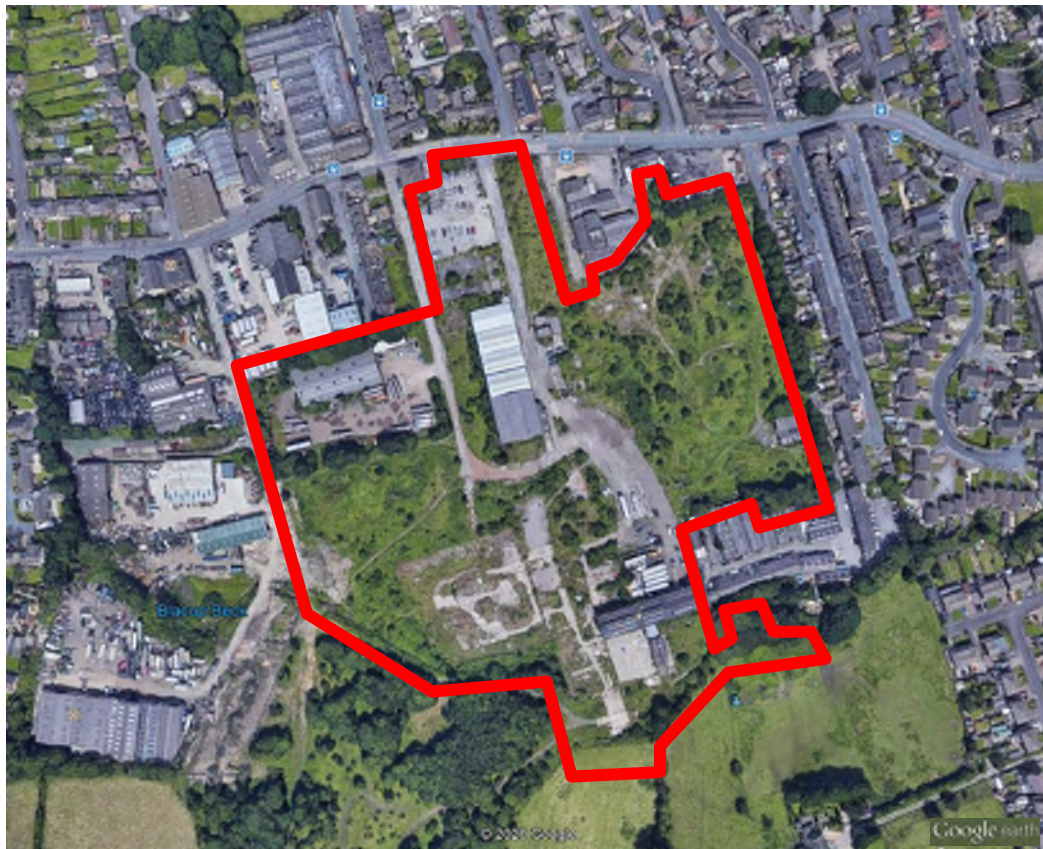


FLOOD RISK ASSESSMENT
WESTGATE, CLECKHEATON
FOR
STRATA HOMES LTD



45538-001

14 May 2021

FLOOD RISK ASSESSMENT
WESTGATE, CLECKHEATON
FOR
STRATA HOMES LTD

Job No. : 45538

Report Status : Issue 2

Document Date : 14 May 2021

Approved :
Chris Hodge

Directors: P Richardson BSc CEng MICE MStructE S R Ellis BEng CEng MStructE MICE C A Topliss BSc CEng CSci CGeol SiLC MICE FGS
S J English BEng CEng MStructE A R Priest BEng A G Marshall BEng CEng MStructE
Technical Directors: A Allison BEng M P Chappell BEng IEng AMStructE K Edwards MSci CGeol FGS
P A Harrison BEng CEng MStructE C Hodge EngTech MICE A J Kerslake BEng FGS
Senior Associates: S J Mitchell BSc MSc CEng MEI MCIBSE MASHRAE M Young MA CEng MICE MStructE
C A Wood BSc, CEng, MStructE, MICE M Dyson BSc CEng MStructE
Associates: A M Cross MEng CEng MICE A Lavelle MEng CEng MICE S R Jackson MEng CEng MStructE R A Noble BSc FGS
Consultants: S D Preston BEng CEng FICE FStructE K R Pursall BEng CEng MStructE

CONTENTS

EXECUTIVE SUMMARY	6
1.0 THE DEVELOPMENT & NATIONAL PLANNING POLICY	8
1.1 Introduction.....	8
1.2 Site location & description.....	8
1.3 Environment Agency - Flood Map for Planning	9
1.4 Kirklees Council Strategic Flood Risk Assessment	10
1.5 National Planning Policy Framework.....	10
1.5.1 Sequential Test	10
1.5.2 Exception Test	10
1.5.3 Climate change	11
2.0 FLOOD RISK.....	12
2.1 Potential sources of flooding.....	12
2.1.1 Fluvial.....	12
2.1.2 Surface water	14
2.1.3 Groundwater	15
2.1.4 Sewerage	15
2.2 Historical Flooding	15
2.3 Residual Flood Risk.....	16
2.4 Flood Mitigation Measures.....	17
3.0 DRAINAGE STRATEGY	18
3.1 Existing drainage	18
3.2 Consultation with Yorkshire Water	18
3.3 Consultation with Environment Agency.....	19
3.4 Consultation with Kirklees Council	20
3.5 Ground conditions.....	20
3.6 Brownfield Calculations.....	20
3.7 Drainage hierarchy	21
3.7.1 Sustainable Drainage Systems (SuDS)	21
3.7.2 Watercourse.....	21
3.7.3 Public sewer.....	21
3.8 Proposals for surface water disposal	22
3.9 Proposals for foul disposal.....	22
3.10 Residual flood risk	23
3.11 Mitigation measures.....	23

4.0	CONCLUSIONS	24
------------	--------------------------	-----------

APPENDICES

- | | |
|-----------------------------|--|
| 1) | Location plan |
| 2) Professional Remediation | Topographic survey (20908_PRL_TP001_1) |
| 3) Strata | Proposed layout (18-CL2-SEGB-WE-01 P) |
| 4) Environment Agency | Online flood mapping |
| | Product 4 flood data |
| | Email correspondence |
| 5) Kirklees Council | Strategic Flood Risk Assessment Maps |
| | Email correspondence |
| 6) DEFRA | Historic flood map |
| 7) Yorkshire Water | Sewer assets plans |
| | Pre-planning response |
| 8) Eastwood and Partners | SuDS checklist |
| | Existing impermeable area plan |
| | Drainage layout (45538_002C) |
| | Estimated storage calculations |
| 9) LITHOS | Soakaway results |

<i>Draft Issue:</i>	<i>14 December 2020</i>	
<i>Issue 1:</i>	<i>18 February 2021</i>	<i>Updated with LLFA and EA enquiry responses</i>
		<i>Updated with EA Product 4 data</i>
<i>Issue 2:</i>	<i>14 May 2021</i>	<i>Updated layout included</i>

EXECUTIVE SUMMARY

The project comprises the proposed development of a 6.47 hectare Brownfield site for residential use.

The Environment Agency's Flood Map for Planning shows the majority of the site to lie within Flood Zone 1 at low risk of fluvial flooding. The southern extent of the site is in Flood Zone 2 and 3, at medium to high risk of fluvial flooding from the Blacup Beck. In accordance with current Planning Practice Guidance 'Flood Risk and Coastal Change', sequential testing should be considered. Consultation with Kirklees Council in December 2020 identifies that sites allocated in the local plan are considered to have passed a sequential test.

An exception test is required for any residential dwelling proposed in Flood Zone 3. Kirklees Council state that housing should not be proposed in Flood Zone 3 and only landscaped areas proposed in Flood Zone 2.

Kirklees Council state that they expect the culverted section of Blacup Beck to be opened as part of the development. The opening of the culvert will mitigate against the current flood risk caused by the surcharging of this asset.

There is a very low to high risk of surface water flooding, primarily concentrated in the southern portion of the site.

Any raising of existing ground levels within flood zone 2 and 3 areas will require floodplain compensation.

Surface water disposal is considered in accordance with the drainage hierarchy in Building Regulations Part H 2010 and Planning Practice Guidance 'Reducing the causes and impacts of flooding', paragraph 80, reference ID 7-080-20150323.

Infiltration type SuDS such as soakaways are not considered to be viable on the site due to the presence of impermeable ground and deep made ground. Surface water disposal will be to Blacup Beck to the south of the site.

Surface water disposal will be to Blacup Beck to the south of the site subject to approval from the EA and LLFA.

Kirklees Council have stipulated that surface water discharge must be reduced and attenuated to 5 l/s/ha equating to a total allowable 32.3 l/s. Attenuation storage for rainfall

events will be provided for up to the 1 in 100 year plus climate change event. The total estimated storage volume is 2065 m³ subject to detailed design.

Foul effluent should discharge via gravity to the 450mm public combined sewer recorded along the southern boundary of the site, unless the existing 225mm combined sewers on site are found to connect to the wider public sewerage network. Historic and existing connections may be possible to utilise.

1.0 THE DEVELOPMENT & NATIONAL PLANNING POLICY

1.1 Introduction

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

The project comprises the development of an approximate 6.47 hectare Brownfield site for residential use.

1.2 Site location & description

The site is located in Cleckheaton, to the south of Bradford and is centred on the coordinates 418374, 425036 (Appendix 1).

The site is bounded by Westgate to the north, Quarry Road to the east, Blacup Beck to the south, Brick Street to the west and existing industrial buildings to the north-west. The surrounding area is predominantly occupied by industrial, residential and commercial buildings.

The site currently contains derelict buildings and light industrial operations. Several industrial buildings on site have been demolished for at least 10 years and these areas are now occupied by vegetation and residual concrete slabs.

The site falls from the north at 107.1 mAOD to the south-east corner at 91.4 mAOD with an average gradient of 1 in 160 (Appendix 2).

Proposals are for 194 houses to be developed with access from Westgate to the north (Appendix 3).

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

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

1.3 Environment Agency - Flood Map for Planning

The Environment Agency's Flood Map for Planning (Appendix 4) shows the majority of the site to lie within Flood Zone 1 (low risk). The southern extent of the site lies within Flood Zone 2, with a section in the south-west of the site within Flood Zone 3.

Zone 1 refers to land having less than a 1 in 1,000 annual probability of river flooding (<0.1%). Zone 2 refers to land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%). Zone 3 refers to land having a greater than 1 in 100 annual probability of river flooding (>1%).

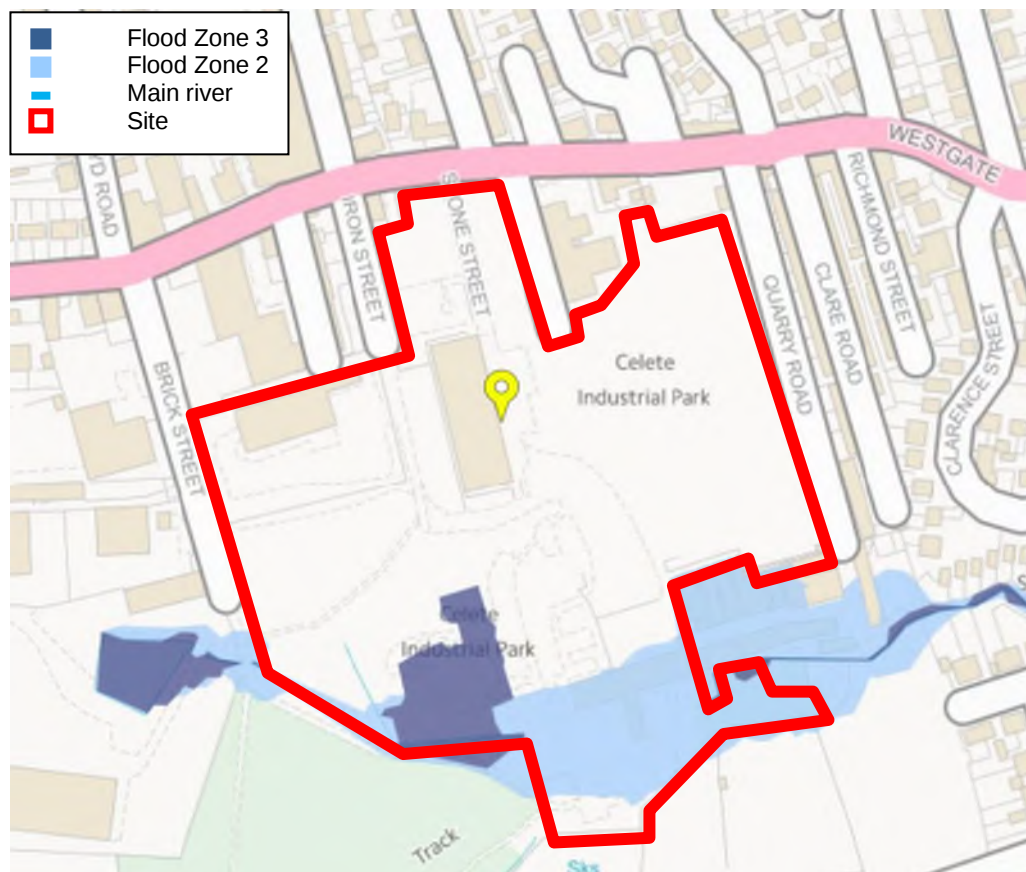


Figure 1 - Environment Agency's Flood Map for Planning

1.4 Kirklees Council Strategic Flood Risk Assessment

Kirklees Council's Level 1 Strategic Flood Risk Assessment flood map is based on the Environment Agency's flood map and identify the same flood zone areas across the site (Appendix 4).

1.5 National Planning Policy Framework

National Planning Policy Framework (February 2019) sets out the principles for assessing the suitability of sites for development, in relation to flood risk, as part of the planning process.

1.5.1 Sequential Test

Initially a Sequential Test is applied to the allocation of land suitable for development. The test is required for any development proposed in Flood Zone 2 or 3 (and occasionally also in Flood Zone 1 where there are flood risks present which are not identified on the Environment Agency's Flood Maps for Planning).

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

The majority of the site lies within Zones 1 at low risk of fluvial flooding. However, the southern portion of the site is in Zones 2 and 3 at medium to high risk of potential fluvial flooding and therefore a sequential test should be considered.

Consultation with Kirklees Council in 2011 identified that a full sequential test was not required due to the small proportion of the site residing within Flood Zone 3 (Appendix 5). Following consultation in November 2020 Kirklees Council's position remains unchanged as sites allocated in the local plan are considered to have passed a sequential test.

The Kirklees Council Policy states that no housing can be built in areas within Flood Zone 3 and to avoid risk all together, areas in Flood Zone 2 should be landscaped (Appendix 5).

1.5.2 Exception Test

If, following application of the Sequential Test, it is not possible for the development to be located in zones with a lower probability of flooding the Exception Test can be applied if

appropriate. Tables 2 and 3 of the Planning Policy Guidance “Flood Risk and Coastal Change”³ list flood risk vulnerability and flood zone compatibility. These tables are used to determine whether the Exception Test is appropriate for the development.

Table 2 of the Planning Policy Guidance⁴ classes residential use as “More Vulnerable”.

Table 3 of the Guidance⁵ classes “More Vulnerable” development as compatible with Zones 1 and 2 and compatible with Zone 3a if the Exception Test can be passed. The proposed residential development will be sited in Zone 1, 2 and 3. An exception test is required for any residential dwelling proposed in Flood Zone 3.

1.5.3 Climate change

An issue emphasised in the Planning Policy Guidance is the requirement to take account of potential climate change effects. New development is generally accepted as having a 100 year design life for flood risk purposes. The Environment Agency’s report ‘Flood risk assessments: climate change allowances’⁶, published in February 2016, recommends a 20 to 40% increase in peak rainfall intensity is taken into account for small and urban catchments for design horizons up to 2115. For the purposes of this Flood Risk Assessment, a 30% increase in peak rainfall intensity has been used for assessing storage requirements; 30% being an average between the “central” and “upper end” of the data range given in the report. It is recommended that the potential effects of a peak rainfall increase of 40% are considered in detailed design.

³ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

⁴ <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>

⁵ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/575184/Table_3_-_Flood_risk_vulnerability_and_flood_zone_compatibility_.pdf

⁶ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-2>

2.0 FLOOD RISK

2.1 Potential sources of flooding

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

2.1.1 Fluvial

The nearest ordinary watercourse is the Blacup Beck located along the south western boundary and crosses the southern extent of the site. The Blacup Beck converges with the River Spen, a main river, located approximately 1km east of the site.

EA flood map for planning shows that the Blacup Beck is culverted for 80m through the southern portion of the site. Fluvial flooding in the southern extent of the site is indicative of surcharging at the head of the culvert and overtopping of the Blacup Beck embankments downstream of the culvert.

River levels

The principal source of flooding is the Blacup Beck. Water levels for varying return periods have been received from the Environment Agency and are shown in Table 4 below.

The reference sites are located along the southern border of the site, upstream (BLAC01_1330 and BLAC01_1287) and downstream (BLAC01_1155 and BLAC01_1098) of the culverted Blacup Beck.

Blacup Beck- River Spen Flood Warning Improvements					
Reference site	Return period				
	1 in 25 yr	1 in 50 yr	1 in 100 yr	1 in 100 yr + 20% CC	1 in 1000 yr
BLAC01_1330	94.77 mAOD	94.80 mAOD	94.83 mAOD	94.89 mAOD	95.12 mAOD
BLAC01_1287	94.58 mAOD	94.61 mAOD	94.63 mAOD	94.68 mAOD	94.94 mAOD
BLAC01_1155	91.32 mAOD	91.37 mAOD	91.41 mAOD	91.49 mAOD	91.75 mAOD
BLAC01_1098	90.54 mAOD	90.56 mAOD	90.59 MADO	90.74 mAOD	91.30 mAOD

Table 4: River Spen Flood Warning Improvements - 2009, JBA, Environment Agency

The site lies at around 95 mAOD in the southern and south-western extents and around 93 mAOD in the south-eastern extent. The south-western extent is therefore 0.11 m above the 1 in 100 year + 20% CC event. The south-eastern extent is 1.51 m above the 1 in 100 year event + 20% CC event.

Defence levels

The Environment Agency asset map only identifies assets on the Blacup Beck downstream of the site. Details of the culvert in the southern portion of the site have not been provided, however, Kirklees Council state that they expect the Blacup Beck to be opened up where it is currently culverted as part of the Kirklees Policy (Appendix 5).

