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DW0660	9th June 2014
Project:	
Manchester Science Park Proposed Temporary Car Park at Ripon Street Depot Flood Risk Assessment	
Client:	
Manchester Science Park Limited	

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Report status:

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Signature:

Date: 9th June 2014

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**Manchester Science Park
Temporary Car Park**

Ripon Street

Flood Risk Assessment

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Postcode M15 6SZ**

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1.0 Introduction

A new temporary car park is proposed on the former Ripon Street Council Depot, adjacent to the existing Manchester Science Park land.

This report considers potential flood risk from all sources and the surface water aspects of the proposals.

2.0 Executive Summary

A temporary car park is to be provided on the former Ripon Street Council Depot on Ripon Street, Manchester.

The existing depot buildings are to be demolished and the hardstandings used as temporary car parking. The proposed site will have exactly the same impermeable area than existing and surface water run-off rates and volumes from the site will not increase.

The temporary car park site is within "Flood-zone 1"; above the 1 in 1000 year risk levels from the Corn Brook river culvert which flows underground alongside Charles Halle Road, as advised by The Environment Agency

The existing site drainage is to be maintained, together with its connect to the existing combined public sewer system at a flow rate to be agreed with United Utilities.

The existing drainage system is to be modified to provide on-site rainwater storage, together with flow attenuation to ensure that as a minimum, the surface water run-off from the site will be reduced by 50% from existing.

Sustainable rainwater disposal is to be considered following detailed site investigation, however due to the industrial nature of the existing site it may not be possible to use soakaways.

3.0 Existing site flood zoning and river systems

The existing site is in Manchester City Council ownership with empty depot buildings and a large concrete yard. The site is accessed off Ripon Street & Denmark Road and is bounded by Manchester Science Parks to the North, Denmark Road to the South, Holy Name Catholic School to the East and Cornerstone Day Centre/George Halle Road to the West. Refer to Appendix A for site location.

There is an existing river system next to the site. It is the Corn Brook which is a historic watercourse and a historic map of the old Manchester watercourses is attached in Appendix E.

Corn Brook is shown on the United Utilities public sewer records, contained in Appendix F, and is marked as a brick culvert 3300mm width and 1805mm height next to Charles Halle Road. The Environment agency has a hydraulic river model of the Brook and risk level data has been purchased from the Agency. Risk level data is contained in Appendix C.

The risk levels have been used by the Agency to map flood risk in the area and the issued EA mapping is likely to be based on land levels derived from LIDAR aeroplane surveying. Private land surveys to Ordnance Datum are more accurate and the Agency data plus accurate survey levels have been used to accurately flood-zone the proposals sites. The overall site slopes westwards from Lloyd Street North towards Charles Halle Road and the Corn Brook culvert line.

The Corn Brook watercourse siphons under the Bridgwater Canal at Cornbrook and outfalls to the Manchester Ship Canal at Pomona Dock. Manchester has many culverted streams and rivers and these have even been the subject of books and papers over the years- in particular the Geoffrey Ashworth book 'The Lost Rivers of Manchester' which is no longer in print. We attach the North West Geography Society's list of historic flooding in Appendix E. The head of the brook is to the west of Ashton Old Road near to the New Smithfield Market and it can be seen in open channel at Pottery Lane in the Gorton area. Its catchment area is much more extensive as public surface water sewers connect to it. Photos of parts of Corn Brook do appear on the internet with websites such as:-

28dayslater
Goneeightyfive.com
Substormflow.blogspot.co.uk

The existing site slopes downhill westwards with levels at Charles Halle Road of approx. 34.06 on Ripon Street and approx. 34.30m at the boundary with the school.

The gross area of the Temporary Car Park site is approx. 4,500m² (0.45 Ha). Refer to Appendix B for the proposed site layout.

The EA risk level data for Corn Brook gives the following risk levels for the Temporary Car Park site. Refer to Appendix C for the EA flood data.

Temporary Car Park - Node 2

1 in 100 year risk level – 34.70m
1 in 1000 year risk level – 34.86m

The existing ground levels at the site of the Temporary Car Park are approx. 34.20m and the site is therefore categorised as Flood-zone 1.

Refer to Topographical Survey in Appendix C.

4.0 Strategic Flood Risk Assessments

The Manchester SFRA documents and maps have been viewed and extracts from the User Guide and the level 2 final are attached in Appendix D. The area is a Critical Drainage Area (CDA) and as such existing run-off rates are to be reduced by 50%. The reports also stress the importance of considering and implementing sustainable urban drainage systems where possible.

5.0 Proposals and Drainage

The proposals are for a Temporary Car Park partly on the existing Council depot site, reconfiguring the yard and building areas to accommodate temporary parking. See attached proposals plan in Appendix B.

The Temporary Car Park site will have the same impermeable area as the existing site at approx. 4,500m².

New drainage will be just surface water, no foul, and will be via the existing connection to the public combined system, at a flow rate to comply with SR744 and CDA requirements but also in accord with the requirements of United Utilities.

DEFRA's SR744 guidelines require that new surface water flow rates be limited to the existing 1 in 100 year peak flow rates.

Critical Drainage Area requirements are that new surface water peak flow rates are to be 50% of the existing brownfield runoff rates.

The existing complex drains to the public combined sewer system and the new Temporary Car Park layout will do the same. United Utilities drainage system engineers are likely to impose quite strict flow rate limits and these are likely to be more onerous than the DEFRA or CDA limits.

Surface water attenuation is to be provided at surface level and in underground tanks, together with surface water flow restriction. When the completed ground data becomes available the area can be assessed for possible soakaways and SUDS systems; however due to the nature of past use of this part of the site it is not expected that soakaways will be possible.

The guidelines for surface water runoff management for developments are now contained in SR744 – 'preliminary rainfall runoff management for developments'. They allow comparison of proposals with the existing drainage performance of the Temporary Car Park site (principle 4) and on this basis the surface water run-off rates or volumes will decrease slightly as a result of the proposal.

6.0 National Planning Policy Framework and Technical Guidance

The proposals are commercial / educational and are classed as 'more vulnerable' in Table 2, and are 'appropriate' in Flood-zone 1 as per Table 3.

All sources of flooding risk are:-

Rivers	– Corn Brook see above
Sea	– no tidal influence
Land	– no un-drained land slopes towards the sites
Groundwater	– no springs or weep areas on site
Sewers	– no reported incidents of on-site sewer flooding
Reservoirs, canals	– no canals nearby.

The EA reservoir risk mapping shows the site as at risk from the Audenshaw reservoirs and Gorton Upper. These reservoirs are all maintained by United Utilities to a 1 in 10,000 year standard which is the high standard required by the Reservoirs Acts and Water Acts and there is little risk to the site.

