Eastwood
CONSULTING ENGINEERS

Flood Risk Assessment

WOODWARD COURT, MIRFIELD

BELLWAY HOMES LTD (YORKSHIRE)

03/07/2026

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CONSULTING ENGINEERS

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FLOOD RISK ASSESSMENT

WOODWARD COURT, MIRFIELD

FOR

BELLWAY HOMES LTD (YORKSHIRE)

49653-ECE-XX-XX-RP-C-0001 **03 July 2026**

FLOOD RISK ASSESSMENT

WOODWARD COURT, MIRFIELD

FOR

BELLWAY HOMES LTD (YORKSHIRE)

Job No.	:	49653
Report Status	:	Issue 4
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Approved	:	

Chris Hodge

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Issue 1: 15 October 2025
Issue 2: 13 November 2025 *Updated with revised site layout and drainage calculations.*
Issue 3: 26 November 2025 *Proposed SuDS features updated*
Issue 4: 03 July 2026 *Updated with revised site layout (Rec: 23.06.2026) and drainage appraisal.*

EXECUTIVE SUMMARY

The project comprises the development of a 4.73-hectare greenfield site for residential use.

The site lies within Flood Zone 1 at low risk of flooding from rivers and sea. For both the present day and climate change scenarios (2040-2060s) there is an area with a low risk of surface water ponding on the southern boundary of the site corresponding with a topographic depression. For the climate change scenario (2040-2060s), there is second isolated area noted to be at low risk of surface water ponding also in the southern portion of the site.

The ground levels on site will be altered to raise depressions in the southern portion to match the remaining areas of the site. The raising of levels and presence of surface water drainage features will remove any surface water ponding and will lower the modelled flood depth. Finished floor levels will also be set 150 mm above external ground levels.

The Kirklees Council SFRA groundwater flood map shows the southern portion of the site to lie in an area with between 25-50% susceptibility to groundwater flooding. The eastern site boundary is recorded to be within an area with a less than 25% susceptibility to groundwater flooding. The Kirklees Council Lead Local Flood Authority pre-application advice notes that a geo-hydrology report should be prepared. Further mitigation measures may therefore be required.

The site lies within Flood Zone 1, with a small area at low risk of surface water ponding. The proposed mitigation measures and site layout will ensure the site is safe for the lifetime of the development, therefore in line with Paragraph 175 of the National Planning Policy and Kirklees Council pre-application advice, a Sequential Test 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.

Surface water disposal will be via gravity to an infiltration basin in the southern portion of the site, subject to approval from the Lead Local Flood Authority.

In line with the Lithos Geoenvironmental Appraisal (Ref: 1668/1F) and subsequent email correspondence, the development should ensure that no dwelling is built within 10 m of the basin crest due to potential ground stability issues as a result of focussed sustained water flows in shallow mine workings.

The infiltration basin has been sized using the lowest recorded infiltration rate on site of 3.87 x 10^{-5} m/s. The basin has been sized for the 1 in 100 year plus 45% climate change rainfall event. An approximate basin volume of 1,400 m^3 will be required, subject to detailed design.

The proposed infiltration basin will provide water quality treatment and attenuation as well as adding biodiversity and amenity value to the site. The proposed SuDS features are subject to approval by the Lead Local Flood Authority and detailed design.

Foul effluent should discharge via gravity to the 225 mm public combined sewer south of the site in Hepworth Lane. This is subject to formal approval from Yorkshire Water.

Both the surface and foul water drainage systems will be offered for adoption to Yorkshire Water or a NAV (New Appointments and Variations).

1.0 THE DEVELOPMENT

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 Bellway Homes Ltd (Yorkshire). Any other parties using the information in this report do so at their own risk, unless previously approved in writing. This report only outlines a general drainage strategy for the proposed development. Detailing of the drainage strategy should be provided within, and referenced from, the site specific Drainage Assessment Report (Ref: 49653-ECE-XX-XX-RP-C-0002) and associated plans.

The project comprises the development of a 4.73-hectare greenfield site for residential use.

1.2 Site Location and Description

The site is located within Mirfield, and is centred on coordinates 444080, 432740 (Appendix 1).

The site is bounded by residential properties to the south and west, Woodward Court to the north-west, Hepworth Lane to the south, a school and playing fields to the north, with agricultural fields and a building to the east. The site is currently occupied by open ploughed farmland boarded by hedgerows and wooden fences.

The site falls from approximately 98.34 mAOD in the north-east to approximately 84 mAOD in the south at an average gradient of 1 in 24 (Appendix 2).

Proposals are for 75 household properties with access from Woodward Court in the north-west (Appendix 3).

[1] https://www.gov.uk/government/publications/national-planning-policy-framework--2
[2] https://www.gov.uk/guidance/flood-risk-and-coastal-change

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 Flood Zone 1 (low risk); land having a less than 1 in 1,000 annual probability of flooding from rivers or sea.

Figure 1: Environment Agency's Flood Map for Planning

1.4 Surface Water

The Environment Agency surface water flood risk maps (Figures 2, 3 and Appendix 4) show the majority of the site to be at a very low risk of surface water flooding for both present day and climate change (2040-2060s) scenarios.

For both the present day and climate change (2040-2060s) scenario, there is a small area with a low (0.1%-1%) risk of flooding on the southern boundary. For the climate change scenario, there is a second isolated area at low risk (0.1%-1%) of flooding in the southern portion of the site.

Figure 2: Environment Agency – Risk of surface water flooding map (present day scenario)

A 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).

Figure 3: Environment Agency – Risk of surface water flooding map (2040-2060s, climate change scenario)

1.5 Kirklees 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). The surface water flood map included in the SFRA shows surface water flooding to cover a larger extent than the Environment Agency maps. The discrepancy is due to the 2016 SFRA mapping predating 2025 Environment Agency mapping.

1.6 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 and epoch suited to the design life

[3] https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall

of the development. For the Aire and Calder Management Catchment the Upper End Allowance of 45% should be used to assess storage requirements.

The Environment Agency surface water flood maps (Section 1.4, 2.1.1 and 2.1.2) include a climate change scenario. This is based on the latest UK Climate Projections (UKCP18) from the Met Office using a mid-range allowance (2040-2060s)[4].

[4] https://www.gov.uk/government/publications/flood-risk-maps-for-surface-water-how-to-use-the-map/92c4e96c-c2e0-4545-9c0e-1b410a4a78e9

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 and Tidal

The nearest watercourse is an unnamed watercourse located approximately 300 m east of the northern portion of the site. This is a tributary of Canker Dyke which ultimately discharges to the River Calder (main river) at a point 2.4 km south-east of the site. These watercourses are not tidally influenced and flood risk from these sources is assessed as negligible.

2.1.2 Surface Water (flood origin and depths)

Surface water flooding

The Environment Agency surface water flood risk maps (Appendix 4) and topographic survey (Appendix 2) have been used to determine any surface water flow paths. For both the present day and climate change (2040-2060s) scenarios, there is an area with a low risk of surface water ponding on the southern boundary of the site corresponding with a topographic depression. For the climate change scenario (2040-2060s), there is a second isolated area noted to be at low risk of surface water ponding also in the southern portion of the site associated with a topographic low point.

Surface water flood depths

The Environment Agency surface water flood risk maps (Appendix 4) show the surface water ponding on site for both the present-day and climate change (2040-2060s) scenario to have a very low (<0.1%) risk of depths reaching 0.2 m each year.

The Environment Agency surface water flood depth maps (Appendix 4) show a smaller extent of flooding than the surface water flood extent maps (Figures 2 and 3). This discrepancy has been raised with the Environment Agency (Appendix 4) and their response notes that the unshaded areas on the flood depth maps are at a very low risk of flooding reaching the specified depth. Based on this information, the surface water flood depths maps have been used to assess the risk of surface water flooding on site given that unshaded areas for the lowest flood depth map are at a very low risk of reaching 0.2 m.

2.1.3 Reservoir

The Environment Agency reservoir flood risk map (Figure 4 and Appendix 4) shows the whole site to lie outside the maximum extent of flooding from reservoirs, even when there is flooding from rivers.

Figure 4: Environment Agency – Risk of reservoir flooding map (QGIS)

2.1.4 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 southern portion of the site to lie in an area with between 25-50% susceptibility to groundwater flooding. The eastern site boundary is recorded as having a less than 25% susceptibility to groundwater flooding (Appendix 5). No information is provided for the northern and western portion of the site.

A Geoenvironmental Appraisal was conducted by Lithos (Ref: 1668/1F) in December 2022. No significant groundwater was encountered during excavations but groundwater monitoring was undertaken over a 3 month period and was recorded at a minimum depth of 3.5 m below ground level.

2.1.5 Sewerage

The surrounding public sewer network is owned and maintained by Yorkshire Water. There is no online public record of any flood risk to the site associated with these sewers.

2.1.6 Historic Flooding

Environment Agency mapping records the site to be outside the historical flood outline (Figure 5 and Appendix 4).

The Kirklees Council pre-application consultation response (Appendix 5) notes that there are no significant flood incidents recorded on their database, although the Lead Local Flood Authority is aware of water ingress at a property on Hepworth Lane which is believed to be caused by flow from the highway and not this development site.

Figure 5: Environment Agency – Historic flood map (QGIS)

2.2 Residual Flood Risk

For both the present day and climate change (2040-2060s) scenarios, there is an area with a low risk of surface water ponding on the southern boundary of the site corresponding with a topographic depression. For the climate change scenario (2040-2060s), there is a second isolated area noted to be at low risk of surface water ponding associated with a topographic low point also in the southern portion of the site.

The Kirklees Council SFRA groundwater flood map shows the southern portion of the site to lie in an area with between 25-50% susceptibility to groundwater flooding. The eastern boundary is recorded to have a less than 25% susceptibility to groundwater flooding.

These risks are not a development constraint and will be managed on the site within the surface water drainage strategy and by the mitigation measures in Section 3.2.

3.0 SEQUENTIAL TESTING AND MITIGATION MEASURES

The National Planning Policy Framework (September 2025) sets out the principles for assessing the suitability of sites for development, in relation to flood risk, as part of the planning process.

3.1 Sequential Test

Initially a Sequential Test is applied to the allocation of land suitable for development. The test is required for any development proposals in areas at risk of flooding, taking into account all sources of flood risk.

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.

Paragraph 175[5] of the National Planning Policy Framework notes that a proportionate approach should be taken for Sequential Testing. If it is demonstrated that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development without increasing flood risk elsewhere, then the sequential test need not be applied.

The site lies within Flood Zone 1, with small area at low risk of surface water ponding. The proposed mitigation measures (Section 3.2) and site layout will ensure the site is safe for the lifetime of the development, therefore in line with Paragraph 175 of the National Planning Policy and Kirklees Council pre-application advice (Appendix 5), a Sequential Test is not required.

3.2 Flood Mitigation Measures

The ground levels on the site will be altered to raise depressions in the southern portion of the site to match the remaining areas of the site. The raising of levels and presence of surface water drainage features will remove any surface water ponding and will lower the modelled flood depth. Finished floor levels will also be set 150 mm above external ground levels.

The Kirklees Council Lead Local Flood Authority pre-application advice notes that a geo-hydrology report should be prepared. Further mitigation measures may therefore be required.

[5] https://www.gov.uk/guidance/flood-risk-and-coastal-change

4.0 DRAINAGE STRATEGY

Detailing of the drainage strategy is provided within a separate site specific Drainage Assessment Report (Ref: 49653-ECE-XX-XX-RP-C-0002) and associated plans. A summary of the proposed drainage strategy is noted below.