Private and local authority maintained defences are present on the western bank of the River Spen, which include a wall and high ground. These continual defences protect the surrounding area inclusive of the site from fluvial flooding originating from the River Spen.

2.1.2 Surface water

The Environment Agency surface water flood risk map (Appendix 4) shows the majority of the site is at very low risk (unshaded areas) with low to high-risk flooding concentrated in the south (See Figure 2).

Very low risk refers to land having less than a 1 in 1,000 annual exceedance probability of flooding (0.1% AEP). Low risk refers to land having between a 1 in 1,000 and 1 in 100 annual exceedance probability of flooding (0.1% - 1% AEP). Medium risk refers to land having between 1 in 100 and 1 in 30 annual exceedance probability of flooding (1% - 3.33% AEP). High risk refers to land having a greater than 1 in 30 annual exceedance probability of flooding (> 3.33% AEP).

There are two surface water flow routes providing a low - high risk of surface water flooding extending from the north of the site to the Blacup Beck in the south. The first originates from south parade and flows through Iron Street before continuing towards the Blacup Beck whilst the second originates from Stone Street.

The surface water flooding shown along the southern boundary of the site is a consequence of overland flow as a result of the flooded Blacup Beck.

Environment Agency surface water flood maps indicate that the medium risk areas are at risk of flood depths between 300 and 900 mm. The high-risk area near the southern boundary of the site is at risk of surface water flood depths greater than 900 mm. These are in line with and coincide with the existing low points and surcharging of the culverted Blacup Beck.

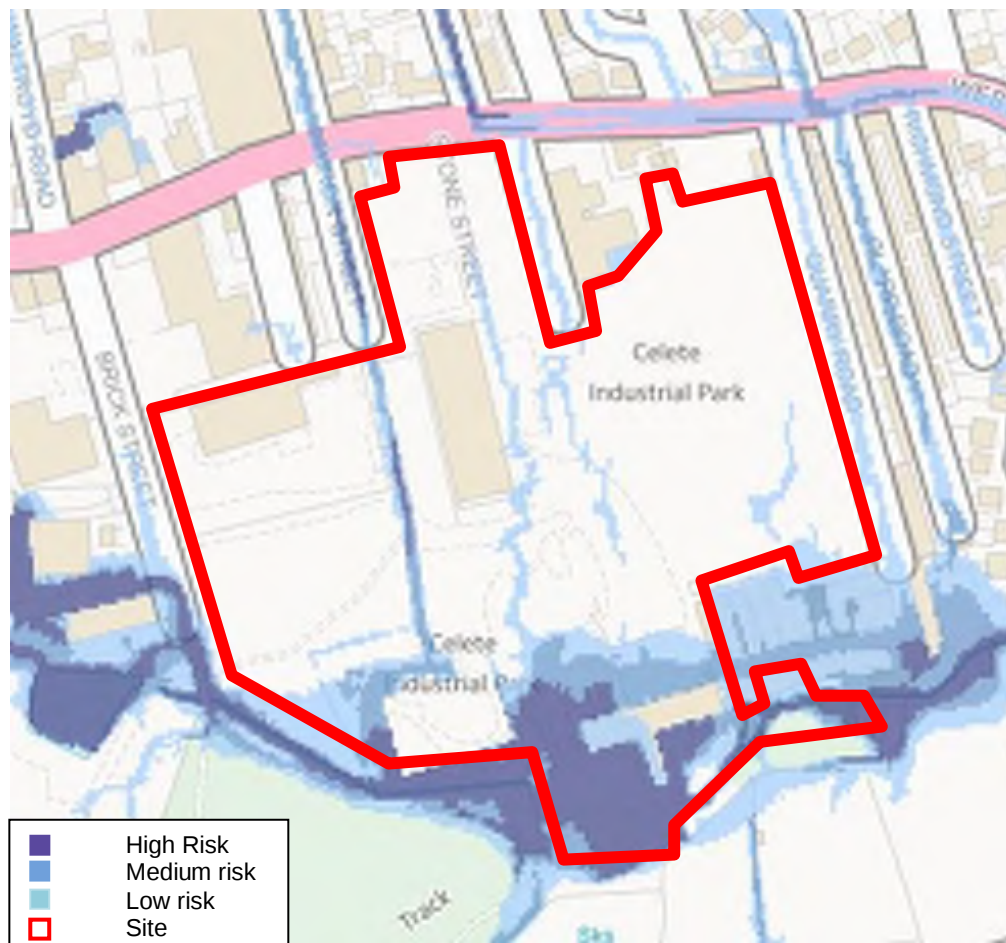


Figure 2 - Environment Agency – Risk of surface water flooding map

2.1.3 Groundwater

Groundwater is a potential flood risk to areas which are low lying and on permeable ground or, occasionally, to areas of higher ground in the vicinity of springs. Kirklees Council SFRA identifies the site as having a < 25% risk of groundwater emergence (Appendix 5).

2.1.4 Sewerage

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

2.2 Historical Flooding

Kirklees Council SFRA does not identify any historic flooding at the site (Appendix 5). DEFRA historic flood maps also record the site to be outside of any recorded historic flood events (Appendix 6).

The Environment Agency does not identify any historic flooding at the site. However, land downstream of the site flooded in 2007 (Appendix 4), originating from the Blacup Beck during heavy rainfall.

2.3 Residual Flood Risk

The southern portion of the site is at medium to high risk of fluvial flooding from the Blacup Beck. High risk areas are indicative of surcharging of the culvert while medium risk areas are a result of overtopping of the watercourse embankments.

The site has surface water flow routes leading to the Blacup Beck, represented as low to high risk surface water flooding.

These risks are not a development constraint and will be managed on the site within the surface water drainage strategy and by the mitigation measures in Section 2.4.

2.4 Flood Mitigation Measures

The ground levels on the site will be altered to raise depressions in the ground surfacing which will remove any surface water ponding. Surface water flow paths will be routed appropriately to the proposed surface water discharge point.

Kirklees Council state that they expect the culverted section of Blacup Beck to be opened as part of the development. The opening of the culvert will mitigate against the current flood risk caused by the surcharging of this asset. Environment Agency flood maps should be updated to reflect this change.

Properties are not proposed within Flood Zone 2 or 3 therefore additional flood mitigation measures are not required for the proposed development.

Any raising of existing ground levels within flood zone 2 and 3 areas will require floodplain compensation.

3.0 DRAINAGE STRATEGY

3.1 Existing drainage

There are two 225 mm public combined sewers in Iron street and Stone Street crossing the site from north to south with outfalls located in the centre of the site. There is a 225 combined sewer on the contouring the west of the site in Brick Street, becoming a 450mm when lining the southern extent of the site flowing east. A 300mm public combined sewer and 600 surface water sewer line the northern extent of the site in the A643 Westgate highway. (Appendix 7).

As the site was previously developed, and still contains industrial buildings, both historic and existing connections to the public sewers are expected to exist. This can be investigated by a drainage survey.

3.2 Consultation with Yorkshire Water

Pre-planning advice has been received from Yorkshire Water (Appendix 7); their letter reference W016675 dated 14th December 2020. The main points of the advice are summarised below.

- There are minor combined and foul sewers crossing the site including; a 150mm public combined sewer, a 225mm public foul sewer and a 450 mm public combined sewer.
- No buildings or other obstructions are to be erected within 3m of the 150mm public combined sewer and 225mm public foul sewer.
- No buildings, obstructions or trees are to be erected within 5m of the 450mm public combined sewer. It may not be acceptable to raise or lower ground levels over this sewer or restrict access to the manholes on the sewer.
- Building over the small diameter public sewers crossing the site may take place under the control of Part H4 Building Regulations 2000.
- The partially mapped sewers within the site are thought to discharge to the 450mm public combined sewer to the south of the site.
- Separate systems should be developed for foul and surface water disposal.

- Foul water should discharge to the 450mm public combined sewer to the south of the site.
- Following the surface water disposal hierarchy, surface water should look to drain either to soakaway or watercourse in the first instance.
- The Blacup Beck is the obvious place for surface water disposal if SuDS are not viable.

3.3 Consultation with Environment Agency

The Environment Agency has been contacted regarding any requirements or restrictions for discharging surface water to the Blacup Beck. A summary of their response dated 04.01.2021 is listed below:

- A permit is not required for discharge of uncontaminated run-off water to surface water.
- If work is to be carried out on or near a river or in flood zone 3, a flood risk activity permit may be required.
- For new developments, SuDS should be provided where appropriate.
- If surface water can be managed during construction so that the discharge is uncontaminated water and meet the conditions set out in the Regulatory Position Statement detailed in the website below, then a permit will not be required.
- After construction, surface water run-off should be uncontaminated rainwater and therefore does not require a discharge permit.

3.4 Consultation with Kirklees Council

Correspondence with Kirklees Council in December 2020 (Appendix 5) states that surface water discharge should be restricted to 5 l/s/ha. Kirklees Council state that they expect the culverted section of Blacup Beck to be opened as part of the development.

3.5 Ground conditions

The British Geological Survey maps record the bedrock geology as Clifton Rock-Sandstone.

Borehole logs (SE12NE9) approximately 140 m north-east of the site record shale overlying sandstone and gritstone. Groundwater was not encountered.

A site investigation carried out by LITHOS (3043/2) reports that made ground is present across the site. Natural ground conditions varied across the site with cohesive alluvium, cohesive and granular residual soil between 0.7 m and 3.8 m deep overlying coal measures bedrock at depths of 1.75 m to 3 m present. Groundwater was encountered in the trial pits.

3.6 Brownfield calculations

The presence of hardstanding slab surfaces and industrial buildings on site result in the site currently discharging, at a minimum, to brownfield rates. The current total estimated hardstanding impermeable area is approximately 2.56 ha (Appendix 8). Surface water discharge attenuated to the brownfield runoff rate with 30% betterment. This equates to:

- $Q = 2.78 \times 50 \text{ mm/hr} \times 2.56 \text{ ha} = 355.84 \text{ l/s}$

With a 30% betterment, the attenuated runoff rate equals $0.7 \times 355.84 \text{ l/s} = \mathbf{249.1 \text{ l/s}}$.

Kirklees Council has requested that the site runoff rate should be limited to 5 l/s/ha. This equates to:

- $Q = 5 \text{ l/s/ha} \times 6.46 \text{ ha} = \mathbf{32.3 \text{ l/s}}$

3.7 Drainage hierarchy

Surface water disposal should be in accordance with the drainage hierarchy in Building Regulations Part H 2010⁷ and Planning Practice Guidance 'Reducing the causes and impacts of flooding', paragraph 080. Disposal via SuDS methods should be considered as the first option. Disposal to the public sewer should be considered only when SuDS methods and disposal to the watercourse are shown to be unsuitable.

3.7.1 Sustainable Drainage Systems (SuDS)

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

Infiltration type SuDS such as soakaways are not viable on the site due to the presence of made ground and impermeable soil. This has been confirmed by soakaway testing conducted by LITHOS in 2011 where infiltration rates were too low to be calculated (Appendix 9).

Other SuDS methods may be applicable and their use is summarised in the appended SuDS checklist (Appendix 8).

3.7.2 Watercourse

The Blacup Beck is located immediately south of the site and is culverted through the south of the site for approximately 80 m. A new outfall would be required to discharge to this watercourse. The Environment Agency advises that a flood risk activity permit may be required for work close to the watercourse. Kirklees Council state that the culverted section of Blacup Beck should be opened as part of the development and surface water discharge should be restricted to 5 l/s/ha.

3.7.3 Public sewer

Pending the confirmed outfall connection of the two 225mm onsite combined sewers, the more suitable sewer outfall would be to the 450mm when lining the southern extent of the site flowing east. A 300mm public combined sewer and 600 surface water sewer line the northern extent of the site in the A643 Westgate highway.

⁷ <https://www.gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h>

3.8 Proposals for surface water disposal

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

- Surface water disposal will be via gravity to the Blacup Beck located immediately south of the site. Subject to approval from the Environment Agency and Kirklees Council.
- Due to the extensive hardstanding areas from residual concrete slabs, access roads and existing buildings, the site surface water discharge is currently at brownfield runoff rates. Kirklees Council have stipulated that surface water discharge must be reduced and attenuated to 5 l/s/ha which equates to 32.3 l/s.
- Attenuation storage for rainfall events will be provided for up to the 1 in 100 year plus climate change event. The total estimated storage volume is 2065 m³ subject to detailed design.

3.9 Proposals for foul disposal

Foul effluent should discharge via gravity to the 450mm public combined sewer recorded along the southern boundary of the site, unless the existing 225mm combined sewers on site are found to connect to the wider public sewerage network.

3.10 Residual flood risk

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

3.11 Mitigation measures

The proposed surface water drainage system is to be designed to current best practice and to the standards laid out in the publication 'Design and Construction Guidance for foul and surface water sewers' and Building Regulations Part H 2010.

In the event of surface water exceedance as a result of rainfall in excess of the design standard, the site is laid out so that surface water runoff is directed away from houses, including those on neighbouring streets.

4.0 CONCLUSIONS

1. The majority of the site lies within Flood Zones 1 at low risk of fluvial flooding. The southern extent of the site lies in Flood Zone 2 and 3 at medium to high risk of fluvial flooding from the Blacup Beck.
2. Kirklees Council state that they expect the culverted section of Blacup Beck to be opened as part of the development. The opening of the culvert will mitigate against the current flood risk caused by the surcharging of this asset.
3. There is a very low to high risk of surface water flooding, primarily concentrated in the southern portion of the site.
4. Properties are not proposed within Flood Zone 2 or 3 therefore additional mitigation measures are not required.
5. Any raising of existing ground levels within Flood Zone 2 and 3 areas will require floodplain compensation.
6. Surface water disposal will be to the Blacup Beck to the south of the site subject to approval from the EA and LLFA.
7. Kirklees Council have stipulated that surface water discharge must be reduced and attenuated to 5 l/s/ha which equates to a total allowable discharge of 32.3 l/s.
8. Attenuation storage for rainfall events will be provided for up to the 1 in 100 year plus climate change event. The total estimated storage volume is 2065 m³ subject to detailed design.
9. Foul effluent should discharge via gravity to the 450mm public combined sewer recorded along the southern boundary of the site, unless the existing 225mm combined sewers on site are found to connect to the wider public sewerage network. Existing connections need to be confirmed via a CCTV survey.
10. The level of risk and safeguards available are considered appropriate to this class of development.

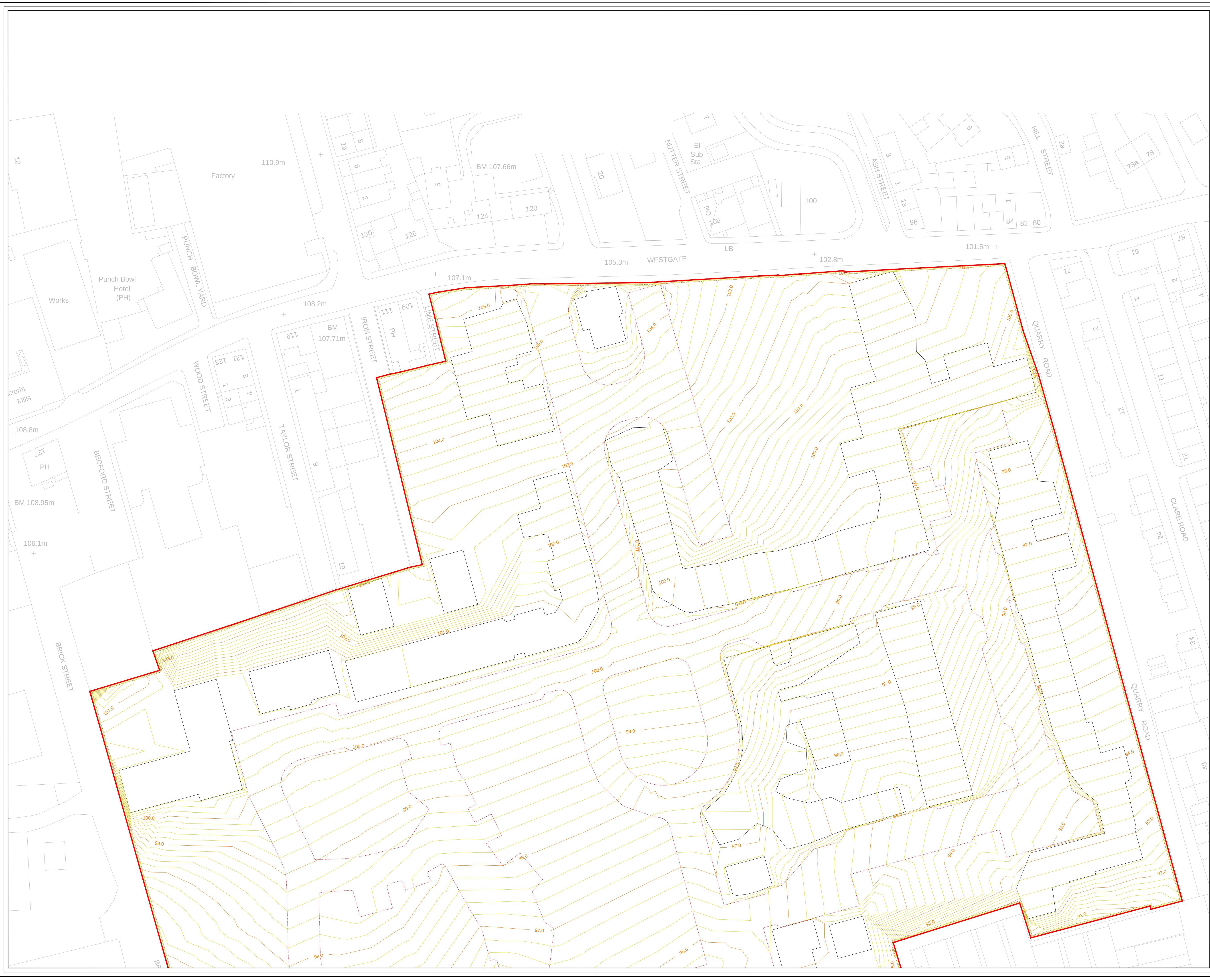
APPENDICES

APPENDIX 1



Site location

APPENDIX 2



PROFESSIONAL

REMEDIATION.