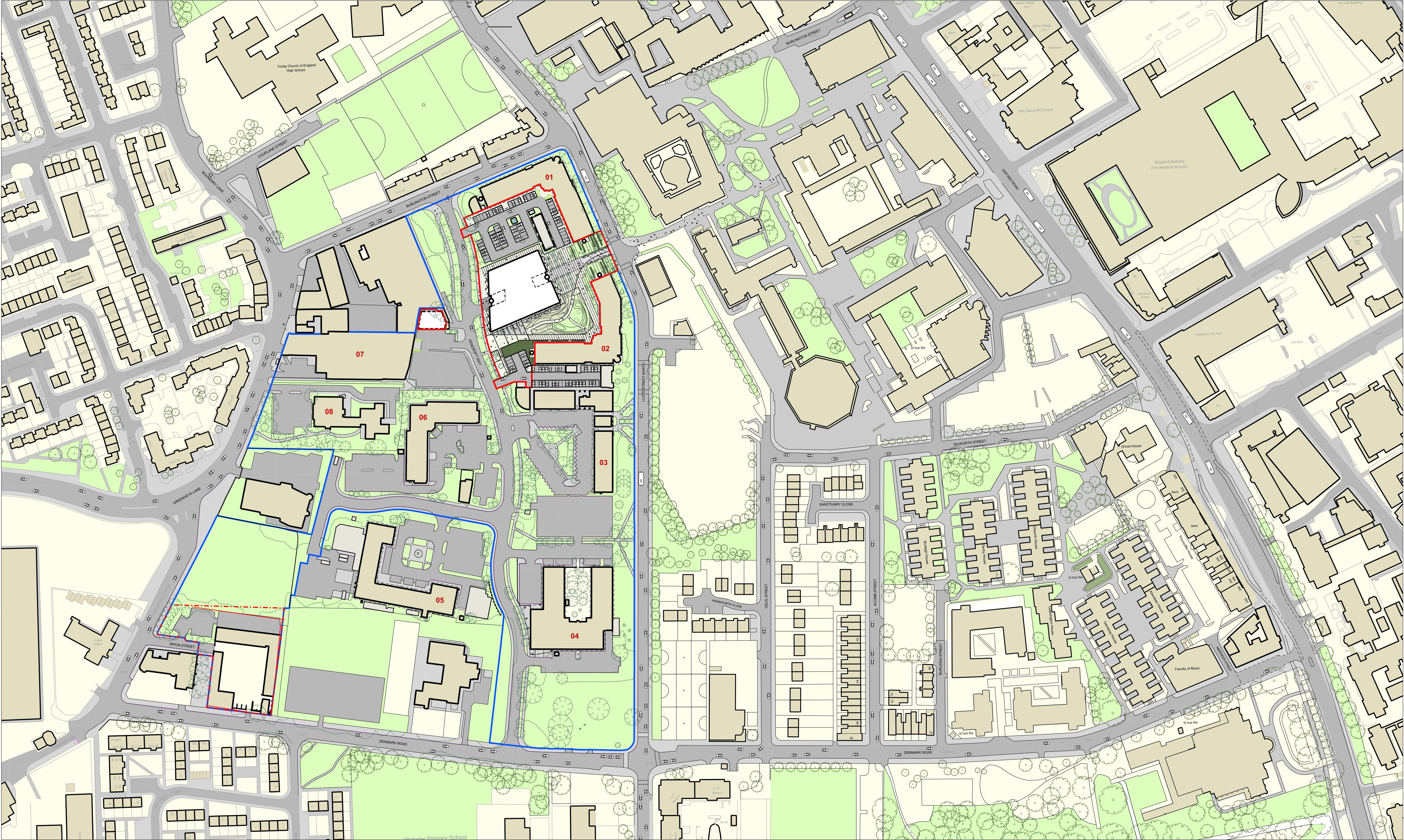
Pluvial risk - see EA mapping which is based on a 1 hour, 1 in 200 year storm with all existing drainage assumed full. There is little risk to the sites.

Refer to Appendix G for risk of flooding maps for:-

Flooding from Rivers & Sea
 Flooding from Groundwater
 Flooding from Surface Water
 Flooding from Reservoirs

Appendix A

Site Location Plan



BUILDING DESIGN PARTNERSHIP SHALL HAVE NO RESPONSIBILITY FOR ANY USE MADE OF THIS DOCUMENT OTHER THAN FOR THAT WHICH IT WAS PREPARED AND ISSUED.

ALL DIMENSIONS SHOULD BE CHECKED ON SITE.

DO NOT SCALE FROM THIS DRAWING.

ANY DRAWING ERRORS OR DIVERGENCES SHOULD BE BROUGHT TO THE ATTENTION OF BUILDING DESIGN PARTNERSHIP AT THE ADDRESS SHOWN.

Drawing Key:			
	Surrounding Context Buildings		MSP Bruntwood Ownership 72,935 Sq.m 785,066 Sq.ft
	Proposed MSP Hub		Cycle Storage
	MSP Phase 1 The Hub 9,611 Sq.m 103,452 Sq.ft		
	MSP Phase 1 Ripon Street Car Park 4,505 Sq.m 48,491 Sq.ft		

MSP Building Key:			
01	Williams House	08	Hillel House
02	Kilburn House		
03	Enterprise House		
04	Skelton House		
05	Synergy House		
06	Rutherford House		
07	Greenheys		