4.1 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 an infiltration basin in the southern portion of the site, subject to approval from the Lead Local Flood Authority.
- In line with the Lithos Geoenvironmental Appraisal (Ref: 1668/1F) and subsequent email correspondence, the development should ensure that no dwelling is built within 10 m of the basin crest due to potential ground stability issues as a result of focussed sustained water flows in shallow mine workings.
- The infiltration basin has been sized using the lowest recorded infiltration rate on site of 3.87 x 10^{-5} m/s.
- The basin has been sized for the 1 in 100 year plus 45% climate change rainfall event. An approximate basin volume of 1,400 m^3 will be required, subject to detailed design. Calculations and the drainage layout are provided in Appendix 7.
- The proposed infiltration basin will provide water quality treatment and attenuation as well as adding biodiversity and amenity value to the site. The proposed SuDS features are subject to approval by the Lead Local Flood Authority and detailed design.
- The surface water drainage system will be offered for adoption to Yorkshire Water or a NAV (New Appointments and Variations).

4.2 Proposals for foul water disposal

Foul effluent should discharge via gravity to the 225 mm public combined sewer south of the site in Hepworth Lane. This is subject to formal approval from Yorkshire Water.

The foul water drainage system may be offered for adoption to Yorkshire Water or a NAV (New Appointments and Variations).

4.3 Residual flood risk

There is a potential flood risk to site occupiers and to others from surface water runoff as a result of the development as all surface water will now be channelled within the drainage network rather than be allowed to flow overland. The residual risk of surface water flooding caused by channelling all surface runoff into the drainage network can be managed by the general flood mitigation measures outlined in Section 4.4.

4.4 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 or blockage scenarios, the site is laid out so that surface water runoff is directed away from buildings, including those on neighbouring streets.

5.0 CONCLUSIONS

1. The site lies within Flood Zone 1 at low risk of flooding from rivers and sea. For both the present day and climate change scenarios (2040-2060s) there is an area with a low risk of surface water ponding on the southern boundary of the site corresponding with a topographic depression. For the climate change scenario (2040-2060s), there is second isolated area noted to be at low risk of surface water ponding also in the southern portion of the site.

2. The ground levels on the site will be altered to raise depressions in the southern portion of the site to match the remaining areas of the site. The raising of levels and presence of surface water drainage features will remove any surface water ponding and will lower the modelled flood depth. Finished floor levels will also be set 150 mm above external ground levels.

3. The Kirklees Council SFRA groundwater flood map shows the southern portion to lie in an area with between 25-50% susceptibility to groundwater flooding. The eastern site boundary is recorded to be within an area with a less than 25% susceptibility to groundwater flooding. The Kirklees Council Lead Local Flood Authority pre-application advice notes that a geo-hydrology report should be prepared. Further mitigation measures may therefore be required.

4. The site lies within Flood Zone 1, with a small area at low risk of surface water ponding. The proposed mitigation measures and site layout will ensure the site is safe for the lifetime of the development, therefore in line with Paragraph 175 of the National Planning Policy and Kirklees Council pre-application advice, a Sequential Test is not required.

5. 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.

6. Surface water disposal will be via gravity to an infiltration basin in the southern portion of the site, subject to approval from the Lead Local Flood Authority.

7. In line with the Lithos Geoenvironmental Appraisal (Ref: 1668/1F) and subsequent email correspondence, the development should ensure that no dwelling is built within 10 m of the basin crest due to potential ground stability issues as a result of focussed sustained water flows in shallow mine workings.

8. The infiltration basin has been sized using the lowest recorded infiltration rate on site of 3.87×10^{-5} m/s.

9. The basin has been sized for the 1 in 100 year plus 45% climate change rainfall event. An approximate basin volume of 1,400 m^3 will be required, subject to detailed design.

10. The proposed infiltration basin will provide water quality treatment and attenuation as well as adding biodiversity and amenity value to the site. The proposed SuDS features are subject to approval by the Lead Local Flood Authority and detailed design.

11. The surface water drainage system will be offered for adoption to Yorkshire Water or a NAV (New Appointments and Variations).

12. Foul effluent should discharge via gravity to the 225 mm public combined sewer south of the site in Hepworth Lane. This is subject to formal approval from Yorkshire Water.

13. Both the surface and foul water drainage systems will be offered for adoption to Yorkshire Water or a NAV (New Appointments and Variations).

14. The level of risk and safeguards available are considered appropriate to this class of development.

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APPENDICES

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APPENDIX 1


Wellhouse Ln
Wellhouse Ln
Hepworth Ln
Hepworth Ln
Hepworth Dr
Balderstone Hall Ln


Crossley
Primrose
Dismantled R
Sch
Sch
87
Primrose
Farm
100
Recn
Gd
Balderstone
Hall
Northorp
21
82
85
irfield
21
Towngate
Castle Hall
Hill
Motte
77
65
50

Eastwood
CONSULTING ENGINEERS

APPENDIX 2


HAYCOCK & TODD
LAND SURVEY CONSULTANTS•ARCHITECTURAL SURVEYORS
The Hollies, 43 Church Street, Royston, Barnsley, S71 4QU
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E : info@land-surveying.co.uk W : land-surveying.co.uk
SITE SURVEY
WOODWARD COURT
MIRFIELD.
Sheet 1 of 1
Surveyed by SH, DR
Datum
Drawn by SH, DR
GRID- Related to Ordnance Survey using One Point Localisation on Station S1. Orientation at OS Grid North.
Date of Survey November 2012
Scale 1/200
LEVEL- Related to Ordnance Survey by connection to the OS Active Network by G.P.S
Survey Job No. S7770
LEGEND
Manhole shown thus MH
Inspection Cover IC
Lamphole LH
Gully G
Lampost LP
Telegraph Post TP
Electricity Poles EP
Road Traffic Signs RS
Traffic Lights TL
British Telecom BT
Cable Television CATV
Fire Hydrant FH
Safety Valve SV
Stopcock Water SCW
Stopcock Gas Gas
Unknown Stoptop ST
Spot Level +123.562
Kerb Line
Fence Line Wood post & rail Or
Hedge Line
Contours 5m interval 105
Contours 1m interval 33
Tree Spread S 5.0
Girth G 1.30
Cover Level CL 112.335
Invert Level IL 111.733
Foul Drain
Surface Water
Unknown Service Serv
Survey Station S3 Or S3

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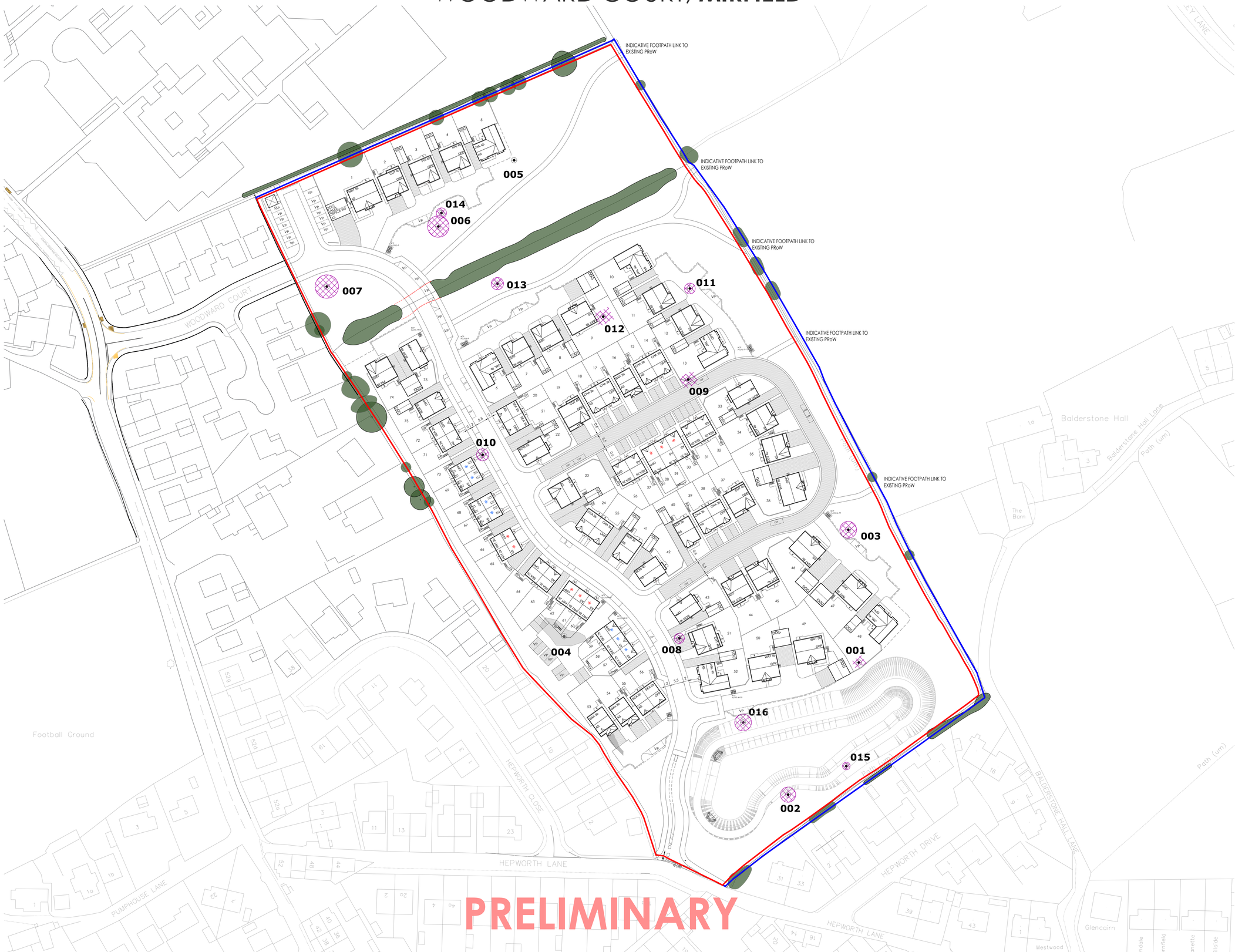
APPENDIX 3

WOODWARD COURT, **MIRFIELD**

Bellway



DRAWING LEGEND:

- RED LINE BOUNDARY
- OWNERSHIP BOUNDARY
- AFFORDABLE UNITS - RENT
- AFFORDABLE UNITS - INTERMEDIATE
- EXISTING TREES/HEDGEROWS TO BE RETAINED
- EXISTING TREES/PLANTING TO BE REMOVED
- VISITOR PARKING BAY
- ON STREET VISITOR PARKING SPACE
- BIN COLLECTION POINTS FOR SHARED DRIVES
- BIN STORAGE POINT
- CYCLE STORE

WOODWARD COURT, MIRFIELD
SCHEDULE OF ACCOMMODATION

House Type	Bed No/Storey	Building Regs	Type	Parking	Sq.ft	No. Units	Total Sq.ft	%
Freesale								
Seamstress	2B/2	M4(2)	End	PS	824	12	9888	20%
Chandler	3B/2	M4(2)	End	PS	963	8	7704	13%
Baxter	3B/2	M4(2)	Det	IG	1015	3	3045	5%
Schweiner	3B/2	M4(2)	Det	SG	1223	3	3669	5%
Bowyer	4B/2	M4(2)	Det	SG	1334	5	6670	8%
Philosopher	4B/2	M4(2)	Det	SG	1457	8	11656	13%
Cutler	4B/2	M4(2)	Det	IG	1360	8	10880	13%
Jeweller	4B/2	M4(2)	Det	SG	1666	6	10116	10%
Watchmaker	5B/2	M4(2)	Det	DG	1880	7	13160	12%
			Freesale Total			**60**	**77,028**	**100%**
Affordable								
Printer	2B/2	M4(2)	End	PS	762	4	3048	27%
Printer	2B/2	M4(2)	Mid	PS	762	1	762	7%
Seamstress	2B/2	M4(2)	End	PS	824	2	1648	13%
Seamstress	2B/2	M4(2)	Mid	PS	824	1	824	7%
Tilman	3B/2	M4(2)	End	PS	1015	2	2030	13%
Tilman	3B/2	M4(2)	Mid	PS	1015	1	1015	7%
Bailster	3B/2.5	M4(1)	End	PS	1188	4	4752	27%
			Affordable Total			**15**	**14,079**	**100%**
			Affordable Site Percentage					**20%**