Yorkshire & Midlands

First Floor Building 6
Centre 27 Business Park
Birstall
WF17 9TB
T: 01924 475599

W www.professional-group.eu

North West

Kingfisher Business Centre
Rawtenstall
Lancashire
BB4 8EQ
T: 01706 224212

E info@professional-group.eu

CLIENT

Michael Steel & Co

PROJECT TITLE

Westgate Cleckheaton

DRAWING TITLE

Formation

STATUS

☐ FOR COMMENT
Drawing issued for discussion purposes only.

☒ TENDER
For pricing and technical approval.

☐ CONSTRUCTION
Final approved document.

SCALE AT OWN RISK

DRAWN BY

BM

DATE

17/01/2018

SCALE

1:500

PAPER SIZE

A1

PROJECTED

NB

DATE

17/01/2018

PROJECT NO.

20908_PRL_TP001_1

REV

-

The Employer must not amend any drawing, design or other intellectual property produced by Professional, without permission in writing from Professional in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, Professional shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or other intellectual property.

REV	DESCRIPTION	BY	DATE
A			
B			
C			
D			
E			

NOTES

Formation contours are designed to achieve an earthworks balance when compared against "3544_04E_EXISTING SITE SURVEY-WITH TREE SURVEY INFO (1)" after a 200mm site strip has been conducted.

It should be noted that the area contained within the red line boundary has changed since the aforementioned survey has been conducted. Therefore in order to achieve accurate design quantities and levels, additional survey work will be required.

Drawing to be approved by Principal Designer before construction work commences. All slopes have been considered in accordance with the 2015 CDM regulations and designed to be equal to or less than the relevant angle of repose for the materials used. Where this has not been possible due to design levels, as shown by the contours, alternative solutions to ensure safety must be sought.

This is a tender drawing only, further work is required before issuing as a construction drawing.

LEGEND

Site Boundary

Building

Road Edge

Bottom Of Bank

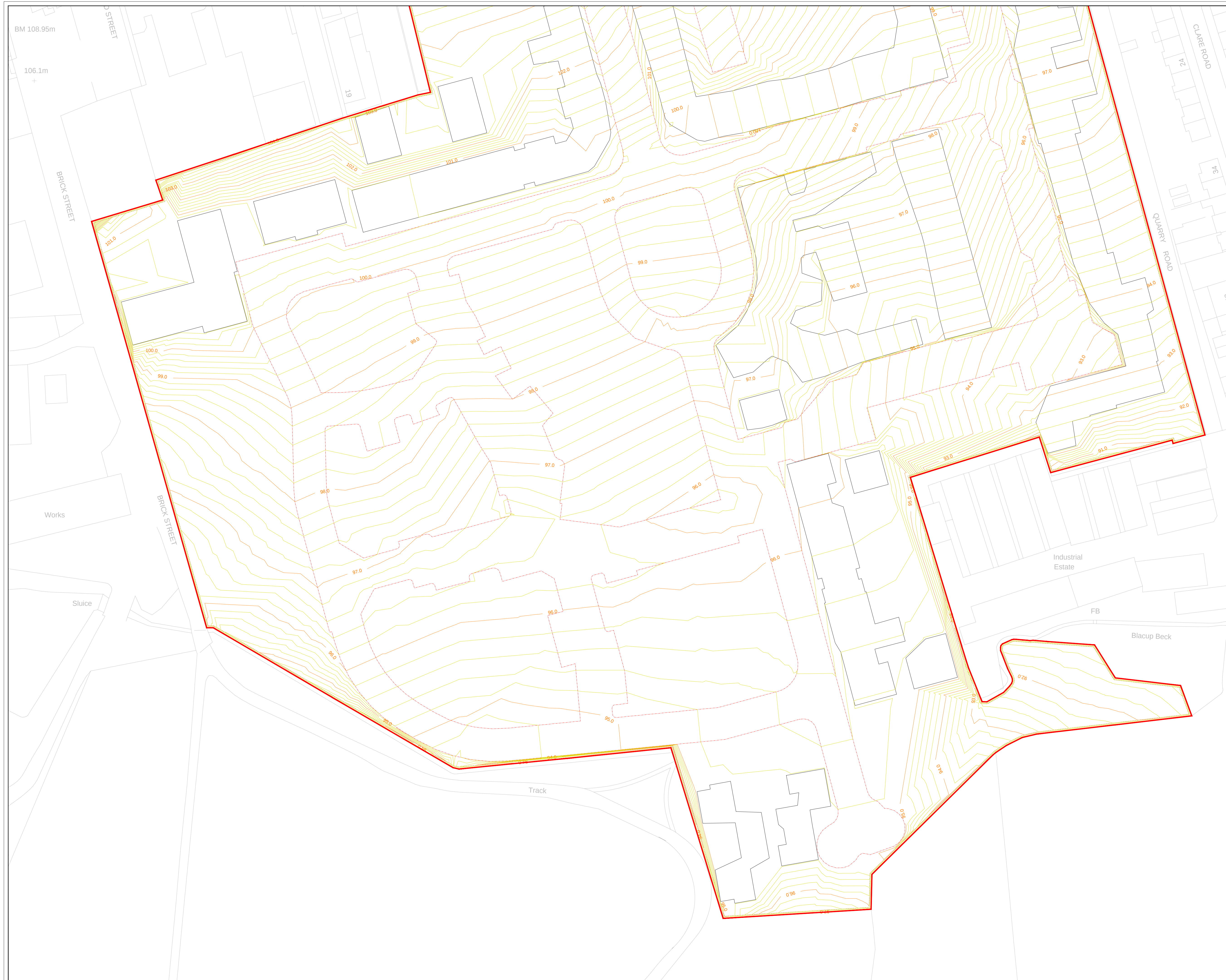
Top Of Bank

Contours (200mm Intervals)

Contours (1m Intervals)

Spot Level

OS Grid Tile



PROFESSIONAL

REMEDICATION.

Yorkshire & Midlands

North West

First Floor Building 6
Centre 27 Business Park
Birstall
WF17 9TB

T: 01924 475599

Kingsfield Business Centre
Ravenshall
Lancashire
BB4 8EQ

T: 01706 224212

W www.professional-group.eu

E info@professional-group.eu

CLIENT

Michael Steel & Co

JOB TITLE

Westgate Cleckheaton

DRAWING TITLE

Formation

STATUS

☐ FOR COMMENT
Drawing issued for discussion purposes only.

☒ TENDER
For pricing and technical approval.

☐ CONSTRUCTION
Final approved document.

SCALE AT OWN RISK

DRAWN BY

DATE

SCALE

DWG NO.

SHEET SIZE

BM

17/01/2018

1:500

A1

CHECKED BY

DATE

DWG NO.

SHEET

NB

17/01/2018

20908_PRL_TP001_2

-

The Employer must not amend any drawing, design or other intellectual property produced by Professional, without permission in writing from Professional in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, Professional shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or other intellectual property.

REV

DESCRIPTION

BY

DATE

A

B

C

D

E

F

NOTES

Formation contours are required to achieve an earthworks balance when compared against "3544_04E_EXISTING SITE SURVEY-WITH TREE SURVEY INFO (1)" after a 200mm site strip has been conducted.

It should be noted that the area contained within the red line boundary has changed since the aforementioned survey has been conducted. Therefore in order to achieve accurate design quantities and levels, additional survey work will be required.

Drawing to be approved by Principal Designer before construction work commences. All slopes have been considered in accordance with the 2015 CDM regulations and designed to be equal to or less than the relevant angle of repose for the materials used. Where this has not been possible due to design levels, as shown by the contours, alternative solutions to ensure safety must be sought.

This is a tender drawing only, further work is required before issuing as a construction drawing.

LEGEND

Site Boundary

Building

Road Edge

Bottom Of Bank

Top Of Bank

Contours (200mm intervals)

107.0

Contours (1m intervals)

107.35

Spot Level

OS Grid Tile

APPENDIX 3

WESTGATE : CLECKHEATON

All work to be carried out in accordance with the requirements of the Building Regulations, Water Authority and the Construction (Design and Management) Regulations currently in force.
Do not scale from this drawing. Architect to be notified of any discrepancies.
Verify relevant dimensions on site before commencing work or preparing shop drawings. This drawing is copyright.

Rev	Date	Description	By	Checked
I	18.09.19	LAYOUT RE DESIGNED FOLLOWING ENGINEERING COMMENTS	LA	MB
J	27.03.20	LAYOUT RE-PLOTTED WITH CURRENT GENERALITY. DETAIL APPLIED FOR PLANNING LAYOUT. 10% AFFORDABLE HOUSING SHOWN. TOTAL NUMBERS 184.	LA	LA
K	30.06.20	41 No. OPEN MARKET PLOTS REPLACED BY 44 No. PRS PLOTS WITHIN EASTERN SECTION OF THE SITE.	WS	LA
L	16.11.20	LAYOUT RE-DRAWN FOLLOWING UPDATED OMS HOUSE TYPE MIX. PRS PLOTS REMOVED FROM SITE. ROADS & DRIVES TWEAKED TO SUIT. AFFORDABLE UPDATED FROM 20% TO 30%.	WS	LA
M	11.12.20	BARCELONA & MADRID HOUSE TYPE BLOCK & CODE UPDATED IN LINE WITH NEW HOUSE TYPE MIX.	WS	LA
N	24.12.20	PLOTS REMOVED FROM FLOOD ZONE. PRS RE-INTRODUCED. TOTAL UNITS REDUCED FROM 203 TO 200.	-	-
O	13.01.21	12 No. A11 REPLACED WITH 3 No. A-205 BUNGALOW & 2 No. T2.	WS	LA
P	12.04.21	AFFORDABLE REDUCED TO 20%. PRS PLOT LOCATION TWEAKED FOLLOWING PRODUCTION COMMENTS.	-	-

- SITE LAYOUT KEY:
- 2000 HIGH ACOUSTIC FENCE
standard detail reference: SD10.EX.24
 - 1800 HIGH SCREEN WALL
standard detail reference: SD10.EX.06 & 07
- refer to materials plan for brick/stone
 - 1800 HIGH CLOSE BOARDED TIMBER FENCE
standard detail reference: SD10.EX.17
 - 600 HIGH TIMBER KNEE RAIL
standard detail reference: SD10.EX.22
 - INDICATIVE TREE PLANTING
 - DENOTES LANDSCAPED BIN COLLECTION POINT
900x900mm hard standing area per plot served.
Refer to standard detail SD10.113
 - ELECTRIC VEHICLE CHARGING POINTS
 - DENOTES SUB STATION
- refer to services layout for details
 - TITLE BOUNDARY
 - INDICATIVE CAR PARKING SPACE
 - 900mm WIDE REAR ACCESS GATE
 - 1800x2700 HARD STANDING AREA FOR REFUSE BINS
 - SHOW HOMES
 - WELCOME CENTRE
 - SOCIAL HOUSING
 - PRE-SOLD HOUSING
 - INDICATIVE SHRUB LANDSCAPING
- refer to landscape layout for specific details
 - DENOTES TURF (PRIVATE)
- turf to front and rear gardens to Segment D
Segment A, B & C turf to front gardens only
 - DENOTES TURF (PUBLIC)
- turf areas to Public Open Spaces to be maintained by Management Company
 - DENOTES 900mm WIDE PATH
- refer to specific detail for composition
 - DENOTES 6'x4' TIMBER SHED
- refer to specific detail forshed base
 - FLOOD ZONE 2 AREA
- no units to be plotted within this area
 - FLOOD ZONE 3 AREA
- no units to be plotted within this area

ACCOMMODATION SCHEDULE									
HOUSE TYPE	SALES NAME	BEDS	NO	SO FEET	TOTAL SQ FEET	SQ METRES	TOTAL SQ METRES	%	NOSS REQ. (M)
OPEN MARKET (HMY)									
MY P-202	LIVORNO	2	10	706	7060	65.59	655.89	5.2%	N/A
MY A-205	T1	3	20	2763	111.68	2066.24	11.9%	N/A	
S100	BARCELONA	3	1	1217	113.06	113.06	0.9%		
MY A-451	ROMA (2 BED PLUS STUDY)	3	24	2864	118.16	2735.15	12.4%		
MY P-412	OPORTO (3 BED PLUS STUDY)	3	18	1345	124.95	2269.16	8.3%		
S100	MADRID	4	1	1478	147.8	137.11	0.9%		
S100	BOLCONA PLUS	5	9	1743	156.87	161.93	1457.36	4.6%	
MY A-205	TRAPLES	5	12	2209	241.08	198.64	2239.69	8.2%	
APPROXIMATE TOTAL									
MY A-205	MY A-205 BUNGALOW	2	3	696	2088	84.96	193.86	1.5%	
MY A-205	T1	2	19	1514	151.4	74.86	1422.71	9.8%	
MY A-451	T2	3	14	923	1290.2	85.75	1209.48	7.2%	
MY A-451	AHS	4	2	1246	2492	115.76	231.51	1.0%	
APPROXIMATE TOTAL									
PRS (HMY)									
MY P-202	LIVORNO	2	20	706	14120	65.59	1311.78	10.3%	
MY A-205	T1	2	14	806	11284	74.86	1046.31	7.2%	
MY A-312	T2	3	14	923	1290.2	85.75	1209.48	7.2%	
MY A-451	AHS	4	6	1246	7476	115.76	694.54	3.1%	
AHS UNIMPCT		3	4	933	3732	86.68	349.71	2.1%	
PRS TOTAL									
TOTAL			58				19947	100%	
Area Gross:			5.47	Hectares					
Area Gross:			15.9678	Acres					
Non Developable/POS area			1.496	Hectares					
Non Developable/POS area			4.190951	Acres					
Developable area			4.716	Hectares					
Developable area			11.79679	Acres					
Density:			48.64	Units/Hectare					
Density:			16.45	Units/Acre					
Sq. Metres:			19589.79	Sq. Metres/Hectare					
Sq. Metres/Hectare			4157.39						

HOUSETYPE RANGE: MIY

SPECIFICATION TYPE: TBC

LAND CLUSTER: 2 (W. YORKS)

LAND SEGMENT: B

DRAWING STAGE: 3-PLANNING

strata

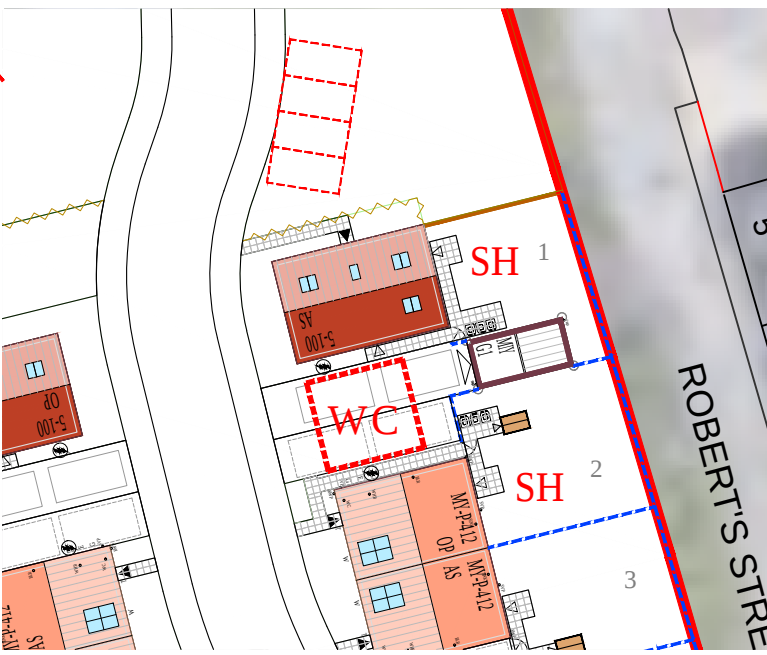
strata homes limited | quay point | lakeside | doncaster | DN4 5PL
t: 01302 308508 www.strata.co.uk

scale: 1:500@A0 | drawn by: WS | date: 16.11.20

Project: WESTGATE, CLECKHEATON BD19 5HT

Drawing: PLANNING LAYOUT

Planning Ref:	N/A
Drawing Number:	18-CL2-SEGB-WE-01
Revision:	P



SHOW HOME COMPLEX-TBC

LANDSCAPE SPEC: SILVER

APPENDIX 4

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
418382/425062

Created
17 Nov 2020 12:03

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

This means:

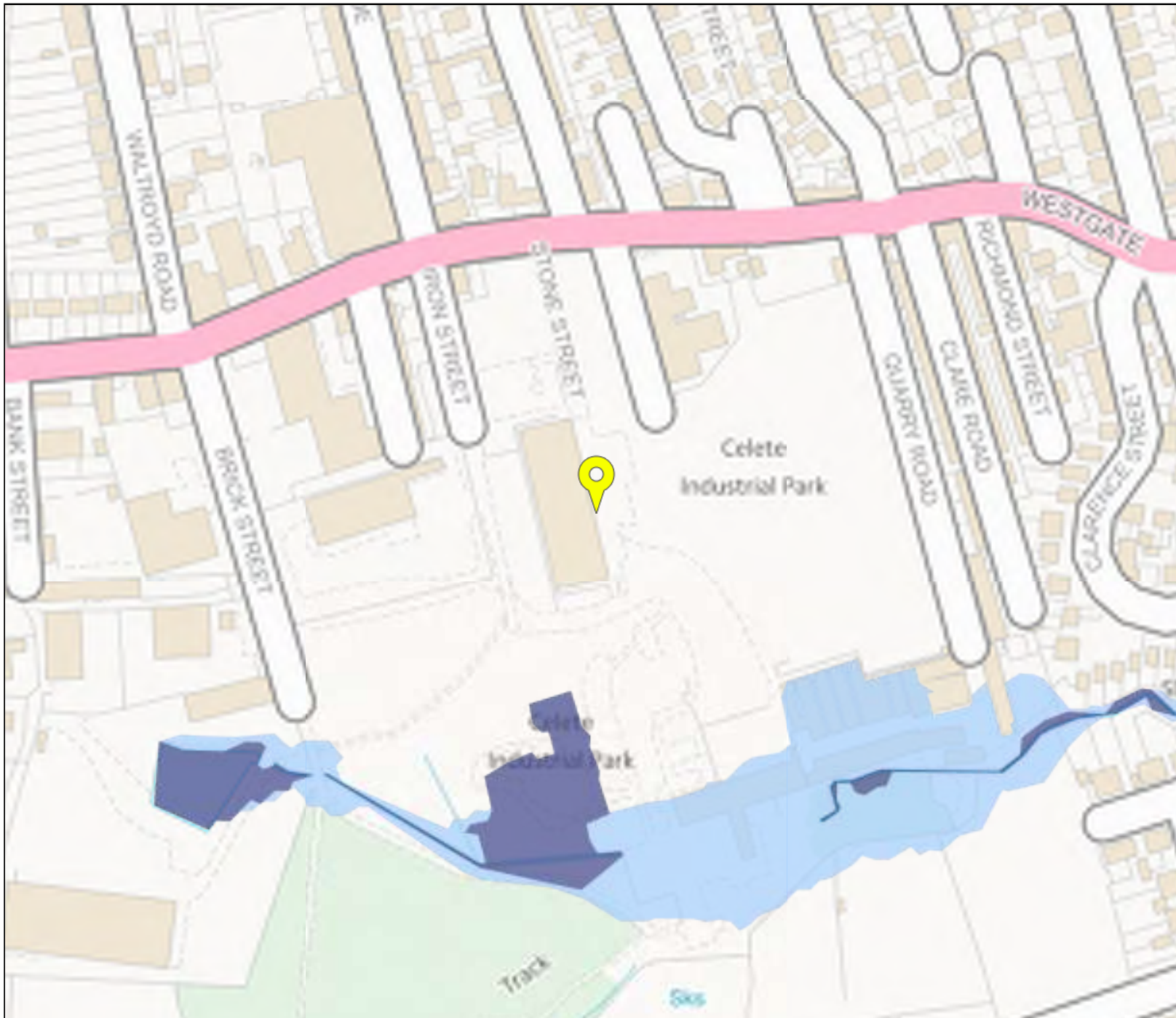
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage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

