

Preliminary Flood Risk Assessment

03 May 2023

Muhammad Arshad Naz

Land adjoined to 1 Dewhurst Road, Huddersfield, HD2 1BW

Report by Mr Louis Turner BSc (Hons)

Supervised by Mr Joseph Turner

CONTENTS

1. Introduction

- 1.1 Project Overview
- 1.2 Purpose of Investigation
- 1.3 Scope of Work
- 1.4 Limitations

2. Site

- 2.1 Site Description and Location
- 2.2 Proposed Development
- 2.3 Vulnerability Classification
- 2.4 Sequential Test

3. Initial Conceptual Site Model

- 3.1 Potential Flood Sources
- 3.2 Potential Flood Receptors
- 3.3 Potential Flood Pathways
- 3.4 Risk Assessment Methodology
- 3.5 Conceptual Site Model

4. Conclusions

- 4.1 Risk Evaluation
- 4.2 Existing Flood Mitigation Measures
- 4.3 Proposed Flood Mitigation Measures
- 4.4 Surface Water Management
- 4.5 Safe Access and Egress
- 4.6 Exception Test
- 4.7 Further Investigation

5. References

1. Introduction

The following document is a Preliminary Flood Risk Assessment carried out by Oakshire Environmental, and includes details of the site, vulnerability classification, flood linkages and an evaluation of risk.

1.1 Project Overview

The client's proposed project involves the erection of a residential dwelling and associated work on land adjoined to 1 Dewhurst Road, Huddersfield, HD2 1BW. Oakshire Environmental have carried out a Preliminary Flood Risk Assessment as described below.

1.2 Purpose of Investigation

The objectives of the Preliminary Flood Risk Assessment were to:

- Develop a detailed assessment of the site.
- Apply the Sequential Test and Exception Test.
- Identify potential flood sources, receptors and pathways at the site.
- Assess the level of potential flood risk.
- Determine the requirement or scope of further investigations or mitigation measures.

1.3 Scope of Work

- Brief introductory information has been noted to provide context to the report and include an Introduction, Project Overview, Scope of Work and Limitations.
- To develop a detailed assessment of the site and apply the Sequential Test and Exception Test, desk studies have been carried out to collate information obtained from sources including the Environment Agency, Local & National Authorities, Strategic Flood Risk Assessments and Digital Terrain Model (DTM) LiDAR topographical surveys.
- This information has been used to identify potential flood sources, receptors and pathways at the site, as part of an initial Conceptual Site Model.
- To assess the level of potential flood risk, a Conceptual Site Model have been produced to categorise the potential severity of the impact of the flood linkage on the receptor and the probability of the flood linkage being present.
- Following the assessment of flood linkages, an evaluation of flood risk, mitigation measures, surface water management and safe access and egress has been conducted to determine the requirement or scope of further investigations.
- Supporting appendix include photographs, maps, and plans of the site.

1.4 Limitations

Quantum Intelligent Trading Ltd is previously and hereafter referred to as “Oakshire Environmental” or “the company”. Oakshire Environmental has exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant when undertaking works of this nature. This report is only valid when used in its entirety and any information or advice contained within the report should not be relied upon until considered in the context of the whole report. Oakshire Environmental disclaims any responsibility to the client, as named on the front of this report (“the client”), and others in respect of any matters outside the scope of this work. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate. This report has been prepared solely for the benefit of the client and any other party using or placing reliance upon any information contained in this report does so at their own risk. Oakshire Environmental accepts no responsibility or liability for the contents of this report being used for any purpose or project for which it was not commissioned. Oakshire Environmental accepts no liability whatsoever for any loss or damage arising from the interpretation or use of this report and in no event shall the company be liable for any punitive, exemplary or other special damages, or for any indirect, incidental or consequential damages, including with respect to the performance or non-performance of any services, whether arising under breach of contract, tort or any other legal theory, and regardless of whether the company has been advised of, knew of, or should have known of the possibility of such damages. Furthermore, Oakshire Environmental does not accept any liability for the consequences of any legislative changes or the release of subsequent guidance documentation and following delivery of the report has no obligation to advise the client or any other party of such changes or their repercussions.

This report excludes consideration of potential hazards arising from any activities at the site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities. Oakshire Environmental does not warrant or guarantee that the site is free of hazardous or potentially hazardous materials or conditions. It should be noted that this report has been produced for environmental purposes only.

2. Site

The following section provides a description of the site, location, proposed development and vulnerability classification, utilising information obtained from the client and publicly available sources.

2.1 Site Description and Location

The site is located on Dewhurst Road in Huddersfield and is approximately 0.03ha. The site is comprised of a vacant plot of grass currently within the residential curtilage of the neighbouring property to the east. A topographic survey of the site undertaken by Landtech Surveys in October 2021 shows that ground levels across the site are between 73.92m and 74.65m AOD, slightly sloping from north to south.

The site is bordered by Dewhurst Road to the north with residential dwellings beyond and additional residential dwellings to the east, south and west. The surrounding area is predominantly residential.

Blackhouse Dike is culvert 17m south west of the site and is a tributary of the River Colne which is situated 425m south east. The site is situated within Flood Zone 3 of the 'Flood map for planning', which means that the land has a high probability of flooding (>1% annual probability of river flooding).

Easting/Northing: 414952/418722

2.2 Proposed Development

The proposed development involves the construction of a two-storey residential dwelling.

2.3 Vulnerability Classification

Table 2 in the NPPF technical guidance (Flood Risk Vulnerability Classification) assesses the flood risk vulnerability of a site based on the site's use. Based on this assessment, the proposed residential development falls within the category of 'more vulnerable'.

The flood map for planning indicates that the site falls within Flood Zone 3 and the Calder Catchment (Kirklees Council) Strategic Flood Risk Assessment (SFRA) shows that this area of Flood Zone 3 is not denoted as functional floodplain (Flood Zone 3b). As part of the SFRA, a further indicative flood zone was delineated called Flood Zone 3ai. Flood Zone 3ai includes developed land with the same level of risk as Flood Zone 3b where water would flow or be stored in times of flooding if not already constrained by development. The site is also shown to be outside of this flood zone.

The Sequential Test is required for new residential dwellings in Flood Zone 3a so this will be carried out and 'more vulnerable' developments are permitted in Flood Zone 3a provided the Exception Test is passed so this will also be carried out.

It should be noted that these Flood Zones do not take into account the impact of any flood defences or site specific mitigation measures.

Table 1: Flood Risk Vulnerability Classification table from National Planning Policy Framework Technical Guidance

Flood Risk Vulnerability Classification					
Flood Zones	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	•	•	•	•	•
Zone 2	•	Exception Test required	•	•	•
Zone 3a	Exception Test required	x	Exception Test required	•	•
Zone 3b	Exception Test required	x	x	x	•

Key: • Development is appropriate
 x Development should not be permitted

2.4 Sequential Test

An appraisal of the Kirklees Local Plan - Allocations and Designations report (2019), which includes sites on the Kirklees Brownfield Land Register, has been conducted to identify potential alternative sites for the proposed development. The Ashbrow ward has been selected as an appropriate search radius due to the small scale of the proposed development. 8 sites were identified in the area, which will be reviewed with respect to the proposed residential development to determine their suitability.

