Eastwood
CONSULTING ENGINEERS

Flood Risk Assessment

PRIMROSE LANE, LIVERSEDGE

JONES HOMES

05 JANUARY 2024

St Andrew's House
23 Kingfield Road
Sheffield, S11 9AS
mail@eastwoodce.com
0114 255 4554
eastwoodce.com

FLOOD RISK ASSESSMENT

PRIMROSE LANE, LIVERSEDGE

FOR

JONES HOMES

47685-001 **05 January 2024**

Eastwood
CONSULTING ENGINEERS

FLOOD RISK ASSESSMENT

PRIMROSE LANE, LIVERSEDGE

FOR

JONES HOMES

Job No.	:	47685
Report Status	:	Issue 5
Document Date	:	05 January 2024

Approved :

Catherine Topliss

Eastwood
CONSULTING ENGINEERS

CONTENTS

APPENDICES

Appendix 1	Location plan
Appendix 2 – F&S Surveying	Topographical survey
Appendix 3 – Niemen Architects	Site plan
Appendix 4 – Environment Agency	Online flood mapping
Appendix 5 – Kirklees Council	SFRA maps
Appendix 6 – Yorkshire Water	Sewer assets plan
	Pre-development enquiry
Appendix 7 – MDJA	Infiltration test results
Appendix 8 – SubScan	CCTV survey
Appendix 9 – Eastwood CE	FEH Greenfield runoff rates
	SuDS checklist
	Impermeable areas plan
	Attenuation calculations
	Proposed drainage strategy

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*
Issue 5:	*05 January 2024 – Updated for layout Rev AA*

EXECUTIVE SUMMARY

The project comprises the proposed development of a 3.07-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 1,484 m^3 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 Framework[1] 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 3.07-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 77 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 intensity[3] 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 rerturn 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 3.07 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	16.3 l/s	19.0 l/s	46.1 l/s	62.5 l/s
	5.3 l/s/ha	6.2 l/s/ha	15.0 l/s/ha	20.4 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 H[4] 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.

[4]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/442889/BR_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 1,484 m^3 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 1,484 m^3 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.

Eastwood
CONSULTING ENGINEERS

APPENDICES

Eastwood
CONSULTING ENGINEERS

APPENDIX 1


NCN66
Primrose Ln
Beauty Chique Salo
& Mobile Beauty
Denby Cl
Darley Rd
Lower Hall Mount

Eastwood
CONSULTING ENGINEERS

APPENDIX 2

F & S Surveying Services Ltd 21, Haw View Yeadon Leeds West Yorkshire LS19 7XF Tel : 07714007707 Email : surveys.sutton@btinternet.com	CLIENT: JONES HOMES YORKSHIRE	DATE: 27/05/2021	
	SITE: LIVERSEDGE	SCALE: 1 : 1	
	TITLE: LAND EVALUATION SURVEY	SURVEYED BY: D Sutton	
	DWG No: FS125072	DRAWN BY: D Sutton	CHECKED BY: DS / BJS

NOTES :-

1. The accuracy of this drawing is dependent on the original specification. Before use of this information the user should contact and consult F & S Surveying Services Limited and satisfy themselves of the detail and accuracy before undertaking any works.
2. All reasonable care has been taken in the survey detail represented on this drawing but any discrepancies must be reported to F & S Surveying Services Limited immediately.
3. This survey provides position and description of features in relation to control stations and in no way implies legal title or boundary ownership.
4. Control stations surveyed using Topcon GPRS system, coordinates and levels to National Grid GPS

LEGEND :-

Building
Road Channel
Road Centre Line
Footpath
Fence Line
Wall Line
Top of Bank
Bottom of Bank
Tarmac Line
Tree Canopy Line
Hedge Line
Overhead Lines
Concrete Lines

GY Gully
MH Manhole Cover
MH Manhole Triangular
MH Manhole Circular
STN Control Station
Gas
ST Stop Tap
SV Stop Valve
WM Water Meter
CATV CATV Inspection Cover
BT BT Inspection Cover

LP Street Light
TP Telephone Pole
EP Electric Pole / Pylon
BH Bore Hole
POST Concrete Post
FH Fire Hydrant
FFL Floor Level
IL Invert Level
+50.521 Spot Height
Road Sign
TL Traffic Light
Trees
Bushes

NORTH

0m 5m 10m 15m 20m
SCALE BAR

Eastwood
CONSULTING ENGINEERS

APPENDIX 3

N

S

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
- V VISITOR PARKING
- RC REFUSE COLLECTION POINT
- BS/RC COMBINED BIN STORAGE & REFUSE COLLECTION POINT
- STRUCTURED TREE PLANTING

EXISTING AREA OF SELF SEEDED TREE COVER TO BE RETAINED

EXTENT OF NATURAL ENVIRONMENT AREA

3m FOOTPATH LINK

NEW HEDGE

PROPOSED FOOTPATH CONNECTION ONTO PRIMROSE LANE

PEDESTRIAN DROPPED KERB ACCESS ONTO PRIVATE DRIVEWAY SHARED SURFACE

EXISTING WALL TO BE RETAINED

EXISTING WALL TO BE RETAINED

EXISTING HEDGE TO BE RETAINED

3m FOOTPATH LINK

PORTION OF EXISTING HEDGE REMOVED TO ACCOMMODATE NEW FOOTPATH

EXISTING HEDGE TO BE RETAINED

PORTION OF EXISTING HEDGE REMOVED TO ACCOMMODATE NEW FOOTPATH

3m FOOTPATH LINK

EXISTING HEDGE TO BE RETAINED

EXISTING HEDGE TO BE RETAINED

EXISTING WALL TO BE RETAINED

EXISTING WALL TO BE RETAINED

AREA OF SELF SEEDED TREE COVER / P.O.S.

EXISTING AREA OF SELF SEEDED TREE COVER TO BE RETAINED

EXTENT OF NATURAL ENVIRONMENT AREA

EXISTING TREES REMOVED TO FORM NEW SITE ACCESS

PORTION OF EXISTING WALL REMOVED TO FORM NEW SITE ACCESS

EXISTING TREES TO BE REMOVED AND REPLACED WITH STRUCTURED PLANTING

EXISTING TREES TO BE REMOVED

EXISTING WALL TO BE RETAINED

450mm HIGH TIMBER KNEE RAIL TO CREATE DEFINED OPEN BOUNDARY

3m FOOTPATH LINK

450mm HIGH TIMBER KNEE RAIL TO CREATE DEFINED OPEN BOUNDARY

3m FOOTPATH LINK

450mm HIGH TIMBER KNEE RAIL TO CREATE DEFINED OPEN BOUNDARY

EXISTING WALL TO BE RETAINED

EXISTING WALL TO BE RETAINED

Drain

Cycle Track

Eddercliffe Bridge (FB)

PRIMROSE LANE

DENE CLOSE

Path

5500 4200 4100 6100 6000

	Schedule of Accommodation						
	To be read in conjunction with drawing no. 3416-1-001 - Latest revision						
	Housetype	**No. of Beds**	**Type**	**No. of Units**	**Percentage**	**Sq. Ft.**	**Total Sq. Ft.**
AP	APARTMENT	2 Bedrooms	Apartment	12	15.58	650	7800.00
KW	KESWICK	3 Bedrooms	Semi-detached/Detached	22	28.57	1009	22198.00
BA	BANBURY	4 Bedrooms	Detached	13	16.88	1354	17602.00
BE	BENTLEY	4 Bedrooms	Detached	16	20.78	1619	25904.00
BU	BUCKLEY	4 Bedrooms	Detached	3	3.90	1473	4419.00
BU(ct)	BUCKLEY CORNER TURNER	4 Bedrooms	Detached	4	5.19	1692	6768.00
LT	LATCHFORD	5 Bedrooms	Detached	7	9.09	1810	12670.00
			Totals	**77**	**100.00**		**97361.00**

rev	date	initials	initials	content
AA	18.08.23	SM	SN	AMENDED PARKING FOR PLOTS 32 & 40, REMOVED SECTION OF HEDGE AND RELOCATED DROPPED KERB NOTE.
Z	09.08.23	SM	SN	AMENDED INLINE WITH COMMENTS RECEIVED FROM HG, PLOTS 11 & 12 CHANGED TO SEMI DETACHED AND PRIVATE DRIVE AMENDED TO VEHICLE ACCOMMODATE TRACKING
Y	07.08.23	SM	SN	AMENDED INLINE WITH COMMENTS RECEIVED FROM HIGHWAY DESIGN REVIEW.
X	02.08.23	JB	–	ADDITIONAL LAND INCLUDED IN DEVELOPMENT AND PLOTS ADDED. FORWARD VISIBILITY SPLAYS REMOVED. MINOR ADJUSTMENTS IN LINE WITH CLIENT COMMENTS. SCHEDULE OF ACCOMMODATION UPDATED.
W	10.07.23	PG	–	DENSITY INCREASED TO 72 PLOTS.
V	30.03.23	PG	–	CLIENT UPDATES.
U	29.03.23	JB	ED	AMENDMENTS MADE IN LINE WITH CLIENT COMMENTS RECEIVED ON THE 24.03.23. SCHEDULE OF ACCOMMODATION UPDATED.
T	13.03.23	SM	ED	TREES TO BE REMOVED AND REPLACED WITH STRUCTURED PLANTING, PLOT 67 BOUNDARY REVISED.

PLANNING

subject to structural review
subject to accurate measured survey

PRIMROSE LANE

PROPOSED SITE LAYOUT

title:
PRIMROSE LANE
HIGHTOWN

client:
JONES HOMES

client ref:

niemen architects
Niemen Architects
Deck 2, The Waterscape
42 Leeds & Bradford Road
Kirkstall, Leeds, LS5 3EG
T: 0113 239 5400
office@niemen.co.uk

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

drawing no: 3416-1-001

revision: AA

Eastwood
CONSULTING ENGINEERS

APPENDIX 4

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**419702/424136**	**3 Jan 2024 11:07**

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 that 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.

Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
419702/424136

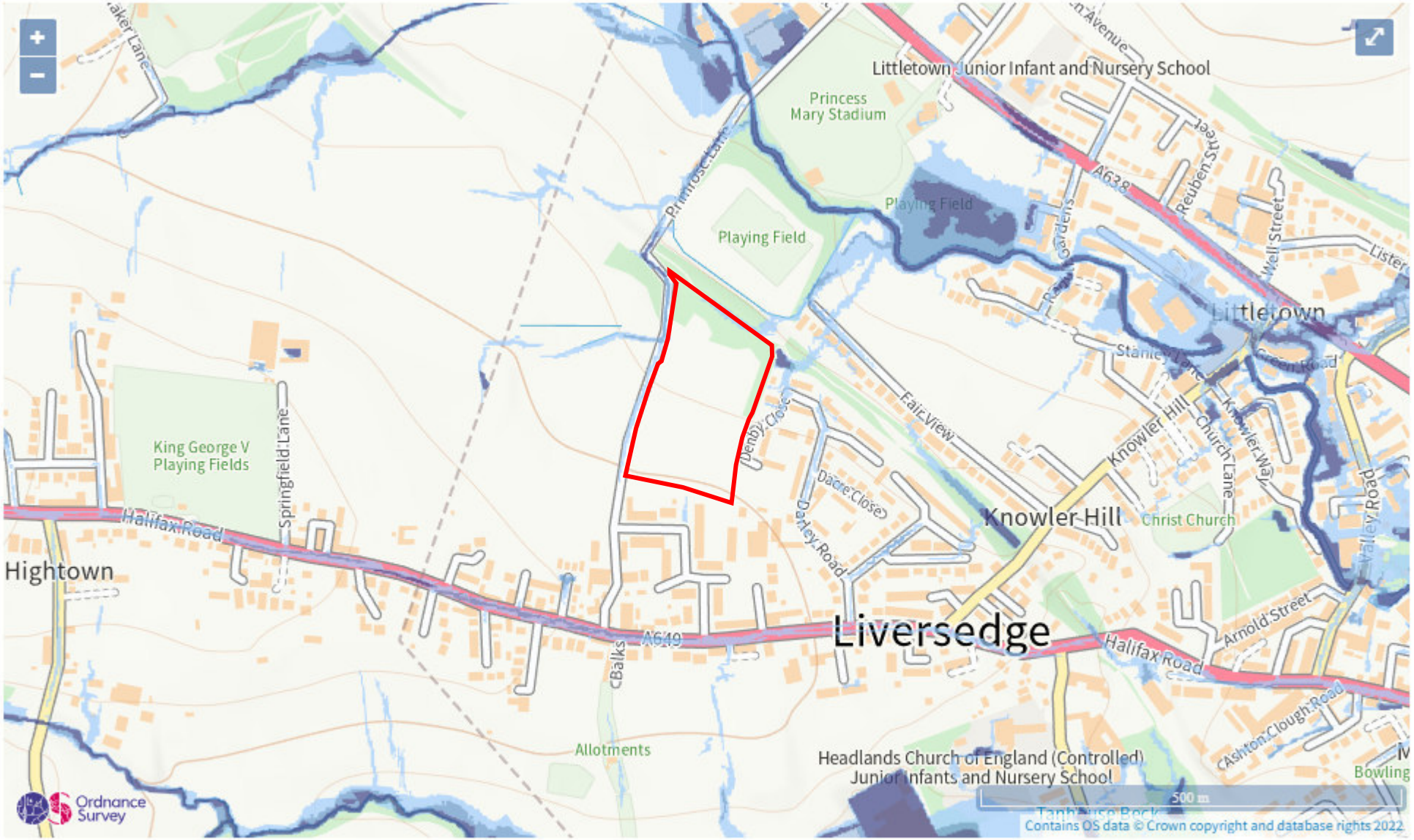
Scale
1:2500

Created
3 Jan 2024 11:07

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m


Risk of Flooding from Surface Water (Basic)
Risk of Flooding from Surface Water
1 in 30 years
RoFSW_Extent_1in30
1 in 100 years
RoFSW_Extent_1in100
1 in 1000 years
RoFSW_Extent_1in1000
Primrose Lane
Spen River
Radulf Gardens
Fair View
Denby Close
Darley Road
Linton Close
Rock Edge
Knowler Hill
Dacre Close
Lower Hall Close
Ripley Road
Burnsall Road
Halifax Road



