600mm a class Z concrete bed and surround must be used.
 - All trenches in roads, paved areas and below slabs shall be backfilled with Type 1 or Type 2 DOT granular sub-base material.
 - All pipes to be laid soffit to soffit at manholes unless noted otherwise.
 - All in situ concrete to be designated mix FN22 conforming to BS 8500-2 unless agreed otherwise.
 - All private drainage to be 100mm diameter and to be laid at minimum: Foul Water 1:80, Surface Water 1:100 unless shown otherwise.
 - All surface and foul water lateral connections to be a minimum 150mm diameter minimum.
 - All drainage to be installed in accordance with Part H of the Building Regulations and BS EN 752 & 12056.
 - Refer to manufacturers instructions for installation details.
 - Where a B125 cover and frame has been approved, this must not be coated in plastic and must have lifting eyes suitably sized to accommodate standard lifting keys. Screw down covers are not acceptable.
 - External works levels to be confirmed prior to the commencement of any drainage works. Subject to architects levels.

REV	DESCRIPTION	SIG	CHK	DATE
P01	First Issue.	IH	CAT	02.12.2022
P02	Updated to suit client comments.	IH	CAT	24.03.2023
P03	Sewer option chosen following CCTV survey of culvert	IH	CAT	30.05.2023
P04	YW sewer levels added	IH	CAT	14.06.2023



JONES HOMES

PRIMROSE LANE, LIVERSEDGE

DRAINAGE STRATEGY

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ECE PROJECT No: **47685** SCALE AT A1 STATUS: **S0** SUITABLE FOR: **Initial**

DRAWING NUMBER: **47685 - ECE - XX - XX - DR - C - 0003** REV: **P04**

Project Originator Zone Level Type Role Number

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.350	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.070	5.00	100.200	1200	419721.519	424029.671	1.350
2	0.189	5.00	98.300	1200	419632.292	424054.245	1.425
3	0.155	5.00	97.500	1200	419624.979	424065.309	1.425
4	0.013	5.00	94.000	1200	419634.672	424101.678	1.689
5	0.015	5.00	93.300	1350	419642.679	424110.119	2.302
6	0.105	5.00	92.650	1350	419660.352	424111.053	1.785
9	0.026	5.00	93.400	1200	419739.315	424088.140	2.177
10	0.070	5.00	92.450	1200	419719.293	424096.237	1.492
11	0.181	5.00	92.150	1350	419697.975	424101.596	1.725
15	0.102	5.00	87.700	1200	419684.199	424172.970	2.290
16	0.012	5.00	87.800	1200	419701.701	424168.072	2.844
12	0.100	5.00	88.300	1500	419713.574	424159.716	4.004
13	0.081	5.00	88.200	1500	419729.318	424158.424	4.299
14	0.120	5.00	87.300	1500	419757.850	424150.717	4.003
Tank Inlet		5.00	86.620	1500	419759.872	424158.325	3.250
8	0.026	5.00	94.100	1200	419748.535	424076.918	1.350
7	0.026	5.00	98.700	1200	419740.185	424042.226	2.700
Outfall			85.271	1200	419811.034	424137.014	2.275