FIRST ISSUE			
ROC	GW	29.04.14	

MSP Building Key:			
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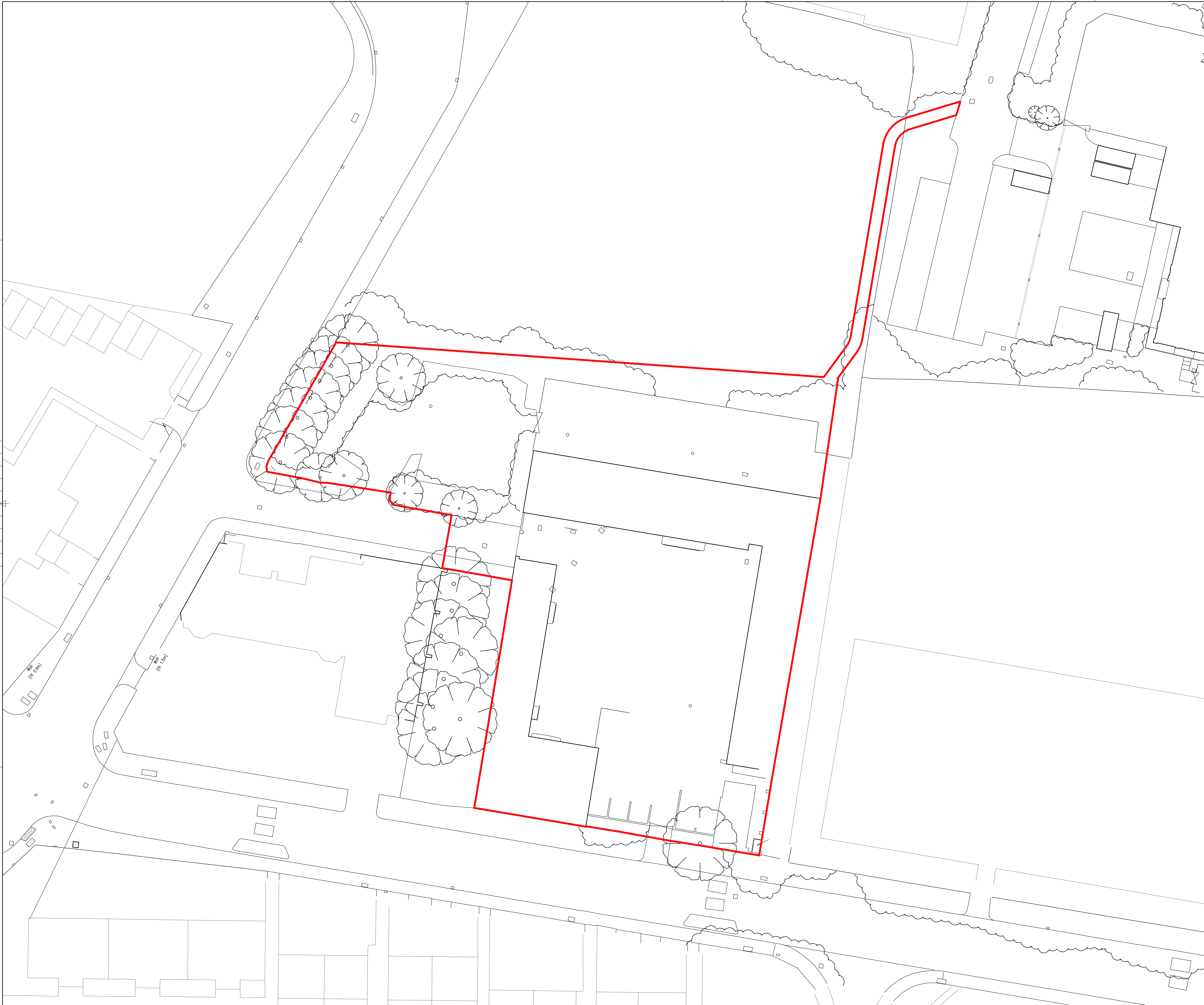
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Appendix B

Existing Site Layout

Proposed Site Layout



BDP SHALL HAVE NO RESPONSIBILITY FOR ANY USE MADE OF THIS DOCUMENT OTHER THAN FOR THAT WHICH IT WAS PREPARED FOR AND ISSUED.
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DO NOT SCALE FROM THIS DRAWING.
ANY DRAWING ERRORS OR OMISSIONS SHOULD BE BROUGHT TO THE ATTENTION OF
A LIAISON CONSULTANT/ENGINEER AT THE APPROPRIATE STAGE.

NOTES

TO BE READ IN CONJUNCTION WITH:
(9-JL011) - TEMPORARY CAR PARK PLAN
(9-JL012) - PLANTING STRATEGY PLAN
(9-JL013) - LANDSCAPE ELEVATIONS
(9-JL014) - LEVELS PLAN
(9-JL015) - DEMOLITION PLAN
(9-JL016) - SURFACE TREATMENT PLAN

COMPASS LIGHTING LAYOUT - 001151-E01
CCTV TO BE LOCATED ON LIGHTING COLUMNS. EXACT
POSITIONS AND SPECIFICATION TO BE AGREED.

IF ECW 06.06.14

DATE: 06.06.14

BY: ECW

FOR: M&G 3JA

PROJECT: RHP

NO: 11

DATE: 06.06.14

BY: ECW

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NO: 11



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THE HUB
MANCHESTER SCIENCE PARKS

RIPON STREET TEMPORARY CAR PARK RED LINE BOUNDARY PLAN	DATE: 1:200 JUNE '14
P2006149 (9-JL017)	



- KEY**
- SITE BOUNDARY
 - TARMAC SURFACE (please refer to drawing (9-JL016 for surface finishes)
 - 900mm HIGH TIMBER POST AND RAIL FENCE
 - AUTOMATED BARRIER
 - LIGHTING TO ENGINEERS DETAILS
 - PROPOSED BOUNDARY PLANTING
 - EXISTING TREES

NOTES

TO BE READ IN CONJUNCTION WITH:
(9-JL012 - PLANTING STRATEGY PLAN
(9-JL013 - LANDSCAPE ELEVATIONS
(9-JL014 - EXISTING LEVELS PLAN

COMPASS LIGHTING LAYOUT - 001151-001(B)
CCTV TO BE LOCATED ON LIGHTING COLUMNS. EXACT POSITIONS AND SPECIFICATION TO BE AGREED.

A IF ECW 03.06.14
CAR PARK LAYOUT REVISED IN LINE WITH CLIENT REQUESTS.
ACCESS FROM DENMARK STREET RELOCATED.
GATES CHANGED TO AUTOMATIC BARRIERS.
1.8m HIGH FENCE REVISED TO TIMBER POST AND RAIL FENCE.
PARKING BAY NUMBERS ADDED.
LIGHTING ADDED.
SHEET SIZE AMENDED.

IF DAW 08.05.14



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THE HUB MANCHESTER SCIENCE PARKS		
RIPON STREET TEMPORARY CAR PARK	SCALE	1:200
	DATE	MAY '14
P2006149	REVISION	(9-JL011 A

Appendix C

Topographical Survey

Environment Agency Flood Risk Data

12th March 2014

PRRSTH1897

Map Reference	Model Node Reference	Easting	Northing	Data	Undefended Levels					
					2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + Climate Change*	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)
1	ea013_Model_CORN02_00012	384001	396008	Modelled Water Level (m aod)	33.09	33.14	33.17	33.24	33.23	33.46
				Modelled Flow (cumecs)	8.71	8.79	8.84	8.96	8.96	8.85
2	ea013_Model_CORN02_00013	384101	396118	Modelled Water Level (m aod)	33.63	33.67	33.70	33.75	33.75	33.86
				Modelled Flow (cumecs)	8.1	8.11	8.12	8.13	8.15	8.13
3	ea013_Model_CORN02_00014	384172	396260	Modelled Water Level (m aod)	33.96	34.01	34.04	34.09	34.09	34.23
				Modelled Flow (cumecs)	8.18	8.19	8.21	8.23	8.25	8.13
4	ea013_Model_CORN02_00015	384198	396369	Modelled Water Level (m aod)	34.32	34.38	34.41	34.47	34.47	34.63
				Modelled Flow (cumecs)	8.16	8.17	8.18	8.19	8.21	8.1
5	ea013_Model_CORN02_00019	384140	396511	Modelled Water Level (m aod)	34.84	34.89	34.92	34.99	34.98	35.16
				Modelled Flow (cumecs)	8.24	8.27	8.29	8.32	8.34	8.3
6	ea013_Model_CORN02_00022	384237	396664	Modelled Water Level (m aod)	35.72	35.76	35.78	35.84	35.83	35.98
				Modelled Flow (cumecs)	8.3	8.34	8.35	8.36	8.37	8.09