Table 2: Sequential Assessment of sites outlined in the Kirklees Local Plan

Availability Assessment		
Site Location	Size (ha)	Comments
Land west of Lower Quarry Road, Bradley	0.87	<p>Site is within Flood Zone 2</p> <p>Potential contamination from railway and adjacent industrial estate</p> <p>Site is within an Air Quality Management Area</p> <p>Noise source near site - Noise from road and rail traffic</p> <p>Power lines cross the site</p>
Land north of Bradley Road, Bradley	68.34	<p>Site is far too large for the proposed single dwelling development</p> <p>Potentially contaminated land and source of odour due to landfill to the north east</p> <p>Part/all of site is within High Risk Coal Referral area</p> <p>Power lines cross the site</p>
Land north and west of Gernhill Avenue, Fixby	10.79	<p>Site is far too large for the proposed single dwelling development</p> <p>Public rights of way cross the site</p> <p>Noise source near site - Noise from road traffic on M62 and Clough Lane</p>
Land to the east of Netheroyd Hill Road, Cowcliffe	1.99	<p>Site is far too large for the proposed single dwelling development</p> <p>Surface water flood risk across the site and drainage will have implications for flood risk downstream along Allison Dike</p> <p>Potential contamination risk</p> <p>Public rights of way cross the site</p>
Land north of Ashbrow Road, Brackenhall	4.65	<p>Site is far too large for the proposed single dwelling development</p> <p>Site is already being developed</p>
Land north of Flint Street, Fartown	1.29	<p>Site is far too large for the proposed single dwelling development</p> <p>Site is within Flood Zone 2 and also at risk of surface water flooding</p> <p>Potentially contaminated land due to existing commercial developments</p> <p>Noise source near site - Noise from road traffic on Bradford Road and Alder Street and depots</p> <p>Potentially contaminated land</p> <p>Odour source near site - Odour from restaurant/takeaways on Bradford Road</p> <p>Part/all of the site is within High Risk Coal Referral area</p>
Land south of St Thomas Gardens, Bradley	0.95	<p>Part/all of site is within a High Risk Coal Referral area</p> <p>A main sewer crosses this site</p> <p>Replacement of existing multi use games area with a single dwelling would not be appropriate</p>
Land north of Deighton Road	2.52	<p>Site is far too large for the proposed single dwelling development</p> <p>Noise source near site - Noise from road traffic on Deighton Road and adjacent school and playing fields</p> <p>Site affected by hazardous installations - Located in Middle/Outer Zone for Syngenta</p> <p>Potentially contaminated land</p> <p>Part/all of site is within a High Risk Coal Referral area</p> <p>Public rights of way to north and west of the site</p>

An assessment of all 8 allocated sites identified a number of constraints, therefore, none of these are considered to be suitable than the proposed development site.

A review of land for sale in the ward was also carried out based on land currently marketed on RightMove.

Table 3: Sequential Assessment of land currently for sale

Land for sale		
Site Location	Size (ha)	Comments
Red Doles Road, Fartown	0.03	Site is within Flood Zone 3a and 3ai Access road also in Flood Zone 3ai, likely to impact safe access and egress Site and access road also at high risk of surface water flooding

One site was identified and this is at higher risk of flooding than the proposed development site and is, therefore, not suitable.

As a result, there are considered to be no reasonably available sites within the search area that would be more suitable for the proposed development and the Sequential Test has been passed.

3. Initial Conceptual Site Model

The following section outlines potential flood sources, pathways and receptors, utilising information gathered in the previous sections, to develop an initial conceptual site model.

3.1 Potential Flood Sources

Rivers & Seas

The site is situated 17m north east of Blackhouse Dike which flows NW-SE beneath the residential area and eventually discharges into the River Colne to the south east. The site is considered to be at risk of flooding in a 1% AEP event and borders an area at risk of flooding in a 5% AEP event.

1D in-channel modelled flood levels are available for Blackhouse Dike, therefore, the nearest upstream node should be used to identify the 1% AEP flood level for the site. In this instance, however, there is a significant difference in ground levels between the two nearest node points, which are located at the upstream and downstream ends of the culvert, and the site. As a result, the modelled flood levels at these nodes are not considered to be representative of flood levels on the site and will not be used to determine the 1% AEP flood level at the site.

Alternatively, the Environment Agency's Huddersfield Data Improvements Project mapping can be used to identify flood levels at the site. These maps include the modelled flood depth, velocity and hazard for the 1% AEP event, with a 20% allowance for climate change, and the 0.1% AEP event. In a 0.1% AEP event, the flood depth at the south of the site is shown to be between 0.3m and 0.6m while the depth at the north would be less than 0.3m. Based on ground levels across the site, the maximum flood level in a 0.1% AEP event is unlikely to exceed 74.95mAOD.

There are flood defences along both banks of Blackhouse Dike at each end of the culvert in the form of high ground offering a design standard of protection of 20 years. Environment Agency data shows that the site and the surrounding area has not previously flooded.

Surface Water

Surface water runoff is caused by heavy rainfall that can overwhelm the drainage network. The Environment Agency Risk of Flooding from Surface Water mapping can be used to identify areas at risk of surface water flooding. Map data shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys and can pond in low-lying areas. The risk is most often confined to roads with some run-off flow routes around properties.

Environment Agency maps show that the south of the site is at low risk of surface water flooding while there is a high risk of flooding along Dewhurst Road to the north. No flooding is anticipated on the site in a 1% AEP event and flood depths are unlikely to exceed 0.3m along Dewhurst Road suggesting a low risk to the proposed development.

Groundwater

Flooding from groundwater can occur when the water table rises and reaches ground level allowing water to seep through to the surface. This means that water may rise up through floors or underground rooms such as cellars or basements. Groundwater flooding is much slower to occur than river flooding and will usually happen days, weeks or even months after heavy or prolonged rainfall. And it may last weeks or even months.

The underlying Stanningley Rock Sandstone bedrock and the nearby Pennine Lower Coal Measures are both Secondary A aquifers. Mapping from the Kirklees SFRA indicates the site to lie within a 1km grid square where between 25% and 50% of the land is susceptible to groundwater flooding. A nearby borehole completed to a depth of 3.8m below ground level identified no groundwater suggesting that shallow groundwater is unlikely to be present within the underlying bedrock and there will also be no large-scale below-ground structures at the site that would be vulnerable to shallow groundwater.

Sewers

Sewer flooding occurs when heavy rainfall and flooding overloads sewer capacity or when sewers cannot discharge to watercourses due to high water levels. Sewer flooding can also be caused by blockages, collapses, equipment failure or groundwater leaking into sewer pipes. Sewer flooding is often synonymous with other sources of flooding such as river, surface water and groundwater flooding.

Historic sewer flood incidents from Yorkshire Water's DG5 Register are shown in the Kirklees SFRA and shows that there are no incidents at the site or in the surrounding area. While this does not mean sewer flooding will not occur in the future, it suggests that the area is not susceptible to sewer flooding.

Reservoirs

The level and standard of inspection and maintenance required for reservoirs means that the risk of flooding from reservoirs is generally very low. There are no reservoirs close to the site and Environment Agency mapping shows there to be a minimal risk to the site in the event that a reservoir were to fail or overtop.

Climate Change

Climate change projections show an increased chance of warmer, wetter winters and hotter, drier summers with a higher likelihood of more frequent and intense rainfall. This is likely to make severe flooding happen more often. It is necessary to ensure that a development will be safe from flooding for its lifetime, which is generally considered to be 100 years for a residential development. Environment Agency guidance recommends that the impacts of climate change on peak river flow are assessed based on management catchments and recommends the use of the 'central' allowances for more vulnerable developments. To assess the impacts of climate change on peak rainfall intensity in large rural catchments the peak river flow allowances should also be used. The central climate change allowance for the 2080s in the Aire and Calder management catchment is 11%.