Notes

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

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

The Open Government Licence sets out the terms and conditions for using government data.
<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>



Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
418382/425062

Scale
1:2500

Created
17 Nov 2020 12:03

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

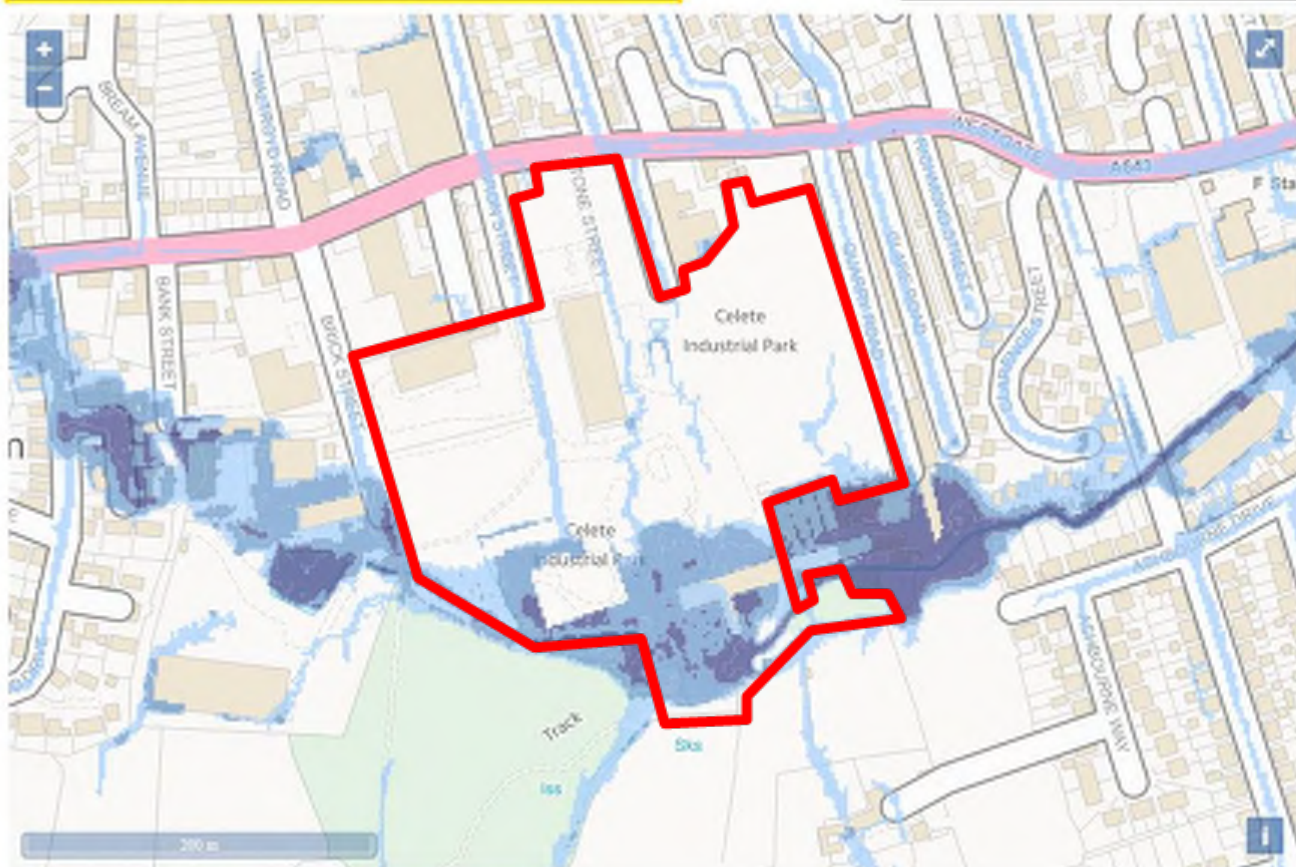
0 20 40 60m

Flood risk

Low risk: depth

Location

Enter a place or postcode



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

Flood depth (millimetres)

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

Jessica Stevenson-Steels

From: France, Debbie <Debbie.France@environment-agency.gov.uk> on behalf of France, Debbie
Sent: 21 December 2020 14:42
To: Jessica.Stevenson-Steels@eastwoodandpartners.com
Subject: Your Enquiry: RFI/2020/194210 [Filed 04 Jan 2021 10:58]
Attachments: Flood History Map 194210.pdf; Flood_History_Information_RFI_2020_REF 194210.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Our Ref: RFI/2020/194210

Dear Jessica

**RE: Westgate, Cleckheaton- Discharge to watercourse
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 17 November 2020. Apologies for the delay in responding

Flood History at your site.

There **is known** flood history at or in close proximity to your site, which is detailed in the attached documents.

Please note that this record doesn't include all of the flooding that may have occurred including and since Storm Dennis, 15th February 2020. Given the process of recording, verifying and updating our record from major floods is extensive and may take a considerable amount of time.

Also in response to your other query:

In order to manage the surface water discharge from the site, we are proposing an attenuated drainage system to Blacup Beck, south of the site.

Please could you advise on any discharge requirements or restrictions that we should be aware of.

Discharge Requirements during construction work:

If the top layer of soil is exposed to surface water run-off it is likely to mobilise sediment and cause a polluting effluent to discharge into the beck. Therefore any discharges to surface water will need treatment prior to discharge and will require an environmental permit under the Environmental Permitting (England and Wales) Regulations (2016). More details on applying can be found at the following website:

<https://www.gov.uk/guidance/discharges-to-surface-water-and-groundwater-environmental-permits>

If surface water can be managed during construction so that the discharge is uncontaminated water and meet the conditions set out in the Regulatory Position Statement detailed in the website below, then a permit will not be required.

<https://www.gov.uk/government/publications/temporary-dewatering-from-excavations-to-surface-water/temporary-dewatering-from-excavations-to-surface-water>

Discharge Requirements after construction work has been completed:

Any surface water run-off should be uncontaminated rainwater and therefore does not require a discharge permit.

More information.

For **flood risk** information, you can access our Long Term Flood Risk maps on the Environment Agency website at <https://flood-warning-information.service.gov.uk/long-term-flood-risk>

This online Flood Risk Map includes a **Surface Water Map**, which is published in partnership with Local Authorities. Local Authorities and/or Water Companies may be able to provide further knowledge on the risk of flooding from other sources.

Where we do have a record of historical flooding, and depending on your access to appropriate software, our **Recorded Flood Outlines are available online to download** in a variety of formats (Shapefile(.shp), Geographic Markup Language (.gml), MapInfo MID/MIF, MapInfo TAB and GeoJSON (.json)) at <https://data.gov.uk/dataset/16e32c53-35a6-4d54-a111-ca09031eaaaf/recorded-flood-outlines>.

I hope that we have correctly interpreted your request. Please see the Open Government Licence ([here](#)) for details of permitted use.

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

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.

If you require any further help, please do not hesitate to contact me.

Yours sincerely

Debbie France
Customers and Engagement Team
Environment Agency | Lateral, 8 City Walk, Leeds, LS11 9AT

debbie.france@environment-agency.gov.uk
External: 0203 0254731 | Internal :54731

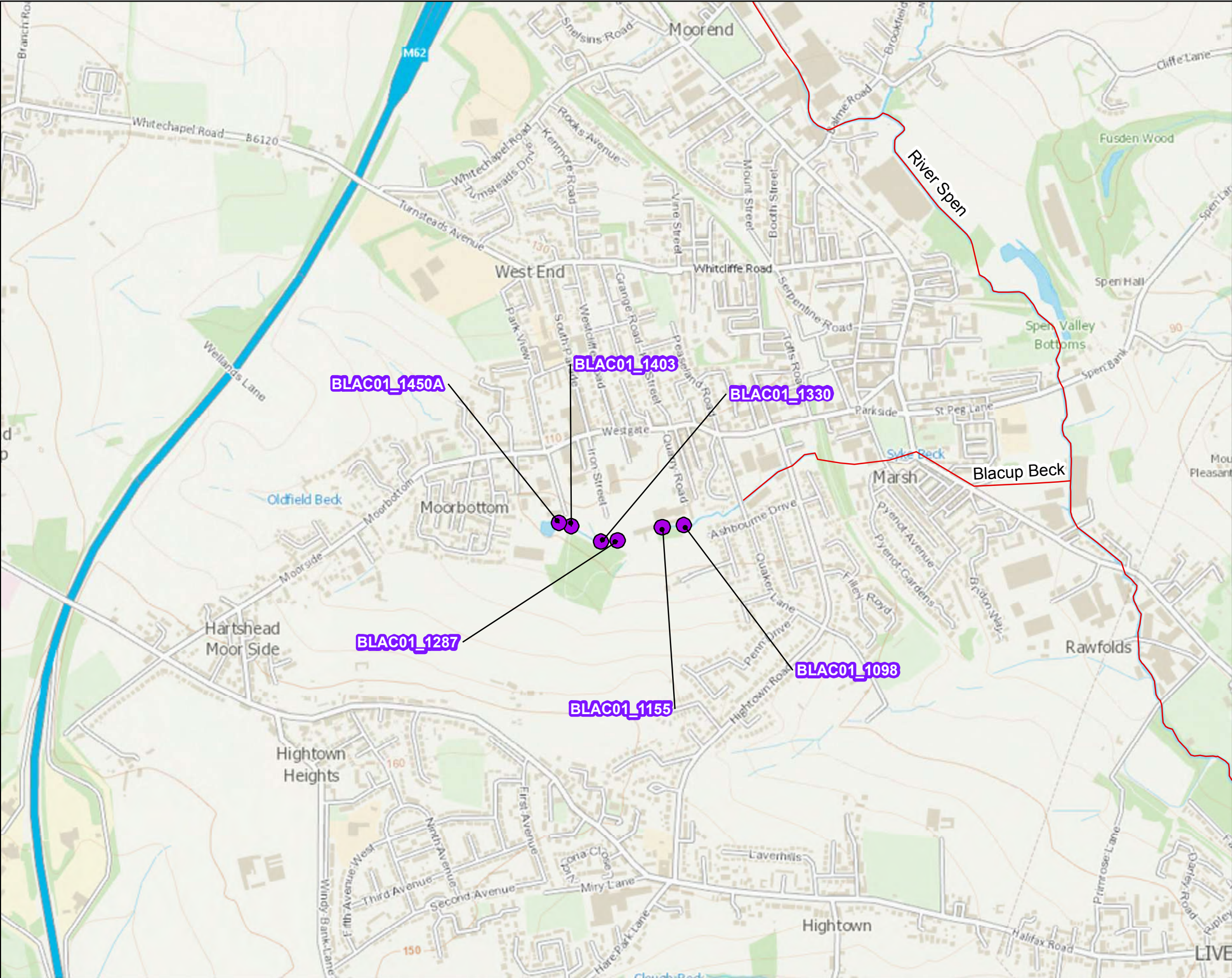
Enquiries Team Tel: 020 847 48174
Email: neyorkshire@environment-agency.gov.uk

Working days: Monday to Friday



RFI/2021/194183 Node Point Map Centred on Your Site off Westgate, Cleckheaton

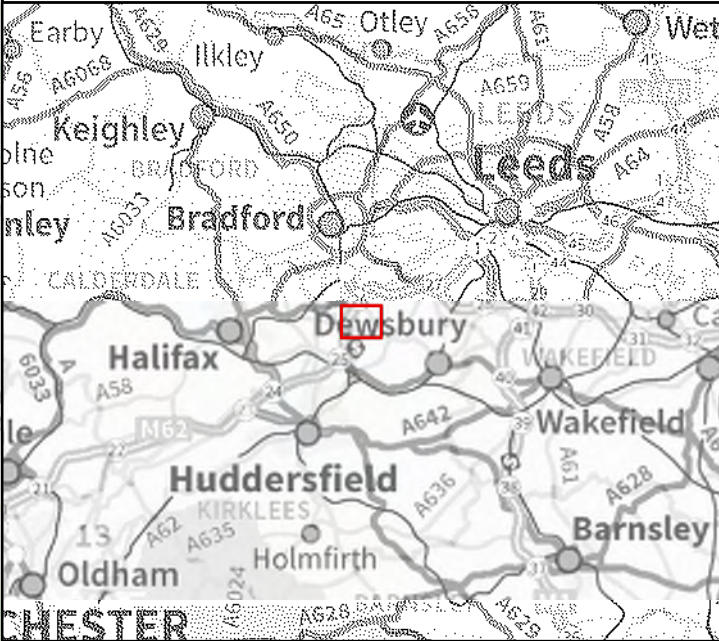
Date created: 10/02/2021



www.environment-agency.gov.uk

Scale: 1:10,000

when reproduced @ A3



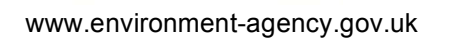
LEGEND

- Main River
- 2009 River Spen Node Points

2009 River Spen Model Results (Level - mAOD, Flow - m³/s) - RFI/2021/194183																
Node Point	Annual Exceedance Probability (AEP)															
	20% AEP (1 in 5)		10% AEP (1 in 10)		4% AEP (1 in 25)		2% AEP (1 in 50)		1.33% AEP (1 in 75)		1% AEP (1 in 100)		1% AEP (1 in 100) +20% CC		0.1% AEP (1 in 1000)	
	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow
BLAC01_1330	94.682	1.793	94.73	2.059	94.772	2.503	94.802	2.794	94.819	2.96	94.831	3.074	94.886	3.591	95.123	5.912
BLAC01_1155	91.177	1.788	91.274	2.324	91.32	2.637	91.369	2.969	91.398	3.167	91.414	3.312	91.487	3.986	91.747	5.807
BLAC01_1098	90.449	1.784	90.509	2.289	90.54	2.668	90.561	2.978	90.575	3.174	90.586	3.314	90.738	3.936	91.304	5.932
BLAC01_1403	95.94	1.799	95.991	2.118	96.071	2.694	96.108	3.041	96.129	3.25	96.137	3.398	96.183	4.074	96.47	6.016
BLAC01_1287	94.477	1.785	94.544	2.305	94.579	2.637	94.605	2.965	94.62	3.159	94.631	3.304	94.68	4.001	94.937	7.382
BLAC01_1450A	97.677	1.815	97.984	2.12	98.073	2.635	98.096	2.944	98.108	3.123	98.116	3.248	98.147	3.826	98.252	6.684

RFI/2021/194183 Assets Map Centred on Your Site off Westgate, Cleckheaton	
Date created: 10/02/2021	

RFI/2021/194183 Assets Map Centred on Your Site off Westgate, Cleckheaton	
Date created: 10/02/2021	



— Main River

- Defences (3rd party maintained)**

— *Journal of the American Medical Association*

- ### Defences (EA maintained)

flood

- Channels (EA maintained)**

simple

- SUB_TYPE

Structures (EA Maintained) - RFI/2021/194183							
ASSET ID	ASSETS TYPE	DESCRIPTION	DESIGN STANDARD OF PROTECTION (SOP)	ASSET MAINTAINER	PROTECTION	TARGET CONDITION	OVERALL CONDITION
268716	screen	Rear of Cleckheaton Medical centre - 1st Screen		environment_agency	fluvial	3	2

Defences (EA Maintained) - RFI/2021/194183

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)
173183	wall	environment_agency	flood_risk_management	61.93	72.60	72.60	fluvial	2	3	
172561	wall	environment_agency	flood_risk_management	33.62	67.90	67.87	fluvial	2	2	
172563	wall	environment_agency	flood_risk_management	38.77	68.08	67.90	fluvial	2	2	
173184	wall	environment_agency	flood_risk_management	159.80	72.37	72.38	fluvial	2	2	
172566	wall	environment_agency	flood_risk_management	31.56	69.11	69.50	fluvial	2	2	
329416	flood_gate	environment_agency	flood_risk_management	2.93	71.13	71.13	fluvial	3	2	

Channels (EA Maintained) - RFI/2021/194183										
ASSET ID	DESCRIPTION	ASSET MAINTAINER	ASSET TYPE	LENGTH (m)	LAST INSPECTION	LOCAL AUTHORITY	PROTECTION	TARGET CONDITION	OVERALL CONDITION	DESIGN STANDARD OF PROTECTION (SOP)
329555		environment_agency	simple_culvert	31.54	15/10/2020	Kirklees District (B)	fluvial	2	2	

Structures (3rd Party Maintained) - RFI/2021/194183							
ASSET ID	ASSETS TYPE	DESCRIPTION	DESIGN STANDARD OF PROTECTION (SOP)	ASSET MAINTAINER	PROTECTION	TARGET CONDITION	OVERALL CONDITION
334337	weir			private	fluvial	9	4
334336	weir			private	fluvial	9	3

