FLOOD RISK ASSESSMENT

ON

ST PAUL'S ROAD

MIRFIELD

ON BEHALF OF

CONNECT HOUSING

ASSOCIATION LIMITED

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Flood Risk Assessment at St Paul's Road, Mirfield 2071/01r1			
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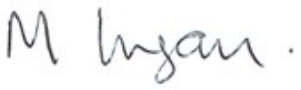
Signature			

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1.0 INTRODUCTION

1.1 Connect Housing Association Limited are proposing to develop a parcel of land located off St Paul's Road in Mirfield, with residential apartments. To supplement the planning application, a Flood Risk Assessment is required.

1.2 It is within the general development strategy of the country for development in areas where there is a risk of flooding to be assessed to avoid unnecessary increase in the requirement for flood defence. Under the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG), consultation is required with the Environment Agency, Land Drainage Authority and Water Authority and a Flood Risk Assessment Report should be prepared considering the development proposals and make recommendations for any flood mitigation measures.

1.3 ARP Associates have been appointed to carry out a Flood Risk Assessment of the site, implement appropriate consultations and prepare a report, in accordance with NPPF, to satisfy the requirements of the Planning Authority.

1.4 The consultations and site appraisal have been carried out between November and December 2019.

1.5 The assessment has been undertaken with reference to the current guidance on applicable climate change allowances, as published by the Environment Agency in February 2016 and last updated in December 2019. It should be noted that new national climate change projections were released in November 2018 (UKCP18), but full guidance on how these latest projections should be applied in the assessment of flood risk has not yet been released. Should new guidance be released prior to discharge of all planning conditions, there may be a requirement to review the assessment of flood risk and any associated mitigation measures.

1.6 It should be noted that the granting of planning permission does not guarantee the availability of flood insurance for new development. The Client is advised to contact their

insurers or the Association of British Insurers, to seek advice prior to considering development in any area which may be at risk of flooding.

1.7 The report has been initially prepared for the use and reliance of the Client only. The report shall not be relied upon or transferred to any other parties without the written agreement of ARP Associates. For the avoidance of any doubt, where ARP Associates enters into a letter of reliance for the benefit of a third party, that third party will be permitted to rely on the report. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party without ARP Associates consent.

1.8 Attention is drawn to the requirements of the Construction Design and Management Regulations 2015, and in particular, the duties and obligations of the Client.

2.0 SITE DESCRIPTION

General

2.1 The site is an irregular rectangular shaped piece of land extending to an area of approximately 0.20 hectares, with overall dimensions of 45m (north - south) by 60m (east - west). The site is developed land and is located close to the centre of Mirfield. The site is centred approximately on Ordnance Survey Grid Reference 420197, 419859 and is considered to be brownfield.

2.2 A site location plan and existing site plan are presented in Appendix A.

Current Use

2.3 The site is currently occupied by a council depot comprising a series of long rectangular buildings along the northern, northeastern, and southeastern boundaries, with a smaller building at the centre. The majority of the site is under hard cover of a mix of asphalt, concrete and rough ground, with a narrow strip of dense vegetation along the boundary with St Paul's Road. Aerial photographs indicate that a large number of vehicles have been stored on site at one point.

2.4 The site has existing vehicular access via a junction onto St Paul's Road, on the eastern site boundary.

Boundaries

2.5 The south eastern boundary is generally formed by a boundary wall adjacent to the western footway of St Pauls Road. Behind this wall is a long building which forms the north-eastern and northern boundary. A high stone wall forms part of the western boundary, with the remainder made up by neighbouring buildings, served from Huddersfield Road, which is southwest of the site.

Topography and Vegetation

2.6 The site has a gentle gradient across the hardstanding areas, generally from the northeast to a low point in southwest. The low point is recorded as being 52.26m AOD, located close to a drainage channel and manhole. Levels were unable to be recorded to the south of this area due to dense vegetation and access issues obscuring the topographical survey. There is local high point in the far west of the site, with hardstanding in this area falling towards the low spot. The gradients on site are approximately 1 in 30. However, the entrance to the site is flatter, with a levels rise at approximately 1 in 100 from the junction with St Pauls Road to an access barrier. A topographical survey is presented in Appendix B for reference purposes.

2.7 Unmaintained shrubs and bushes are present in the east of the site, located behind the boundary wall and the building.

Drainage

2.8 The site includes existing buildings including former council offices, and a drainage system is present. The topographical survey includes details of the existing system and demonstrates that the buildings include gutting at high level discharging through downpipes at ground level into gullies. Manholes on site show incoming and outgoing pipes, with the indication that all buildings outfall to MH.3, located in the lowest part on site, as discussed above. There are drainage channels on site which pick up surface water and also appear to discharge into the on-site system. MH3 has an outgoing pipe heading downstream towards St Pauls Road, suggesting that the whole site is drained into sewers within St Pauls Road. This will need to be confirmed in due course.

2.9 The River Calder, classified as a Main River by the Environment Agency, conveys flow eastwards, located approximately 135m to the south-west of the site. This is close to a confluence between the River Calder and the Aire and Calder Canal, located approximately 150m south of the site.

2.10 From available mapping, the nearest watercourse appears to be Canker Dyke, located approximately 1.25km to the north-east of the site.

3.0 ENVIRONMENT AGENCY CONSULTATION

3.1 A consultation was requested from the Environment Agency, and a copy of their response, reference RFI/2019/152733 and dated 31/12/2019 is presented in Appendix C for reference purposes.

3.2 The Environment Agency flood map for planning show areas of land that could flood from rivers or the sea and are shaded blue. These areas do not take into account defences, as water can overtop them or the defences can fail in extreme conditions. The Zone classifications are:-

3.2.1 Flood Zone 1 - ''Low Probability'' is assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (less than 0.1%).

3.2.2 Flood Zone 2 - ''Medium Probability'' is assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding in any year (1% - 0.1%) and between a 1 in 200 and 1 in 1,000 annual probability of flooding from the sea (0.5% - 0.1%).

3.2.3 Flood Zone 3 - ''High Probability'' is assessed as having a 1 in 100 or greater annual probability of river flooding in any year (greater than 1%) and a 1 in 200 chance or greater annual probability of flooding from the sea (less than 0.5%).

3.3 The Environment Agency flood map shows the site is located within Flood Zone 1.

3.4 The Environment Agency surface water flood map shows areas where surface water only would be expected to flow or pond in England and Wales. The classifications of risk for surface water flooding are as follows:-

3.4.1 Very low - This area has a chance of flooding of less than 1 in 1000 (0.1%) in any given year.

3.4.2 Medium - This area has a chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%) in any given year.

3.4.3 Low - This area has a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%) in any given year.

3.4.4 High - This area has a chance of flooding greater than 1 in 30 in any given year (annual probability of flooding 3.3%).

3.5 The Environment Agency online risk of surface water flooding map demonstrates that the majority of the site is at a 'very low' risk of flooding from surface water.

3.6 The Environment Agency records on the website also demonstrate online that there is no flood risk from rivers or the sea across the site and it is outside the extent of the flood risk from reservoirs map data.

3.7 The Environment Agency provided a flood history map and this confirms it is outside the extent of any previous records of flooding in the area. Other flooding may have occurred which is not shown.

3.8 The Environment Agency provided further details including flood modelled data, and the full consultation is presented in Appendix C for reference purposes.

4.0 WATER AUTHORITY CONSULTATION

4.1 A consultation was requested from Yorkshire Water, who is the Water Authority for this area, and a copy of their response, reference Residential - T661007, dated 3rd December 2019, is presented in Appendix D. In addition, the Water Authority was subsequently re-consulted, and their responses are also provided in Appendix D.

4.2 The Water Authority advise that due to recent change in legislation, there could be sewers which have transferred over to the Water Authority that are not shown on the statutory sewer records, but are located on the Developer's land. The comments reflect the Water Authority's 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 12 months.

4.3 The Water Authority requires development of the site to take place with separate systems for foul and surface water drainage. The separate systems would need to extend to the points of discharge to be agreed.

4.4 In terms of foul water, the Water Authority suggested that foul water domestic waste should discharge to the onsite foul drainage if suitably sited.

4.5 In respect of surface water, under the terms of Section H of the Building Regulations 2010, the disposal of surface water by means of soakaways should be considered as the primary method. The Water Authority advise that the Developer's attention is drawn to Requirement H3 of the Building Regulations 2000. 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. The Developer is advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

4.6 In respect of surface water, Yorkshire Water confirmed that if other methods of surface water disposal are not viable and subject to providing satisfactory evidence as to why they have been discounted, curtilage surface water discharges to the public sewer will be restricted to the level of run-off - i.e. same rate of discharge - to that from the existing use of the site less a 30% reduction in the existing discharge. Any discharge of surface water from the site should discharge to similar points of connection to that of the existing use of the site. The Developer will need to demonstrate positive drainage, based on a 1 in 1 year storm, to the public sewer to Yorkshire Water by means of investigation and calculation carried out at the expense of the Developer.

4.7 To demonstrate this, Yorkshire Water requires details of the existing and proposed drainage layouts with pipe sizes, gradients and connection points, measured impermeable areas of the present and proposed use of the site, along with the calculations that show the existing and proposed discharge rate from the site to the public sewer.

4.8 The Water Authority records demonstrate that a combined sewer is present in the south west of the site, located around the adjacent building (No. 196 Huddersfield Road). This is assumed to be the "foul" sewer which is referred to within the Water Authority consultation. The head of this sewer coincides with Manhole 3, as shown on the topographical survey, which is indicated as the lowest downstream on-site manhole. This all indicates that the whole site currently drains through an on-site connection to the public sewer, which in turn connects into the sewers within Huddersfield Road to the south west of the site.

5.0 LAND DRAINAGE AUTHORITY CONSULTATION

5.1 A consultation was requested from Kirklees Council who is the Land Drainage Authority for this area. Two responses were received during December 2019, and these are presented in Appendix E for reference purposes.

5.2 In terms of flood risk, the authority confirmed that the site is within Flood Zone 1 and no surface water flooding is predicted onsite in the 1:100 year event. Surface water flood risk mapping shows that main roads are used as conduits.

5.3 They have no recorded flood incidents on or near to the site that might impact development.

5.4 It was confirmed that there are no known culverted watercourses on or near the site. There is already a connection shown the public sewer with a trade effluent licence. Accordingly, the authority advised that using the current connection point into the Yorkshire Water sewer is the best option.

5.5 Because this is a brownfield site, the authority requires a minimum surface water discharge reduction of 30% in the 1:1 year event. The allowable proposed discharge rate would be 30% off the existing peak flow using proved area drained in hectares x 2.78mm x 50mm.

6.0 MATERIAL CONSIDERATION IN RESPECT OF NPPF AND PPG

Flood Classification

6.1 The Environment Agency has confirmed that the site falls within Flood Zone 1, which is land assessed as having less than a 0.1% annual probability of river or sea flooding in any year. The proposed development lies wholly within an area with a 'low' risk of fluvial flooding.

End Use

6.2 The existing buildings are proposed to be demolished and the proposals are currently for five apartments with an office, car parking, shared access and landscaping works. The current proposed site plan is presented in Appendix F for reference purposes.

6.3 The Planning Practice Guidance (PPG) includes a dedicated section relating to flood risk and coastal change which advises how to take account of and address the risks associated with flooding and coastal change in the planning process. Within this guidance, Table 2 defines the flood risk vulnerability classification. Applying Table 2 shows that the proposed end use will fall into the 'More Vulnerable' classifications under the general classification 'dwellings'. With reference to NPPF, the siting of More Vulnerable development within Flood Zone 1 is deemed appropriate and assessment of other sites (the Sequential Test) is not deemed necessary.

Flood Sources

6.4 Flooding from Rivers - The River Calder, a Main River, conveys flow eastwards located approximately 135m to the south-west of the site. The Environment Agency Flood Map for Planning shows that flooding risk from these sources occurs well away from the site and, therefore, it is considered that the site is not at risk of flooding from this source.

6.5 Flooding from Local Watercourses - From available mapping, the nearest watercourse appears to be Canker Dyke, located approximately 1.25km to the north-east of the site. The Environment Agency 'Flood Risk from Surface Water Flooding' mapping shows the risk of flooding from this source occurs well away from the site and therefore, it is considered that the site is not at risk of flooding from this source.

6.6 Flooding from the Sea - The site is not located near enough to the sea to be at risk of flooding from this source.

6.7 Flooding from Land - Impermeable surfaces surrounding the site have positive drainage systems in place to drain water away from the site into these drainage systems. To the west of the site, the Environment Agency 'Flood Risk from Surface Water Flooding' mapping shows that adjacent to eastern site boundary, there is a 'low' risk of a surface water floodwater pathway, conveying flow along St Pauls Road. To the southwest of the site, there is a "high" risk of a surface water floodwater pathway, conveying flow along a section of the A644 Huddersfield Road. This is outside of the extent of the site, separated from the site by existing buildings, and occurs at a lower level than the site. St Pauls Road is also lower than adjacent site levels. The junction of Huddersfield Road and St Pauls Road is to the south of the site, at a lower level, and the continuation of the carriageway by Newgate to lower levels provides a route for surface water to disperse to the south. This is reflected in the EA mapping. It is considered unlikely that any surface water could back up and enter the site from the adjacent roads. Therefore, it is considered that flooding from land is at a 'low' risk.