			Total	**75**	**91,107**
Gross Area				**11.70 acres**	**4.73 ha**
Nett Area				**6.54 acres**	**2.65 ha**
Open Space (Exc. Attenuation and BNG habitat zone)				**3.42 acres**	**1.38 ha**

Nett Density	**28**	**dph**	**Nett Coverage**	**13,931**	**sq.ft/acre**		
Single Garage	20	Double Garage	7	Twin Garage	1		
Visitor Parking Bay	29	On Street Visitor Parking	11				

0m 10m 20m 30m 40m 50m

L	Layout updated to client comments.	Jul 26
K	Layout updated to client comments.	Jul 26
J	Layout updated to consultee comments and to include FHS house type range.	Jun 26
H	Existing trees/planting to be removed identified and knee rails amended around shared drives.	Nov 25
G	Fences adjusted at plot 6, 23 & 56. Mineshafts hidden from layout	Nov 25
F	Road alignment adjusted infront of plots 37-40. Additional space for soft landscaping in front of plots 26-32. Footpath links shown indicatively to PRoW on eastern boundary.	Nov 25
E	Plot 12 garage pulled forward.	Nov 25
D	Garages to plots 3,5 and 48 moved forward. Plot 5 and 48 moved to accommodate.	Nov 25
C	Garages to plots 5 and 48 moved forward.	Nov 25
B	Layout updated to clients markup.	Oct 25

SITE LAYOUT - 2520-SI-02L
WOODWARD COURT, MIRFIELD
BELLWAY HOMES
SCALE:1:500@A0 - OCTOBER 2025

PRELIMINARY

PARKER PEEL ARCHITECTURAL
e info@parkerpeel.co.uk w www.parkerpeel.co.uk t 01924 921 860

PRELIMINARY

SITE LAYOUT PLAN - 1:500

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CONSULTING ENGINEERS

APPENDIX 4

Flood map for planning

Your reference	Location (easting/northing)	Created
Unspecified	**420954/421076**	**16 September 2025 15:16**

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

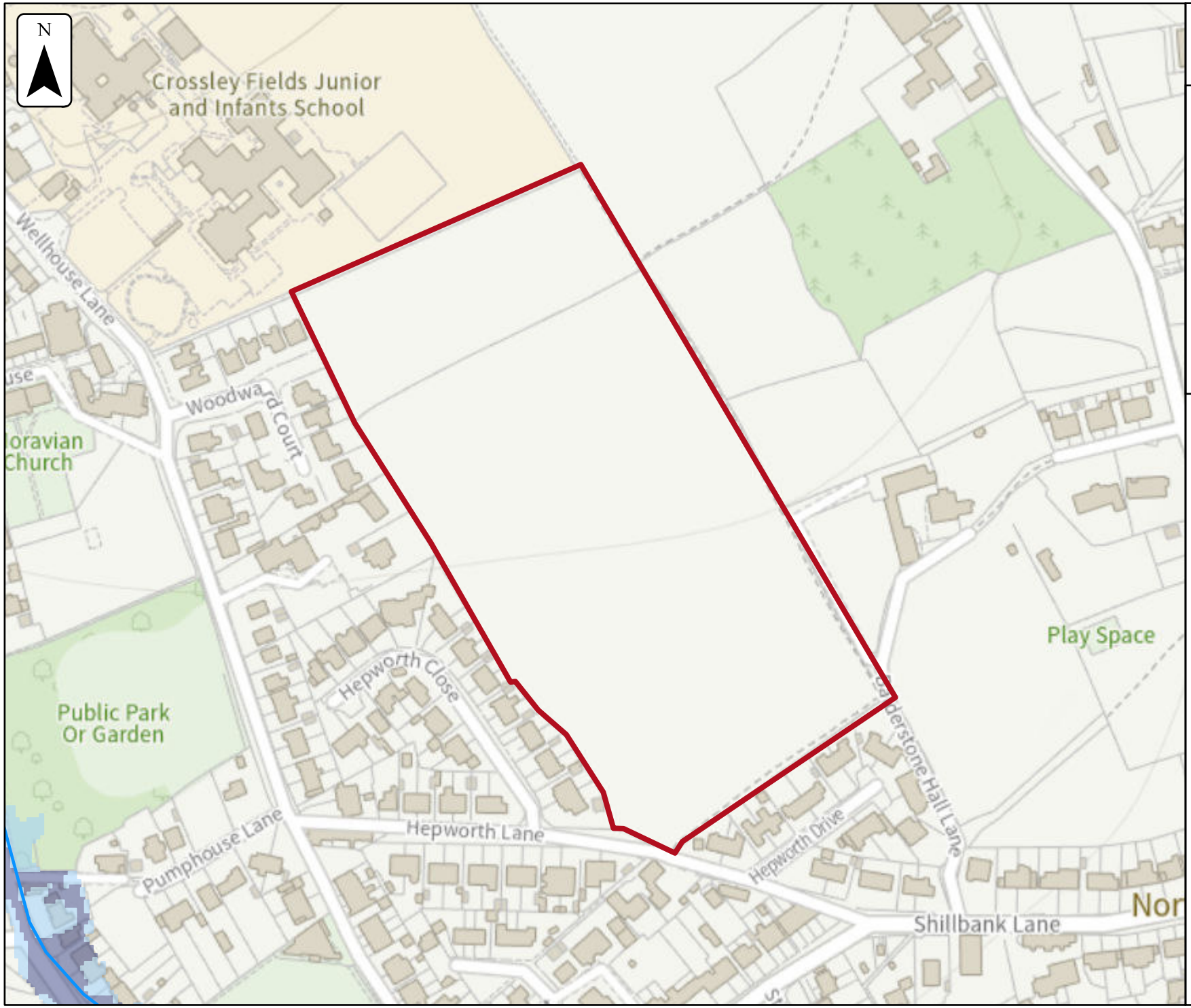
You will need to do a flood risk assessment if your site is **any of the following**:

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

Notes

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

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



Environment Agency

Flood map for planning

Your reference
Unspecified

Location (easting/northing)
420954/421076

Scale
1:2,500

Created
16 Sep 2025 15:16

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

0 20 40 60 m

Environment Agency – Risk of Surface Water Flooding – Present Day Scenario

Environment Agency – Surface Water Flood Depths up to 20cm – Present Day Scenario

Environment Agency – Surface Water Flood Depths up to 30cm – Present Day Scenario

Environment Agency – Risk of Surface Water Flooding – Climate Change 2040-2060s

Environment Agency – Surface Water Flood Depths up to 20cm – Climate Change 2040-2060s

Environment Agency – Surface Water Flood Depths up to 30cm – Climate Change 2040-2060s

Environment Agency – Risk of Reservoir Flooding

Environment Agency – Historic Flooding

From: Enquiries, Unit on behalf of Enquiries, Unit
Sent: 29 May 2025 17:31
To:
Subject: 250529/CLW08 - FW: EA surface water flood maps

The flood risk extents shown for the main Risk of Flooding from Rivers and Sea and Risk of Flooding from Surface Water datasets is the chance that any flooding could occur, regardless of depth.
The depth information for these datasets shows the chance that flooding will reach a given depth (e.g. chance of flooding of 20cm depth or greater).
In any location, the chance of flooding to a given depth decreases as the depth increases.
As an example, a location that has a low chance of flooding to a depth of 10cm would be shown at risk on the extent maps. But it might have a very low chance of deeper flooding to a depth of 20cm and so would not be shown at risk on the 20cm depth maps.

Kind regards

From: J
Sent: 27 May 2025 14:08
To: Enquiries, Unit <
Subject: EA surface water flood maps

Good afternoon,

I am currently reviewing surface water flood maps for a site centred on 456605E, 519410N (location plan attached).

It is noted that some areas are highlighted to be at risk of surface water flooding (attachment 1), but are not shown on the flood depth map (attachment 2) despite the lowest depth category being ‘up to 20 cm’, which I would have expected to cover all areas at risk of surface water flooding.

I have noticed this on multiple occasions for different sites, so this discrepancy is not just specific to this one location.

Please can you advise why all areas shown on the surface water flood extents map may not appear on the surface water flood depths map.

Kind regards,

Eastwood Consulting Engineers is a trading name of Eastwood and Partners (Consulting Engineers) Limited
Registered Office: St Andrew's House, 23 Kingfield Road, Sheffield, S11 9AS
Company No: 1835021, VAT Registration No: 738 2114 44, Web: www.eastwoodce.com Tel: 0114 255 4554

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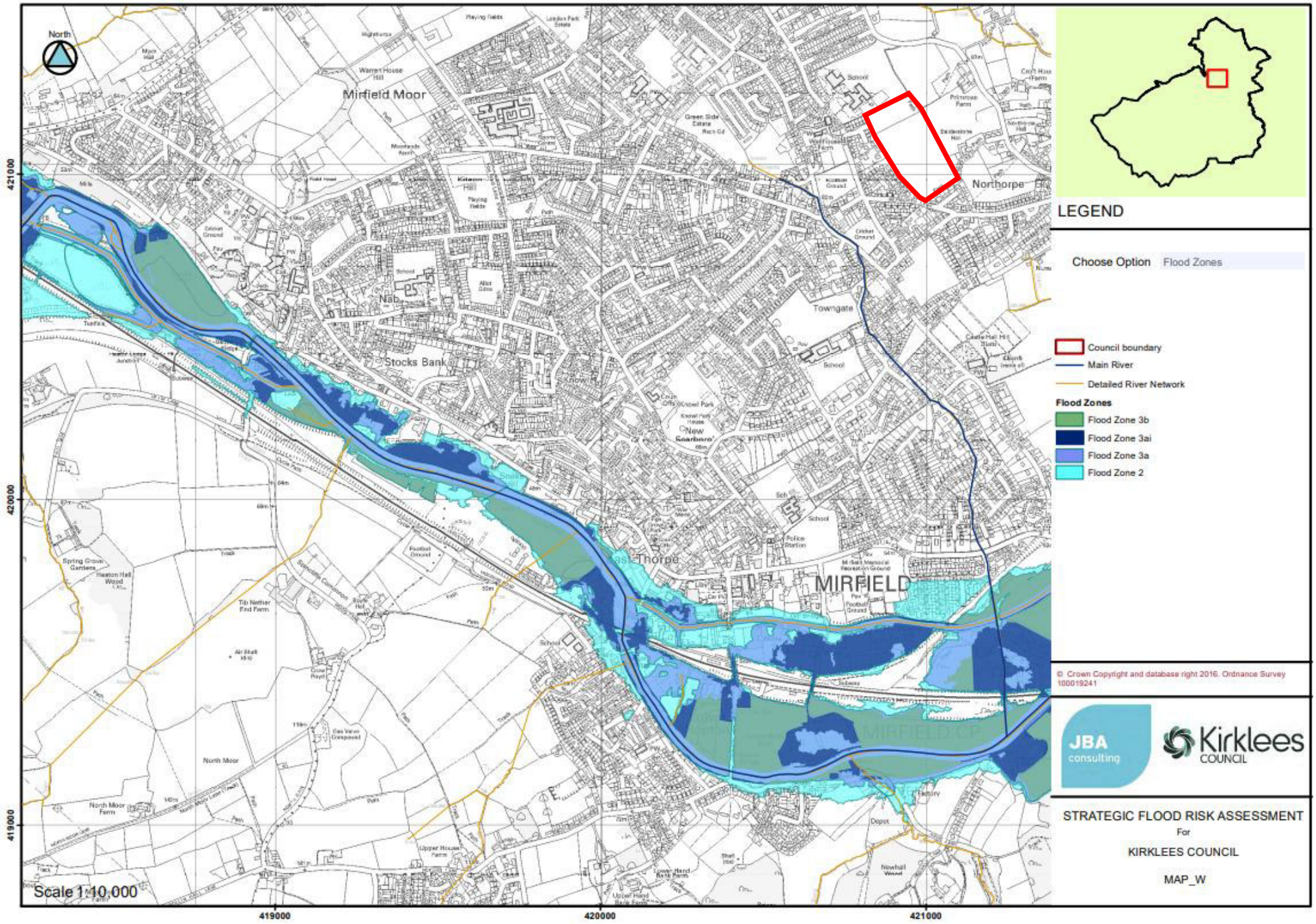
CONSULTING ENGINEERS