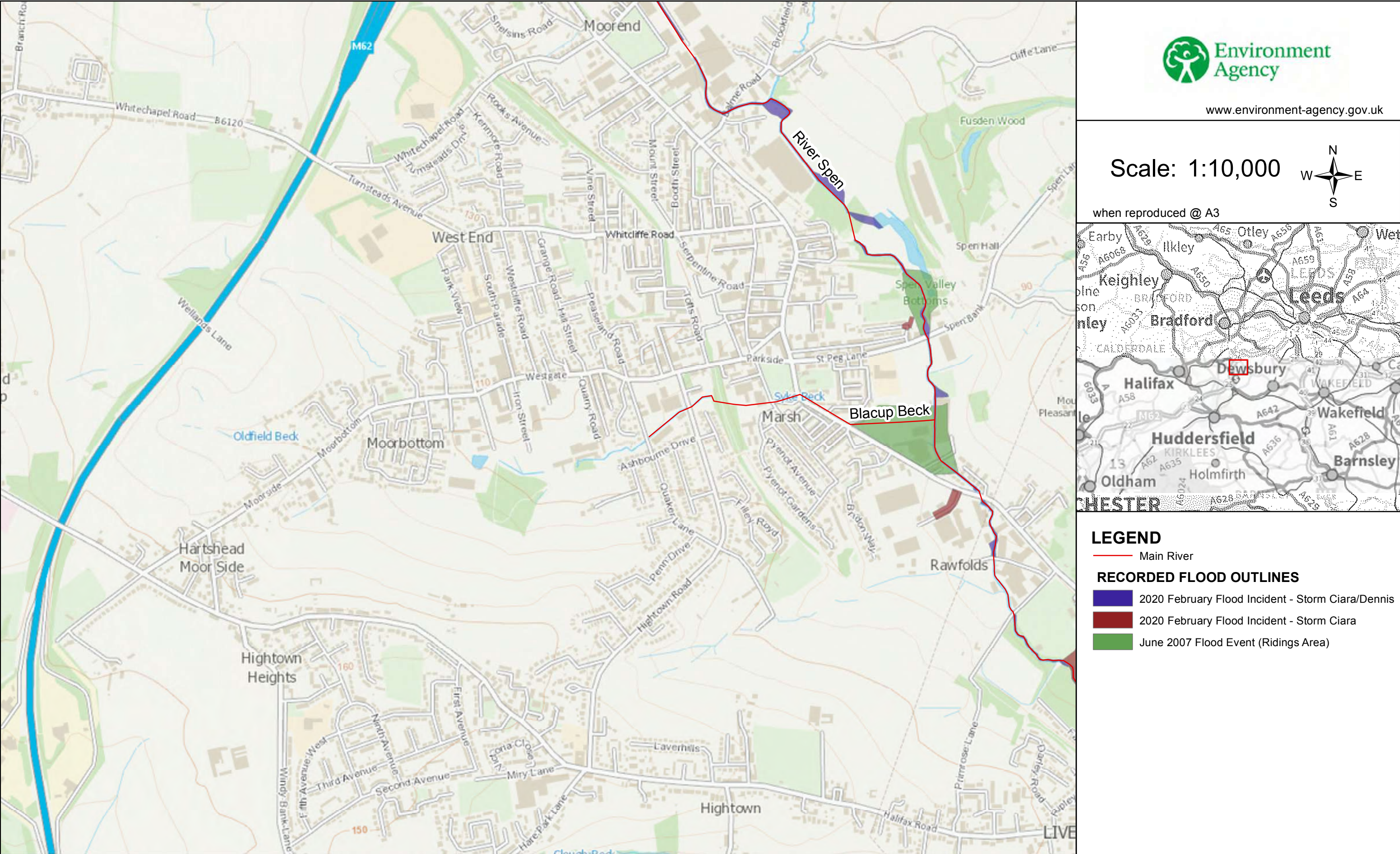
Defences (3rd Party Maintained) - RFI/2021/194183

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)
172562	bridge_abutment	private	flood_risk_management	3.74			fluvial	2	2	
172564	embankment	private	flood_risk_management	72.05	68.48	68.58	fluvial	2	5	
172565	high_ground	private	flood_risk_management	56.23			fluvial	2	2	
173177	wall	private	flood_risk_management	154.06	69.59	69.50	fluvial	2	3	
173179	wall	private	flood_risk_management	209.59	71.07	72.50	fluvial	2	3	
173180	wall	private	flood_risk_management	87.83			fluvial	2	2	
174619	high_ground	private	flood_risk_management	103.34			fluvial	3	3	
27616	high_ground	private	flood_risk_management	200.64			fluvial	2	3	50
160743	high_ground	private	flood_risk_management	15.64			fluvial	3	3	50
160747	high_ground	private	flood_risk_management	7.23			fluvial	3	3	50
160741	high_ground	private	flood_risk_management	8.90			fluvial	3	3	50
159488	high_ground	private	flood_risk_management	62.18			fluvial	3	3	50
159307	high_ground	private	flood_risk_management	15.66			fluvial	3	3	50
159306	high_ground	private	flood_risk_management	44.87			fluvial	3	3	50
159316	high_ground	private	flood_risk_management	3.05			fluvial	3	3	50
159315	high_ground	private	flood_risk_management	17.31			fluvial	3	3	50
159305	high_ground	private	flood_risk_management	6.46			fluvial	3	3	50
159304	high_ground	private	flood_risk_management	9.54			fluvial	3	3	50
159302	high_ground	private	flood_risk_management	6.71			fluvial	3	3	50
159314	high_ground	private	flood_risk_management	8.84			fluvial	3	3	50
159301	high_ground	private	flood_risk_management	4.74			fluvial	3	3	50
159313	high_ground	private	flood_risk_management	19.67			fluvial	3	3	50
159300	high_ground	private	flood_risk_management	5.07			fluvial	3	3	50
159299	high_ground	private	flood_risk_management	16.38			fluvial	3	3	50
160748	high_ground	private	flood_risk_management	27.78			fluvial	3	3	50
160744	high_ground	private	flood_risk_management	10.16			fluvial	3	3	50
174618	high_ground	private	flood_risk_management	163.90			fluvial	3	3	
159312	high_ground	private	flood_risk_management	25.16			fluvial	3	3	50
160729	high_ground	private	flood_risk_management	92.49			fluvial	3	3	50
159311	high_ground	private	flood_risk_management	17.60			fluvial	3	3	50
159310	high_ground	private	flood_risk_management	39.37			fluvial	3	3	50
160928	high_ground	private	flood_risk_management	17.55			fluvial	3	3	50
174617	high_ground	private	flood_risk_management	28.14			fluvial	3	3	
173185	high_ground	private	flood_risk_management	153.01			fluvial	3	3	
173182	bridge_abutment	private	flood_risk_management	9.57			fluvial	2	2	
173181	wall	private	flood_risk_management	87.77			fluvial	3	2	
160752	high_ground	private	flood_risk_management	73.92			fluvial	3	3	50
160927	high_ground	private	flood_risk_management	23.63			fluvial	3	3	50
160926	high_ground	private	flood_risk_management	46.17			fluvial	3	3	50
160751	high_ground	private	flood_risk_management	6.10			fluvial	3	3	50
160750	high_ground	private	flood_risk_management	16.40			fluvial	3	3	50
160925	high_ground	private	flood_risk_management	5.66			fluvial	3	3	50
160749	high_ground	private	flood_risk_management	9.51			fluvial	3	3	50
160745	high_ground	private	flood_risk_management	37.79			fluvial	3	3	50

Channels (3rd Party Maintained) - RFI/2021/194183										
ASSET ID	DESCRIPTION	ASSET MAINTAINER	ASSET TYPE	LENGTH (m)	LAST INSPECTION	LOCAL AUTHORITY	PROTECTION	TARGET CONDITION	OVERALL CONDITION	DESIGN STANDARD OF PROTECTION (SOP)
329555		environment_agency	simple_culvert	31.54	15/10/2020	Kirklees District (B)	fluvial	2	2	

RFI/2021/194183 Flood History Map Centred on Your Site off Westgate, Cleckheaton

Date created: 10/02/2021



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

See the attached map showing the flood history for this site. 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
2020 February Flood Incident - Storm Ciara/Dennis	08/02/2020	19/03/2020	main river	channel capacity exceeded (no raised defences)	Survey
2020 February Flood Incident - Storm Ciara	08/02/2020	14/02/2020	main river	channel capacity exceeded (no raised defences)	Visual
2020 February Flood Incident - Storm Ciara	08/02/2020	14/02/2020	main river	overtopping of defences	Visual
June 2007 Flood Event (Ridings Area)	25/06/2007	26/06/2007	unknown	unknown	Unknown

Please note that this record doesn't include all of the flooding that may have occurred during and since February 2020. Given the process of recording, verifying and updating our record from major floods is extensive and may take a considerable amount of time.

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

2009 River Spen Flood Warning Improvements

See enclosed extracts from 2009 River Spen Flood Warning Improvements produced by JBA in 2009.

Extracts include;

- A table showing modelled level (mAODN) and flow (m³/s) data for the 20% (1 in 5), 10% (1 in 10), 4% (1 in 25), 2% (1 in 50), 1.33 % (1 in 75), 1%(1 in 100) and 0.1% 1 in 1000 Annual Exceedance Probabilities (AEP) for the baseline scenario
- A table showing modelled level (mAODN) and flow (m³/s) data for the the 1% (1 in 100) + 20% Climate Change Annual Exceedance Probabilities (AEP) for the baseline scenario
- A map showing node point locations.
- Depth grids haven't been provided as they don't cover the site.

Flood depth grids 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>

Please note:

It is not possible to say for certain what the flood risk is but we use the best information available to provide an indication so that people can make informed choices about living with or managing the risks. The information we supply does not provide an indicator of flood risk at an individual property / site level.

The flood risk information provided on the attached map does not cover other sources of flooding such as from rivers and sea.

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 2016 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.



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](https://www.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.

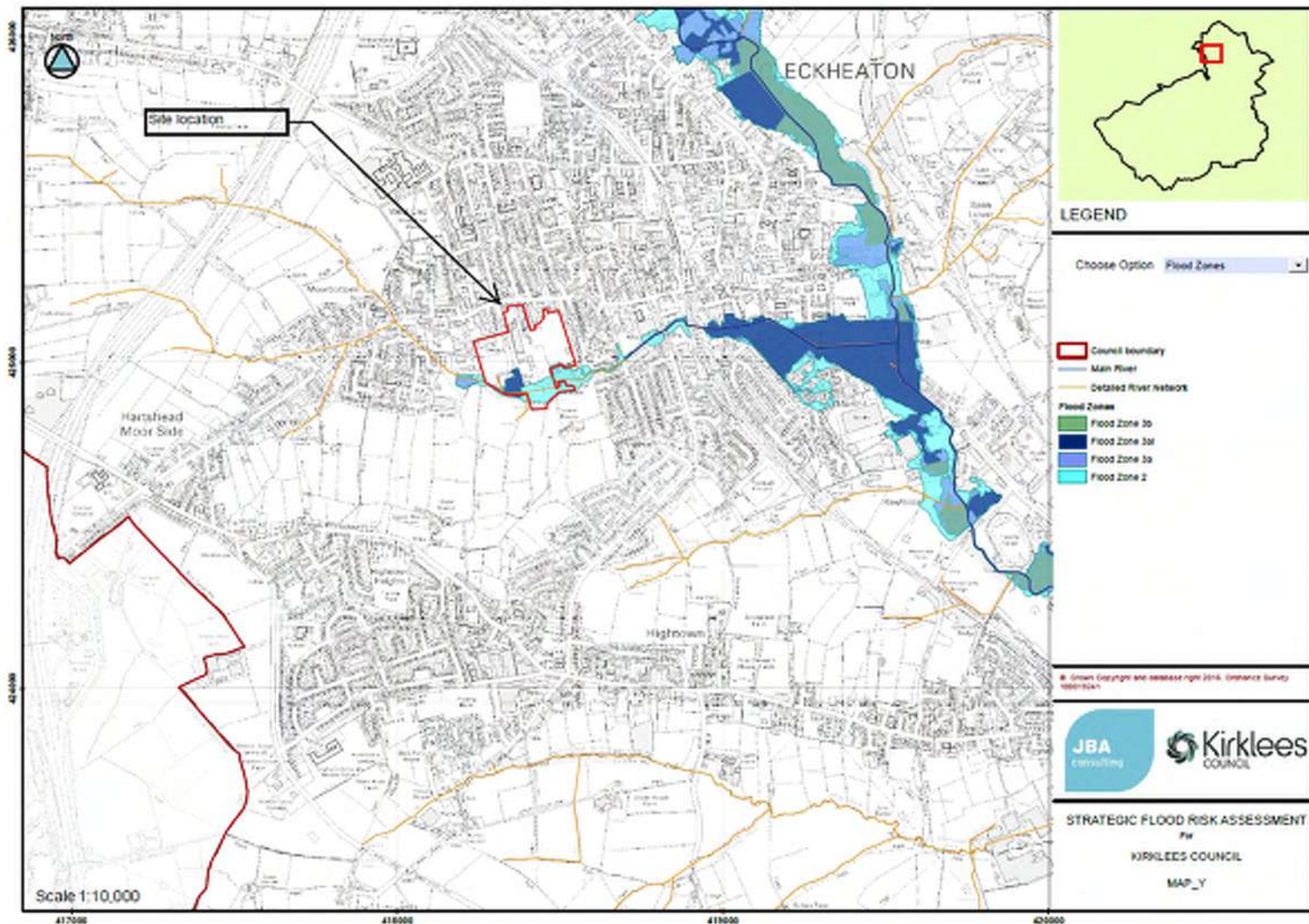
Who should I contact for further information?