6.8 Flooding from Groundwater - Flooding from groundwater can happen when groundwater levels are high. This may be due to rainfall in the groundwater source area, but can also happen on floodplains if river levels are held above the level of the flood plain by embankments. Whilst there is no intrusive ground investigation, a Stage 1 Desk Study Report has been undertaken by ARP Geotechnical Ltd, reference CNN/01r1 and dated 22nd November 2019. Paragraph 4.17.7 of this report advises that British Geological Society data indicates the general area has the "potential for groundwater flooding to occur at

surface". The groundwater regime can only be confirmed by an intrusive investigation. However, it is considered possible that shallow groundwater could be present, from the information available within the desk study appraisal. Within the appendices of the report, the British Geological Society Groundwater Flooding Susceptibility map states there is potential for groundwater flooding to occur at surface.

6.9 On the above basis, is concluded that there is a potential for groundwater flooding to occur at the site, however further investigation would be required to quantify any such risk. In the event that groundwater emerged on site, it is most likely to either emerge in the lowest lying areas, or flow overland towards the lowest lying areas. Mitigation measures are proposed within this report to alleviate the risk.

6.10 Flooding from Sewer - A new drainage system will need to be introduced onto the site and it is possible that any blockage will result in flooding from the lowest cover level of manholes or gullies. This will need to be considered as part of any proposed development, with potential exceedance flows directed away from property to be contained in less vulnerable areas of the site as far as practicable. It is noted that the the existing sewer within the site is the head of the run and located at the lowest point on site, therefore risk from flooding is low and any flooding would likely flow away from vulnerable areas of the development.

6.11 Flooding from Reservoirs, Canals or Artificial Sources - The Environment Agency risk of flooding from reservoir failure map shows the expected inundation area should a reservoir fail and release its capacity. It should be noted, however, that reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925.

6.12 The proposed development site is shown to be outside of the maximum extent of reservoir flooding. The flood extent demonstrates that the Aire and Calder Canal, located approximately 150m south of the site at its closest point, would flood primarily on the southern side of the canal, to lower lying land. There are no canals or other artificial water sources within the vicinity of the proposed development site, therefore the risk from this source is deemed to be low.

Climate Change

6.13 The NPPF and PPG has indicated that the Global sea level will continue to rise, depending on greenhouse gas emissions, and the sensitivity of the climate system and there will be an increase in rainfall intensity across the country.

6.14 United Kingdom climate change guidance was revised by the Environment Agency in February 2016 for peak river flows and peak rainfall intensities.

6.15 With regards to peak river flows, a regionalised approach to climate change impacts has now been adopted based upon the river basin district of the proposed development site, the flood risk vulnerability of the proposed development and the present day Flood Zone classification.

6.16 With reference to Table 1 of the 2016 climate change guidance, as the proposed development site is situated in the Humber River basin district, is located in Flood Zone 1, and has an expected life of greater than 50 years, an allowance of +20% on river flows should be considered based on the 'central' climate change scenario.

6.17 In accordance with Table 2 of the 2016 climate change guidance, for an expected life of greater than 50 years for any new development, the anticipated increase in rainfall intensity will be up to 40%.

6.18 It is understood that the Kirklees Council flood risk requirements for managing on/off-site flood risk from fluvial flooding is to assess the development using a 30% allowance for climate change for the 1 in 100 year event. Therefore, the drainage system should be designed in accordance with this requirement, however it is recommended that the impact of a 40% increase should be considered as a 'sensitivity test' to confirm there are no adverse impacts on the development under this scenario.

Flood Mitigation

6.19 The site falls within Flood Zone 1 and the risk of flooding from rivers and surface water is low, and the Sequential Test is satisfied. A potential risk of groundwater flooding has been identified, subject to further review based on intrusive ground investigations to be undertaken in due course.

6.20 As the site falls within Flood Zone 1, flood mitigation measures are only required in the event of a catastrophic storm or blockage of the existing or proposed sewers. In this event, and to mitigate the risk of groundwater flooding should this be proven to be significant, then it will be necessary to consider some precautionary flood mitigation measures, as follows:-

6.20.1 The finished floor levels to the development shall be raised above general external levels by a minimum of 150mm. This is to mitigate against residual surface water flooding and the potential risk of groundwater flooding of the site.

6.20.2 Properties shall be designed without any basements and ground floors shall comprise solid concrete slabs or beam and block with screed construction to mitigate against future groundwater risk sources.

6.20.3 Incoming electricity supplies shall be raised above ground floor level and ground floor electric sockets shall be served by loops from upper levels.

6.20.4 In the unlikely event of flooding of the site, it would be appropriate to design external levels with falls to non-critical areas, such as landscape, where the water can pond without causing danger for people or damage to buildings.

6.20.5 Ideally, tanking of the external walls and continuous with the damp proof membrane under the concrete floor should be considered.

6.20.6 A sustainable surface water drainage systems shall be provided to manage surface water run-off from the site itself up to the 1 in 100 year plus climate change event.

6.20.7 Anti flood valves shall be installed on all internal building drainage.

6.21 Any mitigation measures, including drainage systems, would require suitable maintenance systems to be implemented, so that the design standard is maintained over the lifetime of the development.

6.22 The above should be reviewed in the event that groundwater flooding is determined to be significant following intrusive investigations.

6.23 As a potential risk of groundwater flooding has been identified, depending on the nature and location of any proposed development, it may be necessary to confirmed groundwater levels by further intrusive ground investigations (including monitoring of seasonal variations) prior to detailed scheme design.

6.24 In the unlikely event of flooding on the site due to exceedance of the drainage system capacity or blockage, it would be appropriate to design external levels with falls to direct overland flows away from the building entrances where possible, so that any flooding remains in the parking areas or flows towards landscaped and parking areas, and potentially through the main site entrance towards St Paul's Road.

Inspection and Maintenance

6.25 There remains a residual risk of flooding in the event that the capacity of drainage systems is exceeded or the system becomes blocked. Any flood mitigation measures, including existing drainage systems, require suitable maintenance systems to be implemented, so that the design standard is maintained over the lifetime of the development, and the likelihood of blockage is reduced.

6.26 Also, as a potential risk of groundwater flooding has been identified, it would be pertinent to maintain existing surface water drainage systems so that water is removed from site as efficiently as possible. If a further understanding of the risk of groundwater flooding is required, it is likely that further intrusive ground investigations (including monitoring of seasonal variations) would be required.

Sustainable Drainage

6.27 In order to comply with the requirements of NPPF, it will be necessary to consider aspects of sustainable drainage techniques for the new development. Whilst there is no intrusive ground investigation, a Stage 1 Desk Study Report has been undertaken by ARP Geotechnical Ltd, reference CNN/01r1 and dated 22nd November 2019. This states that the disposal of surface water using soakaways is unlikely to be practical on the site, given the likely presence of deep low permeability strata on the site. Therefore, for the purposes of this report, a positive connection to either watercourse or sewer system will be required for surface water drainage. However, the proposed development will need to be developed in a sustainable manner, to avoid any potential increase in flood risk as a result of increased run-off to downstream receiving drains and/or watercourses. The surface water run-off from the site will need to be restricted to a rate to be agreed with the Lead Local Flood Authority. They have indicated a 30% reduction from the existing drained area would satisfy this requirement. Other forms of sustainable urban drainage should be incorporated into the scheme during the design development of the project.

Drainage

6.28 It is a requirement of the NPPF to ensure that surface water run-off from any proposed development has negligible consequence on downstream areas either in sewer capacity or discharge to watercourse.

Existing Surface Water Run-Off

6.29 The topographical survey shows evidence that the site has an existing positive surface water drainage system, and the point of discharge is considered to be into public sewers within St Pauls Road. A detailed drainage survey will be required in due course, to confirm the condition, capacity and location of existing drains and existing connections to any surrounding watercourse, drain or sewer.

6.30 The site is currently considered to be 'brownfield', with an impermeable area of approximately 0.2ha. This correlates with the gully positions shown on the topographical survey however a CCTV survey of the existing drainage system will be required to verify this. The Rational Method should be utilised to estimate the existing run-off from the brownfield area of the site.

6.31 Applying a 30% reduction to this existing discharge rate, in accordance with the requirements of the Land Drainage Authority, would indicate the potential proposed surface water discharge rate. A surface water drainage strategy should be prepared for the proposed development.

Foul Drainage

6.32 Yorkshire Water have indicated that they would accept discharge of foul water domestic waste into the on-site public foul/combined sewer.

Proposed Surface Water Drainage

6.33 The proposed surface water system should be designed to accommodate a 1 in 30 year storm event without flooding and the 1 in 100 year storm plus climate change event should be retained within the site in an area which will not affect the new buildings or third party land from flooding. The drainage system will also need to accommodate the 1 in 100 year storm plus 30% climate change event without causing flooding of property of third party land.

6.34 Any connection will be subject to the prior agreement of the Regulatory Authorities.

Emergency Egress During Times of Flood

6.35 It is a requirement under the PPG that occupants should be able to egress any building during times of flood, without being trapped by flood conditions.

6.36 As the site falls within Flood Zone 1 and there is no flooding from the local watercourse, no special mitigation measures are required for emergency egress during times of flood.

7.0 COMMENTS

7.1 As the site falls within Flood Zone 1, flood mitigation measures are only required in the event of a catastrophic storm or blockage of the existing or proposed sewers. The following precautionary mitigation measures are, therefore, recommended:-

7.1.1 The finished floor levels to the developments shall be raised above general external levels by a minimum of 150mm.

7.1.2 The proposed ground floors shall comprise solid concrete slabs or beam and block floors with screed construction.

7.1.3 Incoming electricity supplies shall be raised above ground floor level and ground floor electric sockets shall be served by loops from upper levels.

7.1.4 In the unlikely event of flooding of the site, it would be appropriate to design external levels with falls to non-critical areas, such as landscape, where the water can pond without causing danger for people or damage to buildings.

7.2 In terms of foul water, the Water Authority suggested that foul water domestic waste should discharge to the onsite foul drainage if suitably sited.

7.3 Soakaways are not considered to be a viable proposal for discharge of surface water for this site.

7.4 The proposed surface water system should be designed to accommodate a 1 in 30 year storm event without flooding and the 1 in 100 year storm plus climate change event should be retained within the site in an area which will not affect the new buildings or third party land from flooding. The drainage system will also need to accommodate the 1 in 100 year storm plus 30% climate change event without causing flooding of property of third party

land. Attenuation could be achieved by several methods including above or below ground attenuation.

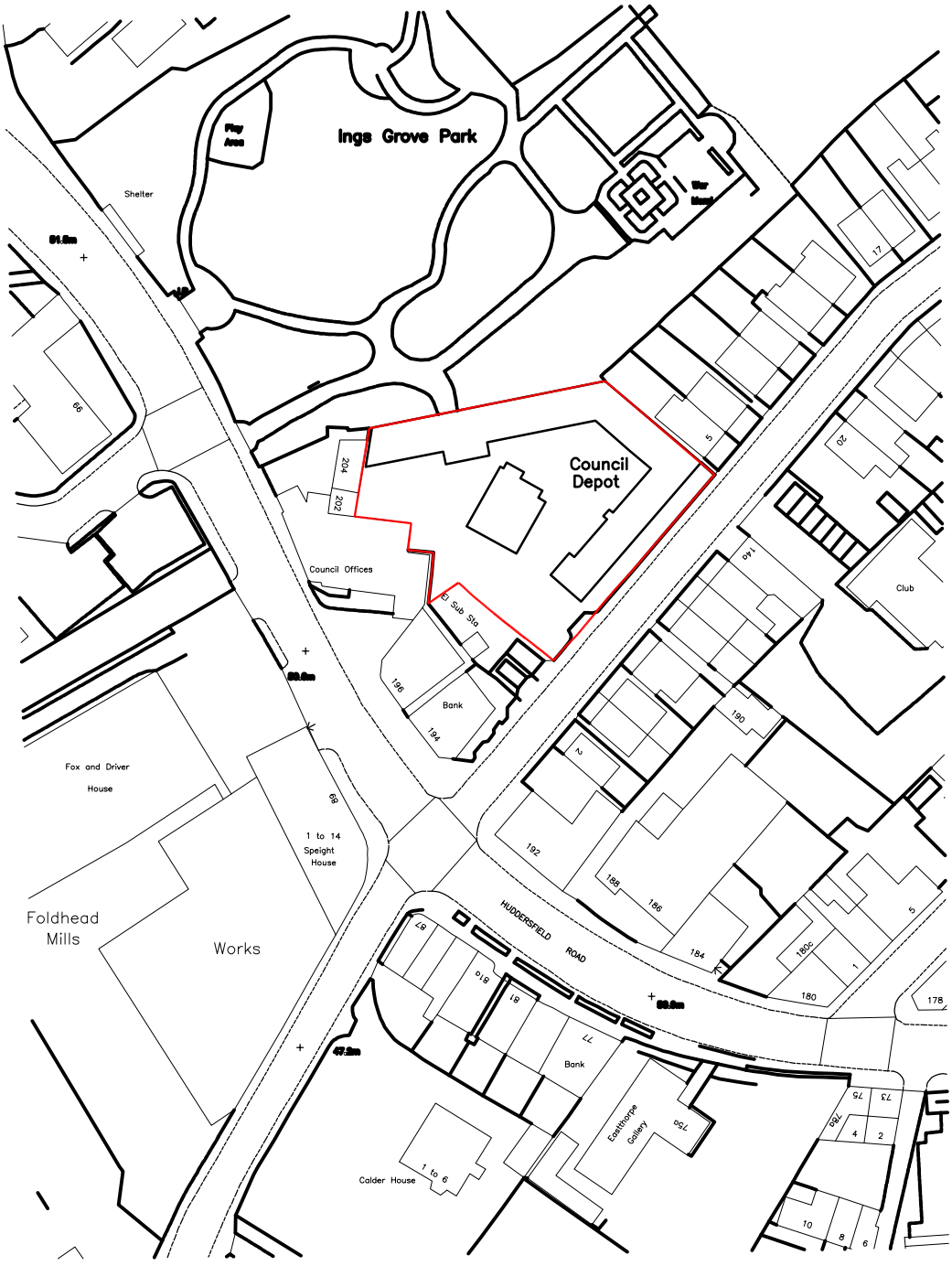
7.5 Any connection will be subject to the prior agreement of the Regulatory Authorities.