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

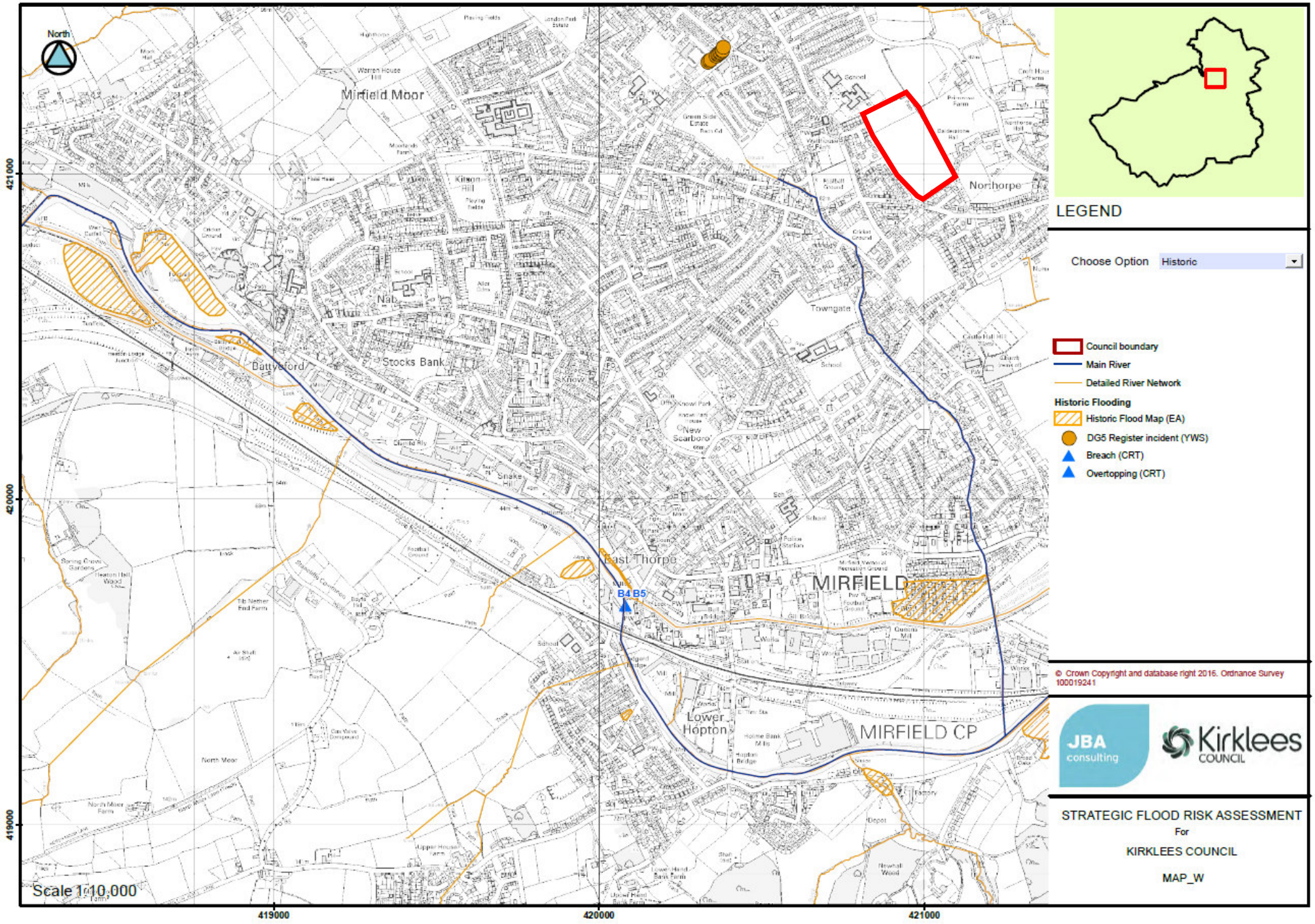
Kirklees COUNCIL

STRATEGIC FLOOD RISK ASSESSMENT

For

KIRKLEES COUNCIL

MAP_W



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)

JBA consulting

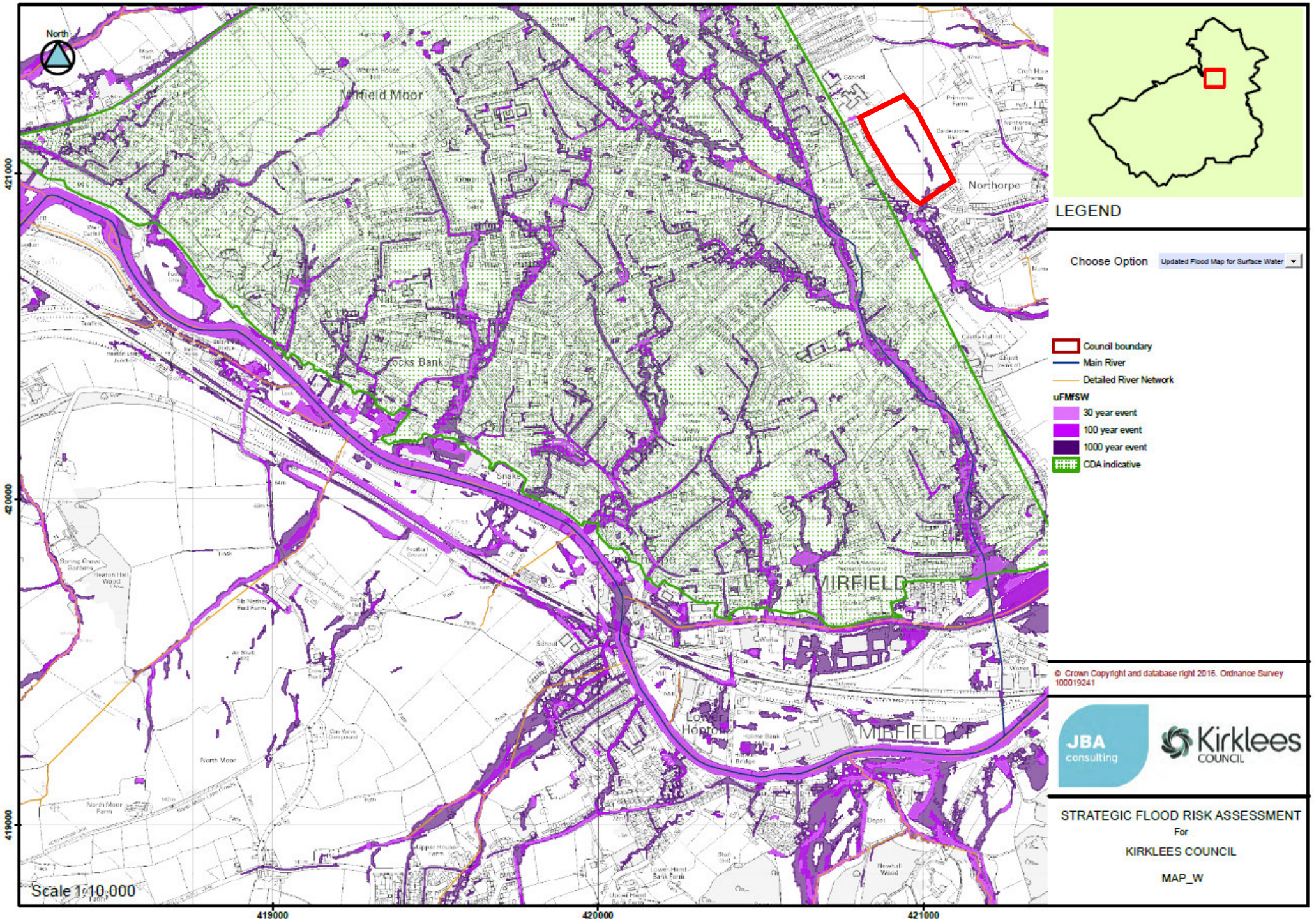
Kirklees COUNCIL

STRATEGIC FLOOD RISK ASSESSMENT

For

KIRKLEES COUNCIL

MAP_W



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

JBA consulting

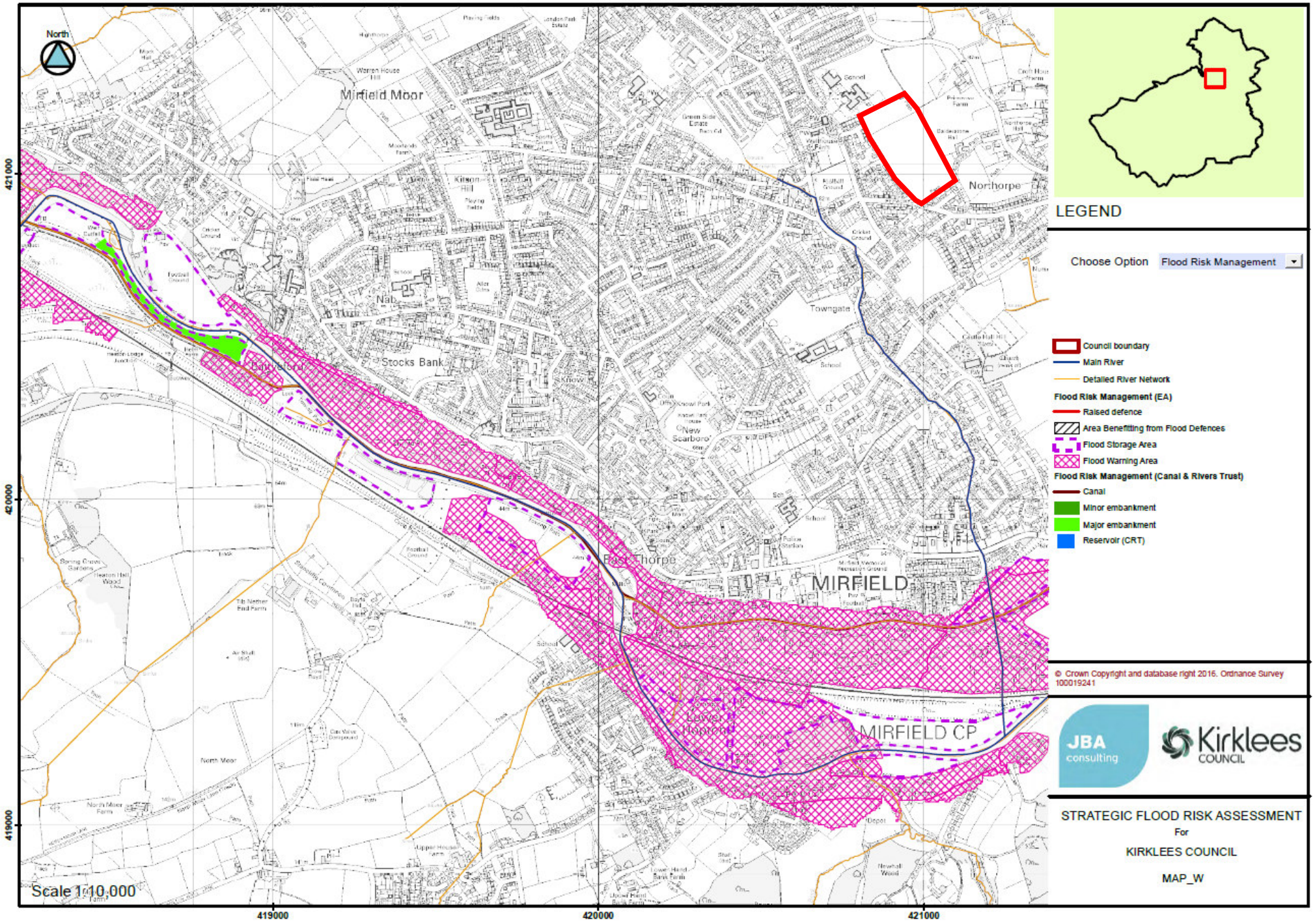
Kirklees COUNCIL

STRATEGIC FLOOD RISK ASSESSMENT

For

KIRKLEES COUNCIL

MAP_W



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)