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

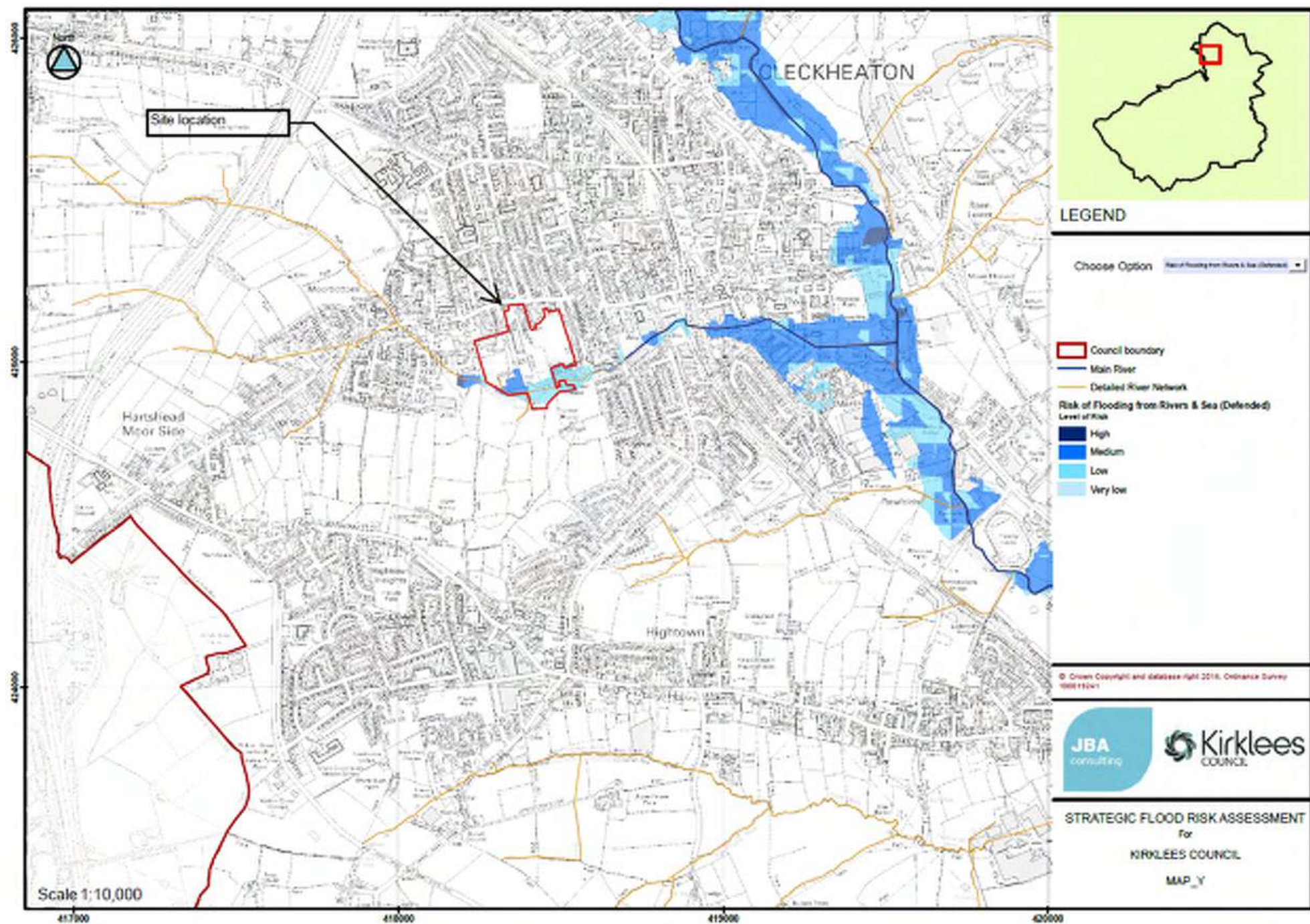
General enquiries: 03708 506 506

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

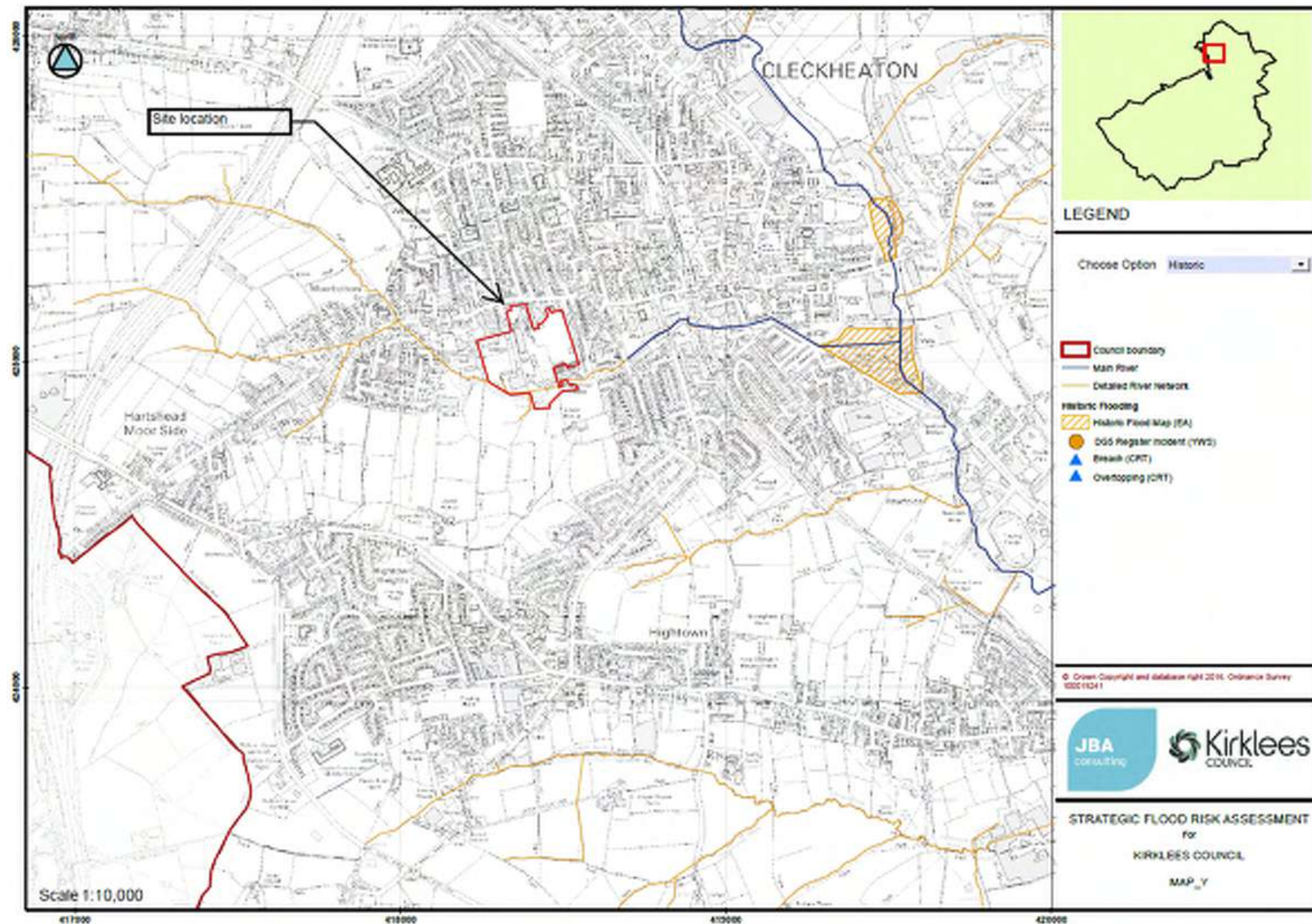
APPENDIX 5



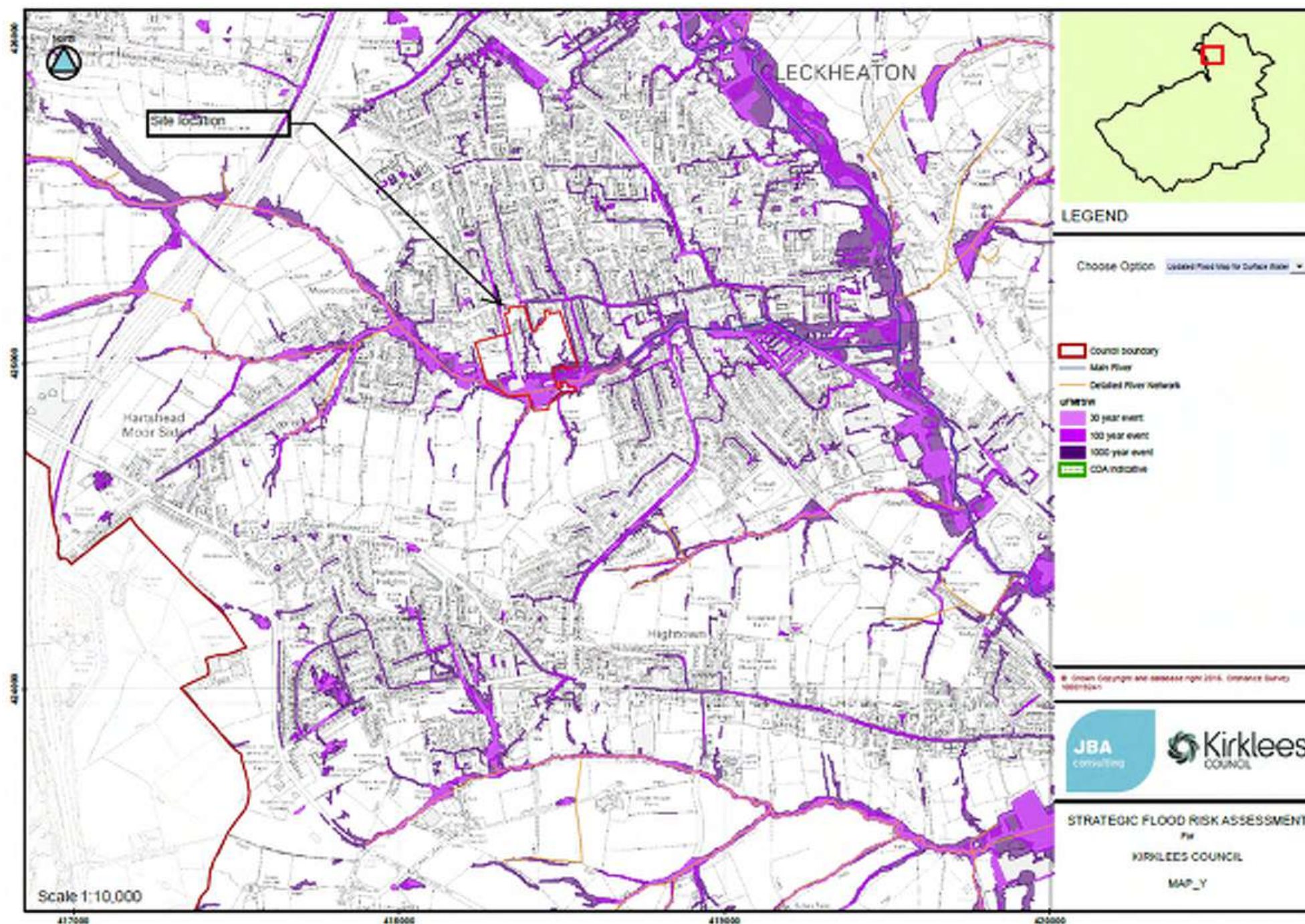
Kirklees Flood Map – Fluvial Flood Zones



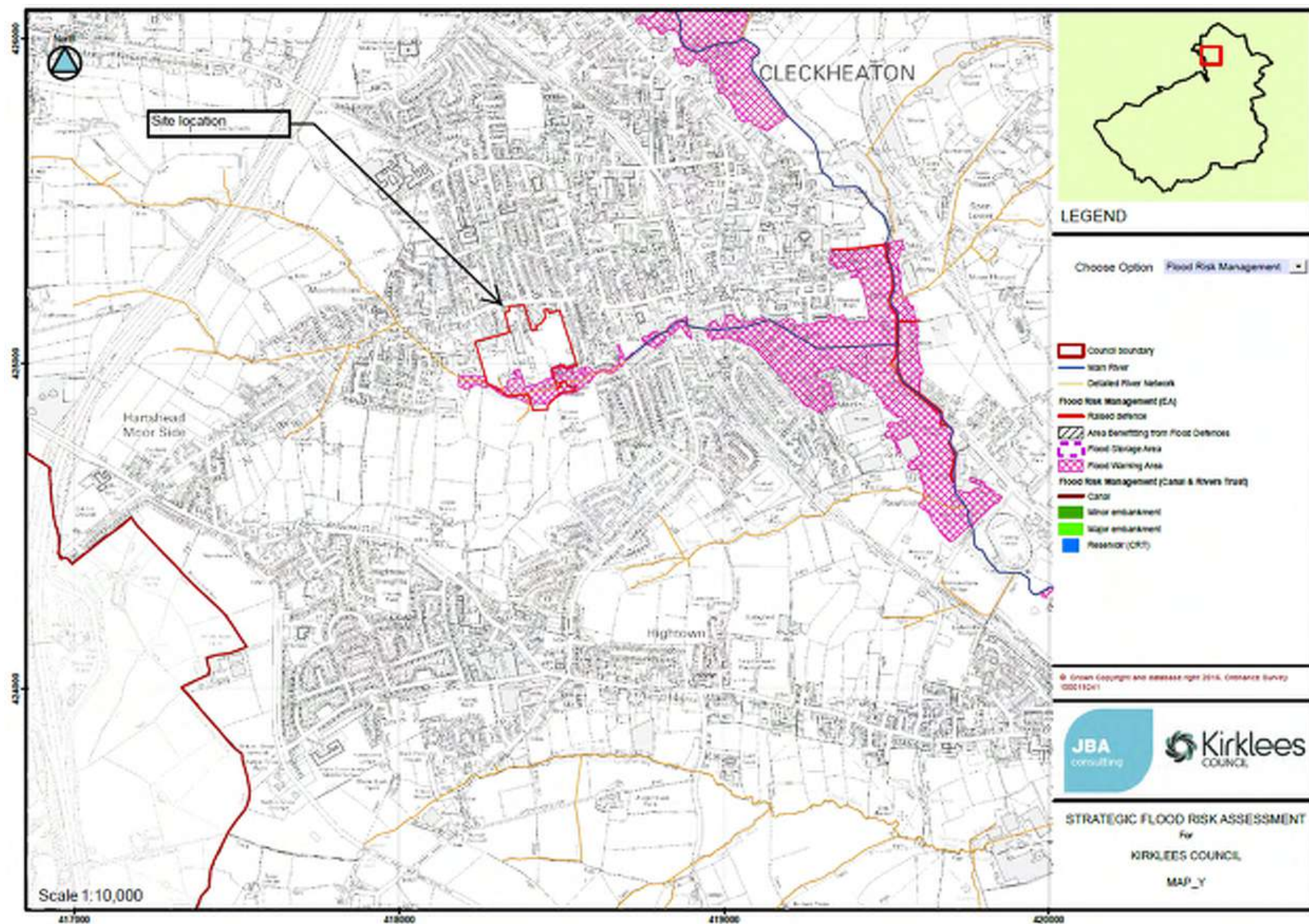
Kirklees Flood Map –Fluvial and Coastal Flooding



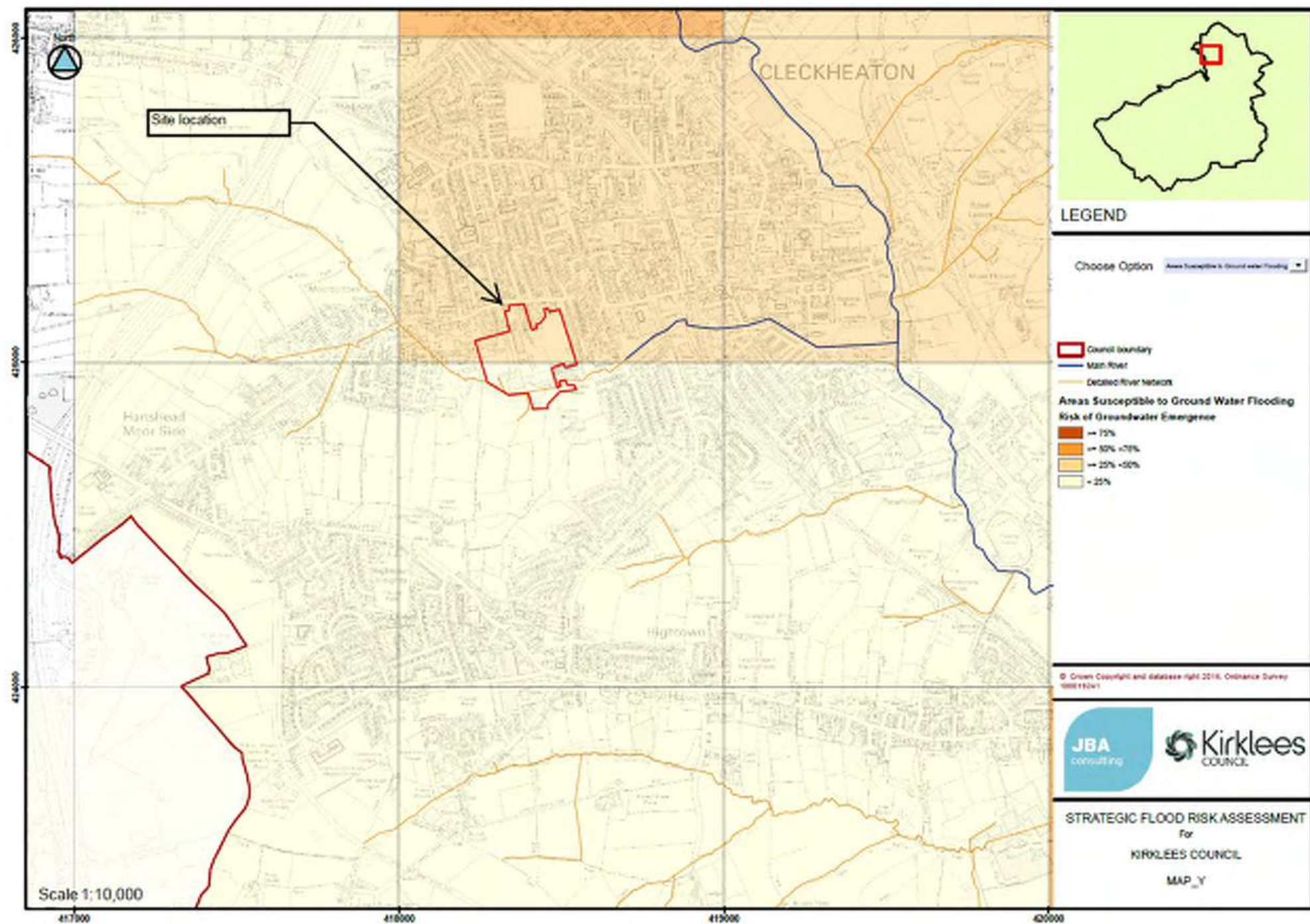
Kirklees Flood Map – Historic Flooding



Kirklees Flood Map – Surface Water Flooding



Kirklees Flood Map –Flood Risk Management



Kirklees Flood Map – Risk of Ground Water Emergence

daniel.alstead

From: matthew.elliott
Sent: 13 May 2011 12:31
To: daniel.alstead
Subject: FW: Westgate Cleackheaton

Regards

Matthew Elliott
Technical Director

Tel: +44 (0)113 2787111

.....

WYG Engineering Ltd. Registered in England number: 1959704. Registered Office: Arndale Court, Otley Road, Headingley, Leeds, West Yorkshire LS6 2UJ VAT No: 431-0326-08

From: matthew.elliott
Sent: 04 February 2011 12:09
To: tom.beavis
Cc: geoff.bowman
Subject: FW: Westgate Cleackheaton

Tom,

Please note: we now also have the surface water flood maps to deal with!

Regards

Matthew Elliott
Technical Director

Tel: +44 (0)113 2787111

.....

WYG Engineering Ltd. Registered in England number: 1959704. Registered Office: Arndale Court, Otley Road, Headingley, Leeds, West Yorkshire LS6 2UJ VAT No: 431-0326-08

From: Paul Farndale [mailto:Paul.Farndale@kirklees.gov.uk]
Sent: 04 February 2011 11:08
To: matthew.elliott
Cc: Bill Topping; 'gemma.snell@environment-agency.gov.uk'
Subject: Westgate Cleackheaton

Hello Matthew,

Further to our recent telephone conversations regarding alterations to flood zones in the vicinity of the site. I have spoken with Bill Topping and agreed that a full sequential test would be inappropriate in the case having considered the proportion of the site affected and the size of the site as a whole. This may

13/05/2011

not be the case for future applications.

In terms of adoption a sequential approach with the site layout, i.e. moving more vulnerable development to flood zone one, this should be a consideration in the application. This would be regarded as an option that may be available. The FRA would have to be updated to reflect the new situation and this would be the opportunity to justify this or alternative options for consideration as to how this risk could be avoided and if impractical, mitigated. I have copied Gemma Snell of the EA into this email as the Agency's viewpoint may differ.

Just to re-iterate, Kirklees Strategic Drainage would have expected to see a consideration of risk from flooding from the ordinary watercourse and the position of the houses at the southern end of the site as mentioned previously, regardless of Blacup Beck being modelled.

This area could be susceptible to surface water flooding and I have attached both the first generation (1 in 200year) and 2nd generation maps (1in 30 & 1 in 200) to illustrate potential surface water flooding. At the moment Kirklees are not treating these as definitive in terms of area and would generally bring in our knowledge of reported incidents in the past alongside. Given that there are no properties currently in this area it is unlikely that we would have received any reports regardless of flooding issues. For these maps simply read that there is a risk in this area as it is a low spot.

I am still in discussions with Tom Beavis over allowable discharge rates and I understand he is still waiting for a response from Yorkshire Water as to whether any discharge to the combined sewer will be permitted given the proof of previous positive discharges. Tom informed me that this was on hold while we sort out the flood zone issues.

If you have any further queries please don't hesitate to contact me.

Paul Farndale
Senior Engineer, Strategic Drainage
Investment & Regeneration Service
Kirklees Council
01484 225377

Jessica Stevenson-Steels

From: Paul Farndale <Paul.Farndale@kirklees.gov.uk> on behalf of Paul Farndale
Sent: 21 December 2020 14:56
To: Jessica Stevenson-Steels
Subject: RE: 45538: Westgate, Cleckheaton - Sequential test [Filed 04 Jan 2021 10:58]

Flag Status: Flagged

Hello Jessica,

Bill Topping is no longer with the planning department. If this site is allocated in the local plan then the sequential test is deemed to have passed. However this is on the basis that a sequential approach can be achieved where all housing and curtilage is located in flood zone 1.

If it isn't allocated and a sequential approach is promoted alongside an analysis of main river modelling that includes climate change allowance, then I do not see the need for a sequential test because the test and approach falls into the same concept of risk avoidance which must come before any consideration of mitigation. The latter only makes the site safe to an extent and the local plan has allocated housing with avoidance in mind.