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	92.549	0.600	98.850	96.950	1.900	48.7	150	6.07	50.0
1.001	2	3	13.262	0.600	96.875	96.075	0.800	16.6	225	6.14	50.0
1.002	3	4	37.639	0.600	96.075	92.311	3.764	10.0	225	6.29	50.0
1.003	4	5	11.635	0.600	92.311	91.148	1.163	10.0	225	6.33	50.0
1.004	5	6	17.698	0.600	90.998	90.865	0.133	133.1	375	6.52	50.0
1.005	6	11	38.793	0.600	90.865	90.425	0.440	88.2	375	6.86	50.0
2.002	9	10	21.597	0.600	91.223	90.958	0.265	81.5	225	5.52	50.0
2.003	10	11	21.981	0.600	90.958	90.575	0.383	57.4	225	5.73	50.0
1.006	11	12	60.177	0.600	90.425	86.725	3.700	16.3	375	7.08	50.0
3.000	15	16	18.174	0.600	85.410	84.956	0.454	40.0	150	5.19	50.0
3.001	16	12	14.519	0.600	84.956	84.596	0.360	40.3	225	5.31	50.0
1.007	12	13	15.797	0.600	84.296	83.901	0.395	40.0	525	7.15	50.0
1.008	13	14	29.555	0.600	83.901	83.347	0.554	53.3	525	7.31	50.0
4.001	Tank Inlet	14	7.872	0.600	83.370	83.347	0.023	342.3	525	5.11	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.445	25.5	17.7	1.200	1.200	0.070	0.0	92	1.559
1.001	3.229	128.4	65.5	1.200	1.200	0.259	0.0	114	3.244
1.002	4.161	165.5	104.7	1.200	1.464	0.414	0.0	131	4.401
1.003	4.161	165.5	108.0	1.464	1.927	0.427	0.0	133	4.430
1.004	1.569	173.3	111.8	1.927	1.410	0.442	0.0	219	1.663
1.005	1.930	213.2	138.4	1.410	1.350	0.547	0.0	221	2.050
2.002	1.449	57.6	19.7	1.952	1.267	0.078	0.0	91	1.318
2.003	1.730	68.8	37.4	1.267	1.350	0.148	0.0	118	1.764
1.006	4.511	498.2	221.6	1.350	1.200	0.876	0.0	175	4.381
3.000	1.596	28.2	25.8	2.140	2.694	0.102	0.0	113	1.805
3.001	2.066	82.1	28.8	2.619	3.479	0.114	0.0	92	1.888
1.007	3.549	768.2	275.7	3.479	3.774	1.090	0.0	217	3.267
1.008	3.071	664.8	296.2	3.774	3.428	1.171	0.0	245	2.987
4.001	1.205	260.8	0.0	2.725	3.428	0.000	0.0	0	0.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.009	14	Outfall	54.921	0.600	83.297	82.996	0.301	182.5	300	8.10	50.0
2.000	7	8	35.683	0.600	96.000	92.750	3.250	11.0	150	5.19	50.0
2.001	8	9	14.524	0.600	92.750	91.298	1.452	10.0	150	5.27	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.009	1.160	82.0	326.6	3.703	1.975	1.291	0.0	300	1.175
2.000	3.058	54.0	6.6	2.550	1.200	0.026	0.0	35	2.086
2.001	3.204	56.6	13.2	1.200	1.952	0.052	0.0	49	2.614

Simulation Settings

Rainfall Methodology	FSR	Summer CV	1.000	Drain Down Time (mins)	240
FSR Region	England and Wales	Winter CV	1.000	Additional Storage (m ³ /ha)	0.0
M5-60 (mm)	19.000	Analysis Speed	Detailed	Check Discharge Rate(s)	x
Ratio-R	0.350	Skip Steady State	x	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	100	40	0	0
30	0	0	0				

Node 14 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	83.297	Product Number	CTL-SHE-0072-3500-2550-3500
Design Depth (m)	2.550	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.5	Min Node Diameter (mm)	1200