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

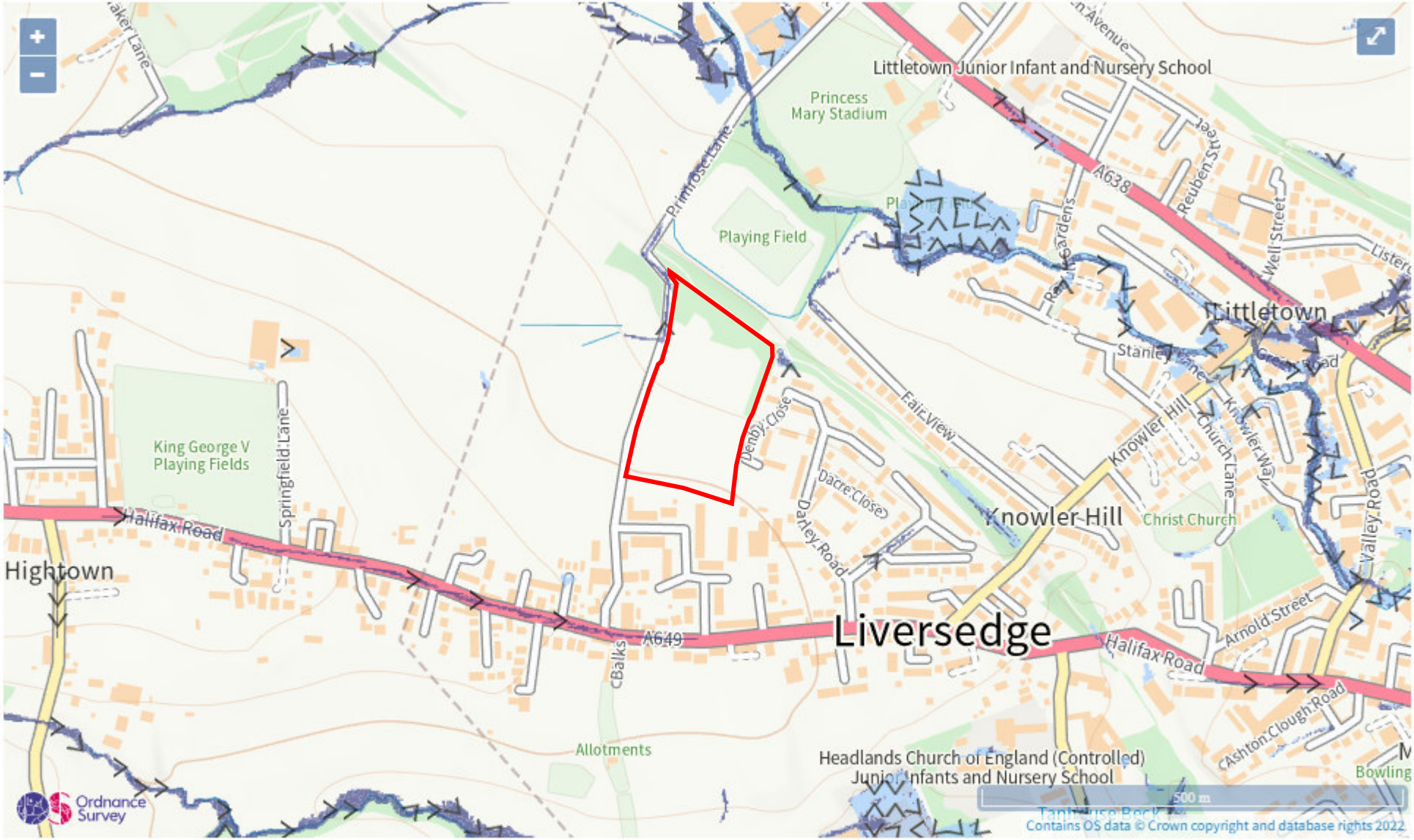
Flood velocity (metres/second)

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)

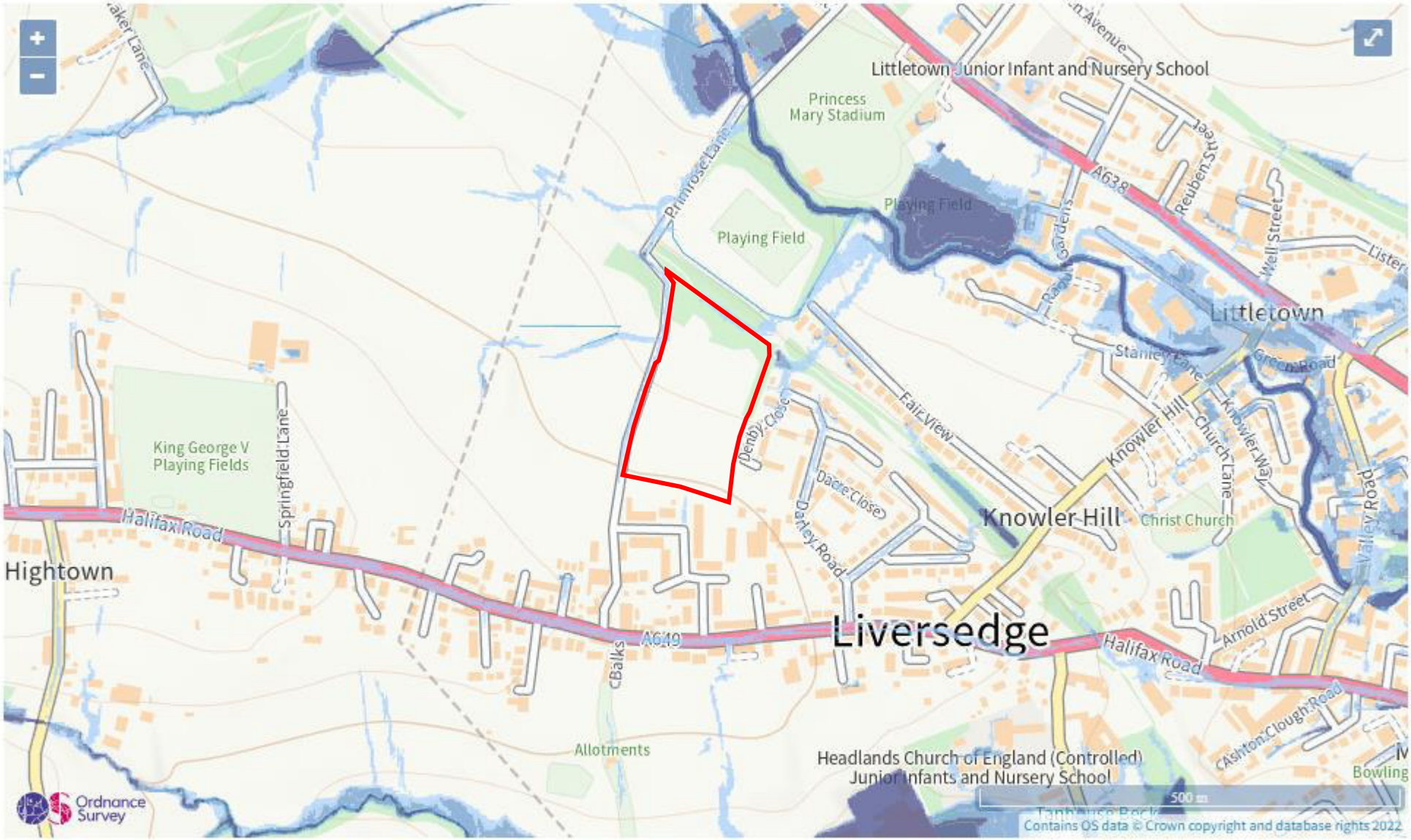
Over 900mm | 300 to 900mm | Below 300mm | Location you selected



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

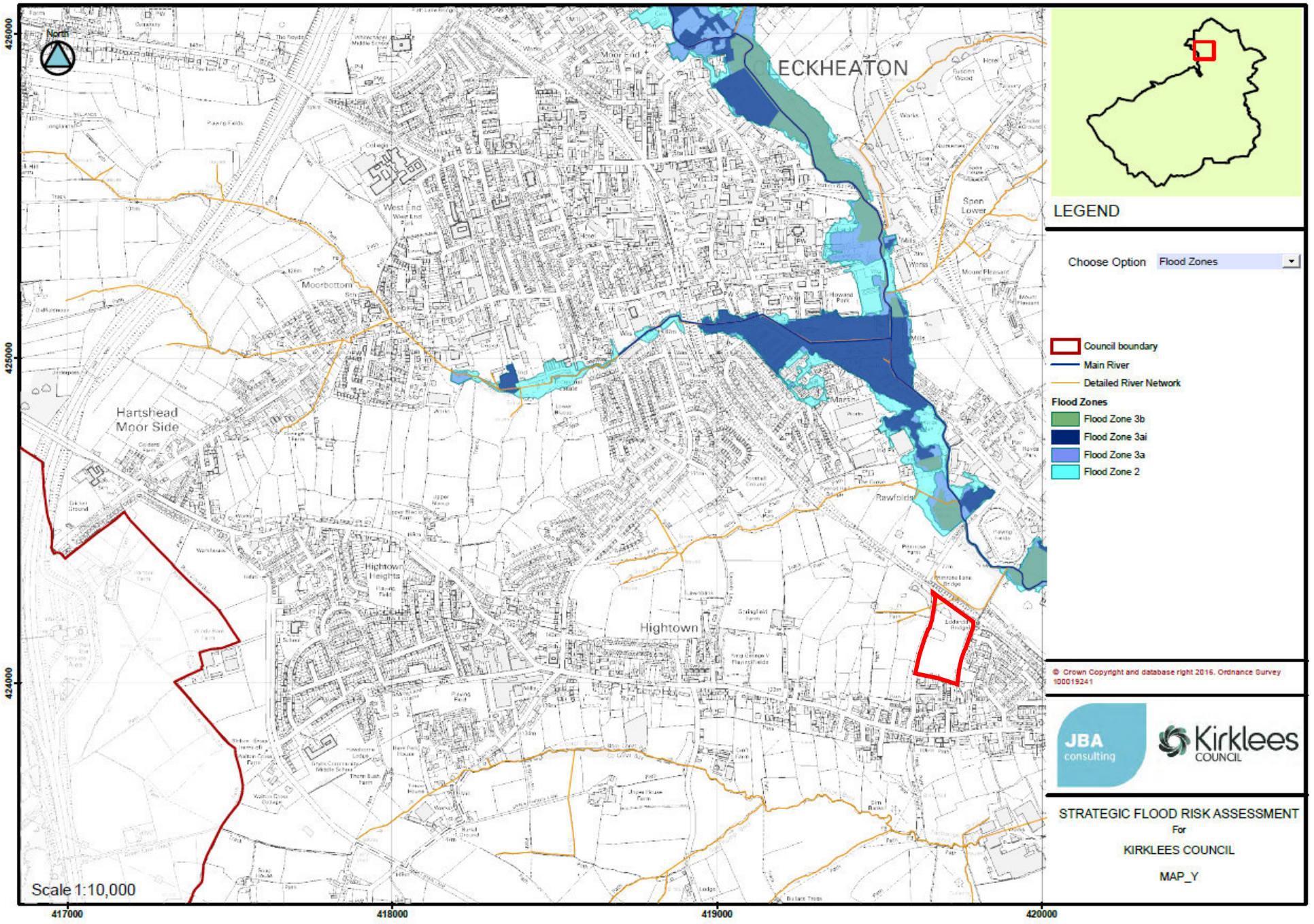
Surface water flood risk: water velocity in a low risk scenario

Flood velocity (metres/second)