Model data taken from the Corn Brook 2009 study

Notes:

AEP - Annual Exceedence Probability

m aod - metres above ordnance datum

*Climate Change Scenario for fluvial only - 20% increase in flow

Appendix D

Extracts from Manchester City, Salford City & Trafford Councils –
Level 2 Hybrid SFRA Documents

Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

USER GUIDE

**Final
May 2010**

**Trafford Council
Sale Waterside
Sale
M33 7ZF**



MANCHESTER
CITY COUNCIL

Salford City Council



TRAFFORD
COUNCIL

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accommodate such flow paths. Floor levels should always be set a minimum of 300mm above adjacent roads to reduce the consequences of any localised flooding.

3.4 Drainage for new developments

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure. It should be borne in mind that the sewer network in places across the Greater Manchester area was designed to drain less development than exists today. Development (both planned for and urban creep such as windfall development and paving over gardens) has increased the coverage of impermeable surfaces and added flow over time and the network is known to be at capacity in many places. The frequent localised flooding experienced in many parts of Greater Manchester, and Salford in particular in this study area, is testament to this problem.

Managing surface water discharges from new development is therefore crucial in managing and reducing flood risk to new and existing development downstream. Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding. The Planning System has a key role to play in setting standards for sustainable drainage from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage plays an important part in reducing flows in the sewer network and in meeting environmental targets, alongside investment in maintenance and new capacity by United Utilities. United Utilities plan their investment on a five year rolling cycle, in consultation with key partners, including the Environment Agency.

Sustainable drainage and the use of Sustainable Drainage Systems (SUDS) is supported by the policy direction in Future Water⁸, Making Space for Water⁹, the Pitt Review¹⁰ and the Flood and Water Management Act¹¹ that provides for more sustainable management of the water cycle, working in partnership across different agencies and new responsibilities for local flood risk management. In particular, the Flood and Water Management Act requires developers to include sustainable drainage in new developments. As part of their new responsibility for local flood risk management, local authorities will be responsible for approving SUDS for new developments and adopting and maintaining them.

Recognising the above, the following order of preference is recommended for drainage from new developments :

- Infiltration
- Discharge to a watercourse
- Discharge to a public sewer

The choice of system will be determined by local ground conditions (including groundwater levels). Whilst infiltration SUDS may be the most suitable for new development, developers must consider the risk of contamination to underlying aquifers.

The guidance below should be used in addition to the Environment Agency Standing Advice¹².

3.4.1 Critical Drainage Areas

⁸ Defra (2008) *Future Water*

⁹ Defra, Department for Transport, HM Treasury and Office of the Deputy Prime Minister (2005) *Making Space for water: Taking forward a new Government strategy for flood and coastal erosion risk management in England; First Government response to the autumn 2004 Making space for water consultation exercise*

¹⁰ The Pitt Review (2008) *Learning lessons from the 2007 floods*

¹¹ Her Majesty's Stationery Office and Queen's Printer of Acts of Parliament (2010) *Flood and Water Management Act* © Crown Copyright

¹² Environment Agency. *Flood Risk Standing Advice for England - PPS25 National Version 2.0*. Can be accessed online at <http://www.environment-agency.gov.uk/research/planning/82584.aspx>

Certain locations are particularly sensitive to an increase in the rate of surface water runoff and/or volume from new development. This can be for a number of reasons, including known local flooding problems associated with these areas. These areas have been defined as Critical Drainage Areas (CDAs) in the SFRA. Specific drainage approaches are recommended in these areas to help reduce local flood risk. The SFRA has designated CDAs as high flood risk areas.

The CDAs provided in the SFRA should be refined over time as more detailed information on flood risk and local flood management assets, including sewer catchments, becomes available.

In these areas, a detailed FRA is advised for all developments over 0.5 hectares, regardless of which Flood Zone the site falls within. This should demonstrate that new development is not at risk from flooding from existing drainage systems or potential overland flow routes. It should also demonstrate that the development will not adversely affect existing flooding conditions by the use of appropriate mitigation measures. The FRA should define and address the constraints that will govern the design of the drainage system and layout of the development site.

The Environment Agency Standing Advice allows developers to screen online for the level of flood risk assessment that is appropriate for a development with regard to the PPS25 Flood Zones. This highlights the need for a FRA in Flood Zones 2 and 3 and in Flood Zone 1 where there are critical drainage problems. The Standing Advice notes that for developments in Flood Zone 1 FRA Guidance Note 1¹³ should be followed 'In areas where the Local Planning Authority has identified drainage problems through a Strategic Flood Risk Assessment or Surface Water Management Plan and they have indicated that a formal flood risk assessment is required'. FRA Guidance Note 1 requires FRAs to provide 'Proposals for surface water management that aims to not increase, and where practicable reduce the rate of runoff from the site as a result of the development (in accordance with sustainable drainage principles, and the Local Planning Authority's published SFRA)'. It is recommended that proposals for development in Critical Drainage Areas, as defined by this SFRA, follow the guidance set out below

Recommended allowable discharge rates for CDAs and other areas

All development should seek to reduce existing local flooding problems and not add to them. The AGMA authorities are currently developing drainage standards for developments within Critical Drainage Areas and for all other areas. Over time, it is envisaged that local authorities will commission drainage strategies (see below) to determine in more detail, and establish the evidence base for, set reductions in surface water runoff from development sites. These will be used to inform the incorporation of targets and standards in Development Plan Documents, supported by Supplementary Planning Documents, as appropriate.

With regard to this, the developer should liaise closely with the Environment Agency, United Utilities and the LPA as soon as possible to determine an appropriate reduction in runoff rate and volume with reference to discharge limits as laid down by any completed SWMP, drainage strategy or local development document for that area. Minimising surface water runoff rates within catchments should be the starting point for negotiations with Developers.