Any promotion of housing in higher risk flood zones would therefore likely fail a test as it would be compared to those sites in the local plan and sites at lower risk will be developed first.

Kind regards,

Paul Farndale
Kirklees LLFA

From: Jessica Stevenson-Steels <Jessica.Stevenson-Steels@eastwoodandpartners.com>
Sent: 26 November 2020 14:23
To: Paul Farndale <Paul.Farndale@kirklees.gov.uk>
Subject: 45538: Westgate, Cleckheaton - Sequential test

Dear Sir,

FAO – Lead Local Flood Authority

I'm producing a Flood Risk Assessment and drainage strategy for a site off Westgate, Cleckheaton. (grid ref: 418374, 425036). Please see attached location plan.

The EA Flood Map for Planning identifies that the majority of the site lies within Flood Zone 1, with a small portion of the southern extent of the site around Blacup Beck in Flood Zone 2 and 3.
There has been correspondence with Kirklees council previously (email attached) regarding the need for a full sequential test given that the majority of the site lies within Flood Zone 1.

Please could you advise if this is still the case considering the small proportion of the site within Flood Zone 3 in comparison to the total site area.

Kind regards,

Jessica Stevenson-Steels

Environmental Engineer

Jessica Stevenson-Steels

From: Paul Farndale <Paul.Farndale@kirklees.gov.uk> on behalf of Paul Farndale
Sent: 21 December 2020 14:25
To: Jessica Stevenson-Steels
Subject: RE: 45538: Westgate, Cleckheaton- Discharge to watercourse [Filed 04 Jan 2021 09:02]

Flag Status: Flagged

Hello Jessica,

There have been pre-applications and applications on this site going back to 2010 in my time with the Council. The site has combined public sewers running from it serving an extended earlier layout of Stone Street and Iron Street. Some remaining buildings and roads discharge to this system. A lot of the area is scrubland and some remaining hardstanding just runs off into landscaped areas. It is unclear where the fronts of the buildings at the bottom drain to but I seem to remember a pipe sticking into Blacup Beck possibly serving the back of one of the buildings.

Quite frankly its in a bit of a state down there and most buildings have been demolished for some time.

On this basis rather than trading off whether some buildings have a direct discharge to Blacup beck and some to sewer it was previously agreed to be expedient and just look at a greenfield run off of 5l/s/ha for the whole site (developed proposed hardstanding only).

Given the size of the site we expect a sequential approach where all buildings are located in the lowest main river flood risk, zone 1. A small percentage of the land is in zone 2 and 3 at the south of the site. Please note one of these areas has a sub class of 3ai in our local plan. No housing can be built here due to Kirklees Policy. We would take the opportunity to avoid risk altogether and have the zone 2 as landscaped areas, certainly not houses or curtilage.

We expect Blacup Beck to be opened up where it is currently culverted. This is also Kirklees Policy.

Hope this helps.

Kind regards,

Paul Farndale
Kirklees LLFA

From: Jessica Stevenson-Steels <Jessica.Stevenson-Steels@eastwoodandpartners.com>
Sent: 17 November 2020 16:27
To: Paul Farndale <Paul.Farndale@kirklees.gov.uk>
Subject: 45538: Westgate, Cleckheaton- Discharge to watercourse

Dear Sir,

FAO – Lead Local Flood Authority

I'm producing a Flood Risk Assessment and drainage strategy for a site off Westgate, Cleckheaton. (grid ref: 418374, 425036). Please see attached location plan.

In order to manage the surface water discharge from the site, we are proposing an attenuated drainage system to Blacup Beck, south of the site.

Please could you advise on any discharge requirements or restrictions that we should be aware of.

In addition, I would appreciate if you could send any information you may hold on flooding for the area including historic records.

Kind regards,

Jessica Stevenson-Steels

Environmental Engineer



Eastwood & Partners (Consulting Engineers) Ltd is a company registered in England and Wales registered No 1835021.
Registered office: St Andrew's House, 23 Kingfield Road, Sheffield, S11 9AS
Web: www.eastwoodandpartners.com
Tel: 0114 255 4554

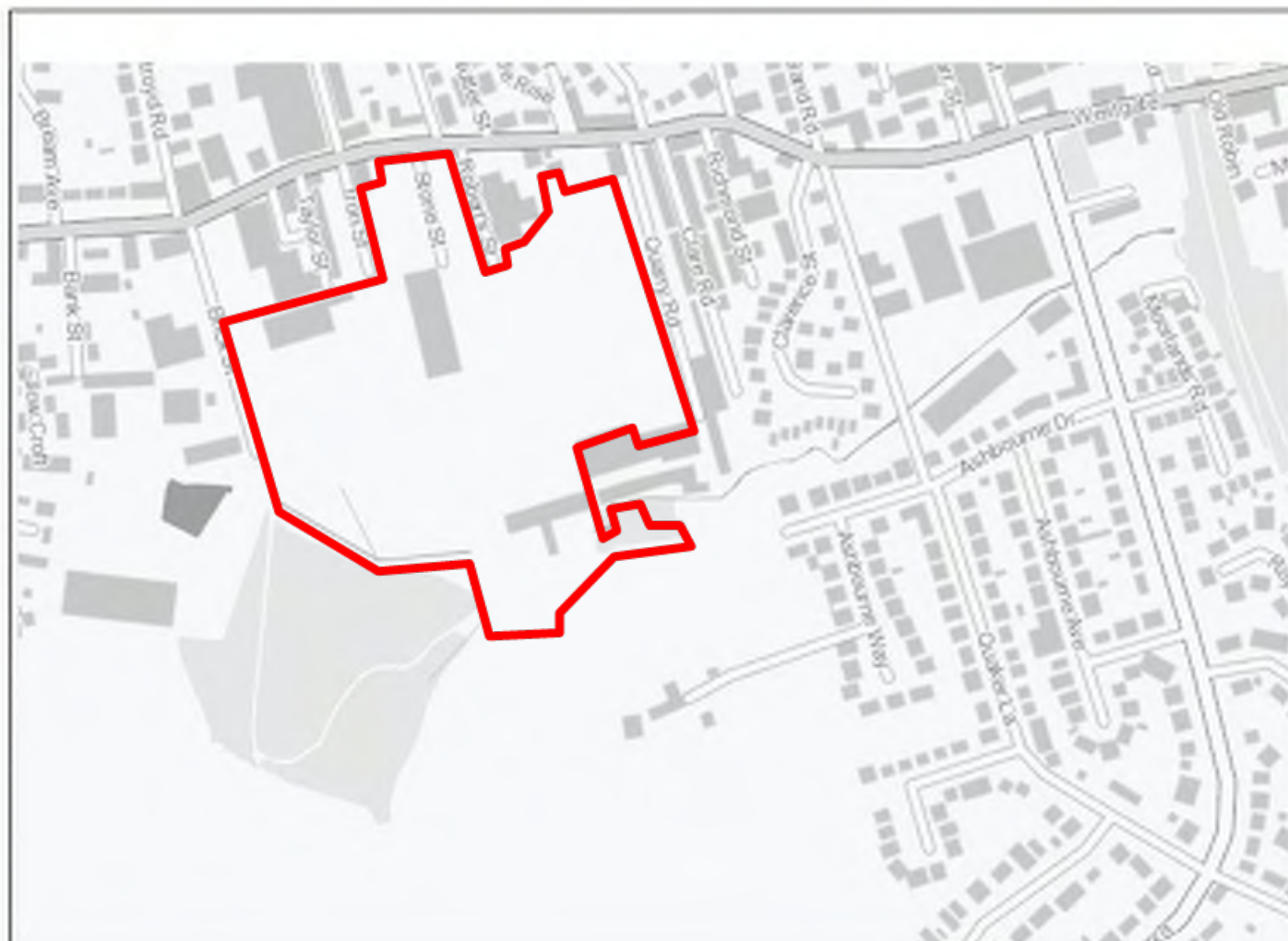
Email confidentiality notice: This message is private and confidential. If you have received this message in error, please notify us and remove it from your system.



[Website](#) | [News](#) | [Email Updates](#) | [Facebook](#) | [Twitter](#)

This email and any attachments are confidential. If you have received this email in error – please notify the sender immediately, delete it from your system, and do not use, copy or disclose the information in any way. Kirklees Council monitors all emails sent or received.

APPENDIX 6



Layer List

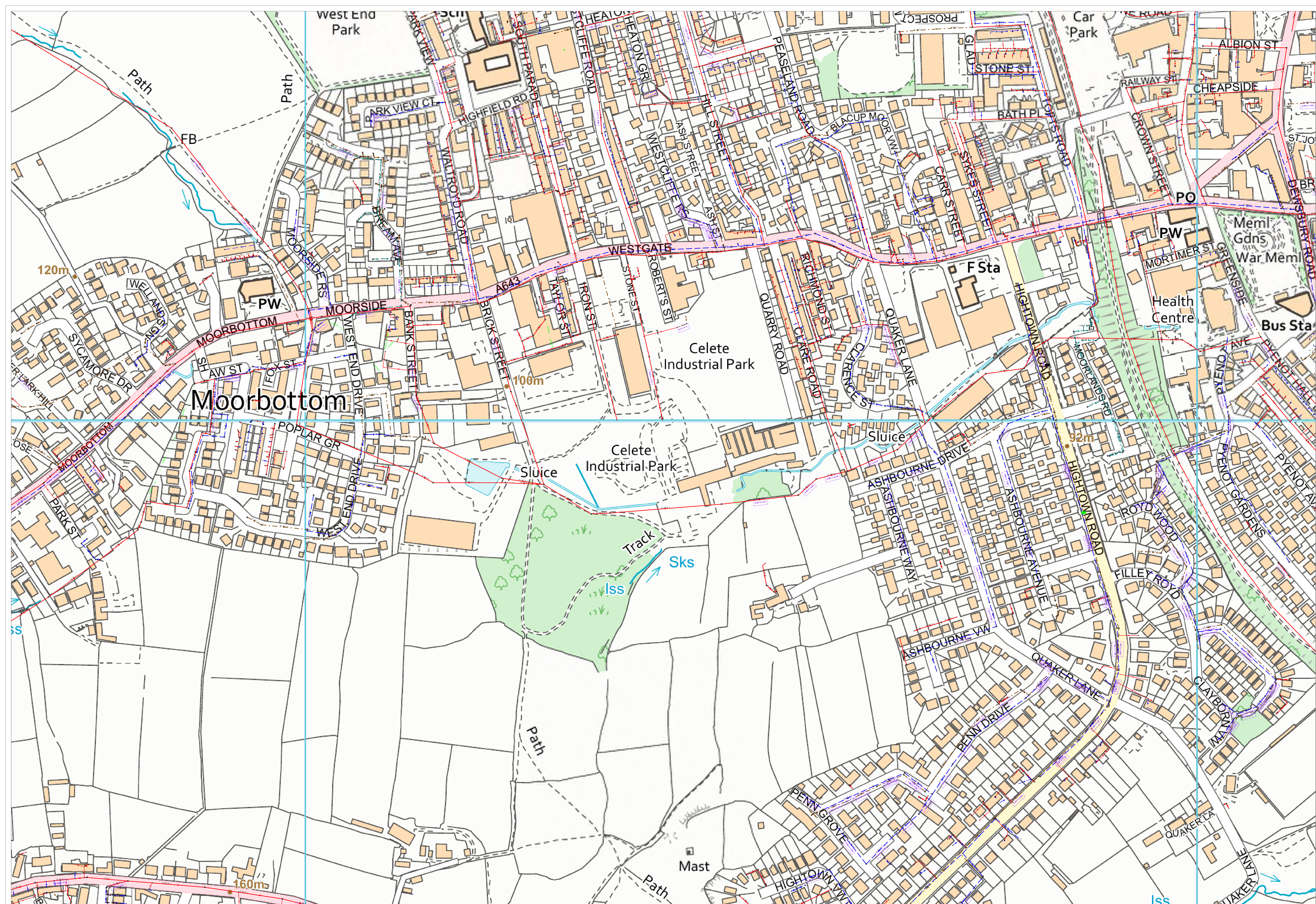
Operational layers

☒ HistoricFloodMap

☒ Historic_Flood_Map



APPENDIX 7



Ms J Stevenson-Steels
Eastwood & Partners
St Andrews House
23 Kingsfield Road
Sheffield
S11 9AS
jessica.stevenson-
steels@eastwoodandpartners.co
m

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

Tel: 0345 120 8482

Fax:

Email:
technical.sewerage@yorkshirewa
ter.co.uk

Your Ref:
Our Ref: W016675

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

14th December 2020

Dear Ms Stevenson-Steels,

Westgate, Cleckheaton, BD19 3NW – Pre-Planning Sewerage Enquiry
U058255 (RESIDENTIAL)

Thank you for your recent enquiry. Our charge of £157.00 will be added to your account with us, reference EPL039. You will receive an invoice for your account in due course.

Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records. The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:

Existing Infrastructure

There are minor combined and foul public sewers, a 150mm diameter public combined, 225mm diameter public foul and combined and a 450mm diameter combined public sewer recorded crossing the site. No buildings, or other obstructions, are to be erected within:

3 (three) metres of the 150/225mm diameter combined/foul sewer centre-lines

5 (five) metres is required at each side of the 450mm diameter combined public sewer centreline

There are a number of small diameter public sewer recorded crossing the site. In this instance, building-over may take place under the control of Part H4 Building Regulations 2000.

The partially mapped sewers are thought to discharge to the 450 mm public combined sewer to the south of the site and shown on the plan provided.

No trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer. If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0345 120 84 82.

(Please note:- due to the change in legislation on 01/10/2011 there may be public sewers within the site boundary which is not recorded on the Statutory Sewer Map the presence of which should be taken into account in the design of the scheme)

Foul Water

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

Foul water domestic waste should discharge to the 450 mm diameter public combined sewer recorded within the southern section of the site.

Foul water from kitchens and/or food preparation areas of any restaurants and/or canteens etc. must pass through a fat and grease trap of adequate design before any discharge to the public sewer network.

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

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.

It is understood that a watercourse (Blacup Beck) is located through the southern part of site. This appears to be the obvious place for surface water disposal (if SuDS are not viable).

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.

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

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement.

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

Yours sincerely

Chris Roberts
Development Services Technician

APPENDIX 8

SUDS Type	SUDS Technique	Description	Suitable	Comments
Source Control	Green roof	Vegetated roof that reduces runoff volume and rate	No	Expected planning requirement for traditional pitched roofs to match neighbouring housing.
	Rainwater harvesting/rainwater butts	Rainwater is stored and re-used	No	Individual storage tank capacity unlikely to meet volume required. Individual water butts can be used for garden watering.
	Permeable paving	Paving which allows inflow of rainwater into underlying construction/soil	Possible	May be suitable for private drives. Private permeable paving areas could provide limited infiltration within the underlying construction material.
Infiltration	Soakaway	Pit or trench which stores and disposes of water to the ground	No	Soakaway testing undertaken by LITHOS conclude that infiltration is not possible on site.
	Filter Drain	Trench which conveys and/or disposes of water to the ground.	No	
	Infiltration Basin	Shallow basin which stores and disposes of water to the ground	No	
Conveyance	Swale	Shallow vegetated depression which conducts and retains water	No	Difficulties of adoption and lack of space.
Detention	Subsurface storage	Traditional underground pipes, tank storage, or modular systems	Yes	Subsurface storage can be facilitated on site.
	Detention Basin	Normally dry but may have small permanent water pools at the inlet and outlet. They can function as POS	No	Poor infiltration rate due to deep impermeable bedrock resulting in residual water and siltation in the basin. Inefficient use of POS.
	Pond	Permanent body of water	Possible	This may be limited by a lack of suitable public open space.
	Wetland	Permanent body of shallow water or marsh	No	Lack of suitable public open space.



Storage Volumes:
Volumes based on 5l/s/ha discharge rate:
1 in 2 year = 430m³
1 in 30 year = 1020m³
1 in 100 year = 1450m³
1 in 100 year + 30% = 2065m³

INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.

NOTES

- All pipes shall be either:
A - PVC to have BSI kitemark status (certified to WIS 4-35-01 and to BS EN 13476) Wavin or similar approved. Maximum pipe length to be 3m. Plastic channel sections in manholes are not acceptable, clay channel sections shall be used.
Please note that where plastic pipes are installed into the ground prior to obtaining approval, then the Developer will have to provide a Light-line survey and report of the prospectively adoptable sewers, which will be at the Developer's expense.
OR
B - Vitrified clay to BS EN 295 with a minimum crushing strength as follows:-
150 dia. - 40 kN/m²
225 dia. - 45 kN/m²
300 dia. - 72 kN/m²
OR
C - Class 120 concrete to EN1916 /BS 5911-1: 2002.
- Pipes OF 675mmØ or greater shall be concrete conforming to be concrete class 120 to EN 1916/BS 5911-1: 2002.
- Where plastic pipes are proposed for adoptable sewers, structural calculations for the plastic pipes and a site investigation report to prove that the ground condition is suitable for the plastic pipes are to be produced.
- All pipes are to be laid soffit level at manholes unless noted otherwise.
- All adoptable sewer works and materials to be in accordance with "Sewers for Adoption" (6th edition), the relevant British/European standards and Yorkshire Water's standards/requirements/addendum to the Mechanical and Electrical specification and kitemarked.
- Manhole covers shall have a clear opening of 600 and shall be class D400 to BS EN 124 with 150 deep frames in highways. Covers to have closed keyways and are to be bedded on steel struts with 1:3 mortar haunching.
- Pipes entering manholes and road gullies shall have a flexible joint within 600 of the inside the manhole or gully joining with a short Rocker pipe.
- Plastic channel sections in manholes are not acceptable and clayware is preferable. Plastic channels are difficult to set in concrete and a satisfactory finish cannot be obtained on the bedding.
- The adoptable sewers should be a minimum of 1m and outside of manholes 0.5m from kerb faces and service margins.
- Sewers must have 5m clearance from trees and hedges (see also figure 2.3 on page 33 in "Sewers for Adoption" 6th edition for restrictions on tree planting adjacent to sewers).
- Sewers to be laid on a class 3 bedding (150mm granular bed and surround). Where depth of cover to top of sewer is less than 1.2m in highways and verges (or less than 0.9m in none vehicular access areas) then a concrete slab is to be provided above the granular bed and surround.
- All trenches in roads and paved areas shall be backfilled with Type 1 DOT granular sub-base material, or other granular material approved by the highway authority.
- Filled ground must be filled and consolidated under the supervision and to the satisfaction of Yorkshire Water before any sewer works are carried out.
- Sulphate resistant cement (C20/25) and precast concrete products must be used or a laboratory report provided proving that such precautions are not necessary.
- The chamber size of manholes with more than one connection in them may need to be increased by an increment to accommodate the connections and bends.
- Cover levels are indicative only. Covers to be set to suit camber/gradients of existing and proposed roads.
- Cover slabs must carry the BSI Kitemark or will be rejected by the Yorkshire Water inspector. Where the clear opening of the Kitemarked product is different to that of the cover and frame, a load bearing slab should be fitted above the cover slab to bring the size down to 600x600 for the Yorkshire Water specified cover size. Refer to CPSA Technical Bulletin issued autumn 2004 for Kitemarked cover slab opening sizes.
- Demarcation chambers to be a min. 450mmØ chamber for 150mmØ foul and surface water pipes up to 1.2m deep. For depths greater than 1.2m, restricted access opening to 350mm is required for health and safety reasons. The maximum depth of demarcation chamber to be 2.0m, where depth exceeds 2m, manhole to be constructed as a Type B manhole.
- Any connection into an existing Yorkshire Water Sewer should only be made following the submission of a completed application form and method statement for YW approval. This must be provided giving 21 days notice of the intention to connect to the public sewer.
- Any lateral connections to a storage tank or storage manhole should be connected above the 'springing level' or via a 'backdrop' into the manhole.
- Yorkshire Water is not obliged to accept filter drain/land drainage run-off into the public sewer network or adoptable drainage system (directly or indirectly). An alternative method of disposal of the land drainage run-off will therefore be required and you will have to liaise with the Local Authority, Land Drainage Section with regard to the disposal of the filter drain/land drainage run-off.
- Bedding and backfill material to conform to the requirement of Water Industry Specification 4-98-02 (Table A2).
- Yorkshire Water policy is not to accept Type "C" manholes ad 1050mm dia manhole rings. Instead it is preferred that you use a type "B" manhole with 1200mm dia or 1500mm dia rings, with the opening sited over the channel where depth of cover to pipe soffit is 1-1.5m.
- Where a B125 cover and frame has been approved, this must be kitemarked, ductile iron, must not be coated in plastic and must have lifting eyes suitable sized to accommodate standard lifting keys. Screw down covers are not acceptable.
- There should be enough clearance to accommodate the bedding for both pipes, approx 300mm - if crossover is near the rocker, then the clearance needed may be increased.