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

Eastwood
CONSULTING ENGINEERS

APPENDIX 5



LEGEND

Choose Option: Flood Zones

- Council boundary
- Main River
- Detailed River Network

Flood Zones

- Flood Zone 3b
- Flood Zone 3ai
- Flood Zone 3a
- Flood Zone 2

JBA consulting

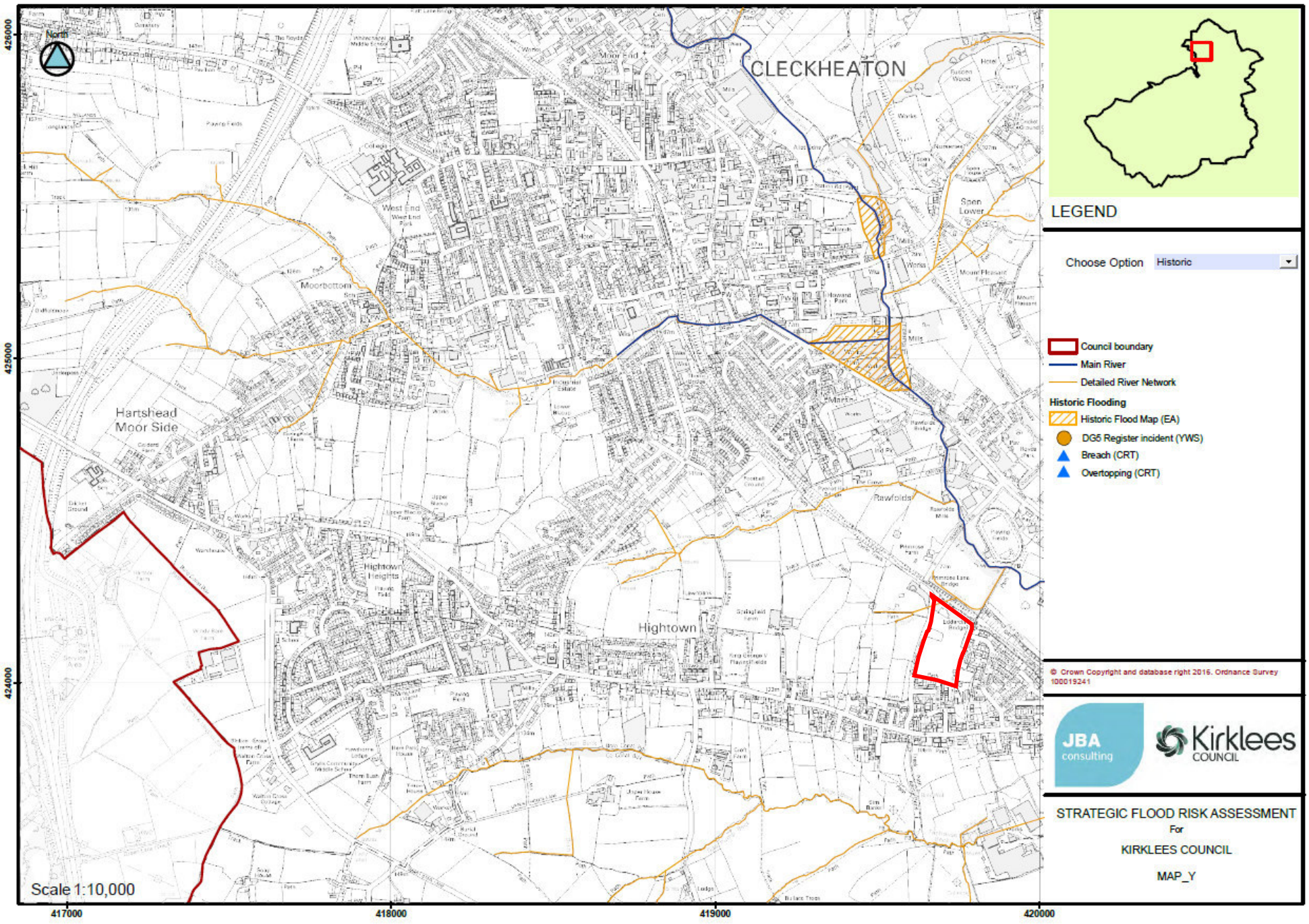
Kirklees COUNCIL

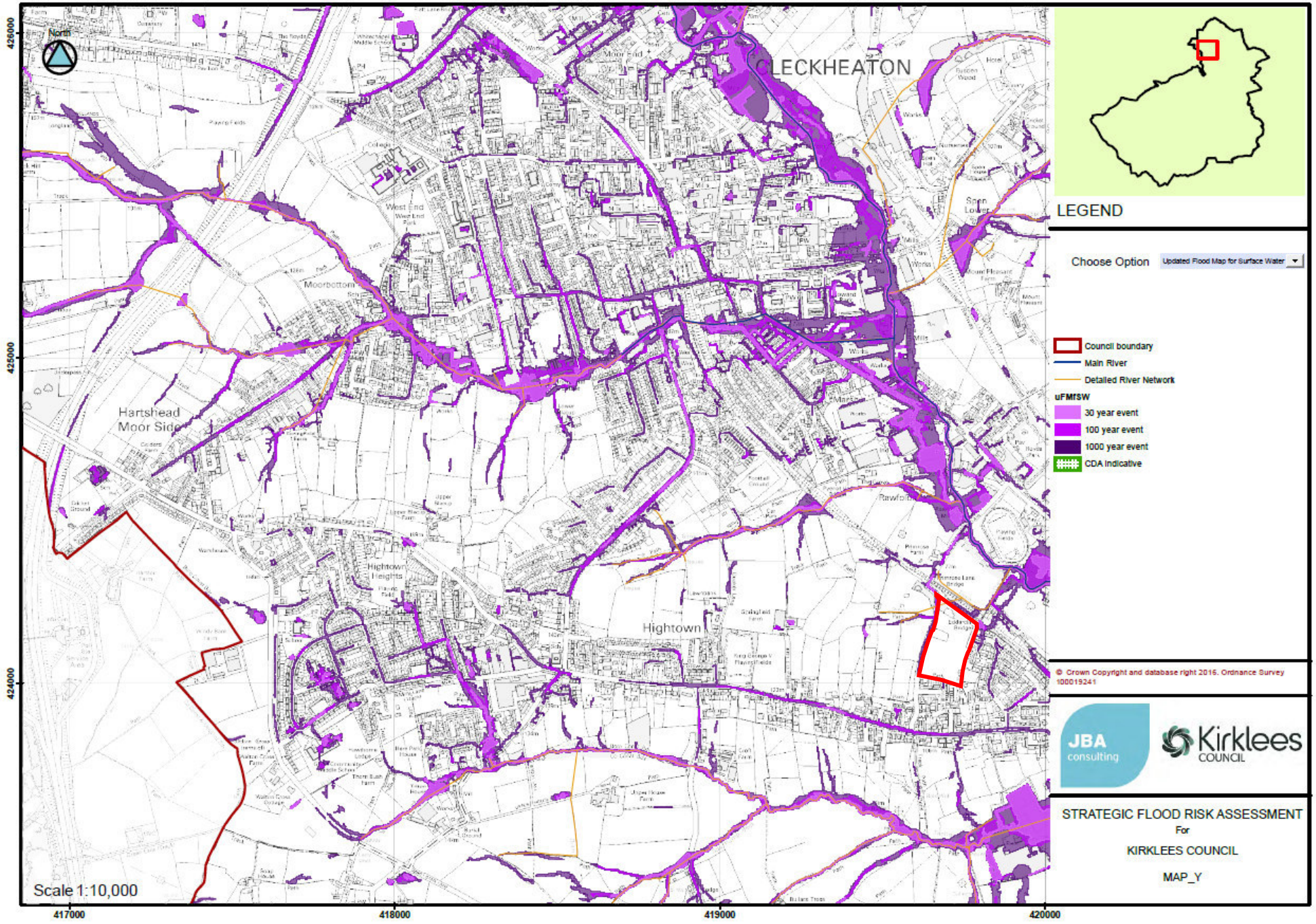
STRATEGIC FLOOD RISK ASSESSMENT

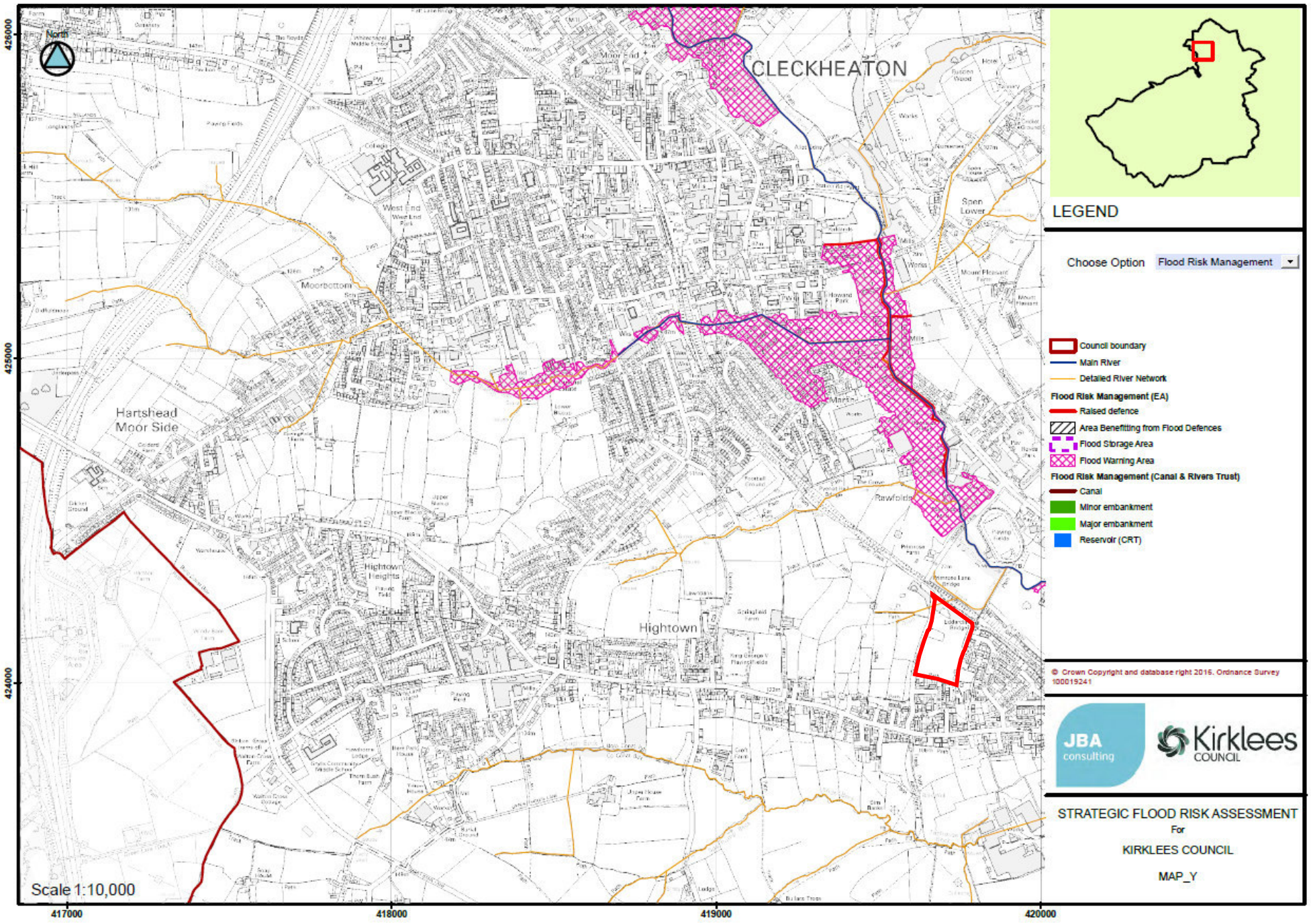
For

KIRKLEES COUNCIL

MAP_Y


North
CLECKHEATON
Moorbottom
Hartshead
Moor Side
Hightown
Heights
Hightown
Rawfolds
Spen
Lower
Scale 1:10,000
426000
425000
424000
417000
418000
419000
420000
LEGEND
Choose Option
Historic
Council boundary
Main River
Detailed River Network
Historic Flooding
Historic Flood Map (EA)
DG5 Register incident (YWS)
Breach (CRT)
Overtopping (CRT)
© Crown Copyright and database right 2016. Ordnance Survey 100019241
JBA consulting
Kirklees COUNCIL
STRATEGIC FLOOD RISK ASSESSMENT
For
KIRKLEES COUNCIL
MAP_Y


North
CLECKHEATON
Moorbottom
West End
Hartshead
Moor Side
Hightown
Heights
Hightown
426000
425000
424000
417000
418000
419000
420000
Scale 1:10,000
LEGEND
Choose Option
Updated Flood Map for Surface Water
Council boundary
Main River
Detailed River Network
uFMfSW
30 year event
100 year event
1000 year event
CDA Indicative
© Crown Copyright and database right 2016. Ordnance Survey 100019241
JBA consulting
Kirklees COUNCIL
STRATEGIC FLOOD RISK ASSESSMENT
For
KIRKLEES COUNCIL
MAP_Y



LEGEND

Choose Option: Flood Risk Management

- Council boundary
- Main River
- Detailed River Network

Flood Risk Management (EA)

- Raised defence
- Area Benefitting from Flood Defences
- Flood Storage Area
- Flood Warning Area

Flood Risk Management (Canal & Rivers Trust)

- Canal
- Minor embankment
- Major embankment
- Reservoir (CRT)