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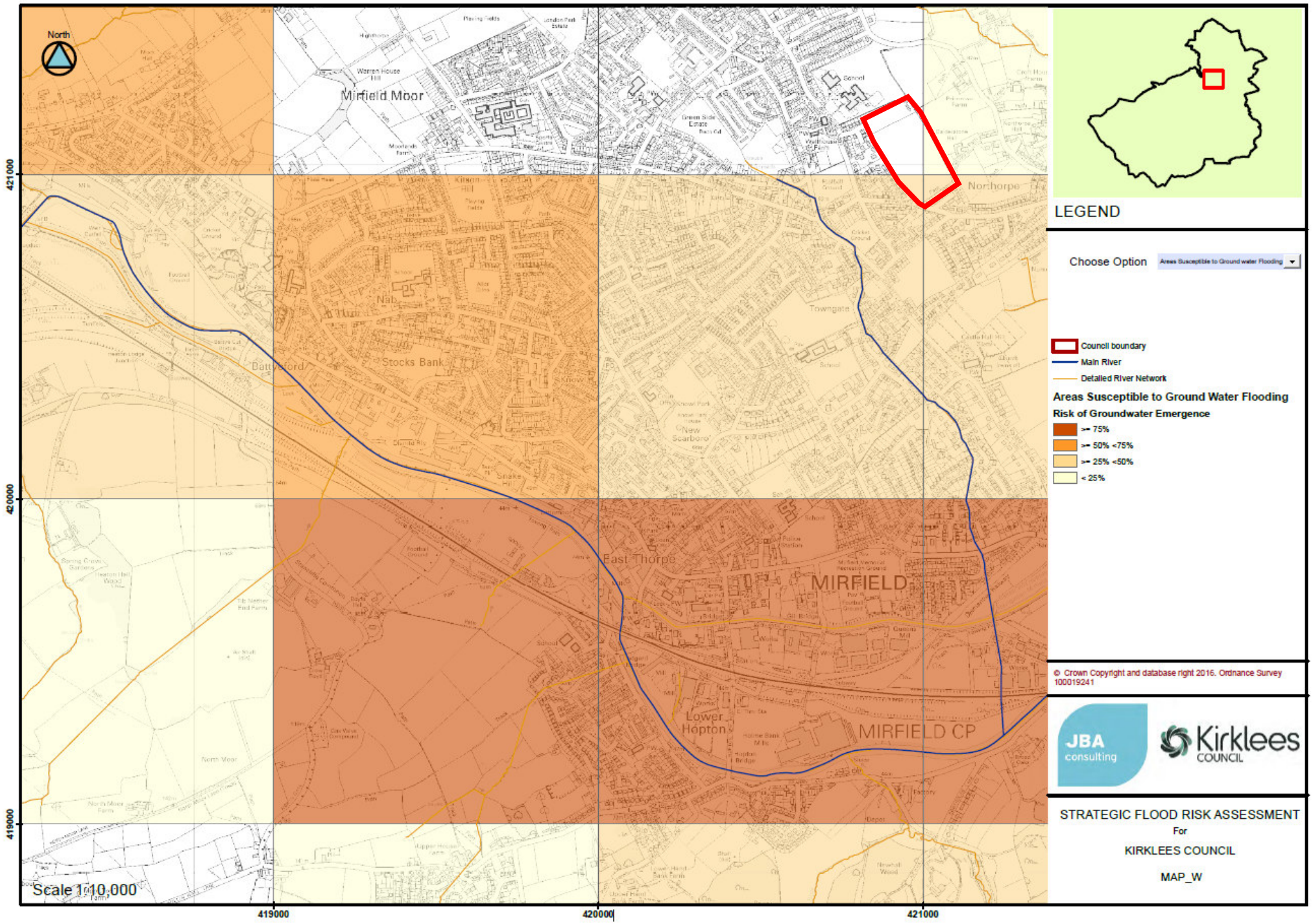
STRATEGIC FLOOD RISK ASSESSMENT

For

KIRKLEES COUNCIL

MAP_W



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%

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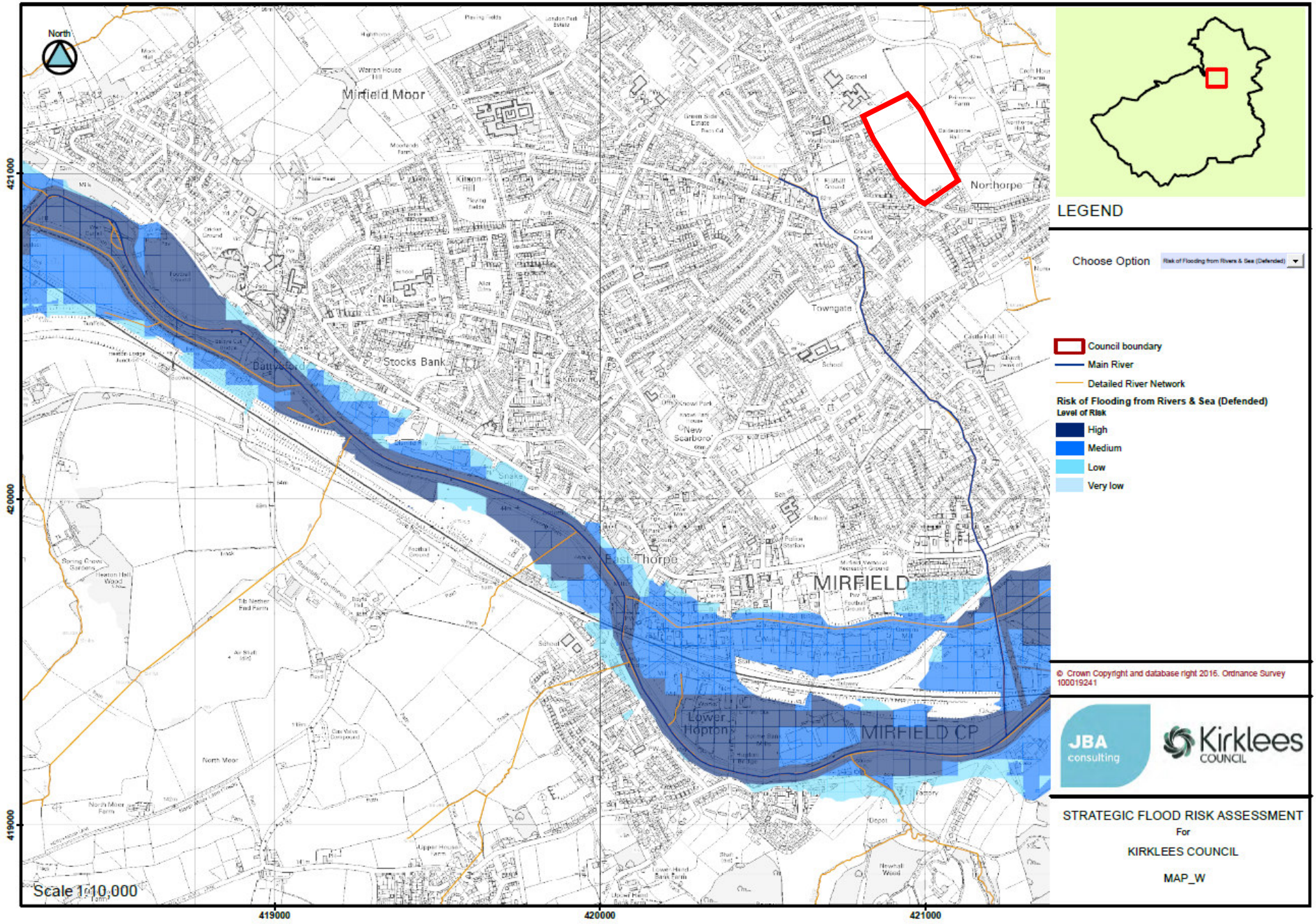
STRATEGIC FLOOD RISK ASSESSMENT

For

KIRKLEES COUNCIL

MAP_W



JBA consulting

Kirklees COUNCIL

STRATEGIC FLOOD RISK ASSESSMENT

For

KIRKLEES COUNCIL

MAP_W

Kirklees Council
Planning and Development Service
PO Box 1720
Huddersfield

Pre-Application Consultation Request

Town and Country Planning Act 1990

Observations By:	**KC, Lead Local Flood Authority**

Application No.	**2025/20746**
Proposed Development:	**Pre application for residential development**
Location:	**Land off, Woodward Court, Mirfield, WF14 0PY**
Applicant/Agent:	**Paul Butler PB Planning Ltd**
Planning Officer	**Katie Chew**

Your comments on the above proposal are requested. Please e-mail your comments to the DC Admin in either a Microsoft Word or PDF Document to DC.Admin@kirklees.gov.uk by 26-Aug-2025.

The submitted plans and documents for the application can be viewed using Documents from Anite or Anite, please use the application number above.

If I do not receive your response by 26-Aug-2025 then the application may be decided without the benefit of your views.

Dated: 12-Aug-2025

Mathias Franklin
Head of Planning and Development

Kirklees Council
Planning and Development Service
PO Box 1720
Huddersfield

Consultation Response from KC, Lead Local Flood Authority		
2025/20746 at Land off, Woodward Court, Mirfield, WF14 0PY		
Pre application for residential development		
Date Responded: 19th September 2025	**Responding Officer: Paul Farndale**	**Responding Ref:**

Contours

The site falls roughly north to south with a gradient of 1 in 20 to 1 in 23.

Main River Flood Risk

This site is in main river flood zone 1 – low risk.

Sequential Test/Flood Risk Assessment

A sequential test is not necessary. The site is greater than 1 hectare and therefore an official 'full' flood risk assessment is required. We expect this will concentrate on the use of infiltration techniques (see comments in later sections) and flood routing.

Water Features

There are no known watercourses or ponds etc shown on site and in the immediate vicinity of the site.

Surface Water Flood Risk

3rd generation surface water flood risk mapping does not identify any concerns for the site in the 1 in 30 and 1 in 100 return periods which are relevant to lifespan of a site for housing development. The 1 in 1000-year return period does show a linear pattern north to south which suggests a shallow valley that may collect run off from an undeveloped site. The FRA should examine flood routing before a layout is designed so that it can manage blockage scenarios and exceedance events by routing water along roads and open space, avoiding property curtilage.

4th generation surface water flood risk mapping shows some ponding of water at the southern border. Given previous applications on this site we believe that some protection to existing properties along the boundaries of the site to hold exceedance flows and blockage scenarios in safe places on site and any overspill onto Hepworth Lane is expected.

Flood Incidents

Although we have no significant flood incidents recorded on our database. The LLFA is aware of water ingress at a property on Hepworth Lane that we believe was caused by flows along the highway adjacent to the property and not the development site.

Kirklees Council
Planning and Development Service
PO Box 1720
Huddersfield

Surface Water Disposal

In line with the hierarchy of disposal, infiltration techniques should be examined before a direct or indirect connection to watercourse. Only when these have been discounted and agreed with the LLFA can a connection to public sewer be considered.

Infiltration Techniques

This site is shown as category 1 in the British Geological Survey (highly likely to be suitable). The indicative layout provided shows and attenuation basin, so we assume soakaways are not intended.

However previous application on this site had extensive soakaway testing using triple test techniques with bowsers at several locations and submitted information that demonstrated soakaways were viable in accordance with recognised testing procedures.

The above application is available to view on planning portal. We expect these test results to be analysed in the new flood risk assessment and a demonstration alongside any new testing that has taken place as to why conclusions are different and a robust defence of said conclusion.

Due to the age of the previous testing and other such projects in the district subsequently, Kirklees LLFA would also seek a competent person to assess the contribution of previous coal mining works on soakaway tests and any remediation such as grouting that could affect infiltration techniques testing on the undeveloped site to the developed site.