7.6 No special mitigation measures are required for emergency egress during times of flood.

7.7 Subject to compliance with the above, the proposed development can satisfies the requirements of the National Planning Policy Framework and the Planning Practice Guidance in relation to flood risk.

APPENDIX A

SITE LOCATION PLAN



1:1250 EXISTING SITE PLAN

DENOTES SITE BOUNDARY

REVISIONS

Proposed ALD Extra Care Residential Development

ST PAUL'S ROAD, MIRFIELD

EXISTING SITE PLAN

Drawn: - Scale: 1:1250@A4

Date: AUG 18 Checked: -

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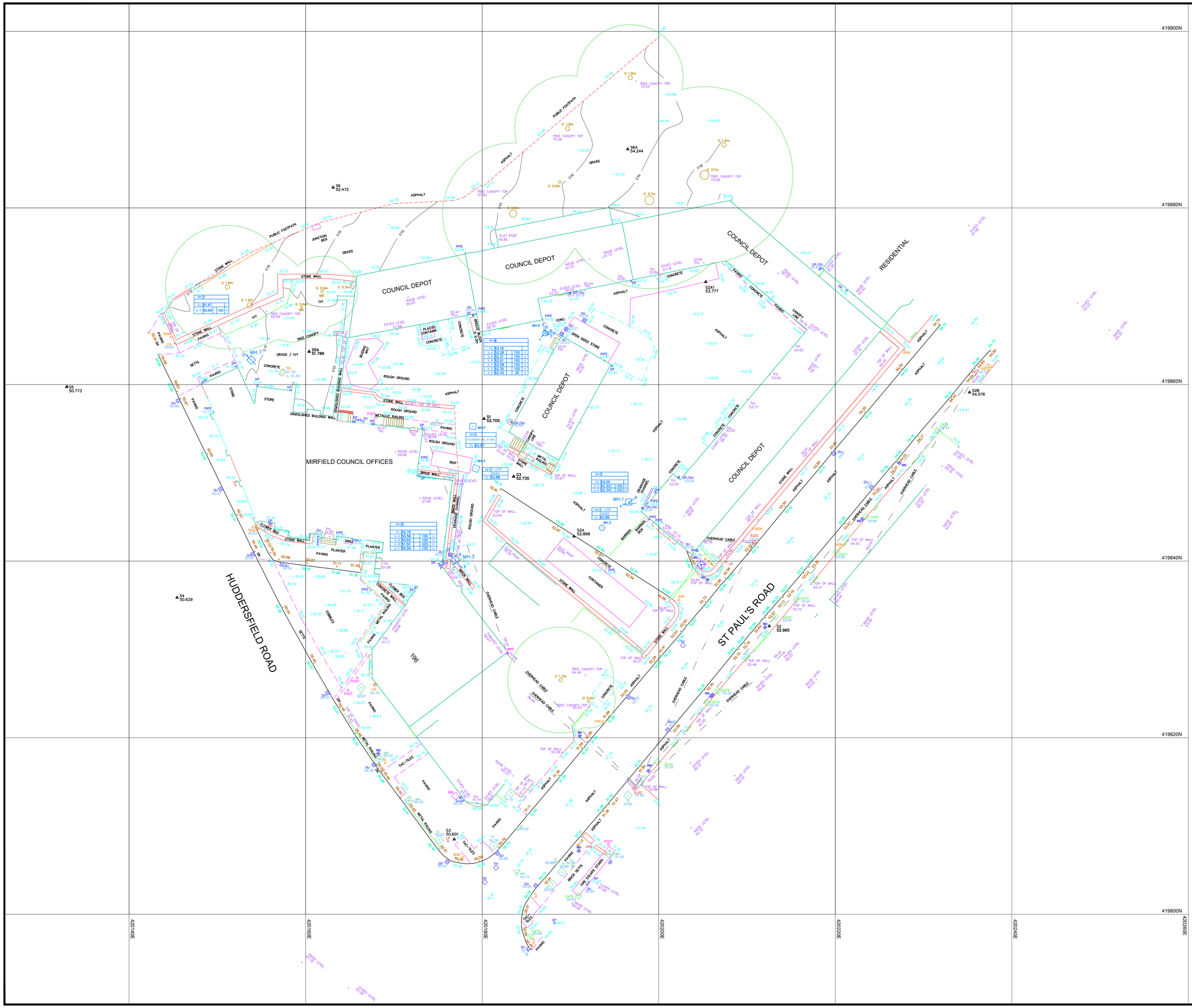
Dwg No: 501/01(01)004 #

APPENDIX B

TOPOGRAPHICAL SURVEY



Notes

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Direction of North

Grid : OS National Grid. Using the OS GPS Network and applying OSTN15 transformation and then removing the scale factor for true distances with a one-step transformation centred on S5

Datum : OS Level Datum. Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections.

Station Listing

Station	Easting	Northing	Level
G3	420183.568	419849.589	52.730
S0	420102.776	419928.826	52.152
S1	420180.218	419856.129	52.705
S2	420212.527	419832.645	52.965
S3	420176.840	419808.491	50.601
S4	420145.437	419835.867	50.629
S5	420132.955	419859.745	50.773
S6	420163.120	419882.314	52.472
S2A	420190.401	419842.797	52.898
S2A1	420205.332	419871.628	53.777
S2B	420235.209	419859.116	54.576
S5A	420160.397	419863.733	51.789
S6A	420196.488	419886.660	54.244

KEY

AIR VALVE	AV	KERB OUTLET	KO
BENCH MARK	BM	LAMP POST	LP
BIN	BIN	MANHOLE (CIRCULAR)	MH
BOLLARD	BOL	MANHOLE (RECTANGULAR)	MH
BORE HOLE	BH	MANHOLE (TRIANGULAR)	MH
BRITISH TELECOM COVER	BT	MARKER POST	MKR
BUS STOP	BUS	GULLY	GU
CABLE TV COVER	CATV	RODDING EYE	RE
CABLE TV SUPPLY	CA	SIGN POST	SIGN
COLUMN	COL	TELECOM COVER	TEL
DROPPED KERB	DK	TELEGRAPH POLE	TP
EARTHING POINT	ER	THRESHOLD LEVEL	THL
ELECTRICITY COVER	ELEC	TRAFFIC LIGHT	TL
ELECTRICITY POLE	EP	TRIAL PIT	PIT
FIRE HYDRANT	FH	WASH OUT	WO
GAS VALVE	GAS	WATER METER	WM
GATE		WATER STOP COCK	SC
INSPECTION COVER (CIRCULAR)	IC	WATER STOP VALVE	SV
INSPECTION COVER (RECTANGULAR)	IC		

COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch.L
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Rev	Date	Drawn	Description	Check
-	--/--/----	--	--	--

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Leeds
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LS10 1SW
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F: +44 [0] 1132 008 901
E: admin@metgeoenvironmental.com
W: www.metgeoenvironmental.com

Client
BREWSTER BYE ARCHITECTS LTD

Site
ST PAUL'S ROAD
MIRFIELD WF14 8AX

Title
TOPOGRAPHICAL SURVEY

Surveyed	TZ, Ca. C	Drawn	TZ
Chk.	DA	Date	28/11/2018

Scale	Job No	Sheet Size	Issue
1:200	P18-00268	A1	01

DWG Ref

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P18-00268	MET	EXT	XX	TOP	M2	G	001

APPENDIX C

ENVIRONMENT AGENCY CONSULTATION

Paul Carter

From: Hastings, Robert <Robert.Hastings@environment-agency.gov.uk>
Sent: Tuesday 31 December, 2019 2:45 pm
To: Paul Carter
Subject: Your Enquiry: RFI/2019/152733
Attachments: Planning advice for developers.pdf; 2015 Calder and Canals Defended Model Results 152733.pdf; 2015 Calder and Canals Undefended Model Results & CC Model Results 152733.pdf; Assets Map 152733.pdf; Flood History Map 152733.pdf; Node Point Map 152733.pdf; Supporting Information 152733.pdf; 3rd Party Maintained Channel Details 152733.pdf; 3rd Party Maintained Defence Details 152733.pdf; 3rd Party Maintained Structure Details 152733.pdf

Our Ref: RFI/2019/152733

Your Ref: 419/27 St. Pauls Road, Mirfield

Dear Paul,

Request for information under the Freedom of Information Act 2000 (FOIA) / Environmental Information Regulations 2004 (EIR)

Thank you for your enquiry which was received on 25th November 2019.

We respond to requests for recorded information that we hold under the Freedom of Information Act 2000 and the associated Environmental Information Regulations 2004.

The requested data is attached. Please also find attached a 'Supporting Information' document which should be read in conjunction with this data.

Flood Data

Please see attached documents. Please note that for this request, no depth grids have been provided as the site is not effected by the 0.1% (1 in 1000yr) AEP.

Discharge Data

"Any discharge to sewer other than domestic sewage should discussed with Yorkshire Water. Apart from the River Calder we are unaware of any watercourses in the immediate vicinity of the development. Any discharge of uncontaminated water e.g. clean rainwater from roofs etc. does not require a discharge permit, however if the water is likely to be subject to contamination i.e. from internal roads or car parking a fully maintained interceptor would be required".

This information is provided subject to the Open Government Licence (here). Please read for details of permitted use.

If you are using our data to inform a development proposal, we encourage you to contact our Sustainable Places team for pre-application advice. Their advice can help you solve key environmental issues early, reduce the chance of an objection and help you design a more sustainable development. To take advantage of this service and gain further details, together with estimated costs, please email sp-yorkshire@environment-agency.gov.uk.

For general enquiries relating to your development or our role within the planning system, please refer to the attached 'Planning advice for developers' document.

I hope that we have correctly interpreted your request. If you are not satisfied with our response to your request for information you can contact us within 2 calendar months to ask for our decision to be reviewed.

Yours sincerely

Rob Hastings
Customers and Engagement Team
Environment Agency | Lateral, 8 City Walk, Leeds, LS11 9AT
robert.hastings@environment-agency.gov.uk
External: 0207 7141125 | Internal :41125

Enquiries Team Tel: 020 847 48174
Email: neyorkshire@environment-agency.gov.uk

Working days: Monday to Friday

Channels (3rd Party Maintained) - RFI/2019/152733										
ASSET ID	DESCRIPTION	ASSET MAINTAINER	ASSET TYPE	LENGTH (m)	LAST INSPECTION	LOCAL AUTHORITY	PROTECTION	TARGET CONDITION	OVERALL CONDITION	DESIGN STANDARD OF PROTECTION (SOP)
165022		private	simple_culvert	911.57	01/08/2019	Kirklees District (B)	fluvial	3	3	30
165020		private	simple_culvert	52.82	01/08/2019	Kirklees District (B)	fluvial	3	3	30
165018		private	simple_culvert	14.02	01/08/2019	Kirklees District (B)	fluvial	3	3	30
148126		private	simple_culvert	391.78	01/08/2019	Kirklees District (B)	fluvial	3	3	30

Defences (3rd Party Maintained) - RFI/2019/152733										
ASSET ID	DESCRIPTION	ASSET MAINTAINER	ASSETS TYPE	LENGTH (m)	ACTUAL Downstream Crest Level (mAOD)	ACTUAL Upstream Crest Level (mAOD)	PROTECTION	TARGET CONDITION	OVERALL CONDITION	DESIGN STANDARD OF PROTECTION (SOP)
26709	high_ground	private	flood_risk_management	739.56			fluvial	3	3	30
28010	high_ground	private	flood_risk_management	824.75	44.90	47.22	fluvial	3	3	30
76385	high_ground	private	flood_risk_management	816.86			fluvial	3	3	30
26712	high_ground	private	flood_risk_management	107.98			fluvial	3	3	30
26711	high_ground	private	flood_risk_management	1346.76			fluvial	3	3	30
26713	high_ground	private	flood_risk_management	70.15			fluvial	3	3	30
166417	high_ground	private	flood_risk_management	36.92			fluvial	3	2	30
165021	high_ground	private	flood_risk_management	33.02			fluvial	3	2	30
166416	high_ground	private	flood_risk_management	33.67			fluvial	3	3	30
165019	high_ground	private	flood_risk_management	35.84			fluvial	3	3	30
166415	high_ground	private	flood_risk_management	91.94			fluvial	3	3	30
165017	high_ground	private	flood_risk_management	91.92			fluvial	3	3	30
466889	high_ground	private	flood_risk_management	95.80			fluvial	3	3	
466888	high_ground	private	flood_risk_management	93.44			fluvial	3	3	