Modelling of the 1% AEP flood extent, with a 20% allowance for climate change, has been carried out as part of the Huddersfield Data Improvements Project. This shows that flood depths at the site would be less than 0.3m and the flood hazard across most of the site would be low, with small patches of moderate risk at the south. Based on ground levels across the site, flood depths at the north, where the proposed dwelling will be situated, are likely to be very low and the maximum flood level in a 1% AEP event, including an allowance for climate change, is unlikely to exceed 74.65mAOD.

Surface water modelling, taking into account climate change, has not been carried out for the site. In the absence of such modelling, the modelled 0.1% AEP flood event can be used as a proxy. Based on this, the south of the site is at risk of surface water flooding, taking into account climate change, to a depth of 0.3m in most areas, with the exception of the south west corner which may flood to a depth of up to 0.9m.

3.2 Potential Flood Receptors

Given the proposed use of the site, the following receptors are considered:

- Residential end users
- Proposed dwelling

3.3 Potential Flood Pathways

Based on the expected on-site receptors, relevant pathways for the above receptors include:

- Blackhouse Dike
- Surface water along Dewhurst Road
- Permeable underlying bedrock
- Local sewers
- Surface water at the south of the site

Pathways between off-site sources and off-site receptors is beyond the scope of this assessment.

3.4 Risk Assessment Methodology

The potential level of risk posed by a particular source is determined by assessing the potential severity of the impact of the flood linkage on the receptor, if it is assumed to be present, and the probability of the flood linkage being present.

Severities are categorised from Minor to Severe and probabilities are categorised from Unlikely to High Likelihood to give a potential level of risk output.

Table 3: Risk Matrix

Probability	Severity of Consequence			
	Severe	Medium	Mild	Minor
High Likelihood	Very High Risk	High Risk	Moderate Risk	Low / Moderate Risk
Likely	High Risk	Moderate Risk	Low / Moderate Risk	Low Risk
Low Likelihood	Moderate Risk	Low / Moderate Risk	Low Risk	Very Low Risk
Unlikely	Low / Moderate Risk	Low Risk	Very Low Risk	Very Low Risk

Very High Risk

There is a high probability that severe harm could arise to a designated receptor from an identified source; or there is evidence that severe harm to a designated receptor is currently happening.

High Risk

Harm is likely to arise to a designated receptor from an identified source.

Moderate Risk

It is possible that harm could arise to a designated receptor from an identified source. It is relatively unlikely that any such harm would be severe or if any harm were to occur it is more likely that the harm would be relatively mild.

Low Risk

It is possible that harm could arise to a designated receptor from an identified source, however, it is likely that this harm, if realised, would normally be mild.

Very Low Risk

There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

3.5 Conceptual Site Model

The information in this section has been compiled to produce an initial conceptual site model outlining the potential sources, pathways and receptors to consider at the site. The level of risk was categorised by considering the severity and probability, as outlined in the previous section.

Table 4: Conceptual site model

Sources	Pathways	Receptors	Severity	Probability	Potential Level of Risk
Fluvial Flooding	Blackhouse Dike	Residential end users Proposed dwelling	Mild	Low Likelihood	Low The Environment Agency's Huddersfield Data Improvements Project mapping shows that, in a 0.1% AEP event, the flood depth at the south of the site is shown to be between 0.3m and 0.6m while the depth at the north would be less than 0.3m. Based on ground levels across the site, the maximum flood level in a 0.1% AEP event is unlikely to exceed 74.95mAOD.
Surface Water Flooding	Surface water along Dewhurst Road		Mild	Unlikely	Very Low No flooding is anticipated on the site in a 1% AEP event and flood depths are unlikely to exceed 0.3m along Dewhurst Road suggesting a low risk to the proposed development.
Groundwater Flooding	Permeable underlying geology		Mild	Unlikely	Very Low Mapping from the Kirklees SFRA indicates the site is of low to moderate susceptibility to groundwater flooding and a nearby borehole completed to a depth of 3.8m below ground level identified no groundwater suggesting that shallow groundwater is unlikely to be present within the underlying bedrock. Furthermore, there will also be no large-scale below-ground structures at the site that would be vulnerable to shallow groundwater suggesting a low risk to the proposed development.
Sewer Flooding	Local sewers		Mild	Low Likelihood	Low The Kirklees SFRA shows that there are no historic sewer flood incidents from Yorkshire Water's DG5 Register at the site or in the surrounding area. While this does not mean sewer flooding will not occur in the future, it suggests that the area is not susceptible to sewer flooding.
Climate Change	Blackhouse Dike		Mild	Likely	Low to Moderate The Huddersfield Data Improvements Project shows that flood depths at the site would be less than 0.3m and the flood hazard across most of the site would be low, with small patches of moderate risk at the south. The maximum flood level for the site in a 1% AEP event, including an allowance for climate change, is unlikely to exceed 74.65mAOD.
	Surface water at the south of the site and along Dewhurst Road		Mild	Low Likelihood	Low Using the modelled 0.1% AEP flood event as a proxy for climate change modelling, the south of the site is at risk of surface water flooding to a depth of 0.3m in most areas, with the exception of the south west corner which may flood to a depth of up to 0.9m.

4. Conclusions

4.1 Risk Evaluation

The initial conceptual site model identified the following potential flood linkages present at the site and the following conclusions have been drawn:

- There is a **low risk** to residential end users and the proposed dwelling from river flooding from Blackhouse Dike to the south west.
- There is a **very low risk** to residential end users and the proposed dwelling from surface water flooding along Dewhurst Road to the north of the site.
- There is a **very low risk** to residential end users and the proposed dwelling from groundwater flooding through the permeable underlying bedrock.
- There is a **low risk** to residential end users and the proposed dwelling from sewer flooding in local sewers.
- There is a **low to moderate risk** to residential end users and the proposed dwelling from river flooding, taking into account climate change, from Blackhouse Dike to the south west.
- There is a **low risk** to residential end users and the proposed dwelling from surface water flooding, taking into account climate change, at the south of the site and along Dewhurst Road to the north.

4.2 Existing Flood Mitigation Measures

There are currently no flood mitigation measures at the site.

4.3 Proposed Flood Mitigation Measures

The maximum modelled flood level for the site in a 1% AEP event, including an allowance for climate change, is unlikely to exceed 74.65mAOD. In the absence of site-specific modelled flood levels, there is a degree of uncertainty regarding this flood level, however, providing a 0.6m freeboard above this level is considered to provide appropriate compensation to account for this uncertainty. The finished floor level of the proposed dwelling should, therefore, be set no lower than 74.25mAOD. This will also protect the dwelling from an extreme flood event (0.1% AEP) and allow safe refuge to be provided within the dwelling.

4.4 Surface Water Management

Generally, it is desirable to discharge surface water runoff into the ground before allowing discharge to a surface water body, surface water sewer, highway drain, or a combined sewer. The site is currently undeveloped and there is no impermeable surface cover, therefore, surface water currently discharges into the ground with excess runoff discharging into the existing sewer network.

The proposed development will increase the impermeable surface cover across the site and the rate and volume of runoff will be greater than the existing run-off rate and volume. As a result, floodplain storage capacity would be reduced and the flood risk off-site may be increased. The proposed development should, therefore, incorporate Sustainable Drainage Systems (SuDS) to maintain the runoff rate and volume to greenfield rate, where possible. Based on the anticipated ground conditions and the gentle slope across the site, the installation of a soakaway at the south is likely to be the most appropriate option for the site.

4.5 Safe Access and Egress

During a design flood event, flood depths on the site are anticipated to be below 0.3m, however, there are areas on Dewhurst Road to the north and north east of the site where flood depths between 0.3m and 0.6m are anticipated which is likely to impact safe access and egress via this route. Alternatively, modelled flood depths along the footpath to the south of the site are below 0.3m and flood velocities to the south west are shown to be between 0.15m/s and 0.3m/s. Based on the Defra Flood Risks to People study this would result in a 'Very Low' hazard, therefore, safe access and egress will be possible during a design flood event by exiting the site at the south west and travelling west along the footpath.