Node Tank Inlet Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	83.370
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	580.0	0.0	2.500	580.0	0.0	2.501	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	11	98.919	0.069	11.4	0.0778	0.0000	OK
15 minute summer	2	10	96.967	0.092	41.0	0.1041	0.0000	OK
15 minute summer	3	10	96.174	0.099	65.9	0.1119	0.0000	OK
15 minute summer	4	10	92.422	0.111	67.7	0.1256	0.0000	OK
15 minute summer	5	10	91.179	0.181	69.5	0.2591	0.0000	OK
15 minute summer	6	11	91.041	0.176	85.9	0.2523	0.0000	OK
15 minute summer	9	10	91.294	0.071	12.5	0.0799	0.0000	OK
15 minute summer	10	10	91.053	0.095	23.8	0.1070	0.0000	OK
15 minute summer	11	11	90.563	0.138	137.9	0.1978	0.0000	OK
15 minute summer	15	10	85.498	0.088	16.5	0.0994	0.0000	OK
15 minute summer	16	10	85.032	0.076	18.3	0.0858	0.0000	OK
15 minute summer	12	11	84.483	0.187	172.3	0.3300	0.0000	OK
15 minute winter	13	9	84.361	0.460	172.8	0.8133	0.0000	OK
15 minute summer	14	9	84.320	1.023	242.0	1.8078	0.0000	SURCHARGED
960 minute winter	Tank Inlet	930	83.846	0.476	14.3	263.3156	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	10.9	1.385	0.425	0.7251	
15 minute summer	2	1.001	3	40.8	2.551	0.318	0.2126	
15 minute summer	3	1.002	4	65.6	3.614	0.396	0.6833	
15 minute summer	4	1.003	5	67.1	3.694	0.406	0.2116	
15 minute summer	5	1.004	6	69.4	1.343	0.400	0.9145	
15 minute summer	6	1.005	11	86.6	1.977	0.406	1.7017	
15 minute summer	9	2.002	10	12.4	0.936	0.215	0.2859	
15 minute summer	10	2.003	11	23.4	1.531	0.340	0.3360	
15 minute summer	11	1.006	12	138.8	3.855	0.279	2.1674	
15 minute summer	15	3.000	16	16.4	1.668	0.581	0.1786	
15 minute summer	16	3.001	12	18.1	1.608	0.221	0.1639	
15 minute summer	12	1.007	13	170.9	2.451	0.223	2.0186	
30 minute summer	13	1.008	14	170.4	1.478	0.256	3.5915	
15 minute summer	14	Hydro-Brake®	Outfall	2.3				33.6
15 minute summer	Tank Inlet	4.001	14	-292.2	-2.096	-1.120	0.9147	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	8	10	92.790	0.040	8.4	0.0452	0.0000	OK
15 minute summer	7	10	96.028	0.028	4.2	0.0319	0.0000	OK
15 minute summer	Outfall	1	82.996	0.000	2.3	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	8	2.001	9	8.3	2.247	0.146	0.0535	
15 minute summer	7	2.000	8	4.2	1.387	0.077	0.1080	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	1	11	98.980	0.130	27.8	0.1469	0.0000	OK
15 minute summer	2	11	97.049	0.174	101.0	0.1966	0.0000	OK
15 minute summer	3	11	96.423	0.348	162.4	0.3930	0.0000	SURCHARGED
15 minute summer	4	10	92.864	0.553	164.7	0.6255	0.0000	SURCHARGED
15 minute summer	5	11	91.360	0.362	162.1	0.5185	0.0000	OK
15 minute summer	6	11	91.193	0.328	204.0	0.4698	0.0000	OK
15 minute summer	9	10	91.345	0.122	30.7	0.1384	0.0000	OK
15 minute summer	10	10	91.131	0.173	58.4	0.1951	0.0000	OK
15 minute summer	11	11	90.661	0.236	333.7	0.3380	0.0000	OK
15 minute summer	15	11	86.143	0.733	40.5	0.8295	0.0000	SURCHARGED
15 minute winter	16	8	85.225	0.269	40.3	0.3039	0.0000	SURCHARGED
15 minute winter	12	8	85.137	0.841	386.5	1.4867	0.0000	SURCHARGED
15 minute winter	13	8	85.027	1.126	421.7	1.9889	0.0000	SURCHARGED
15 minute winter	14	8	84.838	1.541	480.3	2.7236	0.0000	SURCHARGED
2160 minute winter	Tank Inlet	2040	84.603	1.233	21.9	681.7659	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
30 minute summer	1	1.000	2	24.7	1.633	0.969	1.4647	