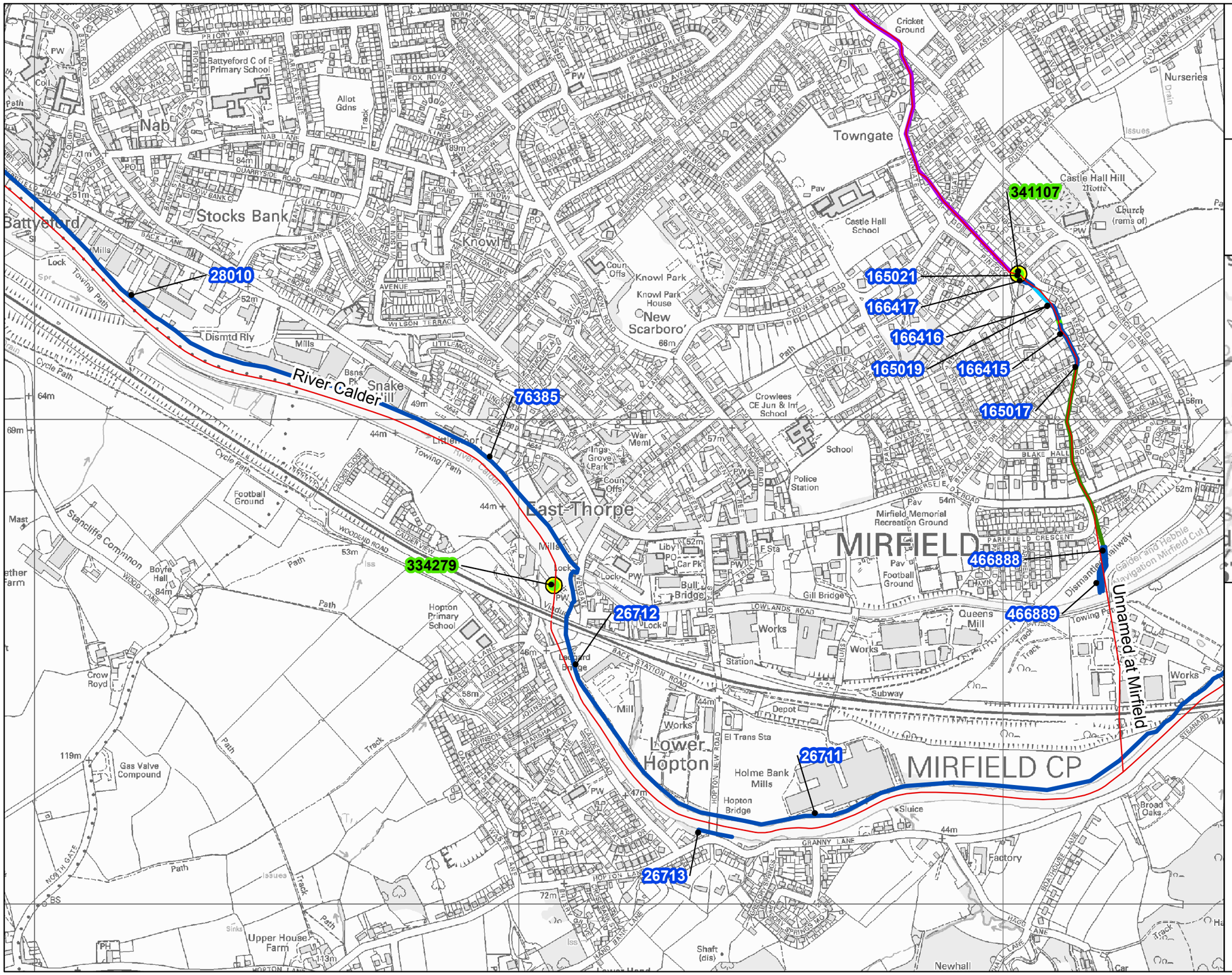
Structures (3rd Party Maintained) - RFI/2019/152733							
ASSET ID	**ASSETS TYPE**	**DESCRIPTION**	**DESIGN STANDARD OF PROTECTION (SOP)**	**ASSET MAINTAINER**	**PROTECTION**	**TARGET CONDITION**	**OVERALL CONDITION**
334279	weir			private	fluvial	9	2
341107	screen			private	fluvial	9	2

2015 Calder and Canals Defended Model Results - RFI 152733 (Level - mAOD, Flow - m³s)

	Annual Exceedance Probability (AEP)																			
	2	2	5	5	10	10	25	25	30	30	50	50	75	75	100	100	101	101	200	200	1000	1000
	50% AEP (1 in 2)		**20% AEP (1 in 5)**		**10% AEP (1 in 10)**		**4% AEP (1 in 25)**		**3.33% AEP (1 in 30)**		**2% AEP (1 in 50)**		**1.33% AEP (1 in 75)**		**1% AEP (1 in 100)**		**1% AEP (1 in 100)+ 20 %**		**0.5% AEP (1 in 200)**		**0.1% AEP (1 in 1000)**	
Node Point	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)	Level (mAOD)	Flow (m3/s)
EA1231293_CALD10_0425	44.76	231.53	45.23	312.47	45.32	329.82	45.68	407.59	45.73	415.15	45.83	439.79	45.90	458.34	45.92	483.25	46.20	532.50	46.07	501.75	47.31	806.52
EA1231293_CALD10_0182	44.66	231.26	45.11	312.98	45.19	330.08	45.52	410.41	45.56	422.69	45.65	450.37	45.71	471.19	45.75	483.18	45.96	554.65	45.85	519.73	46.89	876.93
EA1231293_CALD10_0775	44.91	231.57	45.40	314.73	45.49	332.62	45.86	421.51	45.90	431.90	46.00	461.48	46.07	483.94	46.16	481.87	46.35	575.44	46.23	536.99	47.53	803.37
EA1231293_CALD09_3471	42.70	230.27	43.29	313.67	43.39	331.15	43.81	406.87	43.87	415.94	43.99	438.95	44.06	457.72	44.34	462.10	44.27	528.27	44.22	499.52	45.43	655.32
EA1231293_CALD09_2942	42.26	230.74	42.79	302.75	42.92	312.48	43.40	356.00	43.45	363.45	43.58	378.96	43.65	391.56	43.77	454.52	43.87	443.79	43.85	420.05	44.73	666.45
EA1231293_CALD09_3936	43.00	230.33	43.64	313.84	43.76	331.73	44.25	416.59	44.32	428.63	44.46	455.34	44.55	476.75	44.78	472.02	44.84	555.14	44.74	523.30	46.17	654.90
EA1231293_CALD10_0012d	43.29	230.35	44.02	313.43	44.15	331.10	44.76	410.35	44.85	419.99	45.03	439.81	45.16	454.37	45.34	466.62	45.62	490.56	45.45	479.19	46.85	629.99
EA1231293_CALD09_4198d	43.21	226.18	43.91	300.18	44.04	316.08	44.60	389.11	44.68	399.41	44.83	420.84	44.94	438.78	45.10	455.89	45.31	500.83	45.18	478.96	46.54	586.87
EA1231293_CALD09_3691d	42.84	230.30	43.45	313.76	43.55	331.63	43.98	415.34	44.04	426.55	44.16	452.41	44.24	471.73	44.50	465.94	44.49	535.15	44.41	510.02	45.74	577.80
EA1231293_CALD09_3243u	42.51	230.25	43.07	312.54	43.17	327.72	43.62	387.45	43.68	394.48	43.80	408.90	43.89	420.01	44.13	452.58	44.16	462.10	44.10	441.66	45.26	631.58
EA1231293_CALD09_2868u	42.19	230.74	42.70	303.66	42.83	315.60	43.29	366.17	43.35	374.03	43.46	390.42	43.54	403.92	43.65	459.37	43.74	458.99	43.72	433.74	44.57	674.92
EA1231293_CAHN06_0728	42.84	0.79	42.95	0.83	43.00	0.98	43.40	4.47	43.46	5.07	43.58	6.55	43.65	7.97	43.67	9.19	43.84	17.26	43.78	13.53	45.23	23.89
EA1231293_CAHN060956u	42.84	0.80	42.95	0.86	43.00	1.05	43.41	4.48	43.47	5.08	43.59	6.39	43.67	7.40	43.70	8.29	43.89	13.88	43.82	10.82	46.40	74.42
EA1231293_CAHN06_1419	42.84	0.86	42.95	0.94	43.00	1.18	43.42	4.45	43.47	5.02	43.60	6.40	43.68	7.57	43.71	8.31	43.93	13.18	43.85	10.53	46.49	103.38
EA1231293_CAHN061545u	44.63	0.88	45.07	0.97	45.15	1.20	45.47	4.43	45.51	4.98	45.59	6.42	45.65	7.58	45.68	8.33	45.89	13.18	45.78	10.53	46.81	43.71
EA1231293_CAHN061248d	42.84	0.83	42.95	0.91	43.00	1.12	43.42	4.43	43.47	5.05	43.60	6.40	43.68	7.48	43.71	8.30	43.91	13.50	43.84	10.81	46.30	113.57
EA1231293_INT_1248_1	42.84	0.81	42.95	0.88	43.00	1.08	43.41	4.46	43.47	5.06	43.60	6.39	43.67	7.44	43.70	8.29	43.90	13.51	43.83	10.81	46.34	117.88
EA1231293_INT_956_1	42.84	0.79	42.95	0.85	43.00	1.02	43.40	4.44	43.46	5.08	43.58	6.38	43.65	7.38	43.67	8.29	43.85	14.31	43.79	10.88	44.85	159.13
EA1231293_INT_728_1	42.84	0.82	42.95	0.80	43.00	0.92	43.40	4.41	43.45	7.14	43.56	11.34	43.63	13.76	43.65	13.77	43.79	25.43	43.75	20.92	45.05	96.94
EA1231293_CAHN060413d	42.84	0.85	42.95	0.83	43.00	0.85	43.36	4.70	43.39	7.05	43.42	11.31	43.43	13.39	43.44	13.60	43.46	18.52	43.45	17.05	44.90	23.91
EA1231293_CALD10_0109d	44.63	230.38	45.07	312.02	45.15	328.92	45.47	406.14	45.51	417.55	45.59	444.03	45.65	463.87	45.69	474.62	45.89	543.77	45.78	510.87	46.84	806.11

2015 Calder and Canals Undefended Model Results - RFI/2019/152733 (Level - mAOD, Flow - m³s)						
	Annual Exceedance Probability (AEP)					
	100	100	101	101	1000	1000
	1% AEP (1 in 100)		1% AEP (1 in 100)+ 20 % CC		0.1% AEP (1 in 1000)	
Node Point	Max Stage	Max Flows	Max Stage	Max Flows	Max Stage	Max Flows
EA1231293_CALD10_0425	45.89	454.78	46.32	565.777	47.32	804.30
EA1231293_CALD10_0182	45.70	467.08	46.132	566.218	46.89	880.53
EA1231293_CALD10_0775	46.06	479.65	46.555	564.09	47.54	808.36
EA1231293_CALD09_3471	44.07	453.67	44.67	520.676	45.44	656.36
EA1231293_CALD09_2942	43.69	386.41	44.083	510.622	44.75	665.52
EA1231293_CALD09_3936	44.55	472.77	45.198	534.996	46.18	656.33
EA1231293_CALD10_0012d	45.15	451.20	45.825	516.936	46.85	633.26
EA1231293_CALD09_4198d	44.94	435.24	45.54	507.49	46.56	579.43
EA1231293_CALD09_3691d	44.24	467.60	44.839	516.139	45.75	578.61
EA1231293_CALD09_3243u	43.92	413.90	44.472	504.501	45.27	633.26
EA1231293_CALD09_2868u	43.59	396.44	43.952	518.021	44.58	677.17
EA1231293_CAHN06_0728	43.65	7.81	44.041	26.041	45.24	23.71
EA1231293_CAHN060956u	43.67	7.22	44.168	25.205	46.41	76.49
EA1231293_CAHN06_1419	43.68	7.35	44.249	20.019	46.48	113.33
EA1231293_CAHN061545u	45.64	7.37	46.063	18.152	46.81	43.93
EA1231293_CAHN061248d	43.67	7.29	44.225	20.328	46.31	113.74
EA1231293_INT_1248_1	43.67	7.26	44.203	21.285	46.35	119.06
EA1231293_INT_956_1	43.65	7.21	44.056	25.182	44.86	160.53
EA1231293_INT_728_1	43.63	13.70	43.986	32.532	45.07	97.44
EA1231293_CAHN060413d	43.43	13.34	43.744	16.714	44.91	24.01
EA1231293_CALD10_0109d	45.64	460.29	46.066	549.186	46.85	804.95