- ALL SEWERS TO BE 150mm DIAMETER UNLESS NOTED OTHERWISE
- SW SEWERS SHOULD BE TAKEN AS 1.5m DEEP UNLESS NOTED OTHERWISE
- FW SEWERS SHOULD BE TAKEN AS 1.9m DEEP UNLESS NOTED OTHERWISE
- ALLOWANCE SHOULD BE MADE FOR SOME PERMEABLE PAVING TO PRIVATE DRIVES
- OUTFALL CONSENTS REQUIRED FOR WORKS NEAR WATERCOURSE

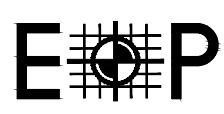
C	Updated to suit latest layout	DV	CH	12.05.21
B	Updated to suit latest layout	DV	CH	09.02.21
A	First Issue.			
REV	DESCRIPTION	SIG	CHK	DATE

STRATA HOMES

CLECKHEATON

DRAINAGE APPRAISAL

Eastwood & Partners
CONSULTING ENGINEERS



St. Andrew's House
23 Kingfield Road
Sheffield
S11 9AS
Tel 0114 255 4554
Fax 0114 255 4330

mail@eastwoodandpartners.com
www.eastwoodandpartners.com

SCALE WHEN PLOTTED AT A1			DRAWING STATUS		
1:500			PRELIMINARY		
DRAWN	CHECKED	DATE	DRAWING NUMBER	REV	
DV	CH	08.12.20	45538/002	C	

Project: Westgate Cleckheaton	Sheet	1.00
	Job No.	45538
Subject: Surface Water Drainage Storage Estimates	Date	27/11/2020
	Designed	JSS
	Checked	KBE
	Revision	A

Site Details :**Information From Wallingford Maps :**

Location :	Cleckheaton	M5-60	19.0 mm
Grid Ref :		r	0.35
		SAAR	900 mm
Total Site Area	6.460 ha	UCWI	97 (Fig. 9.7)
Deduct areas to soakaways	<u>0.000</u> ha	Soil Type	4
Effective Drainage Area	6.460 ha	SOIL	0.45 (Section 7.4)

Total Impermeable	3.876 ha	60% assumed impermeable area
Allow for Urban Creep	<u>0.000</u> ha	0%
Total Impermeable	3.876 ha	

PIMP	60.0%	
PR	<u>47.8</u>	Equation 7.3
Cv	0.80	Equation 7.21
Default Cv	0.84	Designer to insert to override calculated Cv

Design Return Period	100 Years	Max. Branch Length	350 metres
		Approx. Time of Flow	5.8 mins

Percentage Increase For Climate Change: **30%**

Details of Restricted Discharge :

Maximum Permitted Rate of Flow from the System	5.0 Litres/sec.ha
	Litres/sec
Assumed Average Flow as a Proportion (Estimate)	85 %
Average Rate of Flow	27.5 Litres/sec

Calculation of Critical Duration and Storage Volume Required :

Trial Durations (mins)	15	30	60	120	240	360	480
Average Point Intensity (mm/hr)	89.0	59.8	38.4	23.8	14.3	10.5	8.4
Volume of Run-off for the period = Area x Cv x i x D (m3)	724.6	974.3	1250.7	1550.6	1861.0	2052.1	2198.7
With climate change	942.0	1266.6	1625.9	2015.7	2419.3	2667.7	2858.3
Volume of Out-flow for the period = Ave. flow x (D+Tf)(m3)	34.3	59.0	108.4	207.3	405.0	602.6	800.3
Storage Volume for this Duration (m3)	907.7	1207.6	1517.4	1808.4	2014.4	2065.0	2058.0

Storage Volume Required for

100 Year Return Period = **2065.0 m³**
 Is this the worst case (ie. Critical Duration)? 1 (1 = Yes, 0 = No)



Eastwood and Partners
SK01: Impermeable and
greenfield area sketch

-  Greenfield areas
-  Impermeable areas

APPENDIX 9

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

Client: Leadsharp Ltd
 Job Name: Westgate, Cleckheaton
 Job No.: 1237



Trial Pit No.	TP1
Test No.	1

Time	Elpsed Time (min)	Depth to water form ground (m)	(mm)
	0	1.50	1500
	1	1.50	1500
	2	1.50	1500
	3	1.50	1500
	4	1.50	1500
	5	1.50	1500
	12	1.50	1500
	20	1.50	1500
	40	1.51	1510
	70	1.51	1510
	100	1.51	1510
	162	1.51	1510
	192	1.51	1510
			0
			0
			0
			0
			0
			0

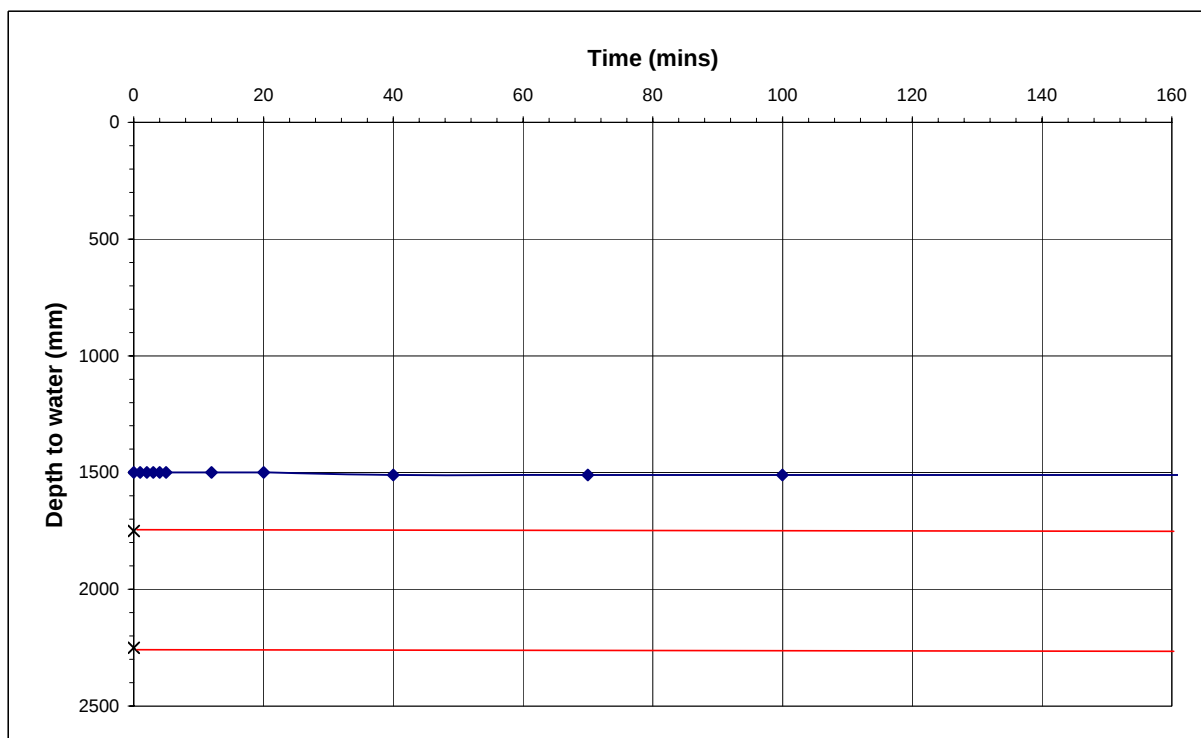
SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	1.60	1600
Width	=	0.30	300
Depth	=	2.50	2500

Effective Depth (% full)	mm	m
75% =	2250.0	2.25
50% =	2000.0	2.00
25% =	1750.0	1.75

Depth at start of test (mm)	=	1500
Depth at end of test (mm)	=	1510

Base area of pit	=	0.48
a_{p50} - 50% internal surface area inc. base	=	2.38
V_{p75-25} - Volume 75 - 25%	=	0.24

Read from the graph:	
t_{p75} (min)	=
t_{p25} (min)	=



Test did not attain 25 % Effective depth. Unable to calculate soil infiltration rate

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

Client: Leadsharp Ltd
 Job Name: Westgate, Cleckheaton
 Job No.: 1237



Trial Pit No.	TP2
Test No.	1

Time	Elpsed Time (min)	Depth to water form ground (m)	(mm)
	0	1.87	1870
	1	1.87	1870
	2	1.87	1870
	3	1.87	1870
	4	1.87	1870
	5	1.86	1860
	10	1.85	1850
	20	1.85	1850
	42	1.84	1840
	83	1.81	1810
	112	1.79	1790
	160	1.78	1780
	180	1.75	1750
			0
			0
			0
			0
			0
			0

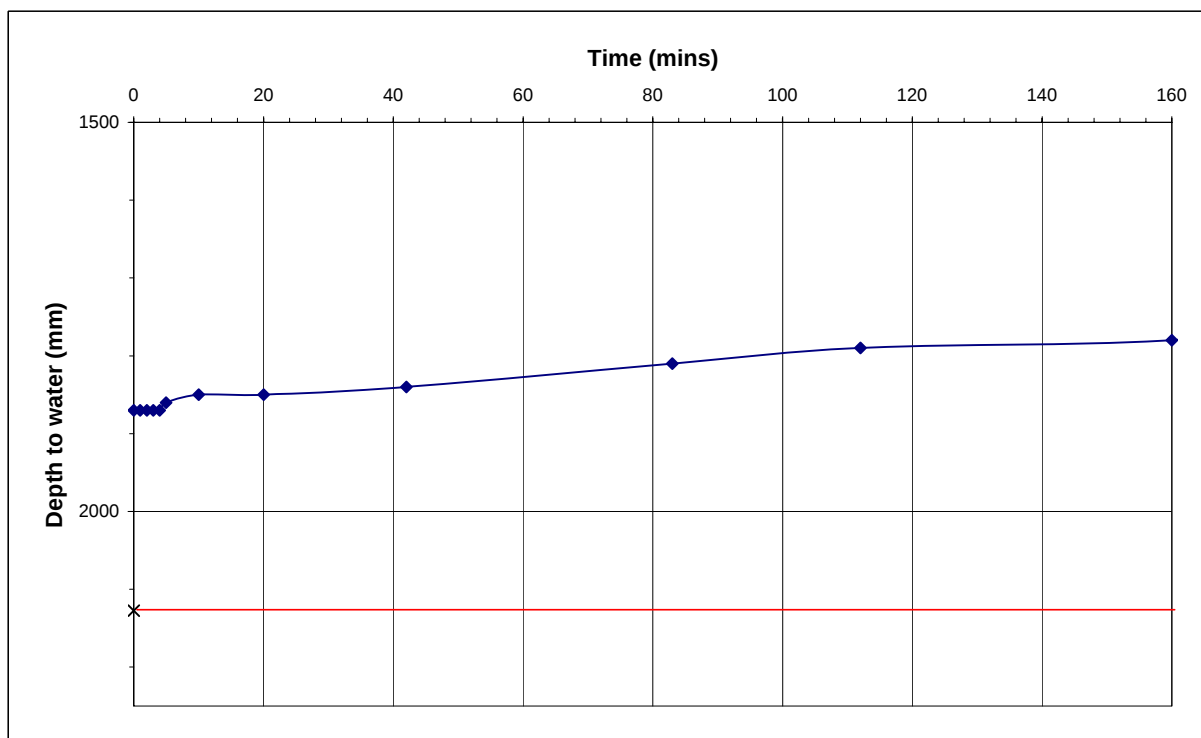
SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	1.90	1900
Width	=	0.30	300
Depth	=	2.90	2900

Effective Depth (% full)	mm	m
75% =	2642.5	2.64
50% =	2385.0	2.39
25% =	2127.5	2.13

Depth at start of test (mm)	=	1870
Depth at end of test (mm)	=	1870

Base area of pit	=	0.57
a_{p50} - 50% internal surface area inc. base	=	2.836
V_{p75-25} - Volume 75 - 25%	=	0.29355

Read from the graph:	
t_{p75} (min)	=
t_{p25} (min)	=



Test did not attain 25 % Effective depth. Unable to calculate soil infiltration rate

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

Client: Leadsharp Ltd
 Job Name: Westgate, Cleckheaton
 Job No.: 1237



Trial Pit No.	TP3
Test No.	1

Time	Elpsed Time (min)	Depth to water form ground (m)	(mm)
	0	2.03	2030
	1	2.03	2030
	2	2.01	2010
	3	2.01	2010
	4	2.00	2000
	5	2.00	2000
	10	1.98	1980
	15	1.90	1900
	35	1.82	1820
	65	1.73	1730
	125	1.60	1600
			0
			0
			0
			0
			0
			0
			0
			0

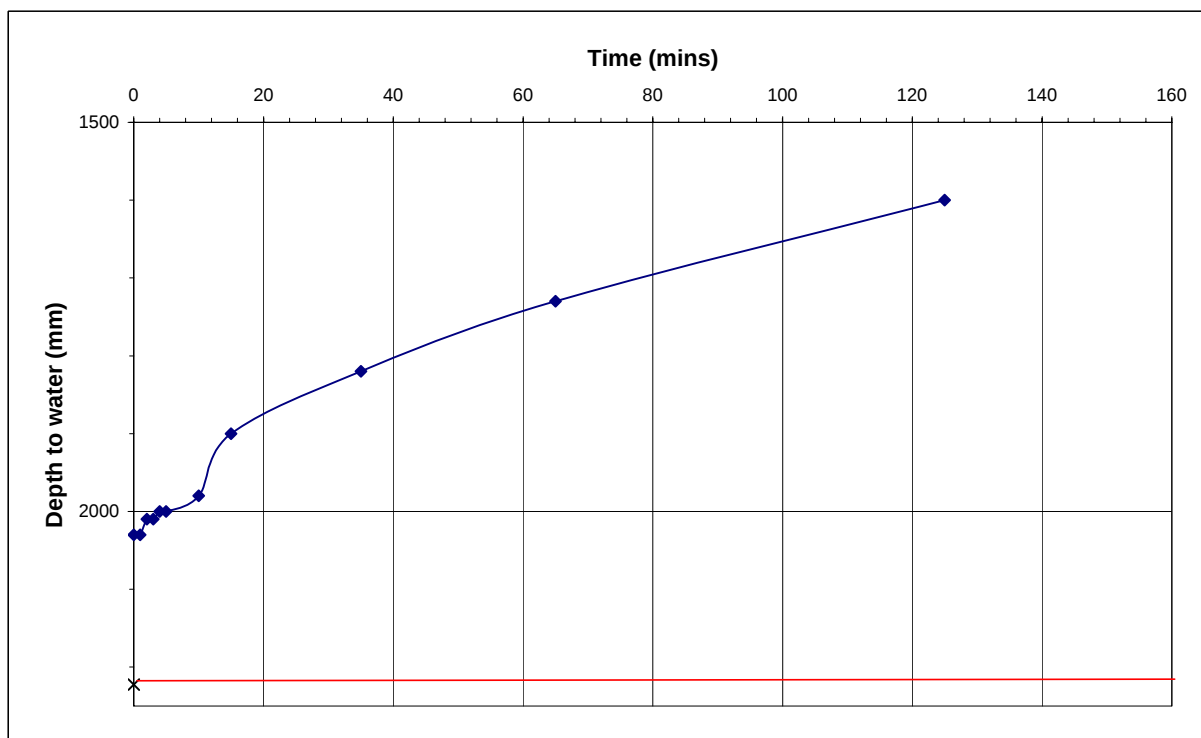
SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	2.10	2100
Width	=	0.30	300
Depth	=	2.80	2800

Effective Depth (% full)	mm	m
75% =	2607.5	2.61
50% =	2415.0	2.42
25% =	2222.5	2.22

Depth at start of test (mm)	=	2030
Depth at end of test (mm)	=	2030

Base area of pit	=	0.63
a_{p50} - 50% internal surface area inc. base	=	2.478
V_{p75-25} - Volume 75 - 25%	=	0.24255

Read from the graph:	
t_{p75} (min)	=
t_{p25} (min)	=



Test did not attain 25 % Effective depth. Unable to calculate soil infiltration rate