We also expect a competent person to look at re-emergence where there is shallow bedrock. There is a possibility that testing runs laterally along bedrock but may not re-emerge, whereas the volumes of water on a fully developed site may re-emerge if fissures are relied upon rather than free draining strata. Cross sections of strata based on boreholes and trial pits are now expected to be presented and analysed by a geo-hydrologist. Where fissures are relied upon and given experience within the district, soakaways should consist of wide linear trenches where practicable or manhole styled soakaways with linear spokes to spread flows over a wide area. This could also be achieved by connecting individual soakaways.

We are aware that for the statutory undertaker to adopt soakaways there need to be accessible and therefore those in back gardens would remain private. For the long-term viability of soakaways, a management company must be set up to with a maintenance/management and replacement programme under section 106 of the Town and Country Planning Act. Any such agreement can be null and void upon adoption.

Highway drainage soakaways may need to be separated. Early discussion with Yorkshire Water or NAV and the Highways Authority are necessary as space will be required that is not considered in the indicative layout plan.

Watercourse

There are no known watercourses in the immediate vicinity of the site.

Kirklees Council
Planning and Development Service
PO Box 1720
Huddersfield

Public Sewers

Although there are surface water sewers located in Hepworth Close and Hepworth Drive, these appear to be transitional sewers, i.e. they connect to a combined system downstream.

A 150mm and a 225mm public combined sewer is located immediately to the site's southern border with Hepworth Lane. We advise the applicant to contact Yorkshire Water for pre-planning advice to see if these sewers are suitable for a restricted 3.5l/s connection from site given they are small diameter. A 300mm combined sewer is located 100m from the site in Flash Lane and maybe Yorkshire Water's preferred connection point. A 225mm surface water sewer is also located in Flash Lane. This is shown 170m from the site but there is a possibility that unmapped section may run closer. This surface water sewer appears to connect to a 300mm combined sewer in Shillbank Lane but I would suggest this is verified as another surface water sewer is positioned metres away from the connection point shown.

Flood Routing

We expect the layout to be designed with flood routing in mind. This could be an exceedance event or blockage scenario where water is surcharging the drainage system and running overland. Main flow routes should avoid property curtilage and use roads and open space. Where water would go if a storm event hit a saturated undeveloped field needs to be considered in this design, i.e. the southern border. Where existing houses can be better protected without making it worse for others, as safe off-site route into the highway should be considered.

Section 106 – Management Company

Under NPPF there is an obligation for the LPA to ensure the adequate management of SUDS (surface water drainage) for the lifetime of the site. This includes from installation. A management company should be set up under Section 106 of the Town and Country Planning Act 1990 with a maintenance and management plan based on the latest CIRIA guide to SUDS but bespoke to the site, agreed by condition. The Section 106 agreement will have a breakout clause for when surface water infrastructure is adopted by Highways Authority, Statutory Undertaker and/or NAV equivalent.

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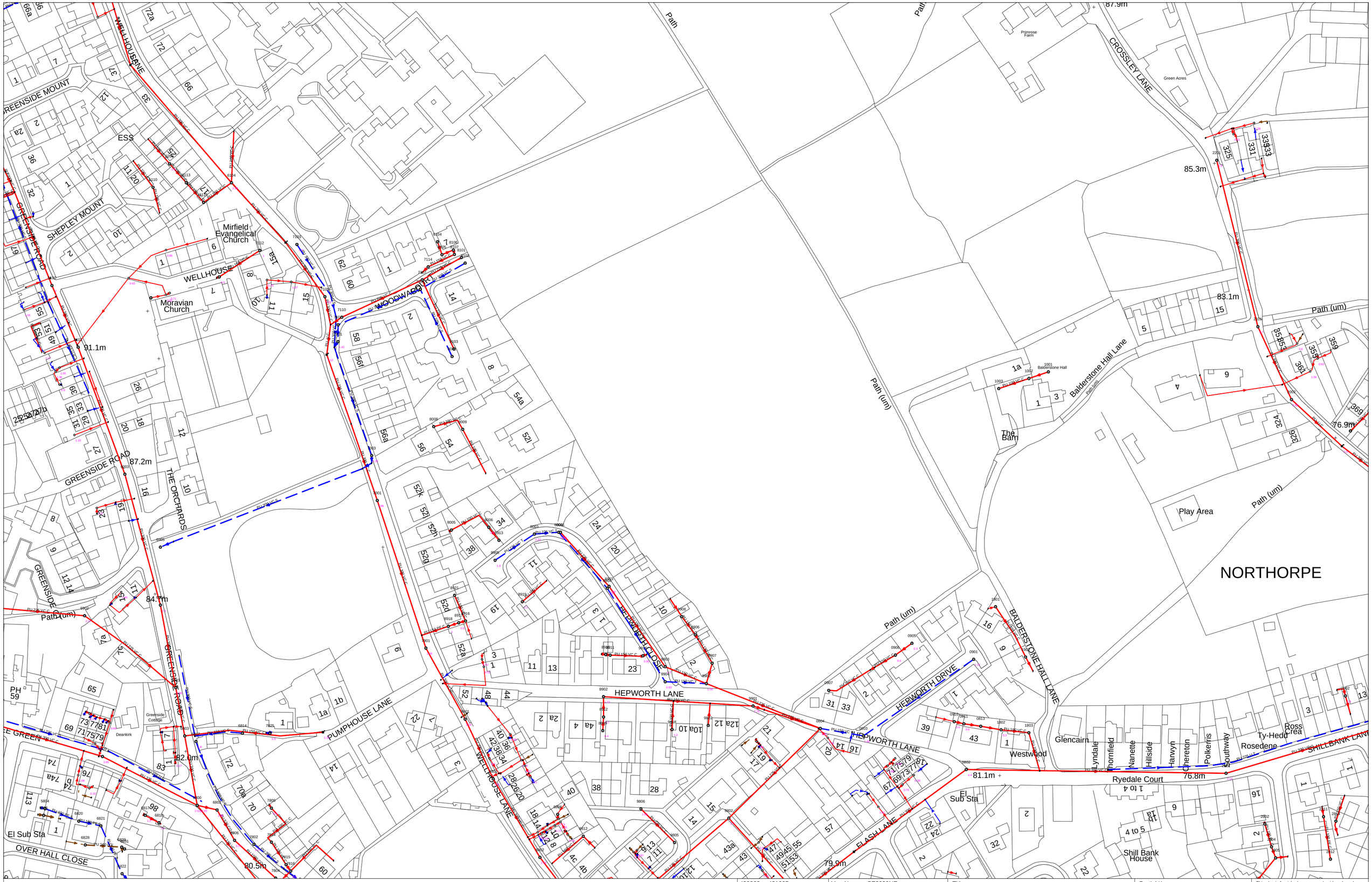
APPENDIX 6



420862 : 421005	Map Name : SE2020NE	Title	Partial Key
Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : G Mullaney Contact Tel :	Notes		Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS
		(Oty) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2024. All rights reserved Ordnance Survey Licence number AC0000813445	Date Req : 09/05/2025, 14:08:35
			Source : Sewer Network Enquiry

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 Gen : 09/05/2025, 14:15:32

UPN: Undefined Originator: G Mullaney, ,

Yorkshire Water Services
Land and Property
Western House
Western Way
Halifax Road
Bradford
BD6 2SZ

Tel: 0345 120 8482
Fax:

Email:
technical.sewerage@yorkshirewater.co.uk

Eastwood Consulting Engineers
St Andrew's House; 23 Kingfield Road
Sheffield
S11 9AS

Your Ref:
Our Ref: A007933

For telephone enquiries ring:
George Mullaney on 0345 120 8482

9th May 2025

Dear Ms Stevenson-Steels,

Woodward Court (land off) Mirfield WF14 0PY - Pre-Planning Sewerage Enquiry V881026

Thank you for your recent enquiry. Our charge of £488.00 plus VAT will be added to your account with us, reference EPL039. You will receive an invoice for your account in due course.

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:

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.

The closest practicable point of discharge for foul will be the 225mm diameter combined public sewer in Hepworth Lane, to the south of the site, but at present it does not have

adequate capacity available to accommodate the anticipated foul water discharge from the proposed site. Subject to the submission of a Formal Planning Application and robust build plan and start date, Yorkshire Water will carry out a feasibility study to determine suitable foul connection points, any available capacity in the public sewer network, together with timescales for any potential upgrading works required.

The cost for any feasibility/modelling/upgrade works will be at Yorkshire Waters cost up-front and recouped via the sites eventual infrastructure charges.

What are infrastructure charges?

We levy infrastructure charges for all newly connected properties that have not been connected to our water or sewer network before. The charges are calculated to recover the cost of reinforcing our existing water and sewer networks needed to serve new developments. The charges are set to recover the costs over the whole of the Yorkshire Water area to increase capacity.

Surface Water

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

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

The public sewer network does not have any capacity available to accept any discharge of surface water from the proposal. If SuDS are not viable, the developer is advised to contact the Environment Agency/local Land Drainage Authority with a view to establishing a suitable watercourse for discharge.

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 online or obtain an application form from our website (www.yorkshirewater.com/developers/sewerage/sewerage-connections/) or by telephoning 0345 120 84 82.

YorkshireWater

Under the provisions of section 111 of the Water Industry Act 1991 it is unlawful to pass into any public sewer (or into any drain or private sewer communicating with the public sewer network) any items likely to cause damage to the public sewer network or interfere with the free flow of its contents or affect the treatment and disposal of its contents. Amongst other things this includes fat, oil, nappies, bandages, syringes, medicines, sanitary towels and incontinence pants. Contravention of the provisions of section 111 is a criminal offence.

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

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the Code for Adoption, 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 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.

All the above comments are based upon the information and records available at the present time and are valid for a period of 12 months. 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

George Mullaney
Town Planning Technician

Eastwood
CONSULTING ENGINEERS

APPENDIX 7

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
S1	0.202	5.00	96.350	1200	420853.952	421152.788	1.475	94.875
S2			96.150	1200	420864.765	421146.005	2.010	94.140
S3	0.096	5.00	95.750	1200	420874.572	421132.649	2.510	93.240
S4	0.261	5.00	94.550	1350	420882.873	421112.936	2.365	92.185
S5	0.086	5.00	91.150	1350	420909.431	421065.107	1.650	89.500
S6	0.101	5.00	90.200	1350	420920.496	421045.654	1.650	88.550
S7	0.084	5.00	88.800	1350	420950.863	421022.635	1.650	87.150
S8	0.071	5.00	88.400	1350	420958.506	421015.703	1.725	86.675
S9	0.045	5.00	87.500	1350	420970.131	420993.743	1.725	85.775
S10	0.240	5.00	86.650	1350	420974.346	420975.695	1.725	84.925
S11			86.500	1350	420985.868	420978.064	1.725	84.775
S12	0.237	5.00	92.550	1350	420997.572	421113.376	1.575	90.975
S13	0.055	5.00	91.700	1350	420947.075	421085.055	1.650	90.050
S14	0.083	5.00	91.800	1200	421022.294	421095.084	1.350	90.450
S15			90.750	1200	421033.275	421073.983	1.745	89.005
S16	0.039	5.00	90.150	1200	421031.651	421059.957	1.810	88.340
S17	0.086	5.00	89.650	1200	421021.086	421050.595	1.705	87.945
S18	0.037	5.00	89.250	1200	420999.920	421043.050	1.701	87.549
S19	0.036	5.00	86.000	1200	420976.093	420963.880	1.125	84.875
S20			85.400		420972.300	420949.559	1.230	84.170
S21	0.015	5.00	84.500	1200	420973.455	420931.893	1.125	83.375
Atten	0.379	5.00	84.460	1350	421025.380	420958.495	1.161	83.299
Outfall			85.000	1350	421028.086	420944.092	0.990	84.010