RFI/2019/152733 Assets Map centred on St Paul's Road, Mirfield, WF14 8AX.
Date created: 20/12/2019



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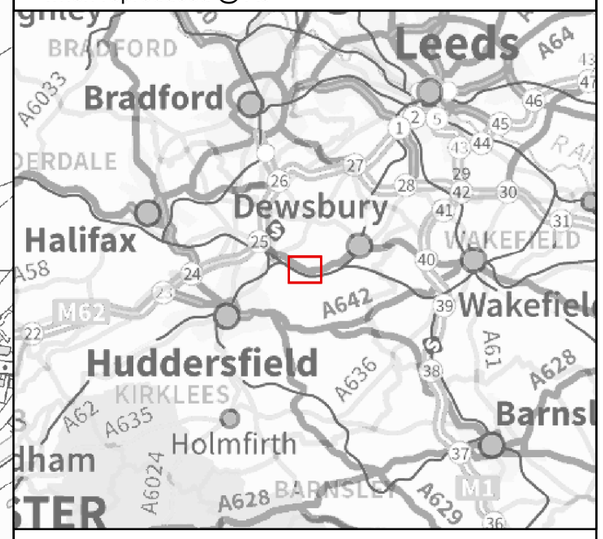


LEGEND

- Main River
- Structures (3rd party maintained)

Defences (3rd party maintained)

SUB_TYPE

- high_ground

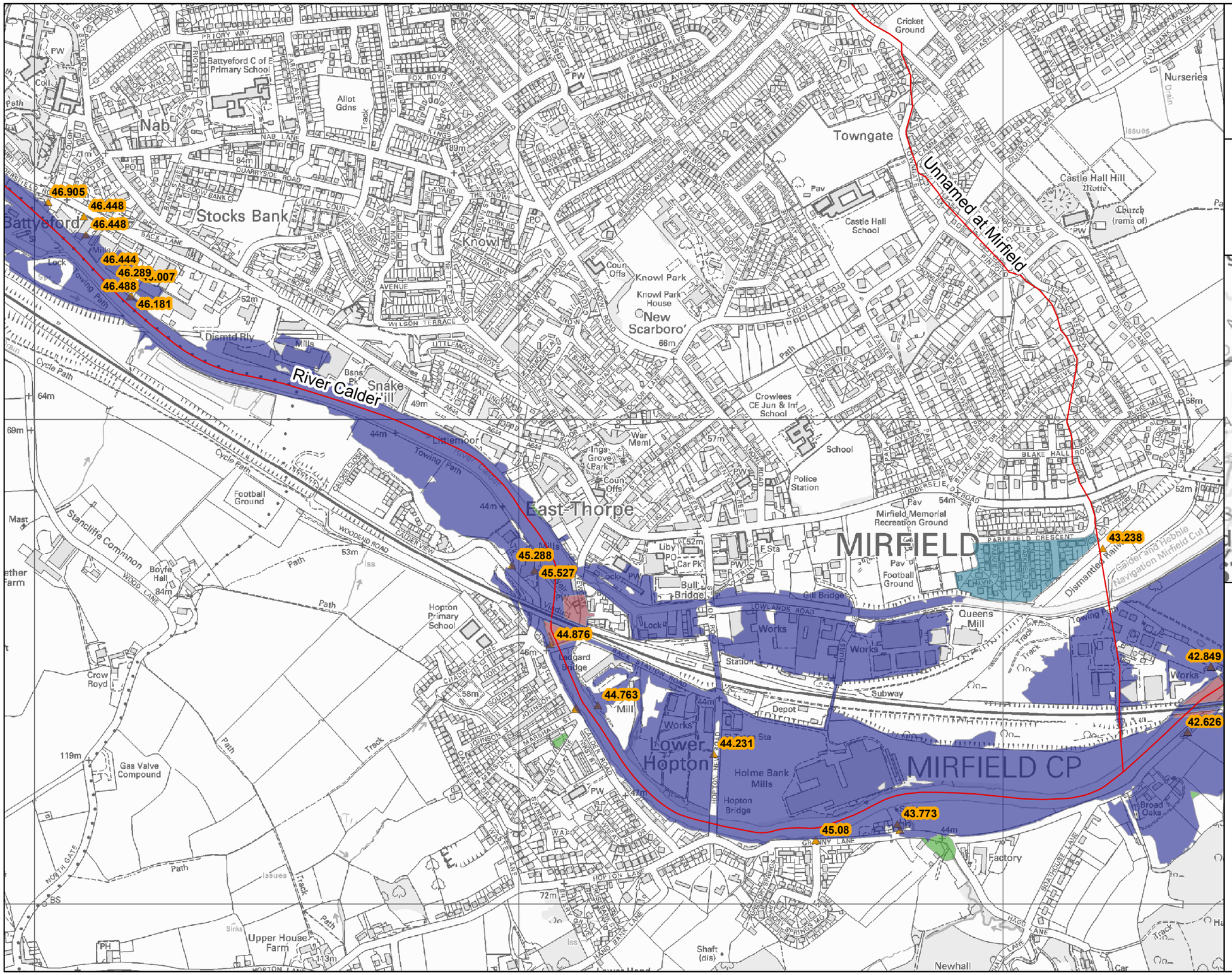
Channels (3rd party maintained)

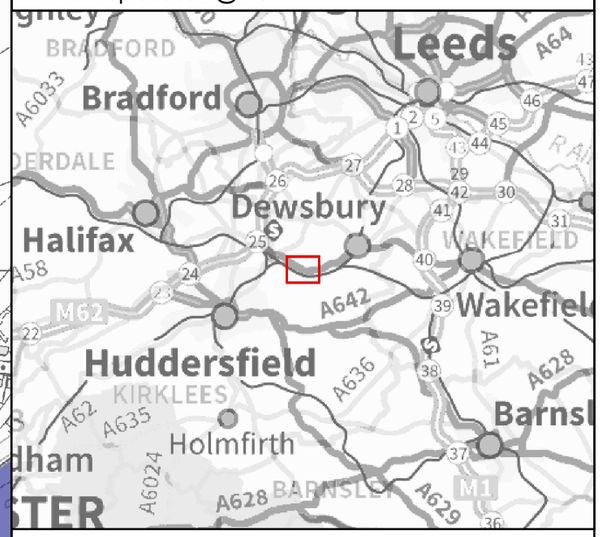
ASSET_ID

- 148126
- 165018
- 165020
- 165022

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506(Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

RFI/2019/152733 Flood History Map centred on St Paul's Road, Mirfield, WF14 8AX.
Date created: 20/12/2019





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LEGEND

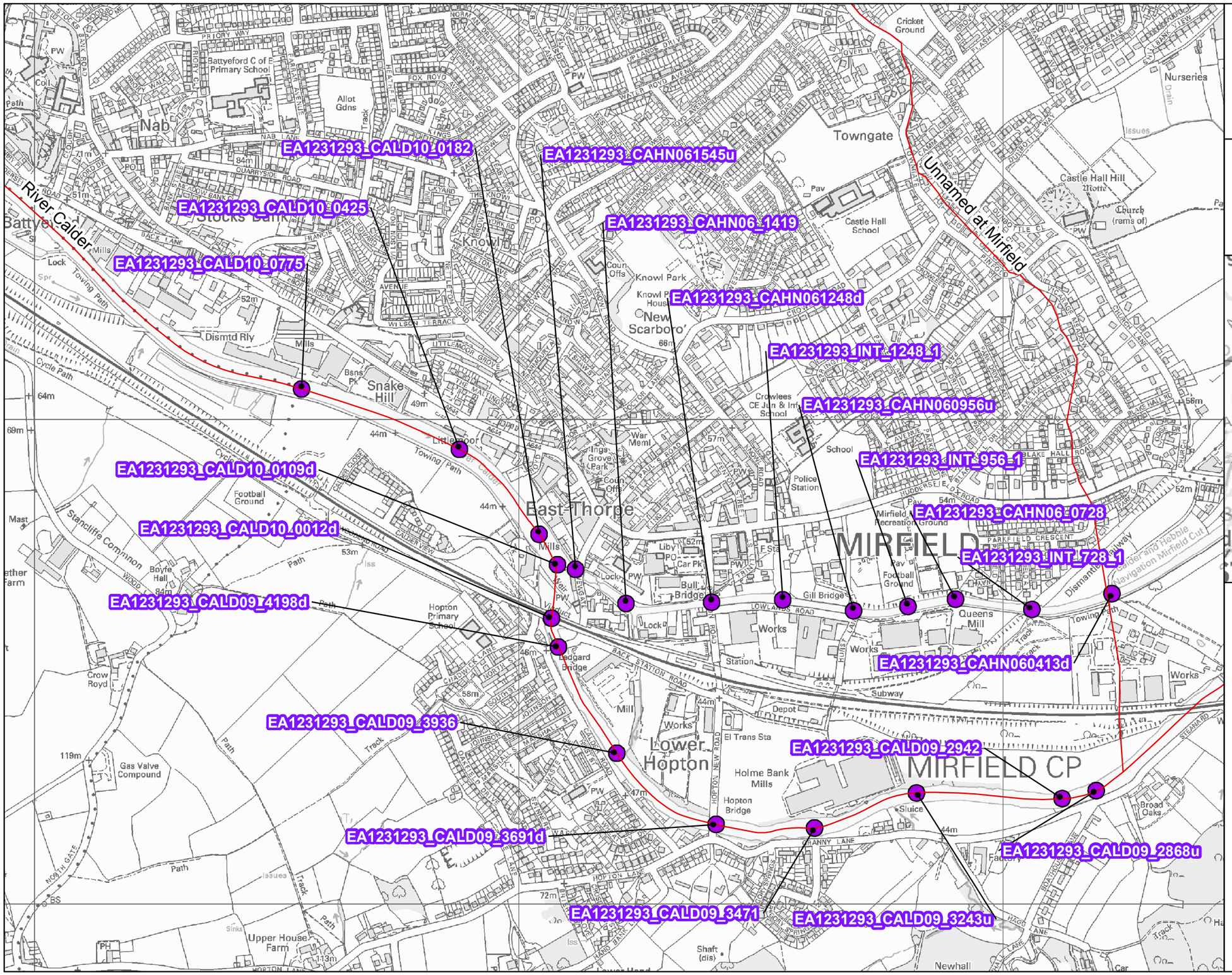
- Main River

Recorded Flood Outline

- 2019 March Flooding Yorkshire
- December 2015 Flood Event
- 123 Autumn 2000
- River Calder. Brighouse to Dewsbury
- Dec 2015 Flood Levels (mAOD)

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506(Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

RFI/2019/152733 Node Point Map centred on St Paul's Road, Mirfield, WF14 8AX.
Date created: 20/12/2019



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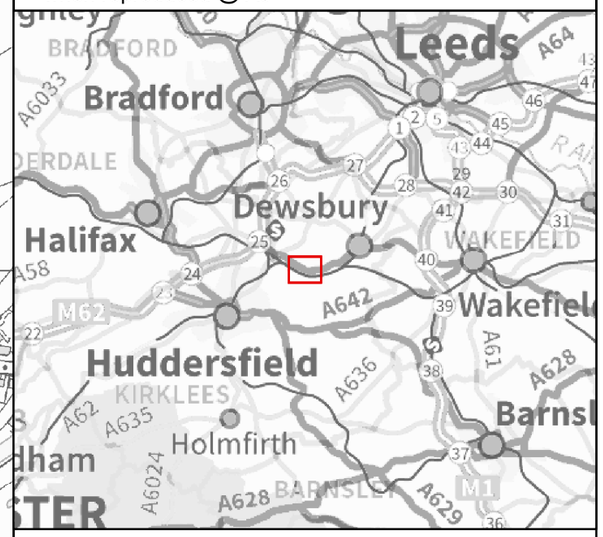


LEGEND

- Main River
- 2015 Calder and Canals Node Point Locations

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506(Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Planning advice for developers – FAQs

Introduction

Local planning authorities (LPAs) across Yorkshire are required to consult us on certain planning applications which affect flood risk, groundwater, waste, or water quality.

If your development falls into one of these categories, we'll be invited to comment on your planning application. Your LPA, when considering your application, will take our comments into account.

We've produced this guidance to summarise the environmental issues we're responsible for. The guidance forms part of our free advice service; if you require site-specific or face-to-face advice, we'll need to recover our costs through our charged advice service. Engaging with us early can help you identify the big issues, reduce the chances of subsequent delays and help you design a more sustainable and attractive development.

Development and flood risk

Is my development proposal at risk of flooding?

The flood map for planning shows where flooding from rivers and the sea may occur. Whilst this map isn't suitable for a detailed flood risk assessment, it'll show which flood zone your development is located within and therefore will indicate whether further assessment is needed. You should also refer to your LPA's strategic flood risk assessment which will provide additional local information on flood risk, including the location of functional floodplain and areas which are susceptible to other sources of flooding such as from surface water or reservoirs.

Will my application need to pass the sequential and exception tests?