JBA consulting

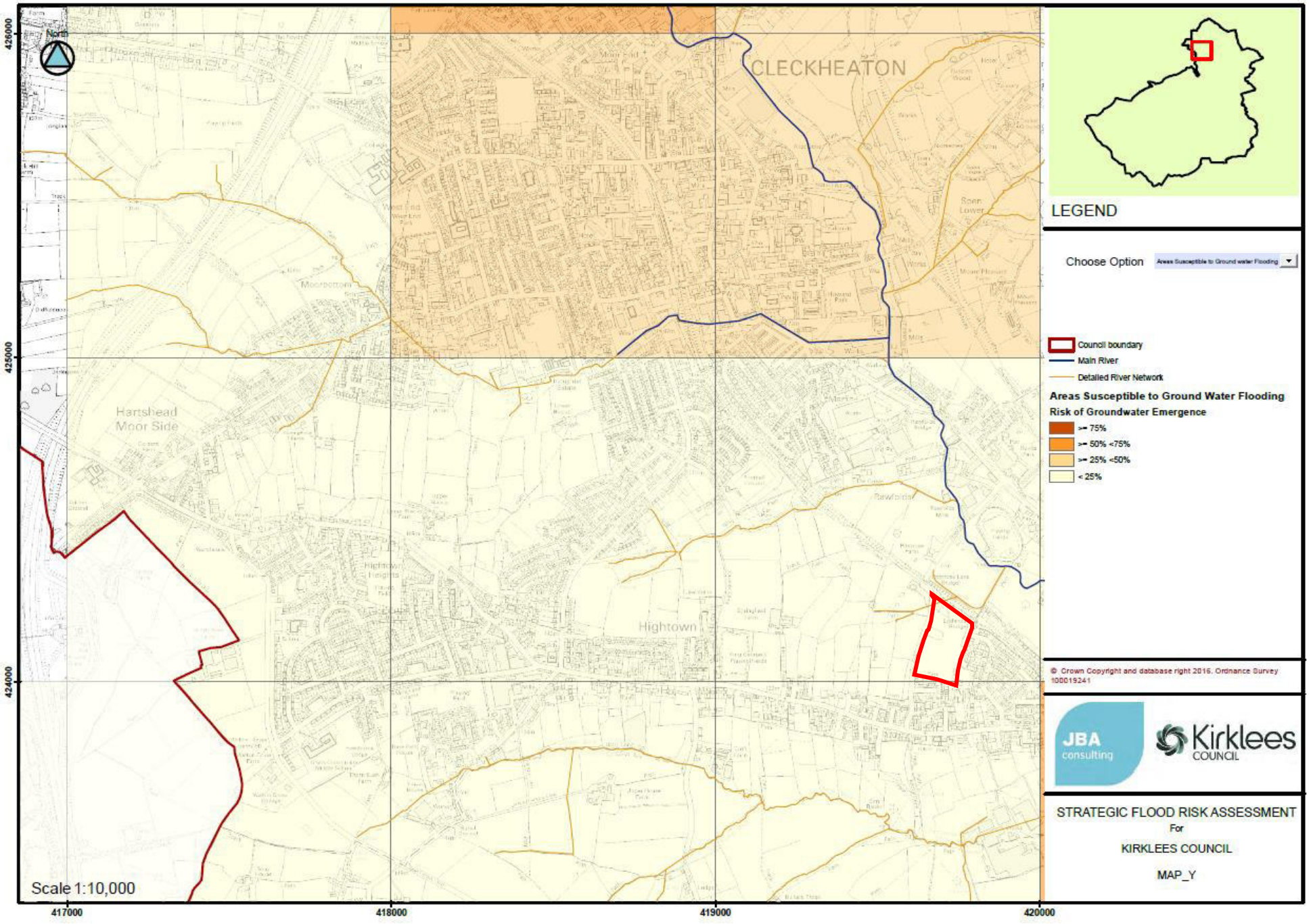
Kirklees COUNCIL

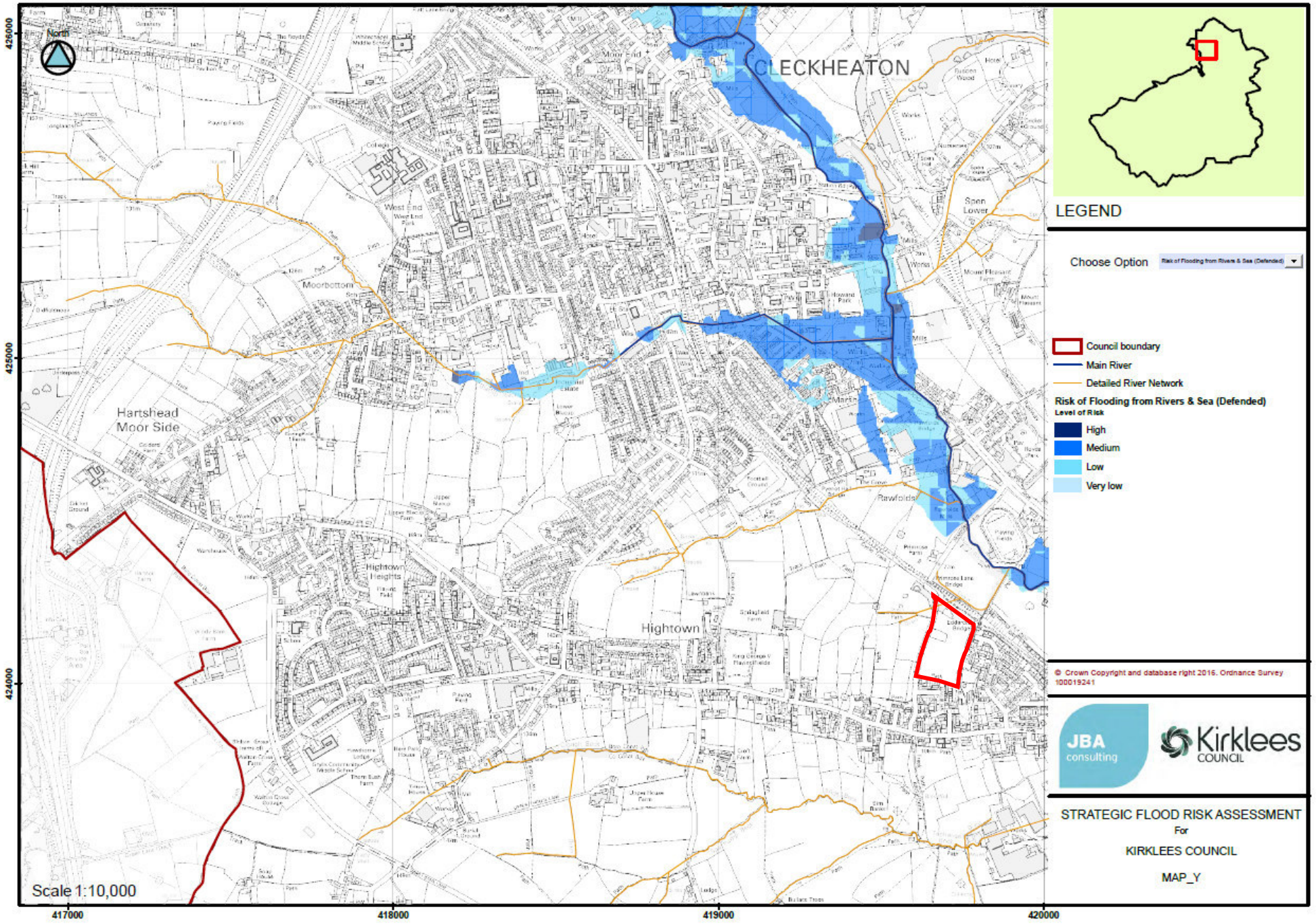
STRATEGIC FLOOD RISK ASSESSMENT

For

KIRKLEES COUNCIL

MAP_Y


North
CLECKHEATON
Hartshead
Moor Side
Hightown
426000
425000
424000
417000
418000
419000
420000
Scale 1:10,000
LEGEND
Choose Option
Areas Susceptible to Ground water Flooding
Council boundary
Main River
Detailed River Network
Areas Susceptible to Ground Water Flooding
Risk of Groundwater Emergence
>= 75%
>= 50% <75%
>= 25% <50%
< 25%
© Crown Copyright and database right 2016. Ordnance Survey 100019241
JBA consulting
Kirklees COUNCIL
STRATEGIC FLOOD RISK ASSESSMENT
For
KIRKLEES COUNCIL
MAP_Y



LEGEND

Choose Option

Council boundary
Main River
Detailed River Network

Risk of Flooding from Rivers & Sea (Defended)
Level of Risk
- High
- Medium
- Low
- Very low

JBA consulting

Kirklees COUNCIL

STRATEGIC FLOOD RISK ASSESSMENT
For
KIRKLEES COUNCIL

MAP_Y

Eastwood
CONSULTING ENGINEERS

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:

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

Your Ref:
Our Ref: Y001558

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:

YorkshireWater

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.

YorkshireWater

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.

YorkshireWater

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

Ian Hopkinson

From: Ian Ellis <IanEllis@bryanghall.co.uk>
Sent: 15 March 2022 07:43
To: Mike Parrott; Alex Freeman-Laverack
Subject: FW: Primrose Lane off Darley Road, Liversedge, WF15 6LN - Pre Planning Sewerage Enquiry U546603
Attachments: pic19718.gif; 21-434-SK-001-SITE CONSIDERATIONS.pdf; Ground Investigation Extract - Soakaway Tests.pdf

⚠ External Message:

Good Morning Gents

Please see the additional comment form YW regarding the pre planning enquiry at Liversedge.

In a nutshell we will be able to make a gravity connection to the foul sewer in Darley Close regarding out new foul water.

Regarding the surface as a last resort we can outfall to the surface water sewer at a restricted rate of 3.5 litres per second if for what ever reason we cannot get to the watercourse due to land constraints.

Our latest drainage feasibility plan is based on an outfall to the sewer at 3.5 litre per second as this is likely to be the worst-case scenario.

An outfall to the watercourse will be based on a green field runoff rate agreed with the LLFA (Kirklees Council). We calculate this to be, approximately, 6.5 litre per second for the site but obviously we need to agree a route through the woodland and into the watercourse to the north. If we can achieve this and then apply the larger discharge rate then we may be able to reduce the amount of surface water attenuation required.

I am not sure how far you may have got with your pre planning consultations with the LLFA and Kirklees Council and potentially this may help determine the final surface water solution considering the land constraints and other issues involved.

Any questions please give me a call.

Kind Regards

Ian Ellis
Associate

Leeds Office

Suite E15 Josephs Well, Hanover Walk, LEEDS LS3 1AB
T 0113 246 1555 M 07809 907766 F 0113 234 2201
E ianellis@bryanghall.co.uk
W www.bryanghall.co.uk

Registered in England and Wales
Company Number 4104802

-----Original Message-----
From: Chris.Roberts@yorkshirewater.co.uk <Chris.Roberts@yorkshirewater.co.uk> On Behalf Of technical.sewerage@yorkshirewater.co.uk
Sent: 14 March 2022 13:48
To: Ian Ellis <IanEllis@bryanghall.co.uk>
Subject: RE: Primrose Lane off Darley Road, Liversedge, WF15 6LN - Pre Planning Sewerage Enquiry U546603

Hi Ian,

Thank you for the additional information.

I would have not objection to a foul gravity connection to the 225 mm foul public sewer in Darley Road.

As a very last resort subject to evidence why a discharge to watercourse could not be achieved I would look to agree 3.5 l/s to the 225 mm surface water public sewer.

Kind Regards
(Embedded image moved to file: pic19718.gif)
*** Please note, all correspondence must be sent to technical.sewerage@yorkshirewater.co.uk and will be responded to within 10 working days ***

|---------->
| From: |
|---------->
>----------|
|Ian Ellis <IanEllis@bryanghall.co.uk> |
>----------|
|---------->
| To: |
|---------->
>----------|
|Technical Sewerage@NotesMail |
>----------|

|---------->
| Cc: |
|---------->
>----------|
|"mike.parrott@emerson.co.uk" <mike.parrott@emerson.co.uk>
|
>----------|
|---------->
| Date: |
|---------->
>----------|
|03/03/2022 13:19 |
>----------|
|---------->
| Subject: |
|---------->
>----------|
|RE: Primrose Lane off Darley Road, Liversedge, WF15 6LN - Pre Planning Sewerage Enquiry U546603
|
>----------|

VR DATED 3/3/2022

(LD)

EXTERNAL SOURCE - THINK BEFORE YOU CLICK

Dear Chris

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

Thank you for your pre planning response detailed above.

I note your response regarding the foul and surface water and would be grateful if you could confirm the following.

You note that out foul water could discharge to the 750mm diameter combined sewer to the north of the site. I believe in engineering terms this will be possible but if we do connect to this sewer our client will have to potentially cross third party land and also run a new pipe through the woodland which may entail the removal of numerous trees to facilitate the construction of the new sewer and also the required easement which I am sure will raise ecological/horticultural concerns. Considering this is there any reason why we could not connect into the recorded

foul sewer in Darley Road? We know we can achieve and outfall via gravity and a connection here removes any impact on the existing woodland.

Regarding the surface you have mentioned we should explore an outfall to ground and watercourse before an outfall sewer could be considered.

Please see the attached extract for the Ground Investigation of the site.
As you will be able to see infiltration is negligible and therefore soakaway will not provide a suitable means of surface water disposal.
Regarding an outfall to watercourse I believe this is achievable in engineering terms albeit the exact location of the outfall into the channel will have to be determined as the condition of the existing watercourse is very variable (please see the attached plan and photos). Also our client will have to cross third party land and also run a new pipe through the woodland which may entail the removal of numerous trees to facilitate the construction of the new sewer and also the required easement which I am sure will raise ecological/horticultural concerns. I appreciate we could requisition the sewer but in terms of the surface water this would not include the outfall into the watercourse and we would still need the riparian owners consent so still may not be possible.

Considering the above issues if we cannot agree or secure a new outfall through the woodland and into the watercourse are you able to confirm an outfall to the surface water sewer in Darley Road may be acceptable and a potential discharge rate you will accept?

I trust the above and attached are in order and hope to hear from you soon but please give me a call if you do have any problems, require anything further or prefer to discuss.

Thank you

Kind Regards

Ian Ellis

Associate

Leeds Office

Suite E15 Josephs Well, Hanover Walk, LEEDS LS3 1AB

T 0113 246 1555 M 07809 907766 F 0113 234 2201

E ianellis@bryanghall.co.uk

W www.bryanghall.co.uk

-----Original Message-----
From: Chris.Roberts@yorkshirewater.co.uk
<Chris.Roberts@yorkshirewater.co.uk> On Behalf Of technical.sewerage@yorkshirewater.co.uk
Sent: 16 February 2022 13:03
To: Nathan Bridge <nathanbridge@bryanghall.co.uk>
Subject: Primrose Lane off Darley Road, Liversedge, WF15 6LN - Pre Planning Sewerage Enquiry U546603

Dear Mr Bridge,

Please find my response below.

(See attached file: Primrose Lane off Darley Road, Liversedge, WF15 6LN – Pre-Planning Sewerage Enquiry U546603 - Copy.pdf)(See attached file:

roberts4_radF8DD2 - Copy.PDF)

Kind Regards

(Embedded image moved to file: pic30932.gif)

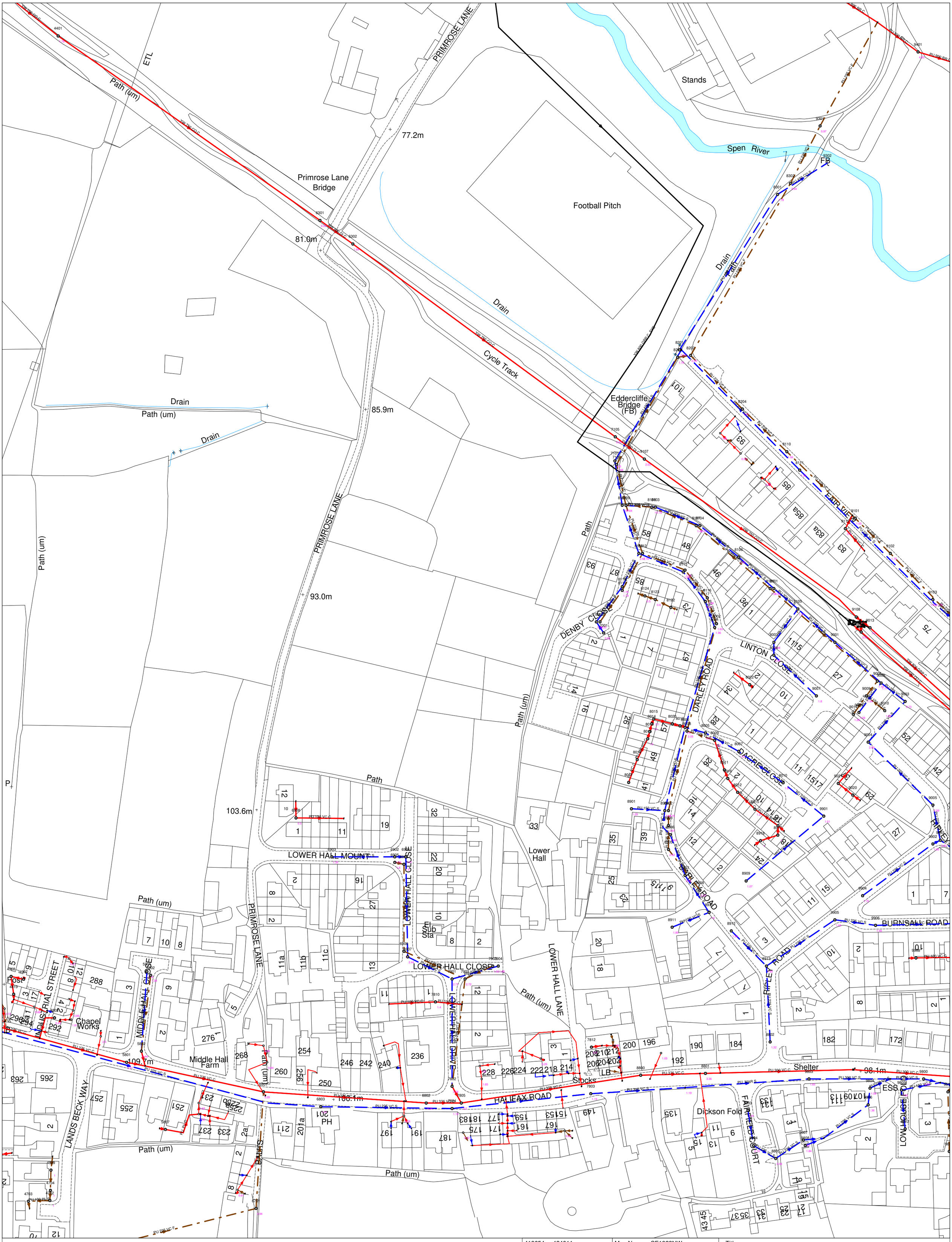
*** Please note, all correspondence must be sent to technical.sewerage@yorkshirewater.co.uk and will be responded to within 10 working days ***