30 minute summer	2	1.001	3	93.1	3.015	0.725	0.4110	
15 minute winter	3	1.002	4	150.1	4.092	0.907	1.3505	
15 minute summer	4	1.003	5	156.1	4.184	0.943	0.4574	
15 minute summer	5	1.004	6	164.2	1.617	0.948	1.8713	
15 minute summer	6	1.005	11	207.8	2.376	0.975	3.4025	
15 minute summer	9	2.002	10	30.6	1.109	0.531	0.5910	
15 minute summer	10	2.003	11	57.4	1.859	0.835	0.6809	
15 minute summer	11	1.006	12	334.3	4.751	0.671	4.2332	
15 minute summer	15	3.000	16	38.6	2.210	1.370	0.3200	
15 minute summer	16	3.001	12	45.1	1.984	0.549	0.5478	
60 minute summer	12	1.007	13	297.8	2.700	0.388	1.8468	
15 minute summer	13	1.008	14	462.0	2.139	0.695	6.3848	
15 minute winter	14	Hydro-Brake®	Outfall	2.8				34.3
15 minute summer	Tank Inlet	4.001	14	-517.0	-3.328	-1.982	1.3740	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	8	10	92.816	0.066	20.5	0.0742	0.0000	OK
15 minute summer	7	10	96.044	0.044	10.3	0.0501	0.0000	OK
15 minute summer	Outfall	1	82.996	0.000	2.7	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	8	2.001	9	20.4	2.851	0.360	0.1039	
15 minute summer	7	2.000	8	10.2	1.754	0.190	0.2096	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	1	9	100.200	1.350	50.4	1.5269	5.3378	FLOOD
15 minute summer	2	9	98.300	1.425	160.2	1.6117	9.7896	FLOOD
30 minute summer	3	16	97.500	1.425	211.6	1.6117	12.4817	FLOOD
15 minute summer	4	11	93.412	1.101	170.4	1.2457	0.0000	SURCHARGED
15 minute summer	5	10	91.691	0.693	178.3	0.9923	0.0000	SURCHARGED
15 minute summer	6	10	91.482	0.617	253.0	0.8834	0.0000	SURCHARGED
15 minute summer	9	11	92.067	0.844	54.7	0.9547	0.0000	SURCHARGED
15 minute summer	10	11	91.784	0.826	101.1	0.9341	0.0000	SURCHARGED
15 minute summer	11	11	90.750	0.325	478.6	0.4644	0.0000	OK
15 minute summer	15	10	87.700	2.290	73.4	2.5900	3.8100	FLOOD
15 minute winter	16	7	85.902	0.946	62.0	1.0695	0.0000	SURCHARGED
15 minute winter	12	7	85.826	1.530	584.7	2.7031	0.0000	SURCHARGED
2880 minute winter	13	2760	85.811	1.910	59.2	3.3755	0.0000	SURCHARGED
2880 minute winter	14	2760	85.811	2.514	26.2	4.4427	0.0000	SURCHARGED
2880 minute winter	Tank Inlet	2760	85.811	2.441	23.6	1349.4620	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	27.6	1.669	1.080	1.6293	
60 minute winter	2	1.001	3	94.9	3.021	0.739	0.4229	
30 minute summer	3	1.002	4	163.9	4.120	0.990	1.4969	
60 minute summer	4	1.003	5	168.0	4.255	1.016	0.4627	
15 minute winter	5	1.004	6	178.0	1.639	1.028	1.9520	
15 minute summer	6	1.005	11	251.9	2.424	1.182	4.1056	
15 minute summer	9	2.002	10	53.1	1.336	0.922	0.8589	
15 minute summer	10	2.003	11	100.9	2.538	1.468	0.8654	
15 minute summer	11	1.006	12	478.9	4.993	0.961	5.7833	
15 minute winter	15	3.000	16	55.7	3.166	1.976	0.3200	
15 minute winter	16	3.001	12	66.4	2.058	0.808	0.5774	
15 minute summer	12	1.007	13	612.8	2.837	0.798	3.4127	
15 minute summer	13	1.008	14	671.7	3.109	1.010	6.3848	
2880 minute winter	14	Hydro-Brake®	Outfall	3.5				508.0
15 minute summer	Tank Inlet	4.001	14	-755.1	-4.229	-2.895	1.7006	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	8	11	92.857	0.107	37.3	0.1213	0.0000	OK
15 minute summer	7	10	96.061	0.061	18.7	0.0687	0.0000	OK
15 minute summer	Outfall	1	82.996	0.000	2.9	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
60 minute summer	8	2.001	9	26.4	3.024	0.467	0.1824	
15 minute summer	7	2.000	8	18.6	2.100	0.344	0.3564	