While safe access and egress should be possible during a design flood event, the site is situated within the Environment Agency's 'Allison Dike at Hillhouse' Flood Warning Area, so it is advised that residents sign-up to receive these warnings in order to prepare for a potential flood event.

It is also noted that the proposed finished floor level of the dwelling will be above the extreme flood level (0.1% AEP) allowing safe refuge to be provided within the dwelling where safe egress is not possible.

4.6 Exception Test

There are two criteria that must be met in order to demonstrate that the Exception Test has been passed. It must be demonstrated that the development will provide wider sustainability benefits to the community that outweigh flood risk and will also be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The development will increase the provision of new market housing in the borough meeting an identified need and will also provide an infill development within an existing row of houses where there is already infrastructure in place, such as roads, footpaths and sewers. Given the relatively low risk of flooding at the site, these sustainability benefits are considered to outweigh the flood risk at the site.

It has been demonstrated that the development can be made safe from flooding for its lifetime and the incorporation of SuDS will ensure that the flood risk elsewhere is also not increased.

Consequently, the wider sustainability benefits provided by the development and the proposed elevated finished floor level demonstrate that the Exception Test has been passed.

4.7 Further Investigation

The site lies within Flood Zone 3, based on the Environment Agency's Flood Map for Planning. Assessment of the risk to the site from all sources of flooding, including consultation of the Kirklees Council SFRA, shows that the site is considered to be at low risk from river and sewer flooding and a very low risk from surface water and groundwater flooding. The risk from reservoir flooding is considered to be negligible.

There is also considered to be a low to moderate risk to the site from river flooding and a low risk from surface water flooding when taking into account climate change.

As a result, it is recommended that the finished floor level of the proposed dwelling is set no lower than 74.25m AOD. The proposed development should also incorporate Sustainable Drainage Systems (SuDS) to maintain the runoff rate and volume to greenfield rate, where possible.

During a design flood event, safe access and egress will be available by exiting the site at the south west and travelling west along the footpath.

The wider sustainability benefits provided by the proposed infill development and the mitigation and SuDS measures outlined above demonstrate that the Exception Test has been passed.

Provided these mitigation and SuDS measures are implemented, it can be concluded that the proposed residential development will be safe from flooding for its lifetime, while not increasing flood risk elsewhere. It should be noted that this conclusion is based on the currently proposed development plan, therefore, flood risk at the site should be re-assessed if material changes are made to the proposed development.

5. References

British Geological Survey. *British Geological Survey (BGS)* [online] Available at: <bgs.ac.uk/>.

Department for Communities and Local Government, 2012. *Technical Guidance to the National Planning Policy Framework.*

Department for Environment Food & Rural Affairs, 2022. *Climate Change Allowances.* [online] Available at: <environment.data.gov.uk>.

Environment Agency, 2023. *Flood map for planning.* [online] Available at: <flood-map-for-planning.service.gov.uk>.

Environment Agency, 2022. *Flood risk and coastal change.* [online] Available at: <gov.uk/guidance/flood-risk-and-coastal-change>.

Environment Agency, 2022. *Flood risk assessments: climate change allowances.* [online] Available at: <gov.uk/guidance/flood-risk-assessments-climate-change-allowances>.

JBA Consulting, 2016. *Calder Catchment Strategic Flood Risk Assessment – Volume I.* [online] Available at: <kirklees.gov.uk>.

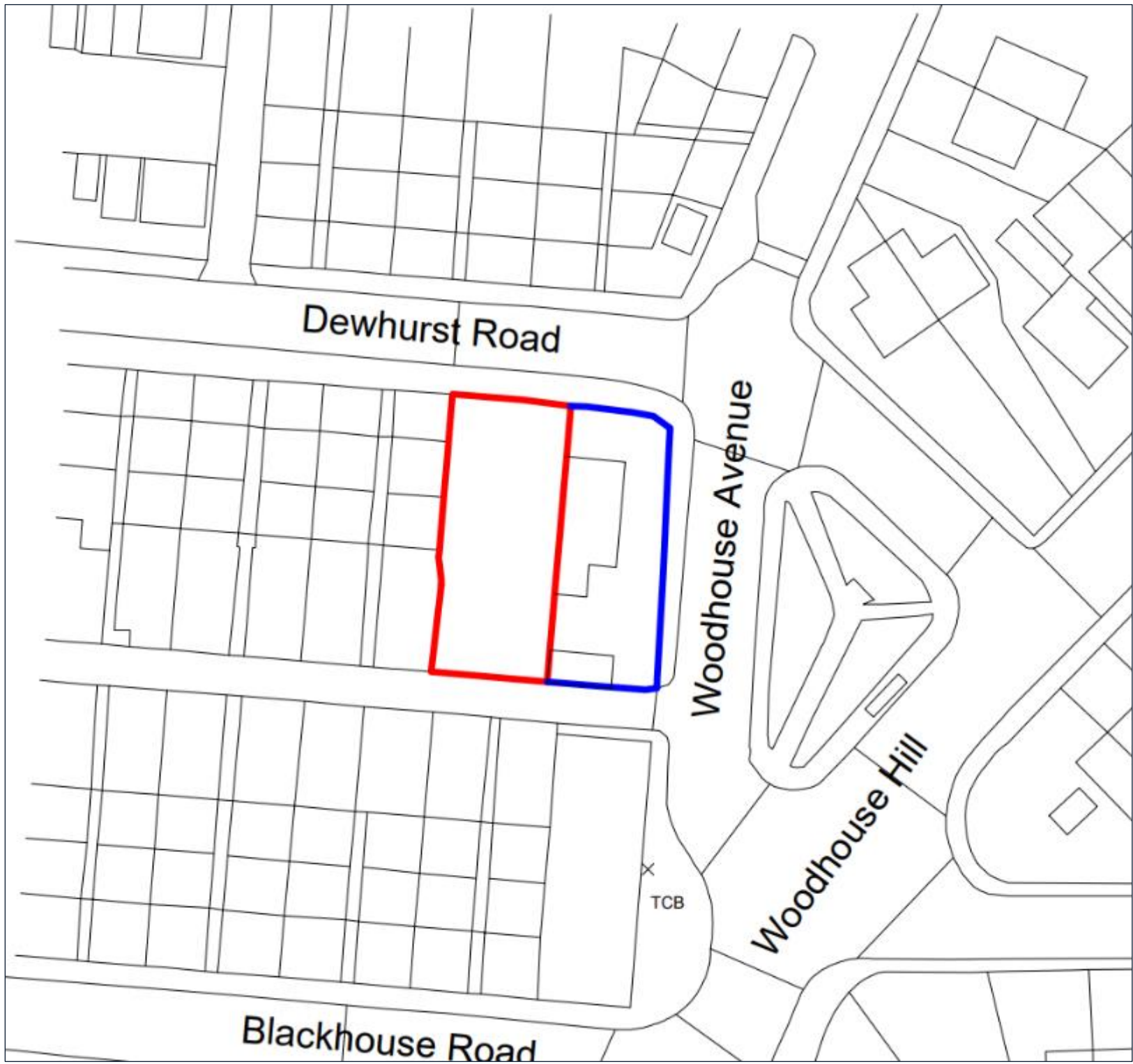
JBA Consulting, 2016. *Calder Catchment Strategic Flood Risk Assessment – Volume II (Kirklees Council).* [online] Available at: <kirklees.gov.uk>.