In the interim, and based on the technical work undertaken for the SFRA, the following guidance is provided:

- Development should aim to deliver Greenfield runoff on Greenfield sites up to a 1 in 100 year storm event, considering climate change
- Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1 in 100 year storm event, considering climate change

¹³ Environment Agency. Flood Risk Assessment (FRA) Guidance Note 1, Development Greater Than 1 Hectare (ha) in Flood Zone 1 (and Critical Drainage areas less than 1ha) Can be accessed online at <http://www.environment-agency.gov.uk/static/documents/Research/FRAGuidanceNote1.pdf>

- Development should be designed so that there is no flooding to the development in a 1 in 30 year event and so that there is no property flooding in a 1 in 100 year plus climate change event

Wherever possible, this should be achieved through the implementation of SUDS. Source control should be considered first. There may be opportunities to deliver SUDS through integrated solutions for collections of strategic sites. The future ownership and maintenance of SUDS systems should be discussed at the planning application stage with the relevant sections of the LPA (including Highways and Drainage), United Utilities and the Environment Agency. This approach should be taken unless the developer can demonstrate that this is not feasible and that there will be no adverse impact caused by the development elsewhere.

This is supported by Category 4 of the Code for Sustainable Homes, which requires developers to ensure that peak run-off rates and run-off volumes will be no greater than the pre-development conditions as a minimum. However, the code recommends that attenuation of the additional flows caused by development should be related to the degree of flood risk in an area. In 'high flooding risk areas', 100% of the additional volume should be attenuated.¹⁴ Planning Policy Statement 1¹⁵ allows local planning authorities to stipulate high levels of the code where there are local circumstances that allow and warrant it. The SFRA has designated CDAs as high flood risk areas.

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography, geology (soil permeability), development density, existing drainage networks within the site and surrounding area, adoption issues and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined at an early stage and a clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential.

3.4.2 Integrated drainage

There is the potential for groups of development sites coming forward to share a central and integrated solution for managing surface water runoff. This is best investigated further through a SWMP or a Drainage Strategy, which may or may not be undertaken at the same time as a SWMP. A Drainage Strategy can be used to assess:

- A strategy to manage surface runoff from the development sites to control flood risk to drainage or river systems downstream.
- A strategy to manage surface runoff within development sites to manage flood risk within the development site.
- A strategy to manage flood risk in the development site from surface water runoff entering from outside the development site.

A Drainage Strategy undertaken as part of SWMP has the advantages that it is developed in partnership with others, with access to key datasets and knowledge and the opportunity to agree drainage standards, a programme for delivering any infrastructure required and long term maintenance responsibilities. New development can provide a key opportunity to reduce flood risk to existing communities and a SWMP provides the opportunity to take an overview of all local flood risk management issues in an area and plan for a mix of new drainage and retrofit measures¹⁶.

A Drainage Strategy will be required to be prepared by the developer(s) where an integrated solution is necessary, due to issues of land constraints, geology, connection to public sewers and watercourses.

Integrated solutions can provide great benefits besides water management, including providing Green Infrastructure enhancements, recreational facilities, improving biodiversity and making communities a better place to live. Where there are several sites that would

¹⁴ CLG (2006) Code for Sustainable Homes

¹⁵ CLG (2007) Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1

¹⁶ Defra (2010) Surface Water Management Plan Technical Guidance

Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

LEVEL 2 SFRA

**Final
April 2010**

**Trafford Council
Sale Waterside
Sale
M33 7ZF**



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River	EA model	Comments
		the Grey Irwell. Under such circumstances there could be backing up of floodwater along the Medlock and more floodwater could flow into the Bridgewater Canal. This could in turn increase flood risk along the canal, especially to the south in Trafford. Again, this highlights the importance of considering flood risk on a cross boundary basis. The River Medlock interacts with the Bridgewater Canal at Medlock Clows (where the Medlock goes into a shaft and culvert in Deansgate). This structure is prone to blockages with debris which could affect water levels upstream. The assumptions in the EA model were carried forward into the SFRA regarding flow between the River Medlock and Bridgewater Canal but further work should consider the variability of flows passing between the river and the canal.
Corn Brook	Atkins (2009) River Medlock and Corn Brook Flood Mapping Study (2D Infoworks CS)	The Environment Agency Infoworks model was converted to Infoworks SD and run using the ground model in the existing model. This produces identical outlines to the Infoworks CS model. The model extends from Railway Street, Gorton to its confluence with the Manchester Ship Canal at Pomona Docks. Key Modelling Assumptions: As in the supplied model, a free outfall to the Manchester Ship Canal is assumed for all events. Key Model Limitations: The sewer system has a finite capacity and hence combined sewer overflow inflows were not factored up for the climate change simulations. Natural catchments inflows were factored up in line with the guidance in PPS25. Urban features (buildings, kerbs, roads etc) are not represented as 'break lines' in the 2D model. This tends to result in a flood outline which is wider spread but with lower depths and velocities than if these features were represented.

2.9.2 Sequence of flooding

In a 1 in 100 year flood event considering climate change, flooding starts at Holt Town and Charles Street, before affecting Palmerston Street and the Hoyle Street Industrial Estate. Flooding would follow a similar pattern in a 1 in 1000 year flood event, but would be more extensive, with flooding overtopping the A665 Pin Mill Brow. Depending on the timing of flood peaks on the different rivers, areas downstream of the Medlock Tunnels may flood first from the Grey Irwell or the River Medlock and may suffer from two flood peaks, one from each watercourse. In such an extreme event, flooding from the Grey Irwell would be deeper and more extensive and cause the River Medlock to back up, resulting in higher flood levels upstream.

Collyhurst Road, followed by the river overtopping its left bank downstream of the confluence with Moston Brook and opposite Hargreave's Street. Flooding becomes more extensive in these areas before the river overtops its right bank onto Roger Street. In a 1 in 1000 year event, the sequence of flooding follows a similar pattern with the flow path from Roger Street extending north and westwards, affecting the Chase Street and Scotland Bridge areas.

2.10 Corn Brook

The Corn Brook drains the urban area south of the River Medlock. The brook is largely culverted and flows from Openshaw in a westerly direction, discharging into the Manchester Ship Canal at Pomona Docks. There are open lengths at the upstream reach (around 750m) and upstream of the siphon under the Bridgewater Canal (around 20m).

The Environment Agency have undertaken a recent detailed flood risk mapping study for the Corn Brook, using the Infoworks software, which is most suitable for heavily culverted watercourses and can route flow overland over a digital elevation model. The modelling shows that the following areas are at risk from flooding (reproduced from the River Medlock SFRM Report⁶):

- A small area around Thorpness Street to the south of Openshaw is at risk of flooding from a 1 in 200 year flood event;
- The depot and industrial estate near to the open channel section along Ambrose Street is at risk in an extreme 1 in 1000 year flood event;
- A depot in West Gorton and housing to the south and east of the railway lines off Bennett Street are at risk during a 1 in 20 year flood event and a school in this area is at risk in an extreme 1 in 1000 year flood event;
- Housing off Kincardine Road and to the east of the University of Manchester is at risk of flooding in a 1 in 25 year flood event. and a school in this area is at risk in a 1 in 100 year flood event;
- Housing in Hulme off Boundary Lane is at risk during a 1 in 50 year flood event; and
- In Moss Side properties to the south of Moss Lane West and to the north of Alexandra Park are at risk in an extreme 1 in 1000 year flood event.