UK Design Flood Estimation

Generated on 25 November 2022 14:49:49 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: D686-5820

Site name: FEH_Point_Descriptors_419715_424135_v4_0_0

Easting: 419715

Northing: 424135

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.03 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 1 year

Summary of results

Rainfall - FEH 2013 model (mm):	13.46	Total runoff (ML):	0.12
Total Rainfall (mm):	8.55	Total flow (ML):	0.25
Peak Rainfall (mm):	2.33	Peak flow (m ³ /s):	0.02

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:15:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	116.52	No
Cmax (mm)	246.04	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.26 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BFO (m ³ /s)	0	No
BL (hr)	26.31 [21.22]	Yes
BR	1.04	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET (mm)	0.48	No
SAAR (mm)	745	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on 25 November 2022 14:50:01 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: D686-5820

Site name: FEH_Point_Descriptors_419715_424135_v4_0_0

Easting: 419715

Northing: 424135

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.03 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 2 year

Summary of results

Rainfall - FEH 2013 model (mm):	15.68	Total runoff (ML):	0.14
Total Rainfall (mm):	9.96	Total flow (ML):	0.29
Peak Rainfall (mm):	2.71	Peak flow (m ³ /s):	0.02

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:15:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	116.52	No
Cmax (mm)	246.04	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.26 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BFO (m ³ /s)	0	No
BL (hr)	26.31 [21.22]	Yes
BR	1.02	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET (mm)	0.48	No
SAAR (mm)	745	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on 25 November 2022 14:50:09 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: D686-5820

Site name: FEH_Point_Descriptors_419715_424135_v4_0_0

Easting: 419715

Northing: 424135

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.03 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 10 year

Summary of results

Rainfall - FEH 2013 model (mm):	28.38	Total runoff (ML):	0.27
Total Rainfall (mm):	18.03	Total flow (ML):	0.53
Peak Rainfall (mm):	4.90	Peak flow (m ³ /s):	0.03

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:15:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	116.52	No
Cmax (mm)	246.04	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.26 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BFO (m ³ /s)	0	No
BL (hr)	26.31 [21.22]	Yes
BR	0.96	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET (mm)	0.48	No
SAAR (mm)	745	No

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UK Design Flood Estimation

Generated on 25 November 2022 14:50:17 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: D686-5820

Site name: FEH_Point_Descriptors_419715_424135_v4_0_0

Easting: 419715

Northing: 424135

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.03 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 30 year

Summary of results

Rainfall - FEH 2013 model (mm):	37.54	Total runoff (ML):	0.37
Total Rainfall (mm):	23.85	Total flow (ML):	0.70
Peak Rainfall (mm):	6.49	Peak flow (m ³ /s):	0.04

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:15:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	116.52	No
Cmax (mm)	246.04	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.26 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BFO (m ³ /s)	0	No
BL (hr)	26.31 [21.22]	Yes
BR	0.92	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET (mm)	0.48	No
SAAR (mm)	745	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on 25 November 2022 14:50:25 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: D686-5820

Site name: FEH_Point_Descriptors_419715_424135_v4_0_0

Easting: 419715

Northing: 424135

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.03 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 100 year

Summary of results

Rainfall - FEH 2013 model (mm):	49.79	Total runoff (ML):	0.50
Total Rainfall (mm):	31.64	Total flow (ML):	0.92
Peak Rainfall (mm):	8.60	Peak flow (m ³ /s):	0.06

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:15:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	116.52	No
Cmax (mm)	246.04	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.26 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BFO (m ³ /s)	0	No
BL (hr)	26.31 [21.22]	Yes
BR	0.86	No