Yorkshire Water customers can get in touch for free with us via live chat or by requesting a free call back at https://www.yorkshirewater.com

Save money on your utility bills and help conserve water by requesting a free water saving pack https://www.yorkshirewater.com/savewater

Yorkshire Water Services Limited

Registered Office Western House, Halifax Road, Bradford, BD6 2SZ Registered in England and Wales No 2366682(See attached file: 21-434-SK-001-SITE CONSIDERATIONS.pdf)(See attached file: Ground Investigation Extract - Soakaway Tests.pdf)



419654 : 424011	Map Name : SE1923NW

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

Title

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

UPN: Undefined
Originator: C ROBERTS, YorMap, 87 2582

Eastwood
CONSULTING ENGINEERS

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, LIVERSEDGE

Contents

Figures

Appendices

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 filing 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 (3rd run)
TP17	1.9	Emptied in 4 minutes (3rd 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

Eastwood
CONSULTING ENGINEERS

APPENDIX 8

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

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)

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

Table of Contents

Project Name	Project Number	Project Date
GR59319_CCTV	LD3343	13/04/2023

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

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

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

Project Information

Project Name	Project Number	Project Date
GR59319_CCTV	LD3343	13/04/2023

Project Drawing, Page 'GR59319_CCTV'

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

Scoring Summary

Project Name	Project Number	Project Date
GR59319_CCTV	LD3343	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.

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

Section Inspection - 03/04/2023 - INLETX

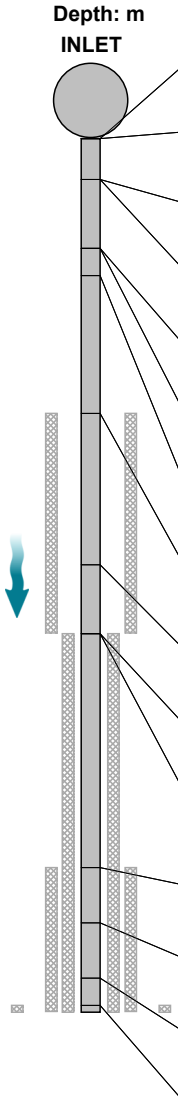
Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
1	1	03/04/23	18:25	LD3343	No Rain Or Snow	Yes	INLETX

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
SS-JM	VEHICLE 1	Camera 1	Not Specified	Not Specified	Not Specified

Town or Village:	Liversedge	**Inspection Direction:**	Downstream	**Upstream Node:**	INLET
Road:	Primrose Lane	**Inspected Length:**	27.20 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	27.20 m	**Downstream Node:**	OUTLET
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	

Use:	Culverted watercourse	**Pipe Shape:**	Rectangular		
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	600 mm	**Width:**	400 mm
Flow Control:	No flow control	**Pipe Material:**	Masonry (regular)		
Year Constructed:	Not Specified	**Lining Type:**	No Lining		
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining		

Comments:
Recommendations:



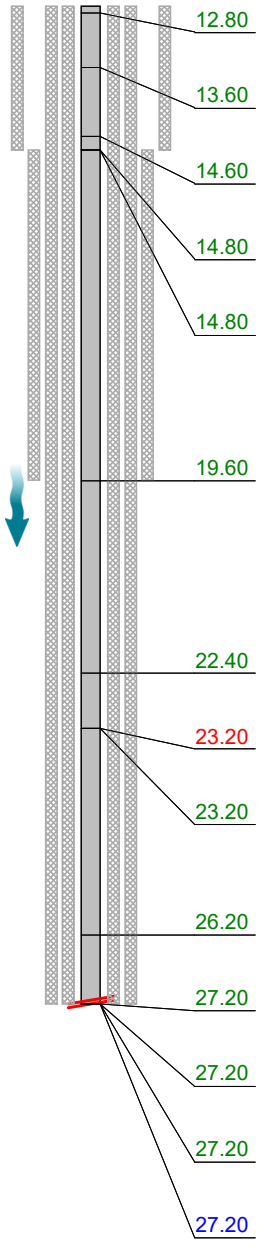
Scale: 1:110 Position [m]		Code	Observation	MPEG	Photo	Grade
0.00		OF	Start node, outfall, reference: INLET	00:00:00	INLETX_2d58e4d7-dbf2-46d5-a	
0.00		WL	Water level, 10% of the vertical dimension	00:00:02		
0.60		OBB	Other obstacles, brick or masonry in invert from 6 o'clock to 8 o'clock, 20% cross-sectional area loss	00:00:03	INLETX_9f78300f-6fb7-4566-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_ba08ec4c-b706-4b28-	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_7858ef46-11cb-4f5c-9	
4.00	S01	DES	Settled deposits, fine, 10% cross-sectional area loss, start	00:00:43	INLETX_366e8b24-8f40-4756-8	
6.20		RM	Roots, mass, 20% cross-sectional area loss	00:00:57	INLETX_a58c74ac-5e61-48b3-	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_b16131f7-55db-4285-	
10.60	S03	DES	Settled deposits, fine, 10% cross-sectional area loss, start	00:01:23	INLETX_9e0fd96f-cd17-4dc5-8	
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_8f576402-9d74-4ce4-8	

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

Section Inspection - 03/04/2023 - INLETX

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
1	1	03/04/23	18:25	LD3343	No Rain Or Snow	Yes	INLETX

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
SS-JM	VEHICLE 1	Camera 1	Not Specified	Not Specified	Not Specified



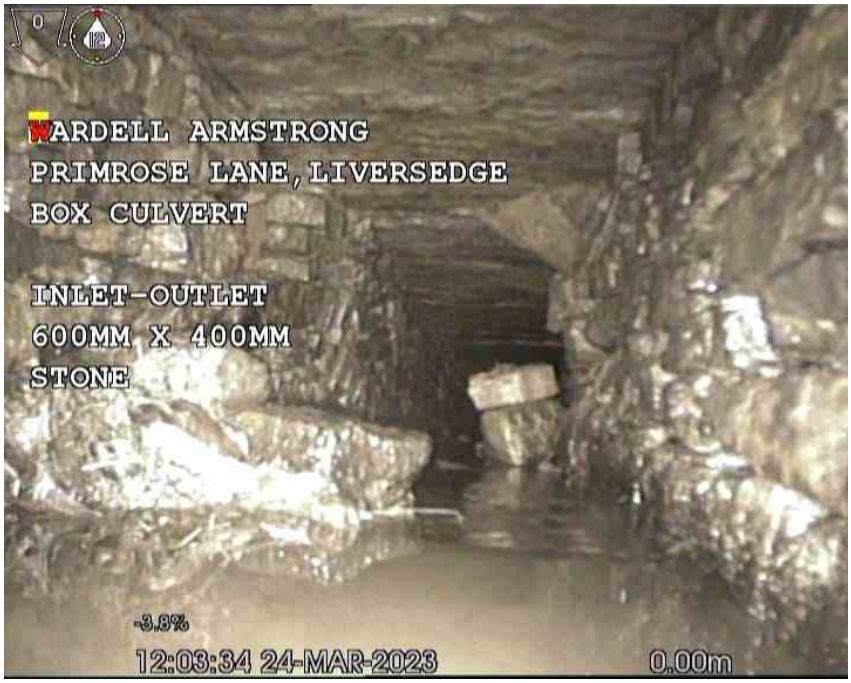
Scale: 1:110	Position [m]		Code	Observation	MPEG	Photo	Grade
	12.80		ID	Infiltration, dripping at 12 o'clock	00:02:46		
	13.60		LR	Line deviates right	00:01:40		
	14.60		LR	Line deviates right: SLIGHT	00:01:46		
	14.80	F04	RF	Roots, fine, finish	00:01:47		2
	14.80	S05	RM	Roots, mass, 10% cross-sectional area loss, start	00:01:48	INLETX_02414660-efa7-4421-8	
	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_4bbeee24-4d52-4136-	4 / 2
	23.20		ID	Infiltration, dripping at 12 o'clock	00:02:42	INLETX_514801fb-812b-4bb8-	
	26.20		DER	Settled deposits, coarse, 30% cross-sectional area loss	00:03:08	INLETX_d9eb86ad-a977-44ca-	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

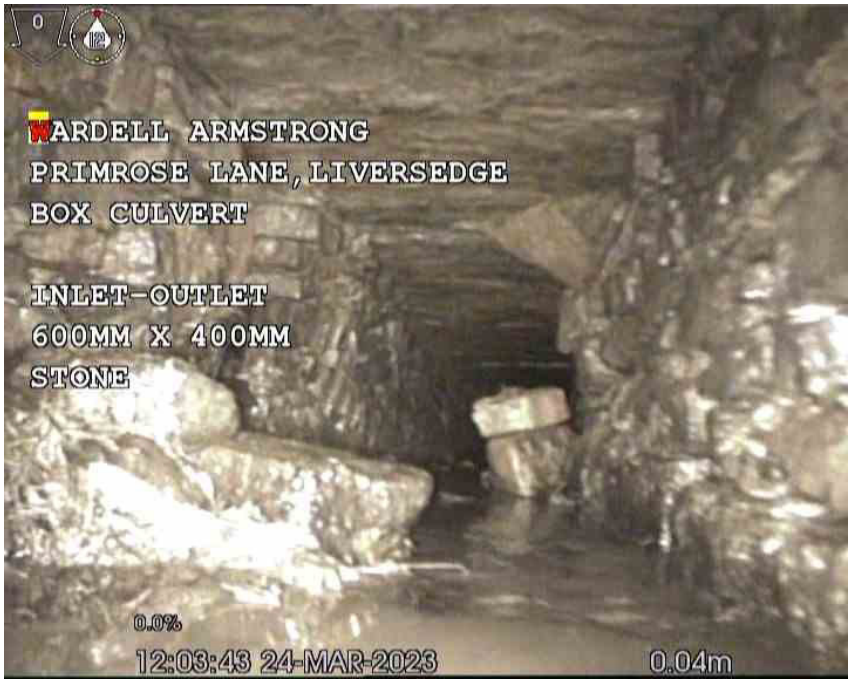
Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

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

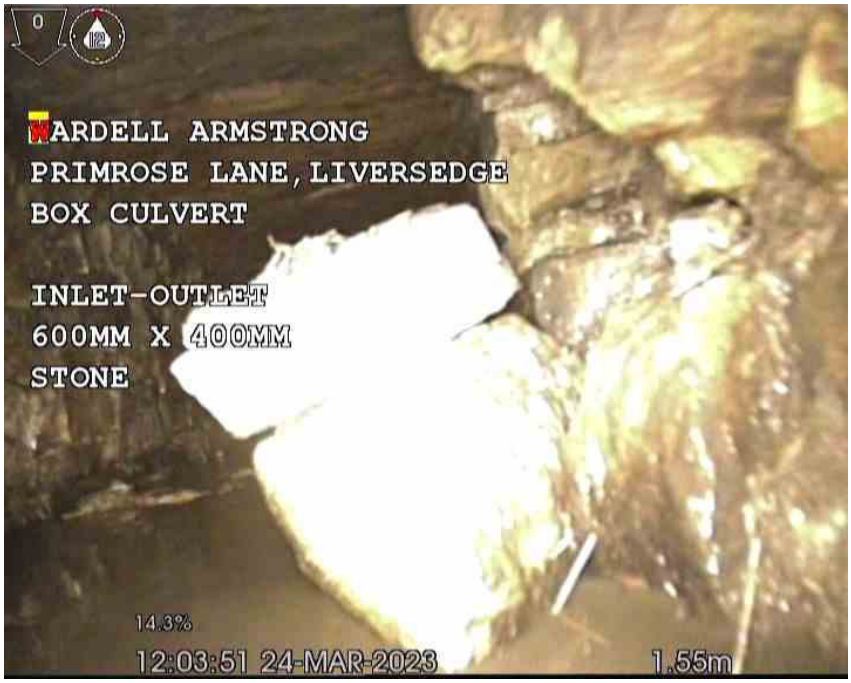


INLETX_9f78300f-6fb7-4566-a267-c3bfc4870626_20230413_122340_815.jpg, 00:00:03, 0.60 m
Other obstacles, brick or masonry in invert from 6 o'clock to 8 o'clock, 20% cross-sectional area loss