The Infoworks model has been run for the SFRA in order to present flood depths and hazards. The flood depth and hazard maps for all scenarios are presented in the Maps Volume. Approximate flood depths and hazards are presented below. These have been extracted over large areas and for more detailed flood information, the Level 2 SFRA maps should be referred to.

⁶ Environment Agency (2009) River Medlock and Corn Brook Strategic Flood Risk Mapping Study

2.19.1 Corn Brook summary

Manchester Strategic Housing Site - West Gorton M0010

Corn Brook is culverted under the site. There will be localised flooding on the site in the 1 in 25 and 1 in 100 year events, mostly affecting Bennett Street and the depot upstream of the railway viaduct. In the 1 in 100 year flood event water will pond up to 1m deep in the Bennett Street area, with localised areas around the depot that will see flooding up to 2m deep. This will result in hazards of 'danger for most' in places. The 1 in 100 year flood event, considering climate change is significantly more extensive in this area. Flood depths will increase and the area of 'danger for most' will be more widespread.

There is significant residual risk to the site during an extreme 1 in 1000 year flood event, with extensive and deep flooding of over 2m in places in the Bennett Street area, including the depot. There will be widespread 'danger for most' in the Bennett Street area, with patches of 'danger for all', around the depot upstream of the viaduct and Vaughan Street. Climate change will increase the extent, depth and hazard associated with flooding in an extreme 1 in 1000 year flood event.

Manchester Strategic Housing Site - Brunswick M0011

Corn Brook is in culvert under this site. Localised flooding is predicted in a 1 in 25 year event between Whitekirk Close and Brunswick Street and Glenbarry Close.

Flooding becomes more widespread in the 1 in 100 year flood event incorporating areas off Wadeson Road. Flooding depths are generally less than 0.5m with localised depths in excess of 2m in the vicinity of Whitekirk Close to the east of Kincardine Road.

Flooding in the 1 in 100 year plus climate change is similar to the 1 in 100 year event with the general hazard categorisation in both events 'very low' increasing to 'dangerous for most' around Whitekirk Close.

There is some residual risk to the site during an extreme 1 in 1000 year and 1 in 100 year plus climate change event. In these events flooding extends north along Kincardine Road and eastwards towards Wadeson Road. Flooding across the majority of the site is less than 0.5m with Whitekirk Close the exception as discussed above. Flood hazard is hence categorised as 'very low' or 'dangerous for some' in the areas where flooding is shallower increasing to 'dangerous for most' for the Whitekirk Close area.

Manchester Strategic Employment Site - Oxford Road Corridor M0042

The Oxford Road Corridor Site is at risk from flooding from both the Medlock and from Corn Brook. The areas of flood risk do not overlap and as such have been discussed independently. Flood risk for this site from the Medlock is detailed in Section 2.9.

Flooding occurs in the 1 in 100 year event with the majority of flooding predicted around Cambridge Street and Coupland Street to a depth of less than 0.5m and a hazard categorisation of 'very low'. Some localised flooding to the west of Oxford Street is to a depth of up to 1.5m and categorised as 'dangerous for most'.

Flooding in the 1 in 100 year plus climate change event is similar to the 1 in 100 year event with some additional flooding around the dental hospital.

The 1 in 1000 year event flood event shows no significant changes to the west of the site from the 1 in 100 year plus climate change event. The flood extent does increase along Upper Brook Street, Booth Street East and Grosvenor Street. In these locations flood depths are predicted to be less than 0.5m with some localised depths up to 1.5m. Hazard categorisations reflect the flood depths ranging from 'very low' to 'dangerous for most'.

The 1 in 1000 year flood plus climate change event is similar to the 1 in 1000 year event with some additional flooding predicted south of Dover Street to a depth of less than 0.5m.

5.3 Critical Drainage Areas:

The Town and Country Planning Order 2006¹¹ defines Critical Drainage Areas as "an area within Flood Zone 1 which has critical drainage problems and which has been notified... [to]...the local planning authority by the Environment Agency". However, the Environment Agency Standing Advice¹² also recognises the part that SFRA play in identifying areas with drainage problems and in doing so highlighting areas that need a FRA to consider drainage in detail.

Certain locations are particularly sensitive to an increase in the rate of surface water runoff and/or volume from new development. There are generally known local flooding problems associated with these areas. These areas have been defined as CDAs in the SFRA. Specific drainage requirements are required in these areas to help reduce local flood risk. These are areas with complex surface water flooding problems that would benefit from a Surface Water Management Plan and subsequent drainage strategy.

The SFRA has developed Critical Drainage Areas where:

1. There is a high risk of localised flooding from ordinary watercourses, including culverts surcharging and overland surface water flows, including the potential for flooding from the sewer network due to failure/ blockage or exceedance events when the storm return period is greater than the sewer was designed for; or
2. Where there are areas of significant redevelopment planned that could have a significant impact on surface water runoff to local watercourses and the sewer network.

Screening for Critical Drainage Areas (CDAs) within the Manchester City, Salford City and Trafford Council areas was undertaken using data from the following sources:

- An understanding of areas where there is a focus for development, such as in the Conurbation Core
- Local authority incident records
- Discussions with Local Authority Drainage Engineers
- Refined surface water flood maps produced for the Level 2 SFRA.
- An assessment of properties at risk based on the SFRA surface water flood map
- United Utilities sewer records and drainage areas
- United Utilities DG5 register

United Utilities sewer flood risk data was not available in the timescales for this project. The Local Authorities should continue to work in partnership with United Utilities over the availability and use of sewer flood risk data. United Utilities flood risk data should be used in further work following on from this SFRA, including Surface Water Management Plan work.

The sewer network can have a significant impact on the location of surface water and sewer flooding for more frequent events. It can also affect the distribution of water throughout urban catchments during flood events, passing excess flows from the combined network into watercourses through combined sewer overflows. It was agreed that without the detailed UU flood risk data, natural catchments would be combined with UU Drainage Areas (showing where sewer systems are interconnected across the boundaries of natural catchments) to define CDA boundaries. It should be noted that only Drainage Areas that intersect the boundaries of Manchester City, Salford City and Trafford Council areas were made available for this study. The sewer catchments of the CDAs may therefore be larger than those produced for this SFRA.

Using the available data, the following Critical Drainage Areas have been provided as part of the SFRA.