Urbanisation parameters

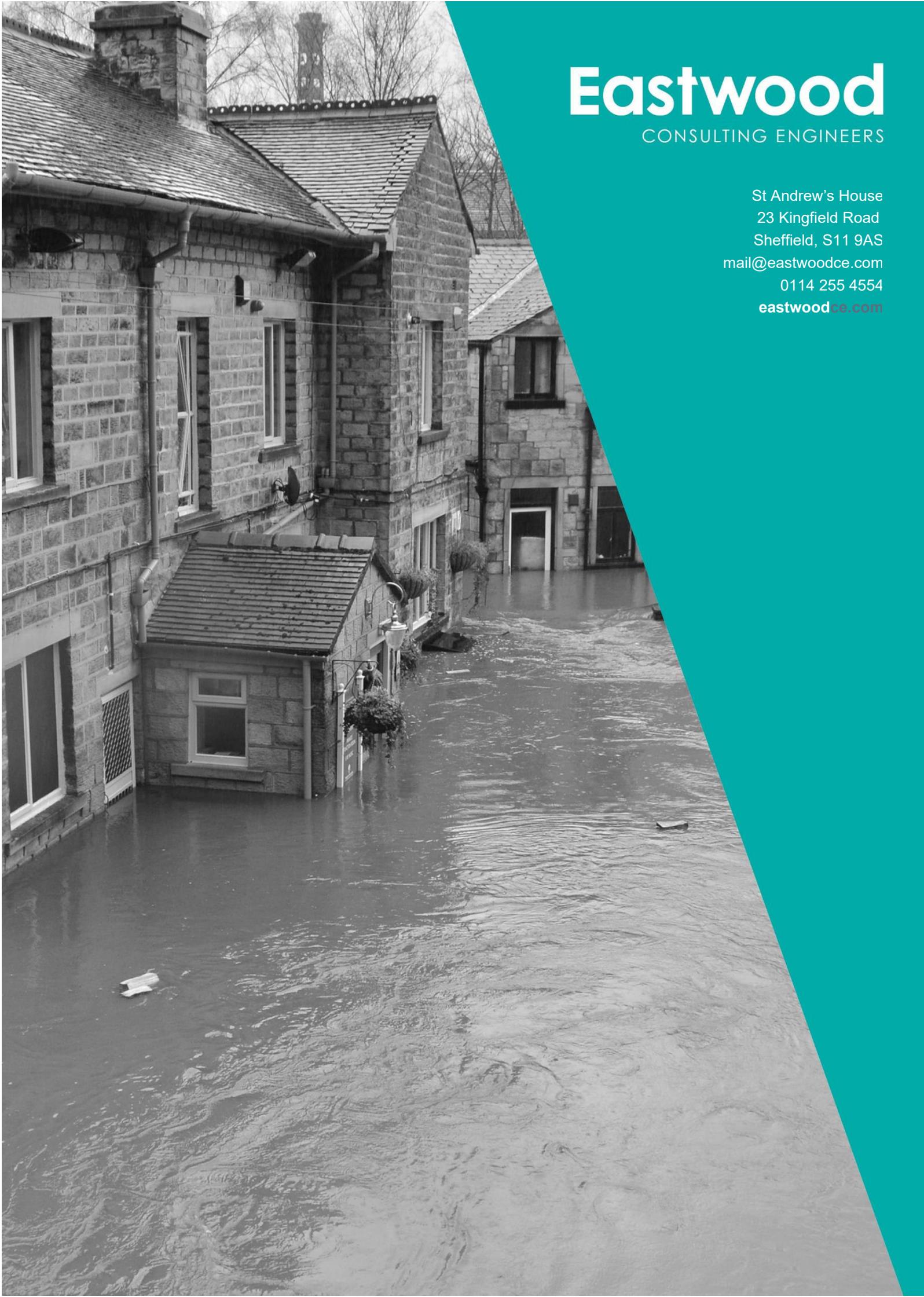
Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET (mm)	0.48	No
SAAR (mm)	745	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM



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