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	S1	S2	15.820	0.600	94.875	94.140	0.735	21.5	225	5.09	48.9
1.001	S2	S3	16.570	0.600	94.140	93.320	0.820	20.2	225	5.19	48.5
1.002	S3	S4	21.389	0.600	93.240	92.260	0.980	21.8	300	5.29	48.2
1.003	S4	S5	54.708	0.600	92.185	89.575	2.610	21.0	375	5.52	47.4
2.000	S12	S13	57.897	0.600	90.975	90.125	0.850	68.1	375	5.44	47.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	2.832	112.6	35.7	1.250	1.785	0.202	0.0
1.001	2.924	116.2	35.4	1.785	2.205	0.202	0.0
1.002	3.379	238.9	51.9	2.210	1.990	0.298	0.0
1.003	3.972	438.7	95.7	1.990	1.200	0.559	0.0
2.000	2.198	242.7	40.8	1.200	1.200	0.237	0.0

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)
2.001	S13	S5	42.603	0.600	90.050	89.500	0.550	77.5	450	5.75	46.6
1.004	S5	S6	22.594	0.600	89.500	88.550	0.950	23.8	450	5.84	46.0
1.005	S6	S7	38.105	0.600	88.550	87.150	1.400	27.2	450	6.00	45.7
1.006	S7	S8	10.318	0.600	87.150	86.750	0.400	25.8	450	6.04	45.6
3.000	S14	S15	23.787	0.600	90.450	89.080	1.370	17.4	150	5.16	48.6
3.001	S15	S16	14.120	0.600	89.005	88.340	0.665	21.2	225	5.25	48.3
3.002	S16	S17	14.116	0.600	88.340	88.020	0.320	44.1	225	5.36	47.9
3.003	S17	S18	22.471	0.600	87.945	87.624	0.321	70.0	300	5.56	47.2
3.004	S18	S8	49.628	0.600	87.549	86.825	0.724	68.5	375	5.94	45.9
1.007	S8	S9	24.847	0.600	86.675	85.775	0.900	27.6	525	6.14	45.3
1.008	S9	S10	18.534	0.600	85.775	84.925	0.850	21.8	525	6.20	45.1
1.009	S10	S11	11.763	0.600	84.925	84.775	0.150	78.4	525	6.28	44.8
1.010	S11	Atten	18.700	0.600	84.775	83.353	1.422	13.2	525	6.33	44.7
4.000	S19	S20	14.815	0.600	84.875	84.170	0.705	21.0	225	5.09	48.9
4.001	S20	S21	17.704	0.600	84.170	83.375	0.795	22.3	225	5.19	48.5
4.002	S21	Atten	12.700	0.600	83.375	83.299	0.076	167.0	225	5.40	47.8
1.011	Atten	Outfall	5.000	0.600	84.060	84.010	0.050	100.0	150	6.41	44.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
2.001	2.311	367.6	49.2	1.200	1.200	0.292	0.0
1.004	4.182	665.1	155.8	1.200	1.200	0.937	0.0
1.005	3.908	621.6	171.5	1.200	1.200	1.038	0.0
1.006	4.015	638.5	184.9	1.200	1.200	1.122	0.0
3.000	2.429	42.9	14.6	1.200	1.520	0.083	0.0
3.001	2.852	113.4	14.5	1.520	1.585	0.083	0.0
3.002	1.975	78.5	21.1	1.585	1.405	0.122	0.0
3.003	1.881	133.0	35.5	1.405	1.326	0.208	0.0
3.004	2.191	242.0	40.7	1.326	1.200	0.245	0.0
1.007	4.274	925.2	235.3	1.200	1.200	1.438	0.0
1.008	4.811	1041.5	241.6	1.200	1.200	1.483	0.0
1.009	2.531	547.8	279.2	1.200	1.200	1.723	0.0
1.010	6.199	1341.9	278.2	1.200	0.582	1.723	0.0
4.000	2.868	114.0	6.4	0.900	1.005	0.036	0.0
4.001	2.784	110.7	6.3	1.005	0.900	0.036	0.0
4.002	1.009	40.1	8.8	0.900	0.936	0.051	0.0
1.011	1.005	17.8	345.5	0.250	0.840	2.153	0.0

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	15.820	21.5	225	Circular	96.350	94.875	1.250	96.150	94.140	1.785
1.001	16.570	20.2	225	Circular	96.150	94.140	1.785	95.750	93.320	2.205
1.002	21.389	21.8	300	Circular	95.750	93.240	2.210	94.550	92.260	1.990
1.003	54.708	21.0	375	Circular	94.550	92.185	1.990	91.150	89.575	1.200
2.000	57.897	68.1	375	Circular	92.550	90.975	1.200	91.700	90.125	1.200
2.001	42.603	77.5	450	Circular	91.700	90.050	1.200	91.150	89.500	1.200
1.004	22.594	23.8	450	Circular	91.150	89.500	1.200	90.200	88.550	1.200
1.005	38.105	27.2	450	Circular	90.200	88.550	1.200	88.800	87.150	1.200
1.006	10.318	25.8	450	Circular	88.800	87.150	1.200	88.400	86.750	1.200
3.000	23.787	17.4	150	Circular	91.800	90.450	1.200	90.750	89.080	1.520
3.001	14.120	21.2	225	Circular	90.750	89.005	1.520	90.150	88.340	1.585
3.002	14.116	44.1	225	Circular	90.150	88.340	1.585	89.650	88.020	1.405
3.003	22.471	70.0	300	Circular	89.650	87.945	1.405	89.250	87.624	1.326
3.004	49.628	68.5	375	Circular	89.250	87.549	1.326	88.400	86.825	1.200
1.007	24.847	27.6	525	Circular	88.400	86.675	1.200	87.500	85.775	1.200
1.008	18.534	21.8	525	Circular	87.500	85.775	1.200	86.650	84.925	1.200
1.009	11.763	78.4	525	Circular	86.650	84.925	1.200	86.500	84.775	1.200
1.010	18.700	13.2	525	Circular	86.500	84.775	1.200	84.460	83.353	0.582
4.000	14.815	21.0	225	Circular	86.000	84.875	0.900	85.400	84.170	1.005
4.001	17.704	22.3	225	Circular	85.400	84.170	1.005	84.500	83.375	0.900
4.002	12.700	167.0	225	Circular	84.500	83.375	0.900	84.460	83.299	0.936
1.011	5.000	100.0	150	Circular	84.460	84.060	0.250	85.000	84.010	0.840

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1200	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	S3	1200	Manhole	Adoptable
1.002	S3	1200	Manhole	Adoptable	S4	1350	Manhole	Adoptable
1.003	S4	1350	Manhole	Adoptable	S5	1350	Manhole	Adoptable
2.000	S12	1350	Manhole	Adoptable	S13	1350	Manhole	Adoptable
2.001	S13	1350	Manhole	Adoptable	S5	1350	Manhole	Adoptable
1.004	S5	1350	Manhole	Adoptable	S6	1350	Manhole	Adoptable
1.005	S6	1350	Manhole	Adoptable	S7	1350	Manhole	Adoptable
1.006	S7	1350	Manhole	Adoptable	S8	1350	Manhole	Adoptable
3.000	S14	1200	Manhole	Adoptable	S15	1200	Manhole	Adoptable
3.001	S15	1200	Manhole	Adoptable	S16	1200	Manhole	Adoptable
3.002	S16	1200	Manhole	Adoptable	S17	1200	Manhole	Adoptable
3.003	S17	1200	Manhole	Adoptable	S18	1200	Manhole	Adoptable
3.004	S18	1200	Manhole	Adoptable	S8	1350	Manhole	Adoptable
1.007	S8	1350	Manhole	Adoptable	S9	1350	Manhole	Adoptable
1.008	S9	1350	Manhole	Adoptable	S10	1350	Manhole	Adoptable
1.009	S10	1350	Manhole	Adoptable	S11	1350	Manhole	Adoptable
1.010	S11	1350	Manhole	Adoptable	Atten	1350	Manhole	Adoptable
4.000	S19	1200	Manhole	Adoptable	S20		Manhole	Adoptable
4.001	S20		Manhole	Adoptable	S21	1200	Manhole	Adoptable
4.002	S21	1200	Manhole	Adoptable	Atten	1350	Manhole	Adoptable
1.011	Atten	1350	Manhole	Adoptable	Outfall	1350	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	20.0		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Node Atten Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.13932	Safety Factor	2.0	Invert Level (m)	83.060
Side Inf Coefficient (m/hr)	0.13932	Porosity	1.00	Time to half empty (mins)	400

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1065.0	1065.0	1.000	1731.0	1743.9	1.001	0.0	1743.9

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	33	94.931	0.056	14.5	0.2179	0.0000	OK
60 minute summer	S2	33	94.196	0.056	14.5	0.0628	0.0000	OK
60 minute summer	S3	33	93.302	0.062	21.4	0.1183	0.0000	OK
60 minute summer	S4	33	92.262	0.077	40.1	0.2808	0.0000	OK
60 minute summer	S5	33	89.599	0.099	66.9	0.2446	0.0000	OK
60 minute summer	S6	33	88.654	0.104	73.9	0.2764	0.0000	OK
60 minute summer	S7	33	87.270	0.120	79.6	0.2946	0.0000	OK
60 minute summer	S8	34	86.800	0.125	101.7	0.2807	0.0000	OK
60 minute summer	S9	34	85.886	0.111	105.0	0.2163	0.0000	OK
60 minute summer	S10	34	85.117	0.192	121.5	0.8101	0.0000	OK
60 minute summer	S11	34	84.889	0.114	121.9	0.1630	0.0000	OK
60 minute summer	S12	33	91.042	0.067	17.0	0.2986	0.0000	OK
60 minute summer	S13	33	90.121	0.071	20.8	0.1499	0.0000	OK
60 minute summer	S14	33	90.489	0.039	6.0	0.0911	0.0000	OK
60 minute summer	S15	33	89.040	0.035	6.0	0.0397	0.0000	OK
60 minute summer	S16	33	88.393	0.053	8.8	0.0822	0.0000	OK
60 minute summer	S17	33	88.015	0.070	15.0	0.1494	0.0000	OK
60 minute summer	S18	33	87.618	0.068	17.6	0.1073	0.0000	OK
60 minute summer	S19	33	84.899	0.024	2.6	0.0421	0.0000	OK
60 minute summer	S20	33	84.194	0.024	2.6	0.0000	0.0000	OK
60 minute summer	S21	33	83.422	0.047	3.7	0.0660	0.0000	OK
360 minute summer	Atten	232	83.218	-0.081	73.3	176.5656	0.0000	OK
60 minute summer	Outfall	1	84.010	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	14.5	1.890	0.129	0.1214	
60 minute summer	S2	1.001	S3	14.5	1.960	0.125	0.1227	
60 minute summer	S3	1.002	S4	21.4	2.073	0.090	0.2208	
60 minute summer	S4	1.003	S5	40.0	2.490	0.091	0.8794	
60 minute summer	S5	1.004	S6	66.7	2.496	0.100	0.6034	
60 minute summer	S6	1.005	S7	73.6	2.392	0.118	1.1746	
60 minute summer	S7	1.006	S8	79.5	2.554	0.124	0.3213	
60 minute summer	S8	1.007	S9	101.9	2.828	0.110	0.8966	
60 minute summer	S9	1.008	S10	105.2	2.043	0.101	0.9697	
60 minute summer	S10	1.009	S11	121.9	2.333	0.223	0.6233	
60 minute summer	S11	1.010	Atten	122.1	3.747	0.091	0.6093	
60 minute summer	S12	2.000	S13	16.9	1.275	0.069	0.7651	
60 minute summer	S13	2.001	S5	20.6	0.994	0.056	0.8915	
60 minute summer	S14	3.000	S15	6.0	1.696	0.140	0.0841	
60 minute summer	S15	3.001	S16	6.0	1.104	0.053	0.0775	
60 minute summer	S16	3.002	S17	8.8	1.281	0.112	0.0967	
60 minute summer	S17	3.003	S18	14.9	1.233	0.112	0.2719	
60 minute summer	S18	3.004	S8	17.4	1.284	0.072	0.6735	
60 minute summer	S19	4.000	S20	2.6	1.167	0.023	0.0330	
60 minute summer	S20	4.001	S21	2.6	0.652	0.023	0.0732	
60 minute summer	S21	4.002	Atten	3.7	0.621	0.091	0.0747	
360 minute summer	Atten	1.011	Outfall	0.0	0.000	0.000	0.0000	0.0
360 minute summer	Atten	Infiltration		22.1				