¹¹ HMSO (2006) The Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006

¹² Environment Agency. Flood Risk Standing Advice for England - PPS25 National Version 2.0. Can be accessed online at <http://www.environment-agency.gov.uk/research/planning/82584.aspx>

Appendix E

Extract from North West Geography Society List of Historic Flooding

Historic Map of Old Watercourses

Table 1: Major flood events in Greater Manchester. (Source: Compiled by Ian Douglas and Nigel Lawson from Municipal and Environment Agency records, the press and literature reviews.)

Year	Location	Cause	Effect
1616	Irwell in Salford	No data	No data
1649	Irwell in Salford	No data	No data
1662	Mersey	No data	Cut Chester and London Roads.
1750	Mersey	No data	Cost many lives.
1767	Mersey	No data	Washed away bridge at Stretford.
1799	Mersey	Banks burst	No data
1828	Mersey	No data	No data
1799-1852	Irwell – 10 events	Siltation	No data
1866	Irwell	No data	No data
1868	Irwell	Siltation by urban debris	No data
1871	Irwell	Loss of channel capacity	No data
1880	Irwell	No data	Severe damage to city centre riverbank properties.
1881	Irwell	No data	Severe flooding in Lower Broughton.
1886	Irwell at Salford	Channel capacity exceeded (No raised Defences)	800 ha with crowded tenements in Lower Broughton flooded up to 2m in depth.
1896	Mersey	No data	Floods in many parts, including Stockport.
1923	Mersey and Irwell	No data	Flooding in Lower Broughton and along Mersey.
1930	Mersey	No data	Flooding and severe bank erosion at Ashton in Mersey.
1940	Mersey and Irwell	Snowfall and Snowmelt	Severe flooding.
1946	Irwell	Channel capacity exceeded	Severe flooding in Salford, 5,300 properties and 243 ha in Lower Broughton.
1954	Irwell	Channel capacity exceeded	600 properties in Lower Kersal and Lower Broughton.
1964	Irwell, Mersey and Beal	Overlapping of banks at Northenden and Douglas Green, Salford	350 properties evacuated in Shaw. Didsbury widespread flooding of fields and property.
1965	Roch	No data	No data
1973	Mersey	No data	Flooding in Stockport.
1980	Irwell	Riverine and sewer flooding	Severe flooding, particularly in Lower Kersal.
1981	Chorlton and Sinderland Brooks	South Manchester 75 mm rain over 3 hours in early August	Widespread flooding along the Chorlton and Sinderland Brook catchments.
1995	Irwell, Roch and culverts	No data	60 houses and 21 industrial units flooded.
2000	Mersey, Irwell, Roch and culverts	Banks overtopped, blocked culverts	Widespread flooding.
2002	Irwell, Roch and culverts	Overtopping of Irwell, backing up drains in Rochdale	11 properties flooded in Irwell Vale.
2004	Netherley, Shaw, Cringle and Chorlton Brooks. Heywood	2 nd wettest August on record, surface water, blocked culverts (Cringle Brook) pumping station breakdown	Cheadle: 22 properties and 2 industrial units affected. M60 motorway near Whitefield closed for 7 hours. Heywood: back-up sewage flooding in a number of homes.
2006	Heywood	July storm (33.2mm rainfall in 1 hour); culvert and sewer overflows	200 homes flooded, 40 homes evacuated.

Riverine flooding

Flood protection from major rivers is the responsibility of the Environment Agency which continuously seeks to reduce the risk of flooding, according to the risk scales expressed in Table 2. In spite of the Agency's efforts, levels of protection to the Mersey, Irwell and Roch, the three major rivers draining Greater Manchester, vary considerably. Much of the Mersey Valley is now low risk with protection to 1:200 years or more

following the development in the 1970s of temporary flood storage basins on park land and golf courses in the natural flood plain. Bypass channels, channel adjustments, bank reinforcements, storm-water tanks and increased drainage and sewerage capacity intend to protect the River Roch in Rochdale and Littleborough to a standard of 1:100 years. However, Lower Kersal and Lower Broughton, the two areas in Greater Manchester to have suffered most from flooding



Appendix F

Extract from United Utilities Sewer Records



<

OS Sheet No: SJ8496SW
Scale: 1: 1250 Date: 17/02/2014



SEWER RECORDS

Appendix G

Maps Showing Risk of Flooding From:-

Rivers & Sea

Groundwater

Surface Water

Reservoirs



Enter a postcode or place name:

Other topics for this area...



Risk of Flooding from Rivers and Sea

[View other Interactive Maps](#)

Risk of Flooding from Rivers and Sea

River flooding happens when a river cannot cope with the amount of water draining into it from the surrounding land. Sea flooding happens when there are high tides and stormy conditions.

The shading on the map shows the risk of flooding from rivers and the sea in this particular area.

Click on the map for a more detailed explanation.