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

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

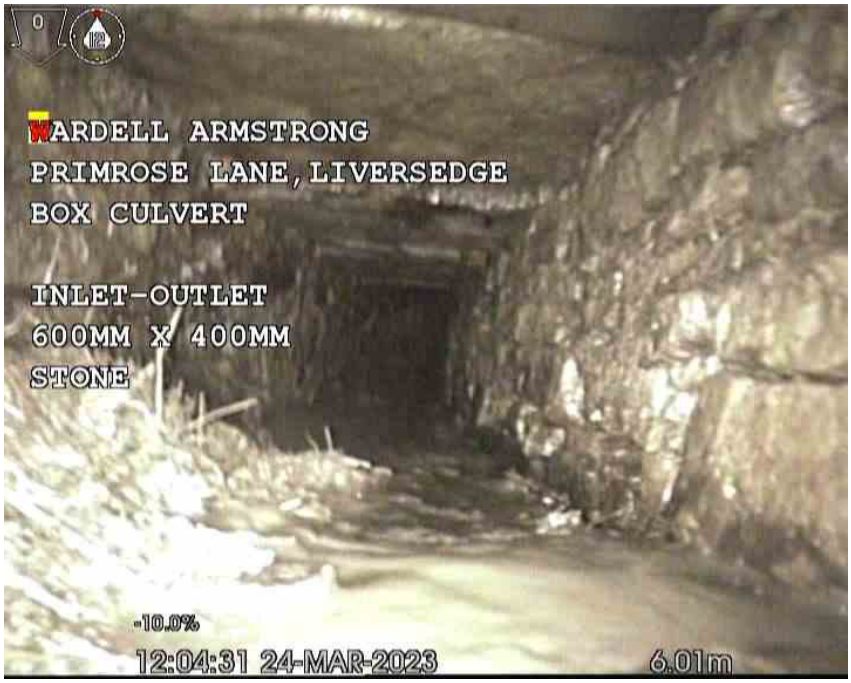
INLETX_7858ef46-11cb-4f5c-9496-9c78f45dc5f5_20230413_122542_642.jpg, 00:00:22, 2.00 m
General photograph taken at this point

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

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



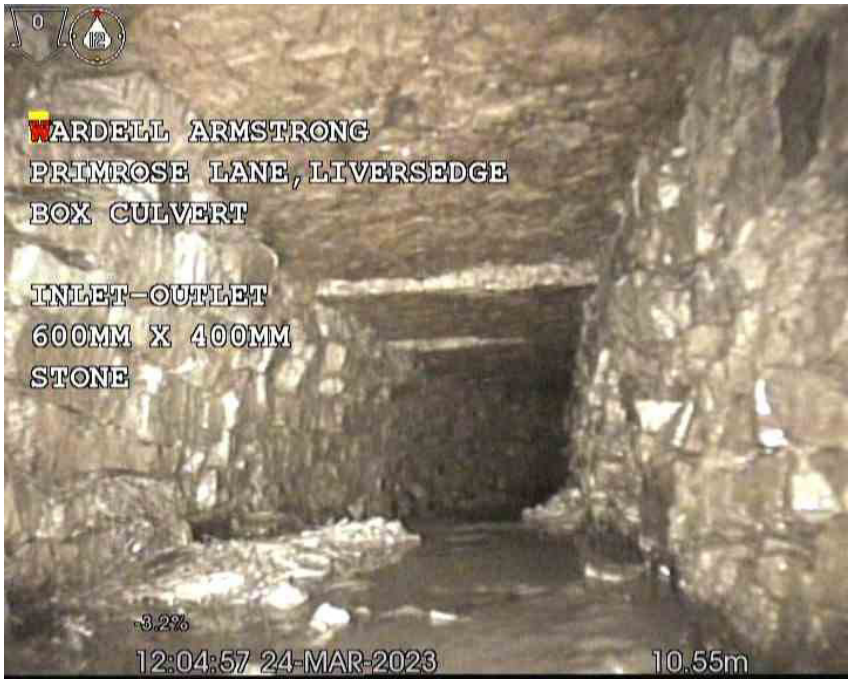
INLETX_a58c74ac-5e61-48b3-924d-87f870bad9b0_20230413_125241_912.jpg, 00:00:57, 6.20 m
Roots, mass, 20% cross-sectional area loss

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

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

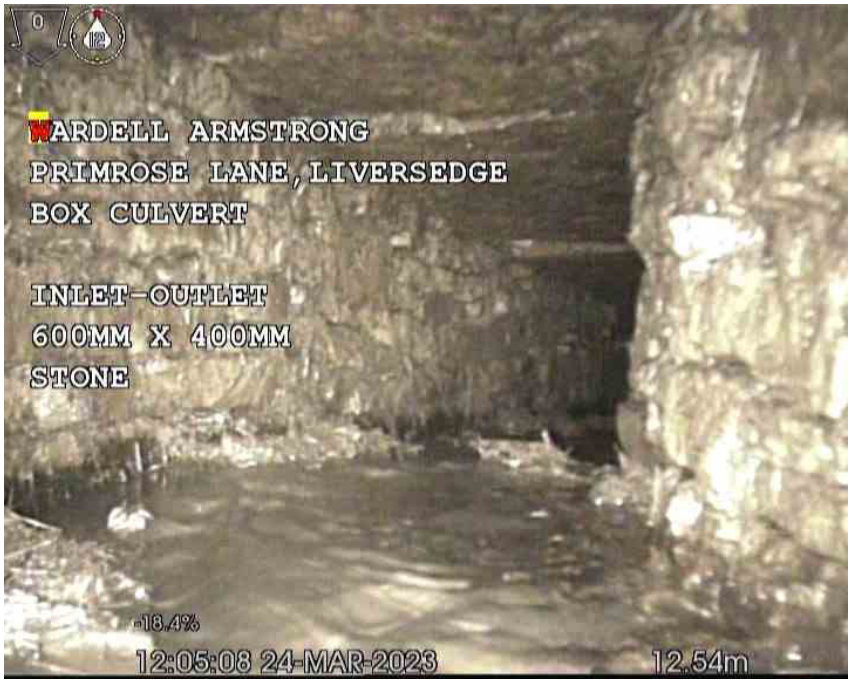


INLETX_9e0fd96f-cd17-4dc5-82b3-10ed61b54c5a_20230413_131718_398.jpg, 00:01:23, 10.60 m
Settled deposits, fine, 10% cross-sectional area loss, start

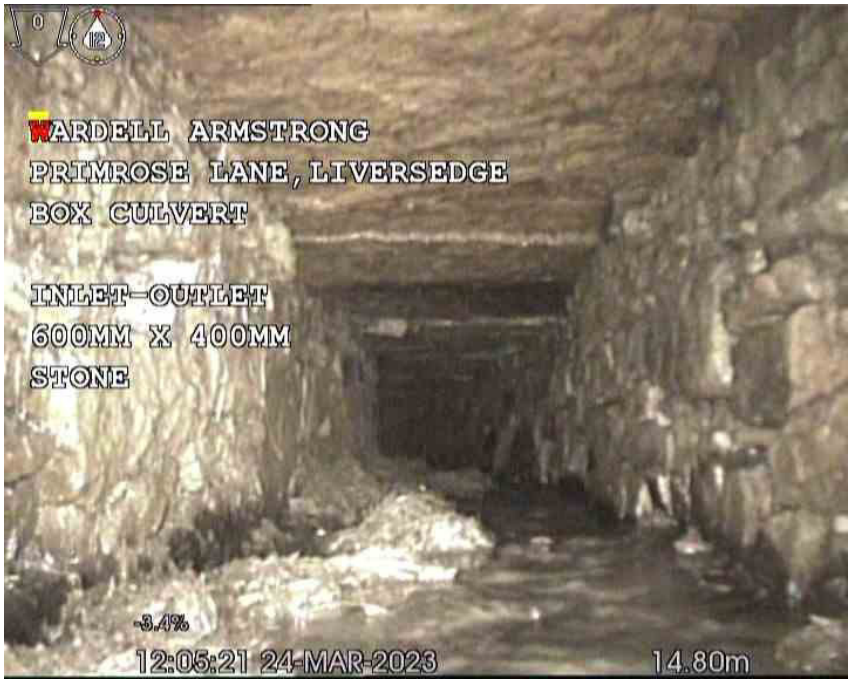
Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

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

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

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

Subscan UDS Limited
126 Whitehall Road, Leeds
Tel. 0344 499 5220
ross.holmes@subscan.com

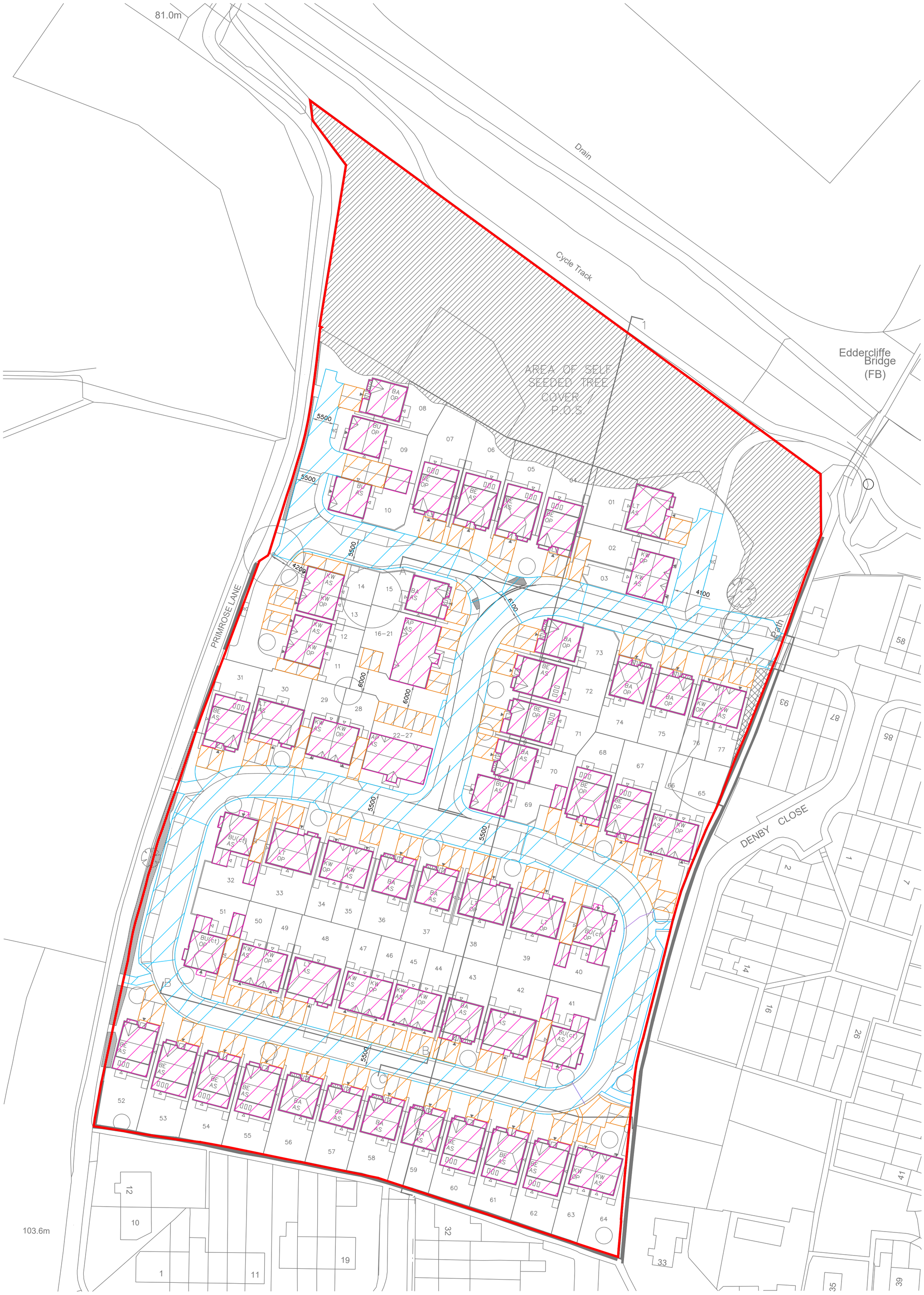
Section Pictures - 03/04/2023 - INLETX

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

Eastwood
CONSULTING ENGINEERS

APPENDIX 9



Roads = 5,059m^2

Roofs = 6,178m^2

Drives / parking = 2,381m^2

Total Impermeable area = 13,618m^2

REV	DESCRIPTION	SIG	CHK	DATE
P01	First Issue.	RS	IH	24.11.2022
P02	Updated to Layout Rev T.	IH	CAT	24.03.2023
P03	Updated to Layout Rev AA.	IH	CAT	03.01.2024