Local planning authorities apply the sequential test to steer development towards areas at the lowest risk of flooding. If your proposal is located within flood zones 2 or 3, you should contact your LPA to discuss the sequential test **before** submitting your application. The LPA may require you to submit information with your application in support of the sequential test.

If the LPA confirm that the sequential test has ruled out steering the development to lower risk sites, the development may also need to pass the exception test by demonstrating that its sustainability benefits outweigh flood risk and that it can be made safe for its lifetime, through the production of a site-specific flood risk assessment. Planning practice guidance advises when an exception test will be required, which will depend on the vulnerability of the development and the flood zone it lies within.

Do I need to submit a flood risk assessment with my planning application?

You'll need to submit a flood risk assessment if your application lies within flood zones 2 or 3 or is over 1 hectare within flood zone 1. You'll also need to submit an assessment if your proposal could be affected by sources of flooding other than from rivers or the sea. For certain lower risk applications, we've provided 'flood risk standing advice' which enables local planning authorities to assess flood risk assessments without the need to consult us.

What information should I include in my flood risk assessment?

We recommend that you refer to the checklist for a site-specific flood risk assessment for detailed advice on what to include in your flood risk assessment. Alongside referring to your LPA's strategic flood risk assessment, you should contact your LPA to find out whether there are any development guidelines which are specific to your locality.

Can I undertake my own flood risk assessment?

Your FRA must be appropriate to the scale, nature and location of the development whilst being credible and fit-for-purpose. Whilst it's possible to undertake your own assessment, most applicants employ suitably experienced professionals. We're not able to recommend specific consultants, but a simple web search should help you source a competent individual or company.

Do I need to consider how climate change will affect my proposal's flood risk?

Yes, you should demonstrate how flood risk will be managed now and over the development's lifetime, taking climate change into account. Please refer to the following guidance when undertaking your flood risk assessment. In some cases we'll hold the climate change flood data you need. In others you'll need to undertake your own analysis to understand the impacts.

Where can I get modelled or historic flood levels from?

Email our Customers and Engagement team (neyorkshire@environment-agency.gov.uk) to find out whether we have any modelled or historic flood levels available for your development site. A list of the packages of information we're able to provide can be found under the 'get information to complete an assessment' section of the planning practice guidance. They'll aim to provide this information within 20 days. We no longer charge for providing this information.

The risk portrayed by your flood map doesn't seem to reflect the site's actual risk. How do I 'challenge' your flood map?

If you have evidence suggesting that our flood map is inaccurate, please contact our Customers and Engagement team (neyorkshire@environment-agency.gov.uk) who will provide you with any existing data we hold. To formally contest our flood zones, you'll need to submit supporting evidence, such as digital copies of a topographic survey or modelling for quality assurance purposes. Digital files of the proposed new flood zones in ArcMap or MapInfo format should also be supplied. Any new outline data you submit must conform to our flood zones policy, copies of which are available on request.

Whilst we'll usually be happy to review any topographical survey or model prior to the application being submitted, we would have to recover our costs for this work. In some cases where work to review and update our existing models is already underway, we may decline to consider a challenge.

As we have to be certain that the data which informs our flood map is fit-for-purpose, any revisions will need to meet stringent quality checks.

SURFACE WATER AND DRAINAGE

Who's responsible for managing surface water?

Lead local flood authorities are responsible for providing advice on the management of surface water resulting from new major development. Internal drainage boards, where established, have permissive powers to manage water levels within their drainage districts, so also play a key role in managing surface water.

Will I need to provide surface water storage and limit the discharge rate?

You should contact your lead local flood authority to discuss surface water discharge rates and storage requirements. Typically, they'll ask that your development does not increase run-off and limits the discharge to the existing greenfield run-off rate (usually 1.4l/s/ha if not calculated).

Do I need to install sustainable drainage systems?

Sustainable Drainage Systems (SuDS) should always be carefully considered in discussion with your lead local flood authority. A SuDS scheme can reduce flood risk, improve water quality, create better habitats for wildlife, and produce pleasant, more amenable places for people.

Infiltration drainage must not, however, pose a risk to groundwater quality. All infiltration SuDS must:

- Meet the groundwater protection criteria set out on GOV.UK
- Not be constructed in ground affected by contamination

Who should I contact about connecting my development to the mains sewer?

Talk to your water company about connecting to their sewerage system. Here are some contact details for water companies operating in the Yorkshire Environment Agency area:

Yorkshire Water	planningconsultation@yorkshirewater.co.uk
Northumbrian Water	developmentenquiries@nwl.co.uk
Severn Trent Water	new.connections@severntrent.co.uk

My development is a long way from the mains sewer. Can I install a 'non-mains' drainage system, such as a package treatment plant?

New development should connect to the public mains sewer wherever possible. Individual treatment plants can deteriorate local water quality and are more challenging to monitor and regulate. If you can't connect to the mains sewer, your planning submission should outline how you will deal with foul drainage discharge. You should include evidence as to why it is not possible to connect to the mains system, including details of any prohibitive costs. Please note that some 'non-mains' foul water drainage systems will require an environmental permit, irrespective of any planning approval.

OTHER ENVIRONMENTAL CONSIDERATIONS

What other environmental issues will you consider with my planning application?

Your planning application will need to demonstrate that any environmental risks can be managed, through design and construction, for the development's lifetime. Alongside flood risk, the key environmental risks we'll consider are:

- **Land Contamination**
  We're mainly interested in those sites where there is a risk of pollution to controlled waters. You should investigate any contamination to see whether the environmental risk or cost of clean-up (remediation) would hinder your proposal. If contamination is known or suspected, a desktop study, investigation, remediation and other works may be required to enable safe development. Our model procedures for the management of land contamination provide further information.

- **Pollution prevention**
  Your application should demonstrate how you'll minimise the risk of pollution from all aspects of your development, including construction and

operation phases. Groundwater can be vulnerable to pollution, as well as rivers and streams. Some areas (source protection zones and aquifers) are especially sensitive to pollutants as they typically supply public drinking water. To find out whether your development is located in an area sensitive to groundwater pollution, visit our interactive maps. Advice on groundwater protection can be found on GOV.UK

- **Fisheries, biodiversity, geomorphology and protected species**
  If your proposal is likely to affect the ecology of a main river, you'll need to carry out a risk assessment. This assessment should show that your development can proceed without demonstrable harm, and should propose mitigation, compensation or enhancements where required. A survey should be carried out if any protected species are thought to be nearby. If this survey confirms the presence of protected species or their habitat, measures should be taken to manage the development's risks. Natural England are the statutory consultee for other biodiversity-related matters. Further information on their remit can be found on GOV.UK

- **Water framework directive**
  If your proposal affects ground or surface waterbodies, you'll need to consider the Water Framework Directive (WFD) and the actions set out in the Humber River Basin Management Plan. You'll also need to submit a WFD Assessment demonstrating how the development will prevent deterioration and improve the waterbody's ecological status.

- **River buffer zone**
  Your development should ensure that an 8m strip of land (planted with locally appropriate, native species) is left undisturbed next to the bank of any main river. This 'river corridor' will improve habitat connectivity and will ensure we're able to access the bank for any future flood defence construction and maintenance.

- **Culverting**
  We're opposed to culverting. Culverts degrade watercourses' ecology and prevent the movement of wildlife and fish. As culverts can easily become blocked, they increase flood risk. They're also difficult to inspect and maintain. We may object to any planning applications involving culverting on a main river and may refuse to grant an environmental permit. Existing culverts should be removed and the river channel and bankside habitat reinstated to restore the ecological continuity of the river channel and its corridor.

Will I need any other Environment Agency permits for my development?

You might need an environmental permit if your development manages or produces waste or emissions that pollute the air, water or land or is work that affects a main river or a sea defence. The lead local flood authority is responsible for any consents relating to ordinary watercourses.

The Environmental Permitting Regulations (England and Wales) 2015 cover water discharges, groundwater activities, flood risk activities, radioactive substances, waste, mining waste and installations. They also include provision for a number of directives including batteries. Further information, including contact details for further permitting related enquiries, can be found here.

As planning and permitting decisions are often closely linked, we have issued detailed guidance for developments requiring planning permission and environmental permits. This guidance explains how, when responding to planning consultations that require environmental permits, we will advise of three possible positions:

- No major permitting concerns
- More detailed consideration is required and parallel tracking is recommended
- Don't proceed – unlikely to grant a permit.

PRE-APPLICATION ADVICE

Can you provide site-specific advice, review a submission document, or attend a site meeting before I submit my planning application?

We encourage you to seek pre-application advice as it can help you solve key environmental issues early, reduce the chance of an objection and help you design a more sustainable development. If you'd like to take advantage of this service, please email our Sustainable Places team so that we can provide further details and estimated costs.

Please note that any pre-application guidance we provide doesn't represent our final view in relation to any future planning application. We recommend that you seek your own expert advice prior to submitting your application.

Who should I contact for further information?

Yorkshire planning enquiries: sp-yorkshire@environment-agency.gov.uk

General enquiries: 03708 506 506

Environment Agency, Lateral, 8 City Walk, Leeds LS11 9AT
https://www.gov.uk/government/organisations/environment-agency

The Flood Map for Planning

The Flood Map for Planning (Rivers and Sea) can be viewed and downloaded as a PDF file on GOV.UK by following this link: https://flood-map-for-planning.service.gov.uk **or downloaded in GIS format under an open data licence from the following address**: https://data.gov.uk/publisher/environment-agency
Please type Flood Map for Planning in the search box.

What is the Flood Map for Planning?

The Flood Map for Planning provides information on flooding from rivers and the sea for England and Wales. The Flood Map also has information on flood defences and the areas benefiting from those flood defences.

The Flood Map for Planning shows the following:

1. Flood Zone 3 (dark blue area on the enclosed map): natural flood plain area that could be affected by flooding from rivers and/or the sea – not taking into account the presence of any flood defences
    - For flooding from rivers the map indicates the extent of a flood with a 1% (1 in 100) chance of happening each year;
    - For flooding from the sea the map shows the extent of a flood with a 0.5% (1 in 200) chance of happening each year.

2. Flood Zone 2 (light blue area): natural flood plain area that could be affected by flooding from rivers and/or the sea – not taking into account the presence of any flood defences. Flood Zone 2:
    - indicates the extent of a flood with a 0.1% (1 in 1000) chance of happening each year.
    - and/or indicates the greatest recorded historic flood, whichever is greater.

3. Flood defences built in the last five years to protect against river floods with a 1% (1 in 100) chance of happening each year, together with some natural or constructed entities which retain, store or channel water and which may protect against smaller floods.

4. Areas benefiting from flood defences - areas that benefit from the flood defences shown, in the event of a river flood with a 1% (1 in 100) chance of happening each year, or a flood from the sea with a 0.5% (1 in 200) chance of happening each year. If the defences were not there, these areas would flood.

Flood History

To the best of our knowledge there is no known flood history for this site. However, in close proximity to this location we do have some flood history available (see enclosed map). The extent of flooding, and/or flood level information is only shown for those watercourses surveyed after the flood. Other flooding may have occurred which is not shown. This is the best information currently available.

Please refer to the following table detailing the causes of those past floods.

Name	Start Date	End Date	Flood Source	Flood Cause	Source of data
2019 March Flooding Yorkshire	14/03/2019	17/03/2019	Main River	Unknown	Agency Survey
December 2015 Flood Event	25/12/2015	29/12/2015	Main River	Channel Capacity	Local Authority
December 2015 Flood Event	25/12/2015	29/12/2015	Main River	Channel Capacity	Consultancy Survey
River Calder. Brighouse to Dewsbury	10/02/2002	13/02/2002	Main River	Channel Capacity	Aerial Photograph
123 Autumn 2000	06/11/2000	04/12/2000	Main River	Unknown	Consultancy Survey

Water causing flooding can come from different places, for example from rivers or the sea; surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system); overflowing or backing up of sewers or drainage systems which have been overwhelmed or from groundwater rising up from underground aquifers.

Assets

Asset Location Map

Please find attached asset map(s) showing location of all (Agency and non Agency maintained) flood defences and channels.

Description of Works

See attached table with description of the defences and structures shown on the above drawing, including condition ratings, upstream and downstream crest levels, where available.

Risk of Flooding – Environment Agency Defences
The risk of flooding in this area is now reduced by the presence of flood defences that we maintain, but there still is a residual risk of flooding if these were to breach or be overtopped by a flood greater than that for which they were designed.

Risk of Flooding – Privately Maintained Defences
You will see that the Environment Agency does not maintain any of those defences. However we undertake regular risk based visual inspections. We do not hold design levels and have no height information on these defences or structures.

Asset Condition Ratings
The performance of a flood defence asset is recorded as the condition of the asset. Our asset inspectors subjectively assess the conditions of assets (during visual inspection site visits) with reference to a national standard template. Each asset is given a rating between one and five with one being very good condition and five being very poor. A condition rating of 3, or 'fair' is the minimal acceptable standard for a critical asset, such as a defence wall that protects properties. We are striving to improve all assets below 'fair' to an acceptable standard.

Asset inspections are done on average every six months, although some critical assets are assessed on a more regular basis. It is possible that adjacent assets are inspected on different dates, which may result in two assets of a similar state of repair having different condition ratings.