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.99%

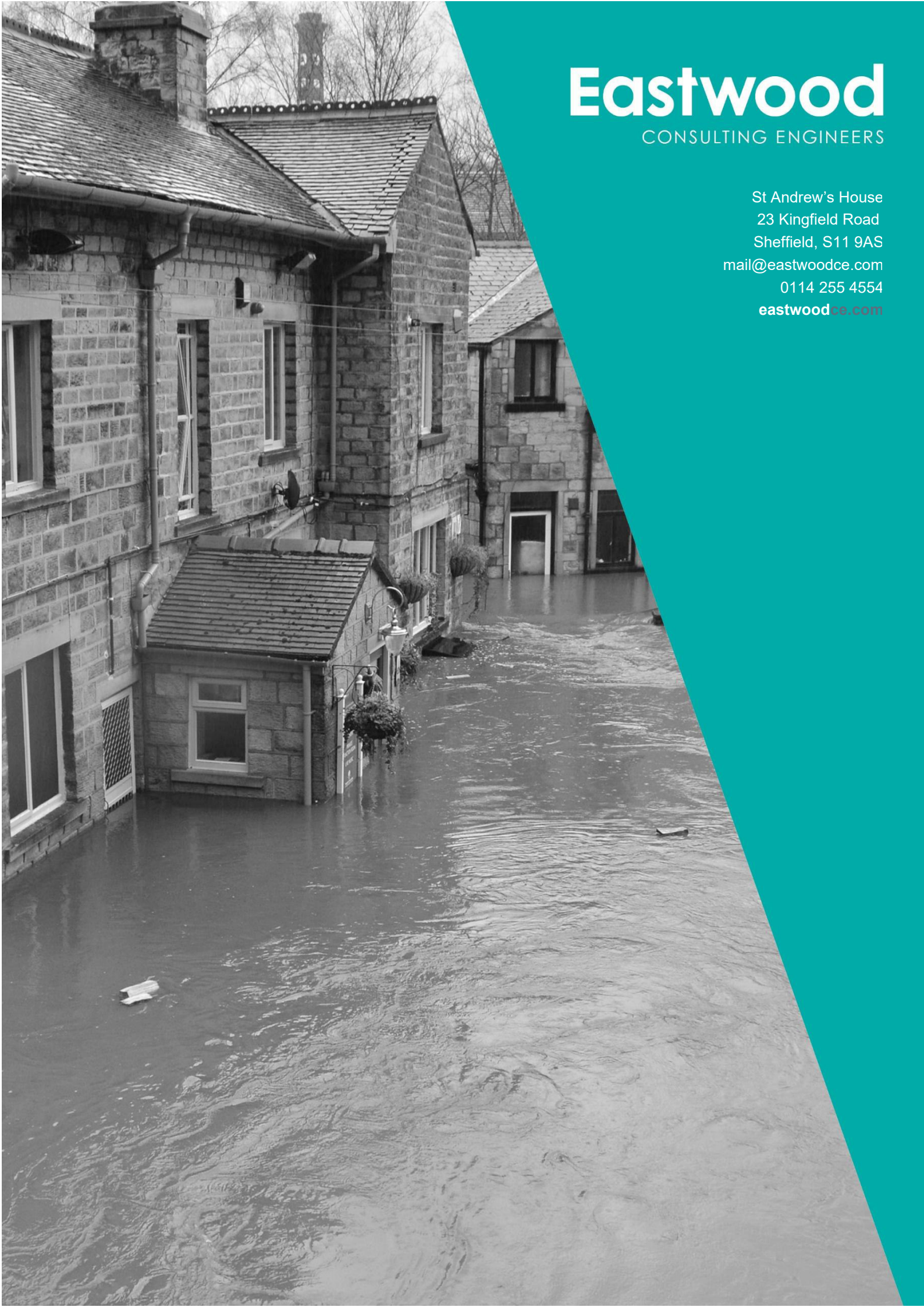
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	33	95.000	0.125	58.9	0.4833	0.0000	OK
60 minute summer	S2	33	94.263	0.123	58.9	0.1396	0.0000	OK
60 minute summer	S3	33	93.375	0.135	86.9	0.2550	0.0000	OK
60 minute summer	S4	33	92.348	0.163	163.1	0.5947	0.0000	OK
60 minute summer	S5	33	89.721	0.221	273.4	0.5466	0.0000	OK
60 minute summer	S6	33	88.777	0.227	302.8	0.6041	0.0000	OK
60 minute summer	S7	33	87.443	0.293	327.2	0.7190	0.0000	OK
60 minute summer	S8	33	86.954	0.279	418.4	0.6291	0.0000	OK
60 minute summer	S9	33	86.042	0.267	431.2	0.5215	0.0000	OK
60 minute summer	S10	33	85.391	0.466	500.4	1.9619	0.0000	OK
60 minute summer	S11	33	85.036	0.261	498.8	0.3731	0.0000	OK
60 minute summer	S12	33	91.115	0.140	69.2	0.6208	0.0000	OK
60 minute summer	S13	33	90.195	0.145	85.1	0.3045	0.0000	OK
60 minute summer	S14	33	90.534	0.084	24.2	0.1988	0.0000	OK
60 minute summer	S15	33	89.075	0.070	24.2	0.0795	0.0000	OK
60 minute summer	S16	33	88.456	0.116	35.6	0.1805	0.0000	OK
60 minute summer	S17	33	88.098	0.153	60.7	0.3264	0.0000	OK
60 minute summer	S18	33	87.692	0.143	71.5	0.2244	0.0000	OK
60 minute summer	S19	33	84.922	0.047	10.5	0.0841	0.0000	OK
60 minute summer	S20	33	84.217	0.047	10.5	0.0000	0.0000	OK
180 minute winter	S21	176	83.591	0.215	4.8	0.3013	0.0000	OK
180 minute winter	Atten	176	83.590	0.291	205.5	660.9946	0.0000	OK
60 minute summer	Outfall	1	84.010	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	58.9	2.624	0.523	0.3552	
60 minute summer	S2	1.001	S3	58.9	2.793	0.507	0.3494	
60 minute summer	S3	1.002	S4	86.9	2.993	0.364	0.6212	
60 minute summer	S4	1.003	S5	163.1	3.646	0.372	2.4485	
60 minute summer	S5	1.004	S6	273.3	3.465	0.411	1.7820	
60 minute summer	S6	1.005	S7	302.7	3.184	0.487	3.6161	
60 minute summer	S7	1.006	S8	326.5	3.463	0.511	0.9711	
60 minute summer	S8	1.007	S9	418.1	3.693	0.452	2.8179	
60 minute summer	S9	1.008	S10	430.4	2.683	0.413	2.8985	
60 minute summer	S10	1.009	S11	498.8	3.136	0.910	1.8201	
60 minute summer	S11	1.010	Atten	497.9	5.221	0.371	1.7868	
60 minute summer	S12	2.000	S13	69.1	1.892	0.285	2.1163	
60 minute summer	S13	2.001	S5	85.1	1.407	0.232	2.5896	
60 minute summer	S14	3.000	S15	24.2	2.442	0.564	0.2357	
60 minute summer	S15	3.001	S16	24.2	1.566	0.213	0.2196	
60 minute summer	S16	3.002	S17	35.6	1.835	0.453	0.2739	
60 minute summer	S17	3.003	S18	60.7	1.775	0.456	0.7686	
60 minute summer	S18	3.004	S8	71.2	1.894	0.294	1.8670	
60 minute summer	S19	4.000	S20	10.5	1.748	0.092	0.0890	
60 minute summer	S20	4.001	S21	10.5	0.935	0.095	0.2756	
180 minute winter	S21	4.002	Atten	4.9	0.670	0.122	0.5012	
180 minute winter	Atten	1.011	Outfall	0.0	0.000	0.000	0.0000	0.0
180 minute winter	Atten	Infiltration		27.3				

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	33	95.223	0.348	110.8	1.3481	0.0000	SURCHARGED
60 minute summer	S2	34	94.352	0.212	108.0	0.2392	0.0000	OK
60 minute summer	S3	33	93.440	0.200	158.8	0.3794	0.0000	OK
60 minute summer	S4	32	92.417	0.232	301.0	0.8442	0.0000	OK
60 minute summer	S5	35	90.226	0.726	507.7	1.7958	0.0000	SURCHARGED
60 minute summer	S6	35	89.508	0.958	546.2	2.5454	0.0000	SURCHARGED
60 minute summer	S7	34	88.223	1.073	565.1	2.6277	0.0000	SURCHARGED
60 minute summer	S8	34	87.583	0.908	723.3	2.0464	0.0000	SURCHARGED
60 minute summer	S9	34	86.752	0.977	744.4	1.9077	0.0000	SURCHARGED
60 minute summer	S10	34	86.016	1.091	866.5	4.5993	0.0000	SURCHARGED
60 minute summer	S11	34	85.168	0.393	865.8	0.5617	0.0000	OK
60 minute summer	S12	33	91.177	0.202	130.0	0.8991	0.0000	OK
60 minute summer	S13	35	90.299	0.249	160.2	0.5223	0.0000	OK
60 minute summer	S14	34	90.767	0.317	45.5	0.7487	0.0000	SURCHARGED
60 minute summer	S15	32	89.100	0.095	42.7	0.1079	0.0000	OK
60 minute summer	S16	32	88.518	0.178	64.3	0.2778	0.0000	OK
60 minute summer	S17	32	88.179	0.234	111.8	0.5015	0.0000	OK
60 minute summer	S18	35	87.774	0.225	130.9	0.3521	0.0000	OK
60 minute summer	S19	33	84.941	0.066	19.7	0.1171	0.0000	OK
60 minute summer	S20	33	84.234	0.064	19.7	0.0000	0.0000	OK
360 minute winter	S21	344	84.060	0.685	5.4	0.9573	0.0000	SURCHARGED
360 minute winter	Atten	344	84.060	0.761	227.6	1403.6390	0.0000	OK
60 minute summer	Outfall	1	84.010	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	108.0	2.809	0.959	0.6212	
60 minute summer	S2	1.001	S3	107.9	3.067	0.928	0.5874	
60 minute summer	S3	1.002	S4	158.2	3.403	0.662	0.9940	
60 minute summer	S4	1.003	S5	300.3	3.868	0.684	4.8957	
60 minute summer	S5	1.004	S6	490.9	3.670	0.738	3.5799	
60 minute summer	S6	1.005	S7	522.1	3.322	0.840	6.0375	
60 minute summer	S7	1.006	S8	563.2	3.610	0.882	1.6348	
60 minute summer	S8	1.007	S9	723.4	3.713	0.782	5.3678	
60 minute summer	S9	1.008	S10	745.5	3.451	0.716	4.0040	
60 minute summer	S10	1.009	S11	865.8	4.152	1.580	2.2892	
60 minute summer	S11	1.010	Atten	865.5	5.735	0.645	2.8304	
60 minute summer	S12	2.000	S13	130.0	2.213	0.536	3.4012	
60 minute summer	S13	2.001	S5	160.2	1.515	0.436	5.2913	
60 minute summer	S14	3.000	S15	42.7	2.631	0.995	0.4187	
60 minute summer	S15	3.001	S16	43.0	1.760	0.379	0.3507	
60 minute summer	S16	3.002	S17	64.6	2.044	0.823	0.4499	
60 minute summer	S17	3.003	S18	110.6	1.996	0.832	1.2426	
60 minute summer	S18	3.004	S8	130.0	1.969	0.537	4.4481	
60 minute summer	S19	4.000	S20	19.7	2.075	0.173	0.1407	
60 minute summer	S20	4.001	S21	19.7	1.065	0.178	0.4272	
360 minute winter	S21	4.002	Atten	5.1	0.596	0.127	0.5051	
360 minute winter	Atten	1.011	Outfall	0.0	0.000	0.000	0.0000	0.0
360 minute winter	Atten	Infiltration		33.7				



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