JONES HOMES

PRIMROSE LANE, LIVERSEDGE

IMPERMEABLE AREAS

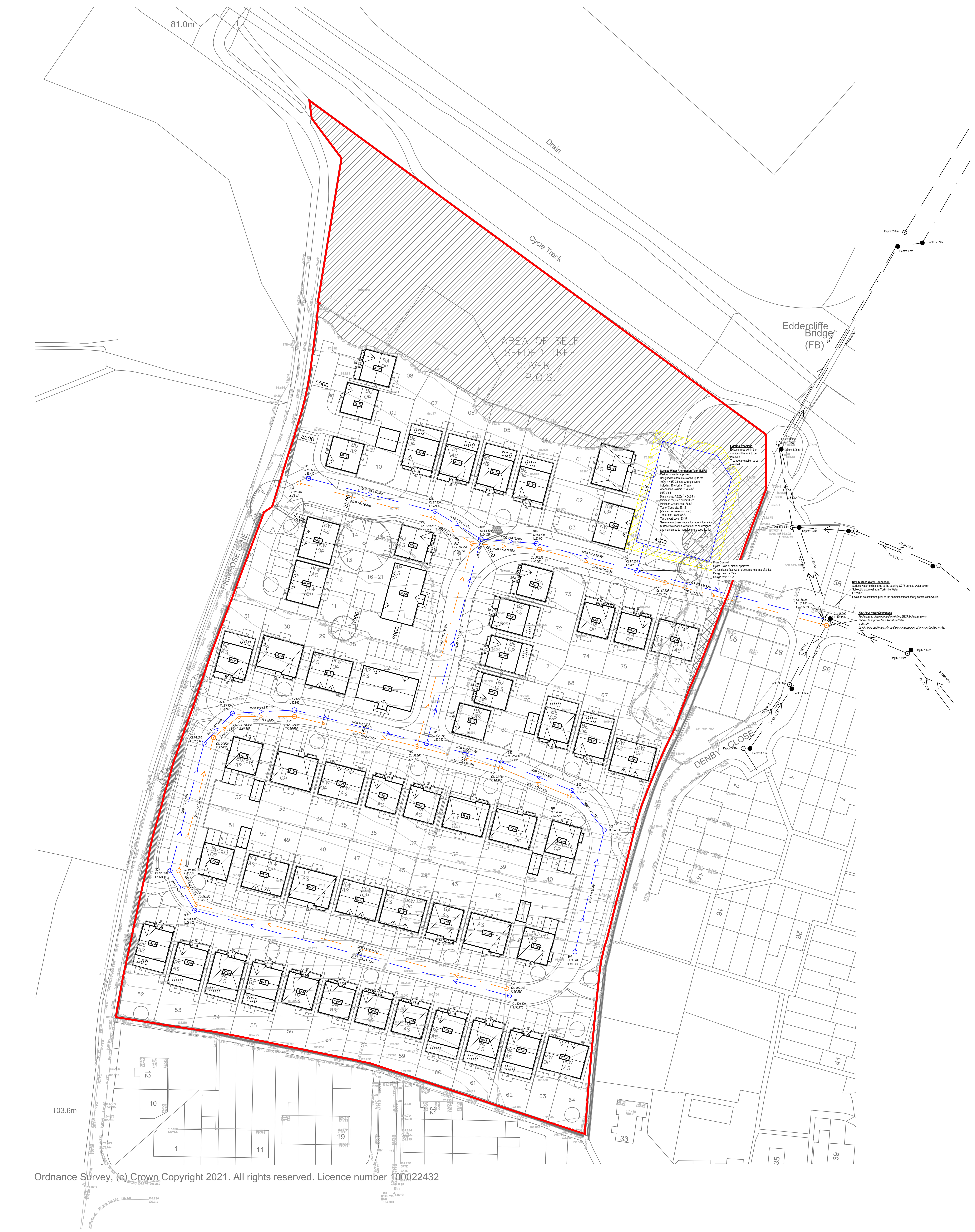
Eastwood
CONSULTING ENGINEERS
St Andrew's House
23 Kingfield Road
Sheffield, S11 9AS
T: 0114 255 4554
E: mail@eastwoodce.com
eastwoodce.com

ECE PROJECT No	SCALE AT A1	STATUS	SUITABLE FOR
47685	1:500	S0	Initial

DRAWING NUMBER: **47685** - ECE - XX - XX - DR - C - **0001** REV P03

Project | Originator | Zone | Level | Type | Role | 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

1. All pipes to be either vitrified clay in accordance with BS EN 295, and having a crushing strength of 40kN/m, or class 120 concrete (54kN/m min) 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.
2. All cover levels are indicative and to be confirmed at detailed drainage design
3. Minimum required cover:
   900mm in pedestrian areas
   1.2m in trafficked areas
4. If the cover to the pipe is less than 600mm a class Z concrete bed and surround must be used.
5. All trenches in roads, paved areas and below slabs shall be backfilled with Type 1 or Type 2 DOT granular sub-base material.
6. All pipes to be laid soffit to soffit at manholes unless noted otherwise.
7. All insitu concrete to be designated mix FND2 conforming to BS 8500-2 unless agreed otherwise.
8. All private drainage to be 100mm diameter and to be laid at minimum:
   Foul Water 1/80,
   Surface Water 1/100
   unless shown otherwise.
9. All surface and foul water lateral connections to be a minimum 150mm diameter minimum.
10. All drainage to be installed in accordance with Part H of the Building Regulations and BS EN 752 & 12056.
11. Refer to manufacturers instructions for installation details
12. 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.
13. External works levels to be confirmed prior to the commencement of any drainage works. Subject to architects levels.

KEY

- Proposed Surface Water Sewer
- Proposed Foul Water Sewer
- Existing Surface Water Sewer
- Existing Foul Water Sewer
- Proposed Surface Water Attenuation Tank
- Attenuation Tank Easement

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
P05	Updated for Layout Rev AA.	IH	CAT	03.01.2024

JONES HOMES

PRIMROSE LANE, LIVERSEDGE

DRAINAGE STRATEGY

Eastwood
CONSULTING ENGINEERS
St Andrew's House
23 Kingfield Road
Sheffield, S11 9AS
T: 0114 255 4554
E: mail@eastwoodce.com
eastwoodce.com

ECE PROJECT No	SCALE AT A1	STATUS	SUITABLE FOR
47685	1:500	S0	Initial

DRAWING NUMBER: 47685 - ECE - XX - XX - DR - C - 0003 (Project, Originator, Zone, Level, Type, Role, Number) REV P05

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	45	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	0.074	5.00	100.200	1200	419721.519	424029.671	1.425
2	0.193	5.00	98.300	1200	419631.952	424054.042	1.500
3	0.159	5.00	97.500	1200	419624.979	424065.309	1.500
4	0.017	5.00	94.000	1200	419634.672	424101.678	1.764
5	0.019	5.00	93.300	1350	419642.679	424110.119	2.377
6	0.109	5.00	92.650	1350	419660.352	424111.053	1.785
9	0.030	5.00	93.400	1200	419739.315	424088.140	2.177
10	0.074	5.00	92.450	1200	419719.293	424096.237	1.492
11	0.185	5.00	92.150	1350	419697.975	424101.596	1.800
15	0.107	5.00	87.600	1200	419664.355	424176.983	2.190
16	0.017	5.00	87.800	1200	419700.361	424167.616	2.769
12	0.105	5.00	88.300	1500	419713.574	424159.716	4.004
13	0.086	5.00	88.200	1500	419729.318	424158.424	4.299
14	0.125	5.00	87.300	1500	419757.850	424150.698	4.003
Tank Inlet		5.00	86.620	1500	419759.872	424158.325	3.250
8	0.031	5.00	94.100	1200	419748.535	424076.918	1.350
7	0.031	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	92.823	0.600	98.775	96.875	1.900	48.9	225	5.82	50.0
1.001	2	3	13.250	0.600	96.800	96.000	0.800	16.6	300	5.88	50.0
1.002	3	4	37.639	0.600	96.000	92.236	3.764	10.0	300	6.01	50.0
1.003	4	5	11.635	0.600	92.236	91.073	1.163	10.0	300	6.05	50.0
1.004	5	6	17.698	0.600	90.923	90.865	0.058	305.1	450	6.30	50.0
1.005	6	11	38.793	0.600	90.865	90.425	0.440	88.2	450	6.60	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	90.350	86.650	3.700	16.3	450	6.80	50.0
3.000	15	16	37.204	0.600	85.410	85.031	0.379	98.2	225	5.47	50.0
3.001	16	12	15.395	0.600	85.031	84.596	0.435	35.4	225	5.59	50.0
1.007	12	13	15.797	0.600	84.296	83.901	0.395	40.0	525	6.87	50.0
1.008	13	14	29.560	0.600	83.901	83.347	0.554	53.4	525	7.03	50.0
4.001	Tank Inlet	14	7.890	0.600	83.370	83.347	0.023	343.1	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	1.876	74.6	19.4	1.200	1.200	0.074	0.0	78	1.580
1.001	3.881	274.4	70.0	1.200	1.200	0.267	0.0	103	3.262
1.002	4.999	353.4	111.6	1.200	1.464	0.426	0.0	116	4.454
1.003	4.999	353.4	116.1	1.464	1.927	0.443	0.0	118	4.497
1.004	1.158	184.2	121.1	1.927	1.335	0.462	0.0	267	1.233
1.005	2.166	344.4	149.6	1.335	1.275	0.571	0.0	207	2.092
2.002	1.449	57.6	24.1	1.952	1.267	0.092	0.0	102	1.387
2.003	1.730	68.8	43.5	1.267	1.350	0.166	0.0	130	1.825
1.006	5.060	804.7	241.6	1.350	1.200	0.922	0.0	168	4.447
3.000	1.319	52.5	28.0	1.965	2.544	0.107	0.0	117	1.342
3.001	2.206	87.7	32.5	2.544	3.479	0.124	0.0	94	2.044
1.007	3.549	768.2	301.6	3.479	3.774	1.151	0.0	228	3.343
1.008	3.071	664.8	324.1	3.774	3.428	1.237	0.0	259	3.053
4.001	1.203	260.5	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	54.916	0.600	83.297	82.996	0.301	182.4	300	7.82	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	1.161	82.0	356.9	3.703	1.975	1.362	0.0	300	1.175
2.000	3.058	54.0	8.1	2.550	1.200	0.031	0.0	39	2.202
2.001	3.204	56.6	16.2	1.200	1.952	0.062	0.0	55	2.771

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	92.823	48.9	225	Circular_Default Sewer Type	100.200	98.775	1.200	98.300	96.875	1.200
1.001	13.250	16.6	300	Circular_Default Sewer Type	98.300	96.800	1.200	97.500	96.000	1.200
1.002	37.639	10.0	300	Circular_Default Sewer Type	97.500	96.000	1.200	94.000	92.236	1.464
1.003	11.635	10.0	300	Circular_Default Sewer Type	94.000	92.236	1.464	93.300	91.073	1.927
1.004	17.698	305.1	450	Circular_Default Sewer Type	93.300	90.923	1.927	92.650	90.865	1.335
1.005	38.793	88.2	450	Circular_Default Sewer Type	92.650	90.865	1.335	92.150	90.425	1.275
2.002	21.597	81.5	225	Circular_Default Sewer Type	93.400	91.223	1.952	92.450	90.958	1.267

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.003	4	1200	Manhole	Adoptable	5	1350	Manhole	Adoptable
1.004	5	1350	Manhole	Adoptable	6	1350	Manhole	Adoptable
1.005	6	1350	Manhole	Adoptable	11	1350	Manhole	Adoptable
2.002	9	1200	Manhole	Adoptable	10	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.003	21.981	57.4	225	Circular_Default Sewer Type	92.450	90.958	1.267	92.150	90.575	1.350
1.006	60.177	16.3	450	Circular_Default Sewer Type	92.150	90.350	1.350	88.300	86.650	1.200
3.000	37.204	98.2	225	Circular_Default Sewer Type	87.600	85.410	1.965	87.800	85.031	2.544
3.001	15.395	35.4	225	Circular_Default Sewer Type	87.800	85.031	2.544	88.300	84.596	3.479
1.007	15.797	40.0	525	Circular_Default Sewer Type	88.300	84.296	3.479	88.200	83.901	3.774
1.008	29.560	53.4	525	Circular_Default Sewer Type	88.200	83.901	3.774	87.300	83.347	3.428
4.001	7.890	343.1	525	Circular_Default Sewer Type	86.620	83.370	2.725	87.300	83.347	3.428
1.009	54.916	182.4	300	Circular_Default Sewer Type	87.300	83.297	3.703	85.271	82.996	1.975
2.000	35.683	11.0	150	Circular_Default Sewer Type	98.700	96.000	2.550	94.100	92.750	1.200
2.001	14.524	10.0	150	Circular_Default Sewer Type	94.100	92.750	1.200	93.400	91.298	1.952

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.003	10	1200	Manhole	Adoptable	11	1350	Manhole	Adoptable
1.006	11	1350	Manhole	Adoptable	12	1500	Manhole	Adoptable
3.000	15	1200	Manhole	Adoptable	16	1200	Manhole	Adoptable
3.001	16	1200	Manhole	Adoptable	12	1500	Manhole	Adoptable
1.007	12	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
1.008	13	1500	Manhole	Adoptable	14	1500	Manhole	Adoptable
4.001	Tank Inlet	1500	Manhole	Adoptable	14	1500	Manhole	Adoptable
1.009	14	1500	Manhole	Adoptable	Outfall	1200	Manhole	Adoptable
2.000	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
2.001	8	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable

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 (m³/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	45	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 (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	625.0	0.0	2.500	625.0	0.0	2.501	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.27%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	11	98.835	0.060	12.0	0.0678	0.0000	OK
15 minute summer	2	10	96.883	0.083	42.2	0.0941	0.0000	OK
15 minute summer	3	10	96.089	0.089	67.9	0.1006	0.0000	OK
15 minute summer	4	10	92.335	0.099	70.4	0.1124	0.0000	OK
15 minute summer	5	10	91.121	0.198	72.9	0.2837	0.0000	OK
15 minute summer	6	11	91.029	0.164	89.9	0.2341	0.0000	OK
15 minute summer	9	10	91.301	0.078	14.8	0.0882	0.0000	OK
15 minute summer	10	10	91.059	0.101	26.7	0.1145	0.0000	OK
15 minute summer	11	11	90.482	0.132	145.4	0.1891	0.0000	OK
15 minute summer	15	10	85.503	0.093	17.4	0.1048	0.0000	OK
15 minute summer	16	10	85.107	0.076	20.0	0.0864	0.0000	OK
15 minute summer	12	10	84.523	0.227	182.1	0.4004	0.0000	OK
15 minute summer	13	10	84.521	0.620	203.4	1.0948	0.0000	SURCHARGED
15 minute winter	14	9	84.461	1.164	256.9	2.0569	0.0000	SURCHARGED
1440 minute winter	Tank Inlet	1350	83.850	0.480	10.9	286.0025	0.0000	OK