Condition ratings of assets may also be affected by the time of year the surveys are conducted, as vegetation may obscure the asset in the summer months, or accessibility may be an issue during winter months. These factors would not usually affect the recorded condition rating of an asset unless the asset is on a borderline between two ratings.

Asset Standard of Protection
Please note that the provided Design Standard of Protection is an estimate and should not be relied on. Please note that where available the defended flood extents provide more reliable information relating to the protection offered by the defence (i.e. at which return period the water levels are likely to overtop the defence). If available and required the defended flood extents can be provided on request.

Modelling

River Calder, Walsden Water and Canals Study 2015

We are providing you with the results from the 2015 study, with extents from which our Flood Map has been updated.

Please see attached extracts:

- Results for peak water levels for and flows for the 0.1% (1 in 1000), 0.5% (1 in 200) 1% (1 in 100), 1.3% (1 in 75), 2% (1 in 50), 3.3% (1 in 30), 4% (1 in 25), 10% (1 in 10), 20% (1 in 5), 50% (1 in 2) Annual Exceedance Probabilities (AEP) for the defended scenario;
- results for peak water levels for and flows for the 0.1% (1 in 1000) and 1% (1 in 100) Annual Exceedance Probabilities (AEP)for the undefended scenario
- Results for peak water levels for and flows for the 1% (1 in 100) plus Climate Change Scenario (+20% Flow), for both the defended and undefended scenarios;

Flood depth and velocity for all return periods are available on request.

Climate Change

Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on gov.uk on 19 February 2016. You should confirm the flood risk vulnerability classification and lifetime of your proposed development in line with NPPF and apply the appropriate climate change allowances.

Bespoke Flood Risk Assessment (FRA) advice:

If the pre-application advice is required with regards the preparation of a site-specific Flood Risk Assessment, this can be requested via the Yorkshire Sustainable Places team (email: sp-yorkshire@environment-agency.gov.uk). Charges may apply for any advice that is provided, this currently stands at £100 per hour per person. The .gov.uk pages provide a good starting point on what to include within a site-specific Flood Risk Assessment and can be accessed via https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications. A site-specific Flood Risk Assessment will need to consider flood risks from all sources, including those associated with defence failure (e.g. breach) and accounting for the predicted impacts as a result of climate change. Please contact the Sustainable Places team if you require advice on how to include these within a Flood Risk Assessment.

Other

Surface Water Map

Lead Local Flood Authorities (LLFA) are responsible for managing local flood risk from surface water flooding and groundwater flooding. You should check with the LLFA as they may have more up to date information regarding this type of flooding.

The Risk of Flooding from Surface Water Flood Map can be viewed and downloaded as a PDF file on GOV.UK by following this link: https://flood-warning-information.service.gov.uk/long-term-flood-risk

Surface Water Drainage

The Lead Local Flood Authority is the statutory consultee for planning matters relating to surface water drainage, therefore it is recommended they should be consulted separately regarding this.

Surface water discharge from new development should ideally 'mimic' the pre-development situation using a sustainable drainage system so that the flow and volume of water in watercourses is not increased.

A permit may be required, under the Environmental Permitting Regulations 2010 from the Environment Agency for any proposed works or structures in, under, over or within eight metres of a 'main river' (e.g. a new outfall). A permit is separate to and in addition to any planning permission granted. Further details and guidance are available on the GOV.UK website: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

Risk of Flooding from Reservoirs Map

Outlines and simplified depth and velocity maps can be viewed on our website:

https://flood-warning-information.service.gov.uk/long-term-flood-risk/#x=438988&y=406600&scale=2

Please, zoom into the location of interest, and then click on the inundated location for details. As a result a list of reservoirs will be provided with supporting information and a links to other data, such as estimated depths and speed of flooding, at the bottom of the result page.

A map of showing the outlines can also be provided on request.

Flood Warning

The site is not covered by a Flood Warning.

LIDAR Data

Please note that our LiDAR data is now available free of charge (Open Data) from http://environment.data.gov.uk/ds/survey/index.jsp#/survey (once zoomed to the relevant location the available LiDAR products will be listed below the map).

Two LIDAR products are available:

1. Tiled LIDAR data - The full tiled dataset consists of historic LIDAR data which has been gathered since 1998. For some areas we have carried out repeat surveys and data is available in a range of resolutions.
2. Composite LIDAR data - The composite dataset is derived from a combination of our full tiled dataset which has been merged and re-sampled to give the best possible spatial coverage.

Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. This technique results in the production of an accurate, cost-effective terrain model suitable for assessing flood risk and other environmental applications.

The Environment Agency owns two LIDAR systems, which are installed in a survey aircraft along with its other operational remote sensing instruments.

The aircraft is positioned and navigated using Global Positioning System (GPS) corrected to known ground reference points. The aircraft typically flies at a height of about 800 metres above ground level and a scanning mirror allows a swath width of about 600 metres to be surveyed during a flight.

The Rights & Responsibilities of a Riverside Owner

The owner of property adjacent to a watercourse is usually deemed to be the riparian owner and, as such, has both riparian rights and responsibilities with regard to the watercourse within their ownership.

For more information on Rights and Responsibilities of a riverside owner, you can visit our website at:

https://www.gov.uk/guidance/owning-a-watercourse

Ordnance Survey Data

Under the terms of our licence agreement with the Ordnance Survey, we are unable to supply the OS data. Under this agreement we can only supply OS data to consultants/contractors carrying out work on our behalf.

Flood Portal

It's a new 'one-stop shop' web portal providing guidance and information on flood risk management in the UK. Arup have written and designed the site, in conjunction with CIRIA, the Local Government Association, the EA and Defra, primarily as a resource for local authority officers, flood risk management professionals, and others with an interest in flood risk. It's a part of the Capacity Building Strategy. http://www.local.gov.uk/floodportal

APPENDIX D

YORKSHIRE WATER CONSULTATION

YorkshireWater

Mr P Carter
Arp Associates
Unit 5/6 Northwest Business Pk
1ST FLR Servia Hill
Woodhouse
Leeds
LS6 2QH

Yorkshire Water Services
Developer Services
Sewerage Technical Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax: (01274) 372 834

Email:
technical.sewerage@yorkshirewater.co.uk

Your Ref: ARP013
Our Ref: V020200

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

3rd December 2019

Dear Mr Carter,

Former Council Depot And Offices, St Paul's Road, Mirfield, WF14 8AX - Pre-Planning Sewerage-Enquiry-Residential T661007

Thank you for your recent enquiry. Our charge of £164.00 (plus VAT) will be added to your account with us, reference ARP013. 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.

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

Foul water domestic waste should discharge to the onsite foul drainage if suitably sited.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. 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.

If other methods of surface water disposal are not viable and subject to providing satisfactory evidence as to why they have been discounted, curtilage surface water discharges to the public sewer will be restricted to the level of run-off - i.e. same rate of discharge - to that from the existing use of the site less a 30% reduction in the existing discharge. Any discharge of surface water from the site should discharge to similar points of connection to that of the existing use of the site. You will need to demonstrate positive drainage, based on a 1 in 1 year storm, to the public sewer to Yorkshire Water by means of investigation and calculation carried out at your expense.

To do this, Yorkshire Water requires to see existing and proposed drainage layouts with pipe sizes, gradients and connection points, measured impermeable areas of the present and proposed use of the site, along with the calculations that show the existing and proposed discharge rate from the site to the public sewer.

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 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 WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991. An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

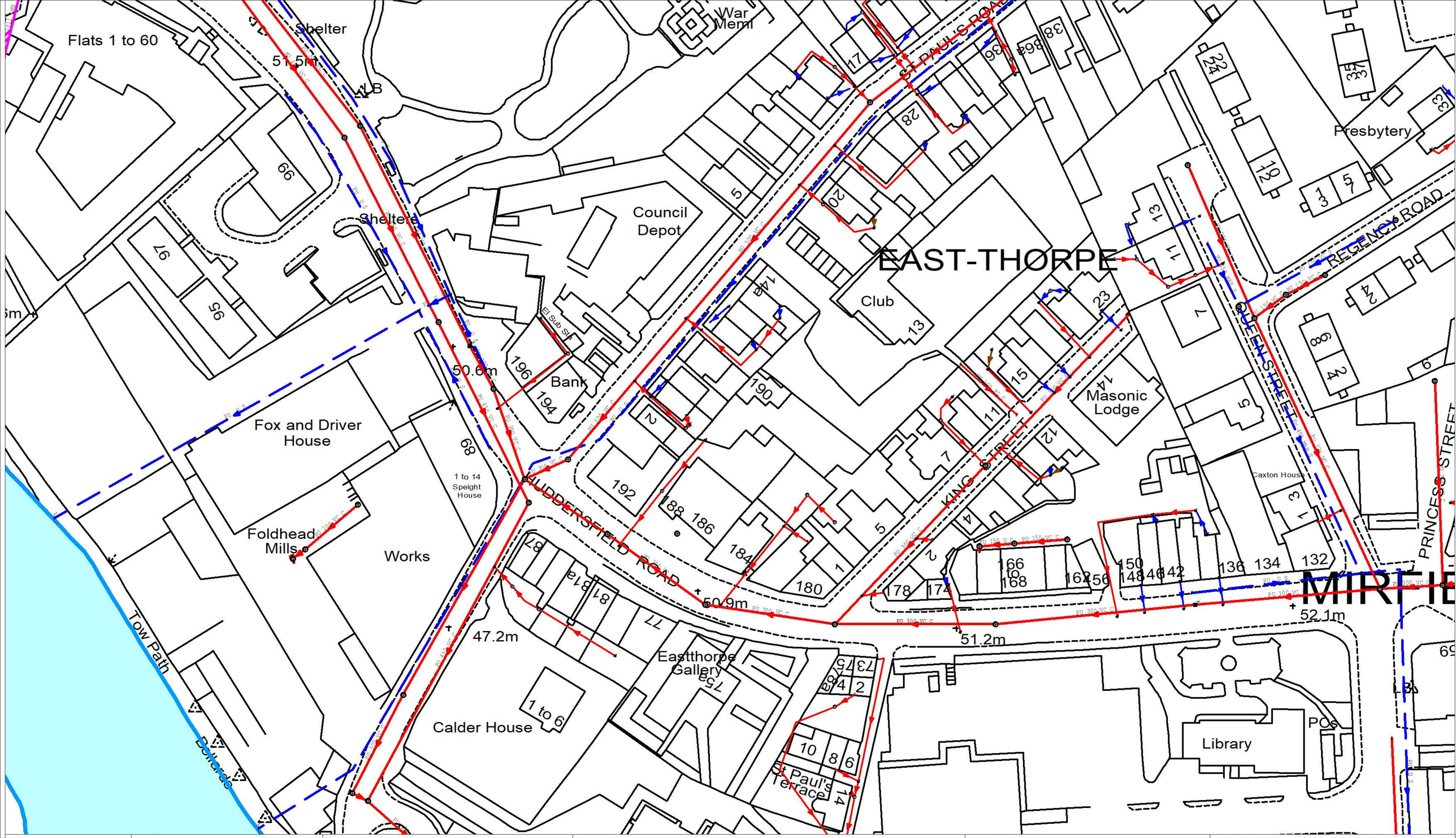
All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct 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

YorkshireWater

We are open Monday to Friday
0800 – 1700
We are closed Bank Holidays and Weekends

Chris Roberts
Sewerage Technical Team
Developer Services
Tel: 0345 1 20 84 82



420054 : 419716	Map Name : SE2019NW	Title	Partial Key Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS
YorkshireWater Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : YorMap Advisor C ROBERTS Contact Tel : 87 2582		Notes (Ody) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2014. All rights reserved Ordnance Survey Licence number 100022432	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 : 03/12/2019, 13:06:36 Source : Sewer Network Enquiry
			Date Gen : 03/12/2019, 13:06:45

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

APPENDIX E

LEAD LOCAL FLOOD AUTHORITY

Paul Carter

Subject: FW: 419/27 St. Pauls Road, Mirfield

From: Paul Farndale [mailto:Paul.Farndale@kirklees.gov.uk]
Sent: Friday 13 December, 2019 11:49am
To: Paul Carter
Cc: David Spacey
Subject: RE: 419/27 St. Pauls Road, Mirfield

Hello Paul,

Usual 30% off peak flow using proved area drained in hectares x 2.7.8 x 50mm.

Main river flood zone 1.

No reports to the council of incidents in the immediate vicinity.

Surface water flood risk mapping shows main roads used as conduits.

There is already a connection shown the public sewer with a trade effluent licence.

Hope this helps.

Kind regards,

Paul Farndale
Kirklees LLFA

Paul Carter

From: Jason Hanks <Jason.Hanks@kirklees.gov.uk>
Sent: Thursday 12 December, 2019 2:28 pm
To: Paul Carter
Subject: RE: 419/27 St. Pauls Road, Mirfield

Good afternoon Paul,

There's not a lot of information on this site from us I'm afraid. Please see below my comments that will hopefully help you out.

Thanks

Jason

Flood Risk

Flood Zone 1
No surface water flooding predicted onsite in the 1:100 year event

Flood Incidents

There have been no recorded flood incidents on or near to the site that might impact development.