Kirklees Council, 2019. *Kirklees Local Plan Allocations and Designations.* [online] Available at: <kirklees.gov.uk>.

Ordnance Survey. [online] Available at: <ordnancesurvey.co.uk/>.

Rightmove. *Property for sale - Find flats and houses for sale in the UK.* [online] Available at: <rightmove.co.uk/property-for-sale>.

Oakshire Environmental. Available at: <oakshireenvironmental.co.uk>



Appendix - Site Maps & Plans	
Description	
Site location plan	
Sources	
UHDesign	
Key	
	Site boundary
	Land owned by the applicant
	North



Appendix - Site Photos
Description
Photo of the site from Dewhurst Road, facing south west
Sources
Muhammad Arshad Naz



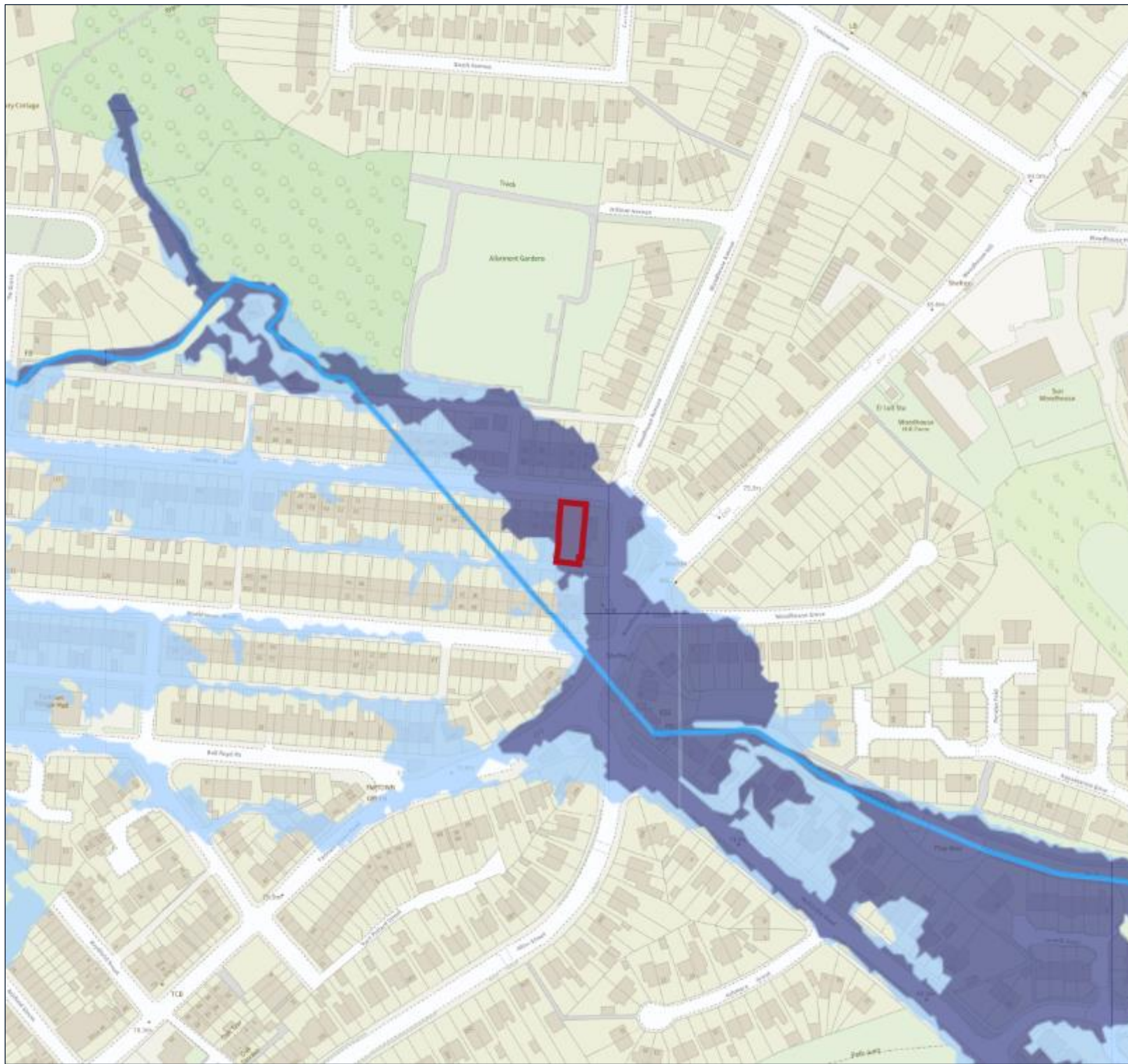
Appendix - Site Photos
Description
Photo of the site from Dewhurst Road, facing south east
Sources
Muhammad Arshad Naz










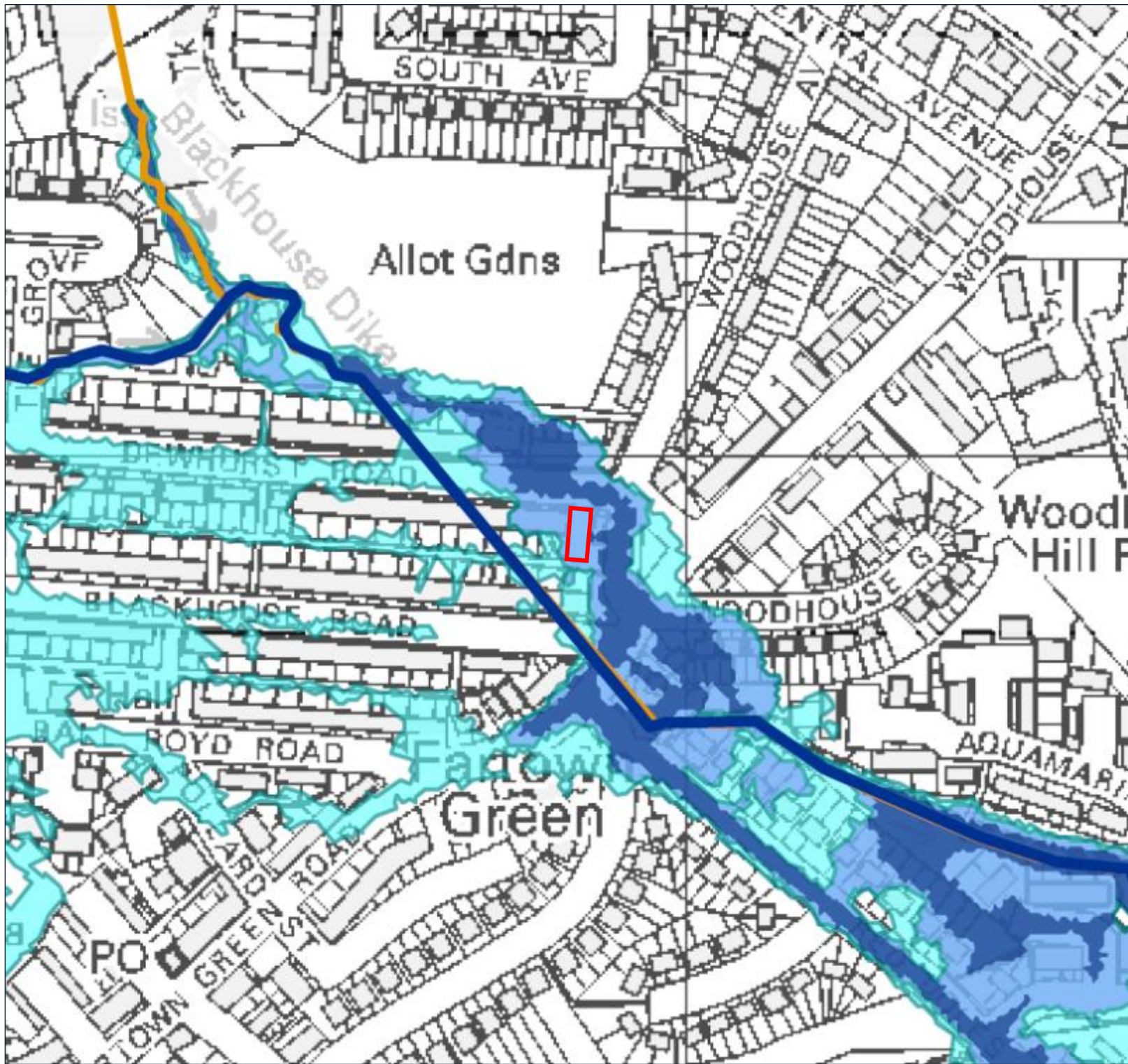
Appendix - Site Photos
Description
Photo of the site from the footpath to the south, facing north east
Sources
Muhammad Arshad Naz