Link Event (Outflow)	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	11.5	1.367	0.154	0.7818	
15 minute summer	2	1.001	3	42.1	2.527	0.154	0.2211	
15 minute summer	3	1.002	4	67.6	3.576	0.191	0.7116	
15 minute summer	4	1.003	5	69.8	3.674	0.197	0.2212	
15 minute summer	5	1.004	6	72.4	1.219	0.393	1.0525	
15 minute summer	6	1.005	11	90.6	1.807	0.263	1.9454	
15 minute summer	9	2.002	10	14.7	0.995	0.254	0.3187	
15 minute summer	10	2.003	11	26.3	1.576	0.382	0.3668	
15 minute summer	11	1.006	12	146.1	3.854	0.182	2.2817	
15 minute summer	15	3.000	16	17.2	1.265	0.328	0.5072	
15 minute summer	16	3.001	12	19.7	1.731	0.225	0.1757	
15 minute summer	12	1.007	13	189.4	2.485	0.247	2.4105	
15 minute summer	13	1.008	14	255.1	1.420	0.384	6.3859	
15 minute winter	14	Hydro-Brake®	Outfall	2.4				33.6
15 minute summer	Tank Inlet	4.001	14	-302.9	-2.193	-1.163	0.9104	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.27%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	10	92.794	0.044	10.0	0.0496	0.0000	OK
15 minute summer	7	10	96.031	0.031	5.0	0.0348	0.0000	OK
15 minute summer	Outfall	1	82.996	0.000	2.4	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	8	2.001	9	9.9	2.359	0.174	0.0608	
15 minute summer	7	2.000	8	5.0	1.455	0.092	0.1227	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.27%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	11	98.872	0.097	29.4	0.1098	0.0000	OK
15 minute summer	2	10	96.941	0.141	104.4	0.1596	0.0000	OK
15 minute summer	3	10	96.148	0.148	167.4	0.1673	0.0000	OK
15 minute summer	4	10	92.401	0.165	173.4	0.1864	0.0000	OK
15 minute summer	5	10	91.278	0.355	180.3	0.5082	0.0000	OK
15 minute summer	6	11	91.148	0.283	221.6	0.4045	0.0000	OK
15 minute summer	9	10	91.359	0.136	36.2	0.1535	0.0000	OK
15 minute summer	10	10	91.151	0.193	65.5	0.2183	0.0000	OK
15 minute summer	11	11	90.569	0.219	356.7	0.3138	0.0000	OK
15 minute summer	15	10	85.711	0.301	42.5	0.3409	0.0000	SURCHARGED
15 minute winter	16	8	85.473	0.442	45.5	0.5001	0.0000	SURCHARGED
15 minute summer	12	9	85.345	1.049	465.4	1.8531	0.0000	SURCHARGED
15 minute winter	13	8	85.226	1.325	468.2	2.3407	0.0000	SURCHARGED
15 minute winter	14	8	85.006	1.709	520.2	3.0194	0.0000	SURCHARGED
1440 minute winter	Tank Inlet	1410	84.605	1.235	28.7	735.6285	0.0000	SURCHARGED

Link Event (Outflow)	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	28.5	1.753	0.382	1.5076	
15 minute summer	2	1.001	3	104.2	3.102	0.380	0.4449	
15 minute summer	3	1.002	4	166.6	4.488	0.471	1.3970	
15 minute summer	4	1.003	5	172.8	4.124	0.489	0.5292	
15 minute summer	5	1.004	6	178.3	1.489	0.968	2.1107	
15 minute summer	6	1.005	11	222.2	2.237	0.645	3.8522	
15 minute summer	9	2.002	10	36.1	1.160	0.626	0.6619	
15 minute summer	10	2.003	11	64.4	1.877	0.937	0.7525	
15 minute summer	11	1.006	12	358.9	4.858	0.446	4.4469	
15 minute summer	15	3.000	16	44.5	1.495	0.849	1.4796	
15 minute summer	16	3.001	12	66.7	2.085	0.761	0.6123	
15 minute summer	12	1.007	13	473.6	2.599	0.617	3.4127	
15 minute summer	13	1.008	14	511.1	2.366	0.769	6.3859	
15 minute winter	14	Hydro-Brake®	Outfall	2.9				34.4
15 minute summer	Tank Inlet	4.001	14	-563.6	-3.647	-2.164	1.3463	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.27%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	10	92.823	0.073	24.5	0.0824	0.0000	OK
15 minute summer	7	10	96.049	0.049	12.3	0.0549	0.0000	OK
15 minute summer	Outfall	1	82.996	0.000	2.9	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	8	2.001	9	24.3	2.975	0.429	0.1187	
15 minute summer	7	2.000	8	12.2	1.830	0.226	0.2394	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.27%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	98.919	0.144	55.1	0.1629	0.0000	OK
15 minute summer	2	11	97.042	0.242	198.1	0.2741	0.0000	OK
15 minute summer	3	11	96.495	0.495	315.4	0.5594	0.0000	SURCHARGED
15 minute summer	4	11	93.272	1.036	322.4	1.1722	0.0000	SURCHARGED
15 minute summer	5	11	91.861	0.938	320.5	1.3426	0.0000	SURCHARGED
15 minute summer	6	11	91.581	0.716	398.1	1.0240	0.0000	SURCHARGED
15 minute summer	9	11	92.352	1.129	61.2	1.2767	0.0000	SURCHARGED
15 minute summer	10	11	92.000	1.042	111.7	1.1785	0.0000	SURCHARGED
15 minute summer	11	11	90.679	0.329	641.3	0.4709	0.0000	OK
15 minute summer	15	10	87.600	2.190	79.7	2.4769	2.6039	FLOOD
15 minute summer	16	11	87.102	2.071	75.5	2.3422	0.0000	SURCHARGED
15 minute summer	12	10	86.738	2.442	790.6	4.3157	0.0000	SURCHARGED
2160 minute winter	13	2100	86.620	2.719	32.7	4.8047	0.0000	SURCHARGED
2160 minute winter	14	2100	86.620	3.323	35.9	5.8718	0.0000	SURCHARGED
2880 minute winter	Tank Inlet	2700	86.620	3.250	67.0	1490.4150	4.5232	FLOOD

Link Event (Outflow)	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	54.3	2.006	0.729	2.6818	
15 minute summer	2	1.001	3	196.9	3.451	0.718	0.8704	
15 minute summer	3	1.002	4	309.7	4.741	0.876	2.6505	
15 minute summer	4	1.003	5	307.0	4.360	0.869	0.8193	
15 minute summer	5	1.004	6	320.6	2.024	1.740	2.8041	
15 minute summer	6	1.005	11	398.5	2.515	1.157	6.0529	
15 minute summer	9	2.002	10	61.3	1.540	1.063	0.8589	
15 minute summer	10	2.003	11	111.4	2.800	1.619	0.8654	
15 minute summer	11	1.006	12	646.6	5.477	0.804	7.0985	
15 minute winter	15	3.000	16	67.3	1.692	1.283	1.4796	
15 minute winter	16	3.001	12	84.2	2.116	0.959	0.6123	
15 minute summer	12	1.007	13	796.8	3.689	1.037	3.4127	
15 minute summer	13	1.008	14	863.2	3.996	1.298	6.3859	
2160 minute winter	14	Hydro-Brake®	Outfall	4.0				396.8
15 minute summer	Tank Inlet	4.001	14	-954.9	-5.055	-3.666	1.7045	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.27%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	12	93.241	0.491	46.1	0.5555	0.0000	SURCHARGED
15 minute summer	7	10	96.068	0.068	23.1	0.0773	0.0000	OK
15 minute summer	Outfall	1	82.996	0.000	3.1	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	8	2.001	9	41.2	2.926	0.728	0.2557	
15 minute summer	7	2.000	8	23.0	2.018	0.426	0.4535	

UK Design Flood Estimation

Generated on 15 December 2023 15:38:11 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

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

Site details Checksum: 1A8E-6A7A

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 - FEH13 (mm):	13.46	Total runoff (ML):	0.13
Total Rainfall (mm):	8.63	Total flow (ML):	0.27
Peak Rainfall (mm):	2.35	Peak flow (m³/s):	0.02

Parameters

Where the user has overriden 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 - FEH13)

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)	1 [0.99]	Yes
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?
BF0 (m^3/s)	0	No
BL (hr)	26.31 [21.29]	Yes
BR	1.04	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m^3/s)	0	No
Exporting drained area (km^2)	0	No
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

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET	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

Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

UK Design Flood Estimation

Generated on 15 December 2023 15:38:31 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

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

Site details Checksum: 1A8E-6A7A

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 - FEH13 (mm):	15.68	Total runoff (ML):	0.15
Total Rainfall (mm):	10.05	Total flow (ML):	0.31
Peak Rainfall (mm):	2.73	Peak flow (m³/s):	0.02

Parameters

Where the user has overriden 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 - FEH13)

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)	1 [0.99]	Yes
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?
BF0 (m^3/s)	0	No
BL (hr)	26.31 [21.29]	Yes
BR	1.02	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m^3/s)	0	No
Exporting drained area (km^2)	0	No
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

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET	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

Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

UK Design Flood Estimation

Generated on 15 December 2023 15:38:40 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

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

Site details Checksum: 1A8E-6A7A

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 - FEH13 (mm):	28.38	Total runoff (ML):	0.29
Total Rainfall (mm):	18.19	Total flow (ML):	0.56
Peak Rainfall (mm):	4.95	Peak flow (m³/s):	0.03

Parameters

Where the user has overriden 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 - FEH13)

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)	1 [0.99]	Yes
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?
BF0 (m^3/s)	0	No
BL (hr)	26.31 [21.29]	Yes
BR	0.96	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m^3/s)	0	No
Exporting drained area (km^2)	0	No
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

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET	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

Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

UK Design Flood Estimation

Generated on 15 December 2023 15:38:50 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

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

Site details Checksum: 1A8E-6A7A

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 - FEH13 (mm):	37.54	Total runoff (ML):	0.39
Total Rainfall (mm):	24.05	Total flow (ML):	0.74
Peak Rainfall (mm):	6.54	Peak flow (m³/s):	0.05

Parameters

Where the user has overriden 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 - FEH13)

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)	1 [0.99]	Yes
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?
BF0 (m^3/s)	0	No
BL (hr)	26.31 [21.29]	Yes
BR	0.91	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m^3/s)	0	No
Exporting drained area (km^2)	0	No
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

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET	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 15 December 2023 15:39:04 by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

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

Site details Checksum: 1A8E-6A7A

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 - FEH13 (mm):	49.79	Total runoff (ML):	0.53
Total Rainfall (mm):	31.91	Total flow (ML):	0.97
Peak Rainfall (mm):	8.68	Peak flow (m³/s):	0.06

Parameters

Where the user has overriden 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 - FEH13)

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)	1 [0.99]	Yes
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?
BF0 (m^3/s)	0	No
BL (hr)	26.31 [21.29]	Yes
BR	0.86	No

Urbanisation parameters

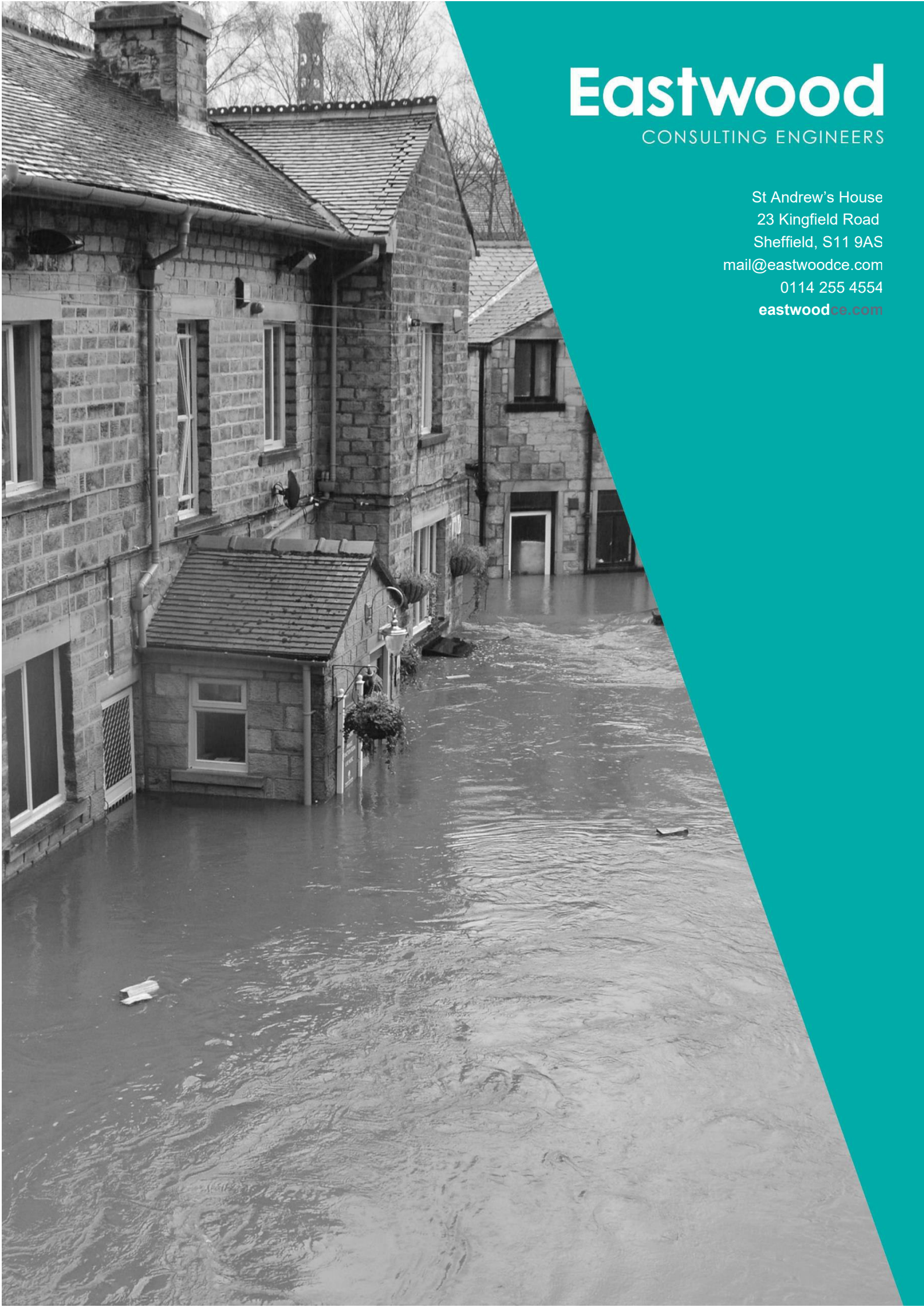
Name	Value	User-defined?
Sewer capacity (m^3/s)	0	No
Exporting drained area (km^2)	0	No
Urban area (km^2)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.31	No
BFIHOST19	0.33	No
PROPWET	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



Eastwood

CONSULTING ENGINEERS

St Andrew's House
23 Kingfield Road
Sheffield, S11 9AS
mail@eastwoodce.com
0114 255 4554
eastwoodce.com