Surface Water Discharge

There are no known culverted watercourses on or near the site.

We agree that using the current connection pint into the YW sewer is the best option. Because this is a brownfield site, we expect a minimum surface water discharge reduction of 30% in the 1:1 year event.

From: Paul Carter [mailto:PaulCarter@arpassociates.co.uk]
Sent: 12 December 2019 14:06
To: Jason Hanks <Jason.Hanks@kirklees.gov.uk>
Subject: FW: 419/27 St. Pauls Road, Mirfield

Good Afternoon Jason,

We have not had a response to the consultation request below. I have seen we have had previous correspondence with yourself – are you able to provide the necessary consultation please?

Thank you in advance,

Kind Regards

Paul Carter
Principal Civil Engineer

0113 245 8498
paulcarter@arpassociates.co.uk

APPENDIX F

PROPOSED SITE PLAN

1:500 SITE PLAN

REVISIONS

connect housing
homes, communities, cultures

Proposed ALD Extra Care Residential Development

ST PAUL'S ROAD, MIRFIELD

PROPOSED SITE PLAN

Drawn: AH	Scale: 1:500@A4
Date: AUG 18	Checked: MH

brewsterbye architects
5 NORTH HILL ROAD
HEADINGLEY
LEEDS
LS6 2EN
telephone
0113 2754000
facsimile
0113 2844250
e.mail
info@brewsterbye.co.uk

Dwg No: 501/01(01)001 #

A P P E N D I X G

INDICATIVE SURFACE WATER DRAINAGE CALCULATIONS

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.904	0.704	19.5	7.8	Flood Risk
30 min Summer	0.890	0.690	19.5	7.7	Flood Risk
60 min Summer	0.661	0.461	19.5	5.1	O K
120 min Summer	0.405	0.205	18.9	2.3	O K
180 min Summer	0.364	0.164	14.9	1.8	O K
240 min Summer	0.343	0.143	12.3	1.6	O K
360 min Summer	0.319	0.119	9.2	1.3	O K
480 min Summer	0.305	0.105	7.5	1.2	O K
600 min Summer	0.296	0.096	6.4	1.1	O K
720 min Summer	0.289	0.089	5.6	1.0	O K
960 min Summer	0.279	0.079	4.5	0.9	O K
1440 min Summer	0.267	0.067	3.3	0.7	O K
2160 min Summer	0.257	0.057	2.4	0.6	O K
2880 min Summer	0.250	0.050	1.9	0.6	O K
4320 min Summer	0.243	0.043	1.4	0.5	O K
5760 min Summer	0.238	0.038	1.1	0.4	O K
7200 min Summer	0.235	0.035	1.0	0.4	O K
8640 min Summer	0.233	0.033	0.8	0.4	O K
10080 min Summer	0.231	0.031	0.8	0.3	O K
15 min Winter	0.997	0.797	19.5	8.8	Flood Risk
30 min Winter	0.913	0.713	19.5	7.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	68.836	0.0	18.1	13
30 min Summer	45.828	0.0	24.1	21
60 min Summer	29.238	0.0	30.7	36
120 min Summer	18.112	0.0	38.0	64
180 min Summer	13.534	0.0	42.6	94
240 min Summer	10.952	0.0	46.0	124
360 min Summer	8.106	0.0	51.1	184
480 min Summer	6.544	0.0	55.0	244
600 min Summer	5.539	0.0	58.2	306
720 min Summer	4.832	0.0	60.9	362
960 min Summer	3.892	0.0	65.4	486
1440 min Summer	2.866	0.0	72.2	722
2160 min Summer	2.108	0.0	79.7	1100
2880 min Summer	1.693	0.0	85.3	1420
4320 min Summer	1.242	0.0	93.9	2168
5760 min Summer	0.996	0.0	100.4	2920
7200 min Summer	0.839	0.0	105.7	3648
8640 min Summer	0.730	0.0	110.3	4328
10080 min Summer	0.648	0.0	114.4	5008
15 min Winter	68.836	0.0	20.2	13
30 min Winter	45.828	0.0	26.9	22

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.530	0.330	19.5	3.7	O K
120 min Winter	0.362	0.162	14.8	1.8	O K
180 min Winter	0.334	0.134	11.1	1.5	O K
240 min Winter	0.317	0.117	9.0	1.3	O K
360 min Winter	0.299	0.099	6.7	1.1	O K
480 min Winter	0.288	0.088	5.4	1.0	O K
600 min Winter	0.280	0.080	4.6	0.9	O K
720 min Winter	0.274	0.074	4.0	0.8	O K
960 min Winter	0.266	0.066	3.2	0.7	O K
1440 min Winter	0.256	0.056	2.4	0.6	O K
2160 min Winter	0.248	0.048	1.8	0.5	O K
2880 min Winter	0.243	0.043	1.4	0.5	O K
4320 min Winter	0.236	0.036	1.0	0.4	O K
5760 min Winter	0.232	0.032	0.8	0.4	O K
7200 min Winter	0.230	0.030	0.7	0.3	O K
8640 min Winter	0.228	0.028	0.6	0.3	O K
10080 min Winter	0.226	0.026	0.6	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	29.238	0.0	34.4	36
120 min Winter	18.112	0.0	42.6	64
180 min Winter	13.534	0.0	47.7	92
240 min Winter	10.952	0.0	51.5	124
360 min Winter	8.106	0.0	57.2	184
480 min Winter	6.544	0.0	61.6	242
600 min Winter	5.539	0.0	65.1	300
720 min Winter	4.832	0.0	68.2	368
960 min Winter	3.892	0.0	73.2	488
1440 min Winter	2.866	0.0	80.9	724
2160 min Winter	2.108	0.0	89.2	1100
2880 min Winter	1.693	0.0	95.6	1460
4320 min Winter	1.242	0.0	105.1	2200
5760 min Winter	0.996	0.0	112.4	2896
7200 min Winter	0.839	0.0	118.4	3536
8640 min Winter	0.730	0.0	123.5	4368
10080 min Winter	0.648	0.0	128.1	5064

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.140

Time (mins) From:	To:	Area (ha)
0	4	0.140

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	11.1	0.700	11.1	1.400	11.1	2.100	11.1
0.100	11.1	0.800	11.1	1.500	11.1	2.200	11.1
0.200	11.1	0.900	11.1	1.600	11.1	2.300	11.1
0.300	11.1	1.000	11.1	1.700	11.1	2.400	11.1
0.400	11.1	1.100	11.1	1.800	11.1	2.500	11.1
0.500	11.1	1.200	11.1	1.900	11.1		
0.600	11.1	1.300	11.1	2.000	11.1		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0199-1950-0800-1950
Design Head (m)	0.800
Design Flow (l/s)	19.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	199
Invert Level (m)	0.200
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	19.5
Flush-Flo™	0.314	19.5
Kick-Flo®	0.605	17.1
Mean Flow over Head Range	-	16.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.9	1.200	23.7	3.000	36.7	7.000	55.4
0.200	18.7	1.400	25.5	3.500	39.6	7.500	57.2
0.300	19.5	1.600	27.1	4.000	42.2	8.000	59.1
0.400	19.3	1.800	28.7	4.500	44.7	8.500	60.5
0.500	18.7	2.000	30.2	5.000	47.0	9.000	62.3
0.600	17.2	2.200	31.6	5.500	49.2	9.500	64.0
0.800	19.5	2.400	33.0	6.000	51.4		
1.000	21.7	2.600	34.3	6.500	53.4		

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.849	0.649	19.5	19.2	Flood Risk
30 min Summer	0.916	0.716	19.5	21.2	Flood Risk
60 min Summer	0.867	0.667	19.5	19.7	Flood Risk
120 min Summer	0.653	0.453	19.5	13.4	O K
180 min Summer	0.494	0.294	19.5	8.7	O K
240 min Summer	0.412	0.212	19.0	6.3	O K
360 min Summer	0.365	0.165	15.1	4.9	O K
480 min Summer	0.343	0.143	12.4	4.2	O K
600 min Summer	0.329	0.129	10.5	3.8	O K
720 min Summer	0.318	0.118	9.1	3.5	O K
960 min Summer	0.304	0.104	7.4	3.1	O K
1440 min Summer	0.287	0.087	5.4	2.6	O K
2160 min Summer	0.273	0.073	3.9	2.2	O K
2880 min Summer	0.265	0.065	3.2	1.9	O K
4320 min Summer	0.255	0.055	2.3	1.6	O K
5760 min Summer	0.249	0.049	1.8	1.4	O K
7200 min Summer	0.244	0.044	1.5	1.3	O K
8640 min Summer	0.241	0.041	1.3	1.2	O K
10080 min Summer	0.239	0.039	1.2	1.1	O K
15 min Winter	0.941	0.741	19.5	21.9	Flood Risk
30 min Winter	0.999	0.799	19.5	23.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	115.731	0.0	30.4	14
30 min Summer	77.804	0.0	40.8	22
60 min Summer	49.937	0.0	52.4	40
120 min Summer	30.956	0.0	65.0	70
180 min Summer	23.058	0.0	72.6	100
240 min Summer	18.577	0.0	78.0	126
360 min Summer	13.656	0.0	86.0	186
480 min Summer	10.974	0.0	92.2	246
600 min Summer	9.254	0.0	97.2	306
720 min Summer	8.046	0.0	101.4	366
960 min Summer	6.447	0.0	108.3	486
1440 min Summer	4.709	0.0	118.7	730
2160 min Summer	3.432	0.0	129.7	1096
2880 min Summer	2.739	0.0	138.0	1464
4320 min Summer	1.989	0.0	150.3	2156
5760 min Summer	1.583	0.0	159.5	2912
7200 min Summer	1.325	0.0	166.9	3656
8640 min Summer	1.147	0.0	173.4	4264
10080 min Summer	1.015	0.0	179.1	5088
15 min Winter	115.731	0.0	34.0	15
30 min Winter	77.804	0.0	45.7	24

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.896	0.696	19.5	20.6	Flood Risk
120 min Winter	0.553	0.353	19.5	10.4	O K
180 min Winter	0.398	0.198	18.5	5.8	O K
240 min Winter	0.365	0.165	15.1	4.9	O K
360 min Winter	0.335	0.135	11.3	4.0	O K
480 min Winter	0.318	0.118	9.1	3.5	O K
600 min Winter	0.306	0.106	7.6	3.1	O K
720 min Winter	0.298	0.098	6.7	2.9	O K
960 min Winter	0.287	0.087	5.3	2.6	O K
1440 min Winter	0.273	0.073	3.9	2.2	O K
2160 min Winter	0.262	0.062	2.9	1.8	O K
2880 min Winter	0.255	0.055	2.3	1.6	O K
4320 min Winter	0.246	0.046	1.7	1.4	O K
5760 min Winter	0.241	0.041	1.3	1.2	O K
7200 min Winter	0.238	0.038	1.1	1.1	O K
8640 min Winter	0.235	0.035	1.0	1.0	O K
10080 min Winter	0.233	0.033	0.8	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	49.937	0.0	58.7	42
120 min Winter	30.956	0.0	72.8	72
180 min Winter	23.058	0.0	81.3	96
240 min Winter	18.577	0.0	87.4	126
360 min Winter	13.656	0.0	96.3	186
480 min Winter	10.974	0.0	103.2	248
600 min Winter	9.254	0.0	108.8	308
720 min Winter	8.046	0.0	113.5	364
960 min Winter	6.447	0.0	121.3	488
1440 min Winter	4.709	0.0	132.9	728
2160 min Winter	3.432	0.0	145.3	1076
2880 min Winter	2.739	0.0	154.6	1440
4320 min Winter	1.989	0.0	168.4	2200
5760 min Winter	1.583	0.0	178.7	2944
7200 min Winter	1.325	0.0	187.0	3592
8640 min Winter	1.147	0.0	194.2	4304
10080 min Winter	1.015	0.0	200.6	5128

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.140

Time (mins) From:	To:	Area (ha)
0	4	0.140

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	29.6	0.700	29.6	1.400	29.6	2.100	29.6
0.100	29.6	0.800	29.6	1.500	29.6	2.200	29.6
0.200	29.6	0.900	29.6	1.600	29.6	2.300	29.6
0.300	29.6	1.000	29.6	1.700	29.6	2.400	29.6
0.400	29.6	1.100	29.6	1.800	29.6	2.500	29.6
0.500	29.6	1.200	29.6	1.900	29.6		
0.600	29.6	1.300	29.6	2.000	29.6		

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Sump Available	Yes
Diameter (mm)	199
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Minimum Outlet Pipe Diameter (mm)	225
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Control Points	Head (m)	Flow (l/s)
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Kick-Flo®	0.605	17.1
Mean Flow over Head Range	-	16.0

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0.200	18.7	1.400	25.5	3.500	39.6	7.500	57.2
0.300	19.5	1.600	27.1	4.000	42.2	8.000	59.1
0.400	19.3	1.800	28.7	4.500	44.7	8.500	60.5
0.500	18.7	2.000	30.2	5.000	47.0	9.000	62.3
0.600	17.2	2.200	31.6	5.500	49.2	9.500	64.0
0.800	19.5	2.400	33.0	6.000	51.4		
1.000	21.7	2.600	34.3	6.500	53.4		