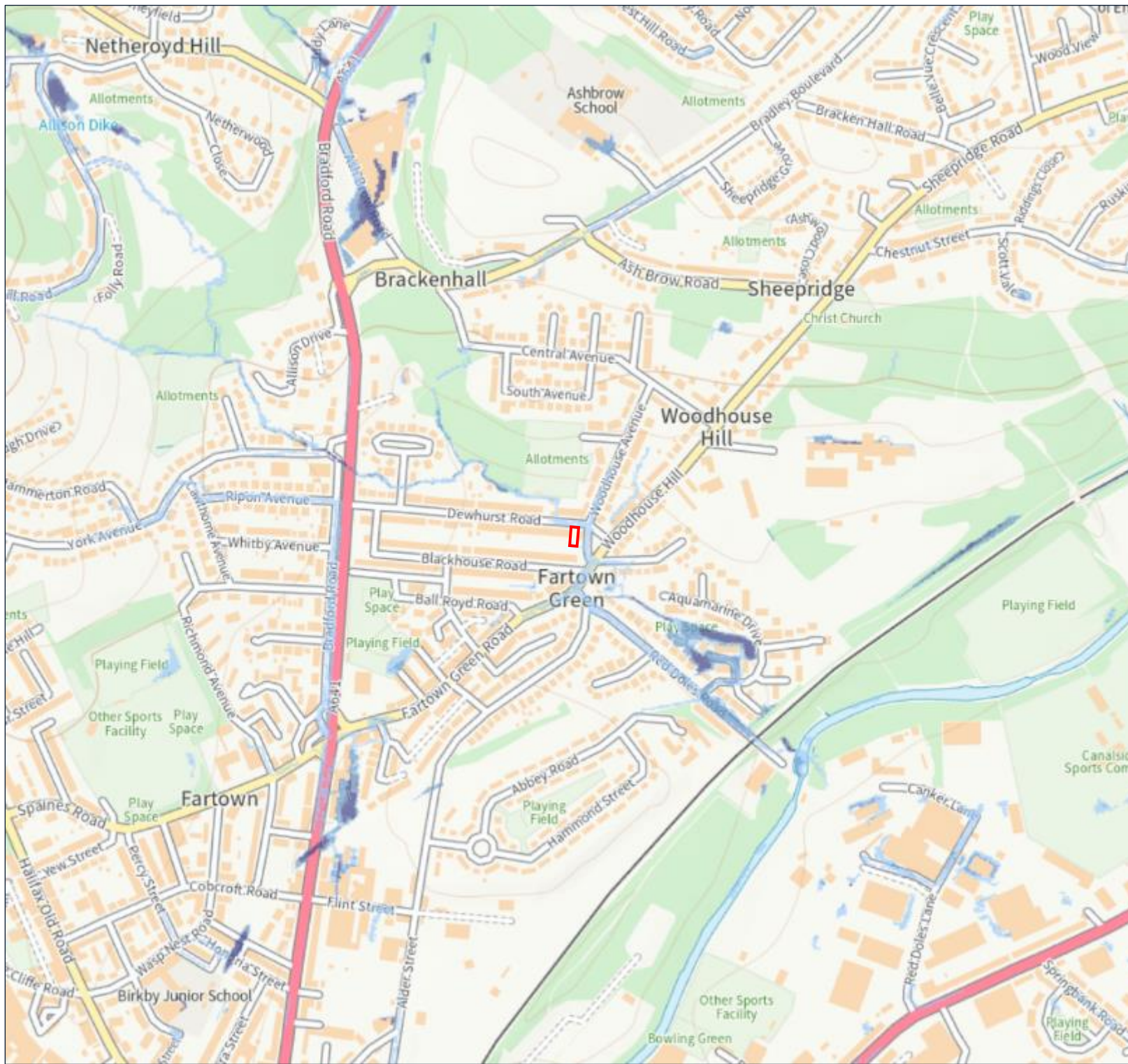
Appendix - Site Photos
Description
Photo of the site from the footpath to the south, facing north east
Sources
Muhammad Arshad Naz








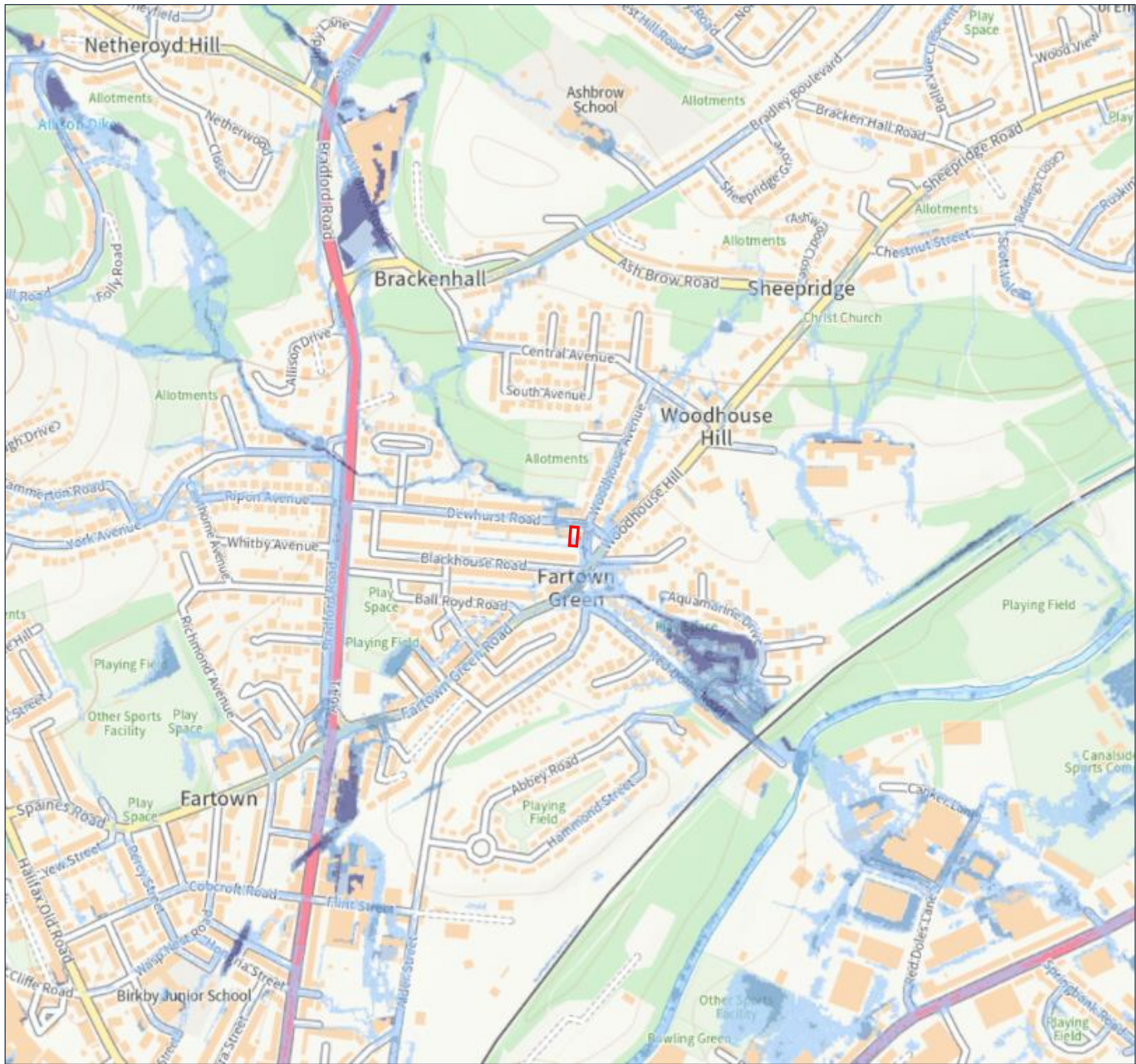
Appendix – Flood Risk Maps	
Description	
Flood zone map for planning	
Sources	
Environment Agency OS data © Crown copyright and database rights	
Key	
	Site boundary
	Flood Zone 1
	Flood Zone 2
	Flood Zone 3
	Main river
	Flood defence
	North








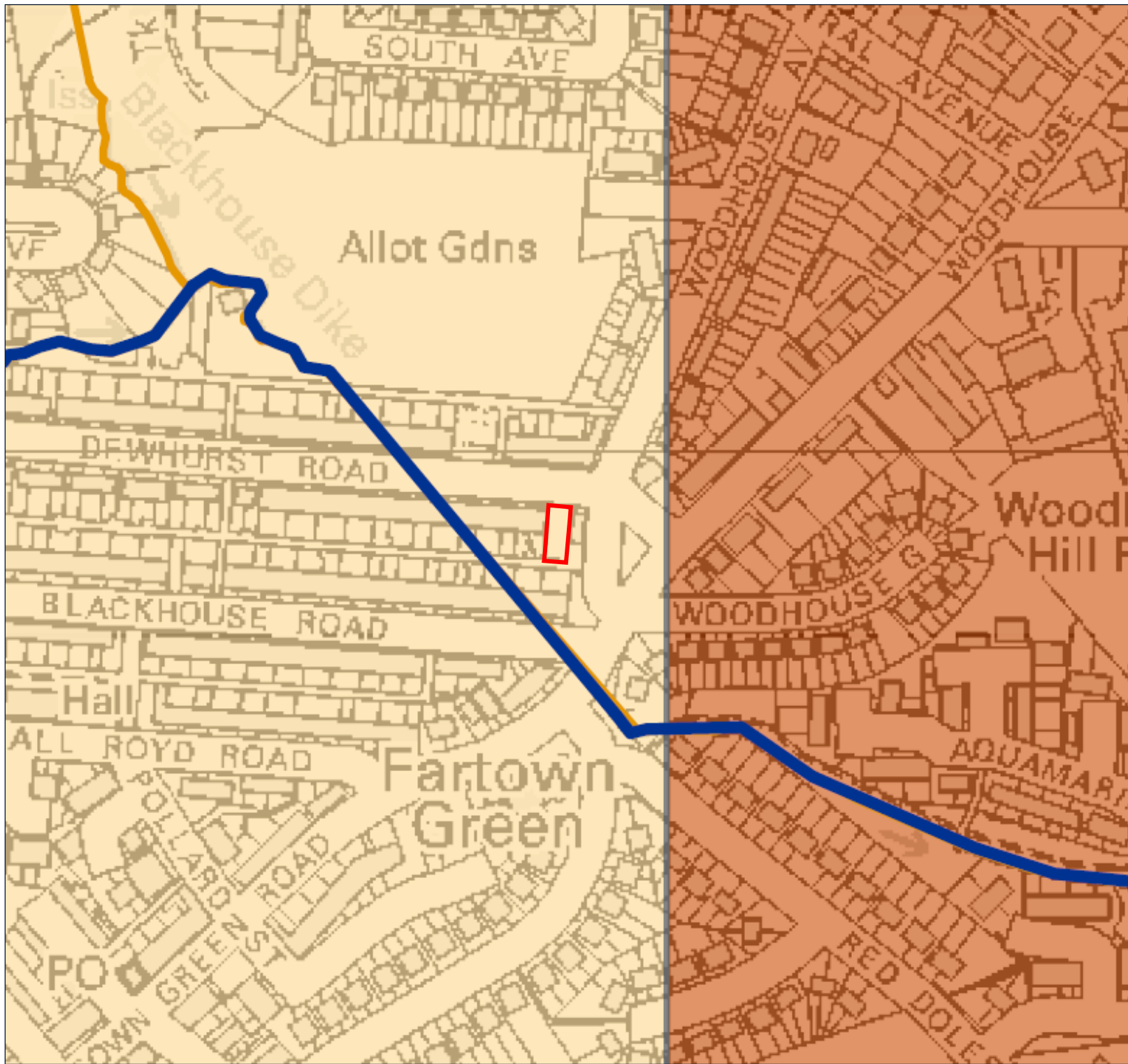
Appendix - Flood Risk Maps	
Description	
Map from Kirklees Council SFRA outlining areas of functional floodplain	
Sources	
JBA OS data © Crown copyright and database rights	
Key	
	Site boundary
	Flood Zone 2
	Flood Zone 3a
	Flood Zone 3ai
	Flood Zone 3b
	North









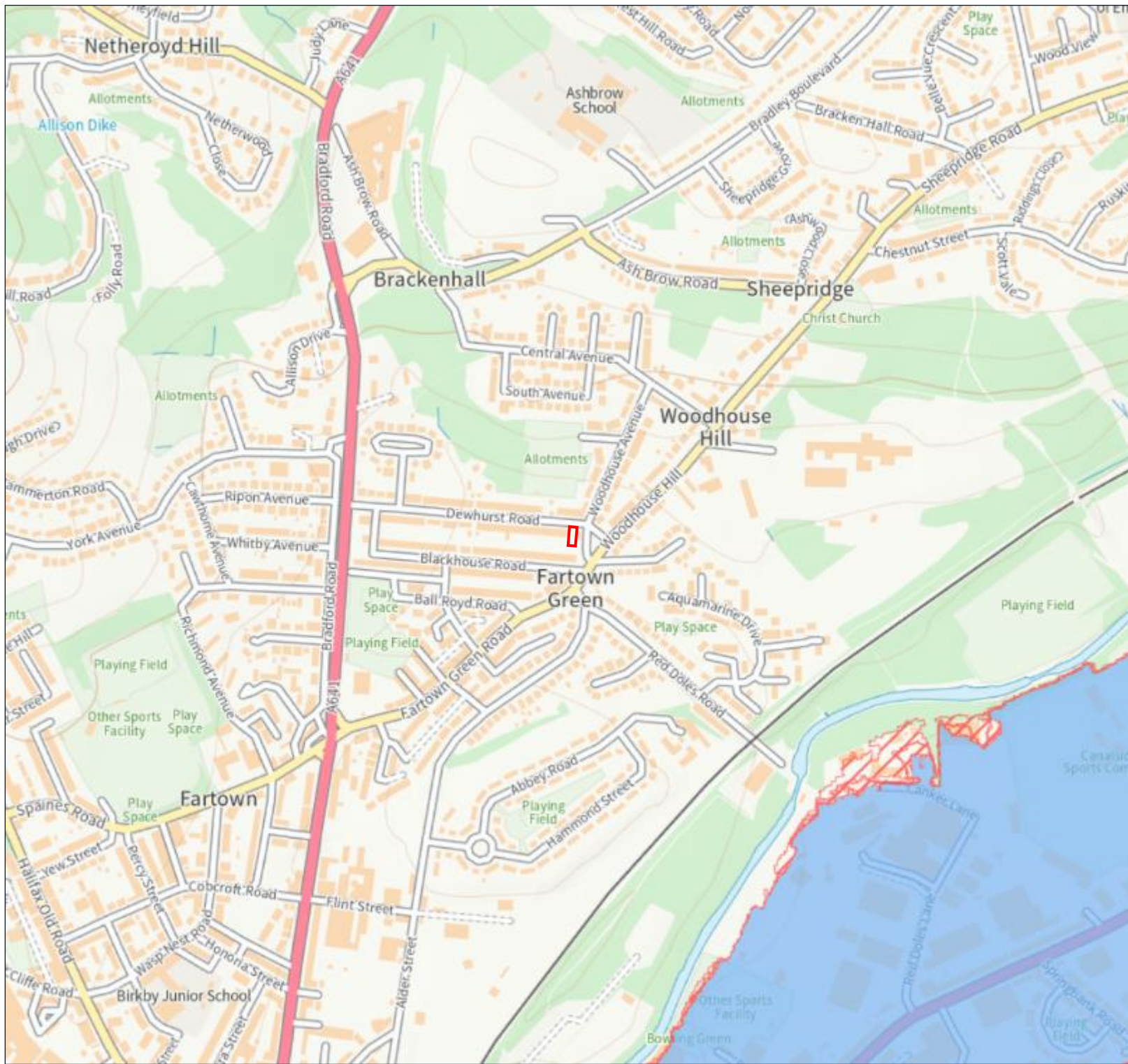
Appendix - Flood Risk Maps	
Description	
Environment Agency map showing the modelled depth of flooding from surface water in a medium risk scenario (1% - 3.3% chance each year)	
Sources	
Environment Agency OS data © Crown copyright and database rights	
Key	
	Site boundary
	Below 0.3m
	0.3m to 0.9m
	Over 0.9m
	North







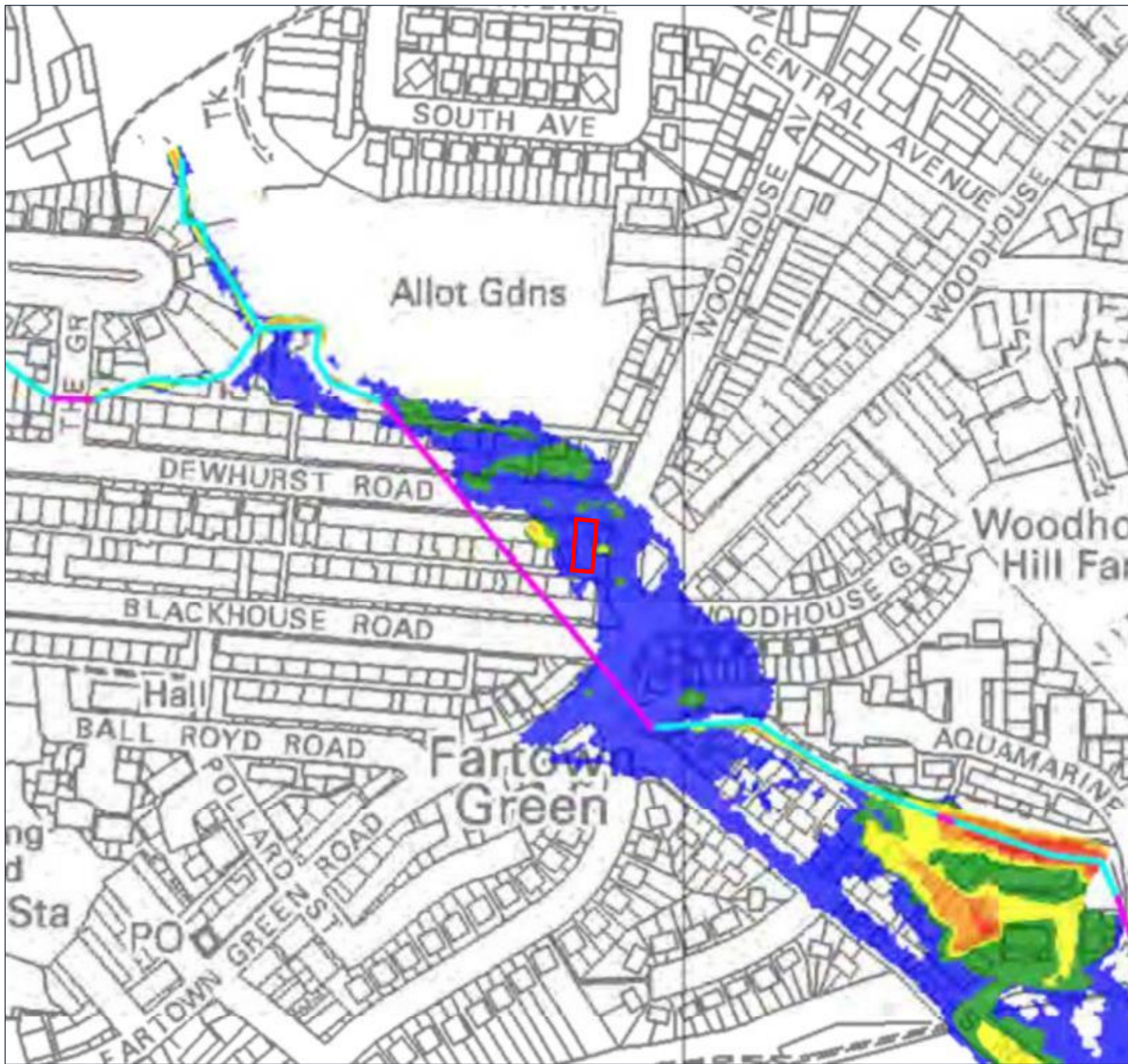
Appendix - Flood Risk Maps	
Description	
Environment Agency map showing the modelled depth of flooding from surface water in a low risk scenario (0.1% - 1% chance each year)	
Sources	
Environment Agency OS data © Crown copyright and database rights	
Key	
	Site boundary
	Below 0.3m
	0.3m to 0.9m
	Over 0.9m
	North












Appendix - Flood Risk Maps	
Description	
Map from Kirklees Council SFRA showing susceptibility to groundwater flooding in the area	
Sources	
JBA OS data © Crown copyright and database rights	
Key	
	Site boundary
	< 25%
	≥ 25% < 50%
	≥ 50% < 75%
	≥ 75%
	North



Appendix - Flood Risk Maps	
Description	
Environment Agency map showing the modelled extent of flooding from reservoirs	
Sources	
Environment Agency OS data © Crown copyright and database rights	
Key	
	Site boundary
	When river levels normal
	When there is river flooding
	North



Appendix - Flood Risk Maps	
Description	
Map from the Environment Agency's Huddersfield Data Improvement Project showing the modelled flood depth in a 1% AEP event, including an allowance for climate change	
Sources	
Environment Agency OS data © Crown copyright and database rights	
Key	
	Site boundary
	0 < 0.3m
	0.3m < 0.6m
	0.6m < 1m
	1m < 2m
	> 2m
	Watercourse
	Culvert
	North