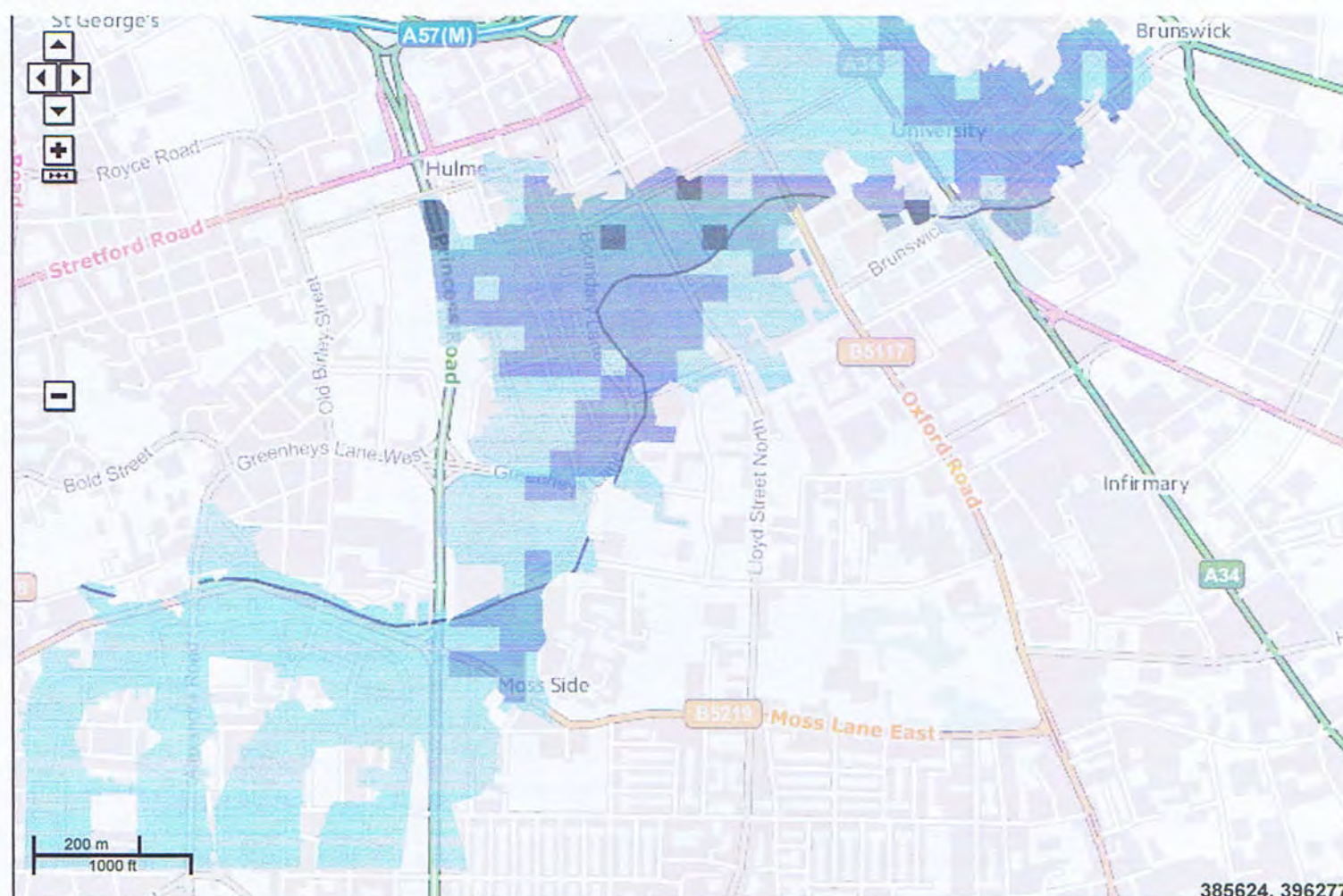
Map of M15 6SZ at scale 1:10,000

[Data search](#)

Map legend

☒ Risk of Flooding from Rivers and Sea

- High
- Medium
- Low
- Very Low



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Enter a postcode or place name:

Other topics for this area...

Flood Map for Planning (Rivers and Sea)

M15 6SZ

Go

Flood Map for Planning (Rivers and Sea)



Map legend

Click on the map to see what Flood Zone (National Planning Policy Guidance definitions) the proposed development is in.

☒ Flood Map for Planning (Rivers and Sea)

Flood Zone 3

Flood Zone 2

Flood defences (Not all may be shown*)

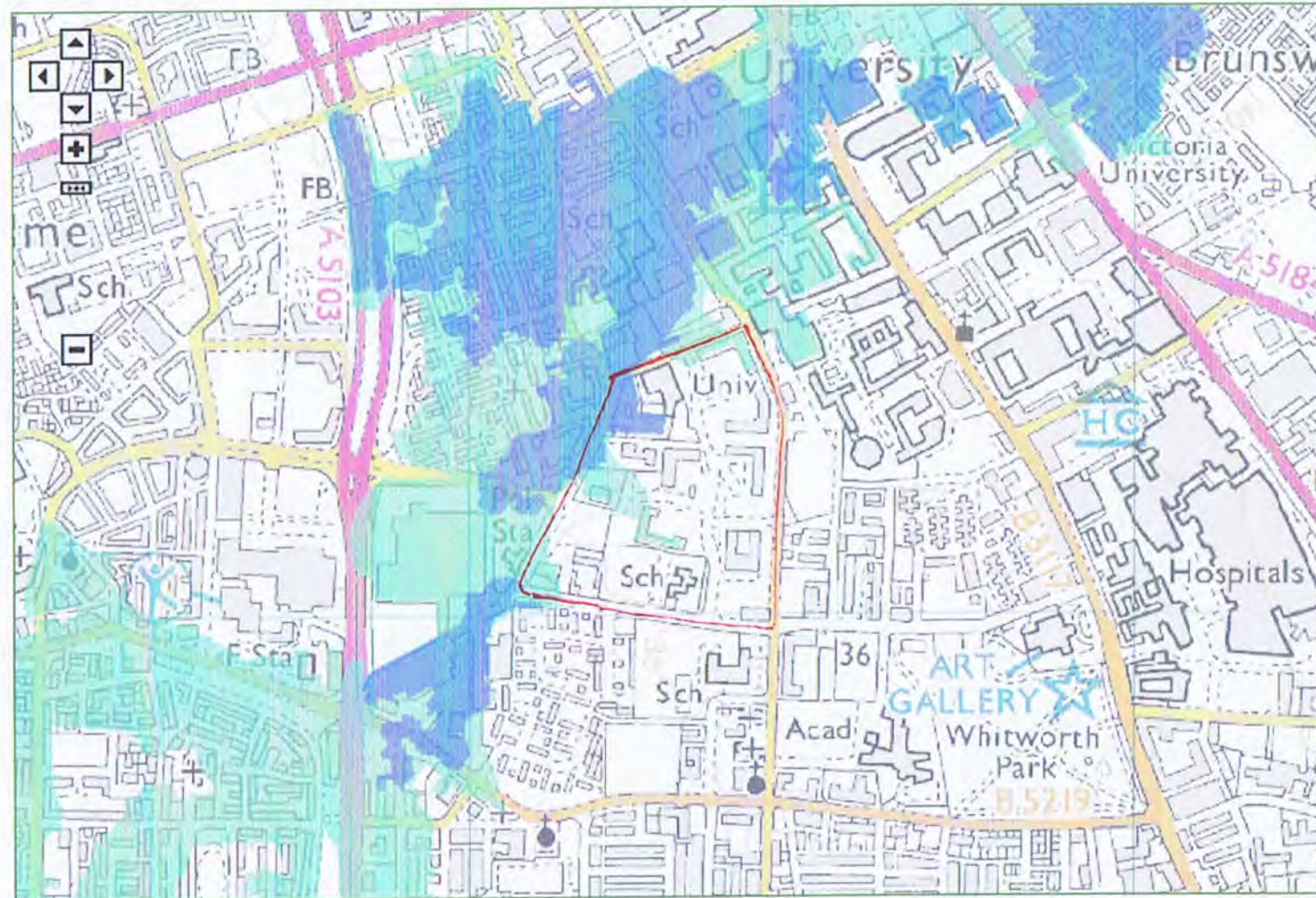
Areas benefiting from flood defences (Not all may be shown*)

Main rivers

M15 6SZ at scale 1:10,000

Data search

Text only version



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More about flooding:

Understanding the Flood Map for Planning (Rivers and Sea)

A more detailed explanation to help you understand the flood map shown above.

Current flood warnings



Enter a postcode or place name:

Other topics for this area...

Groundwater

Go

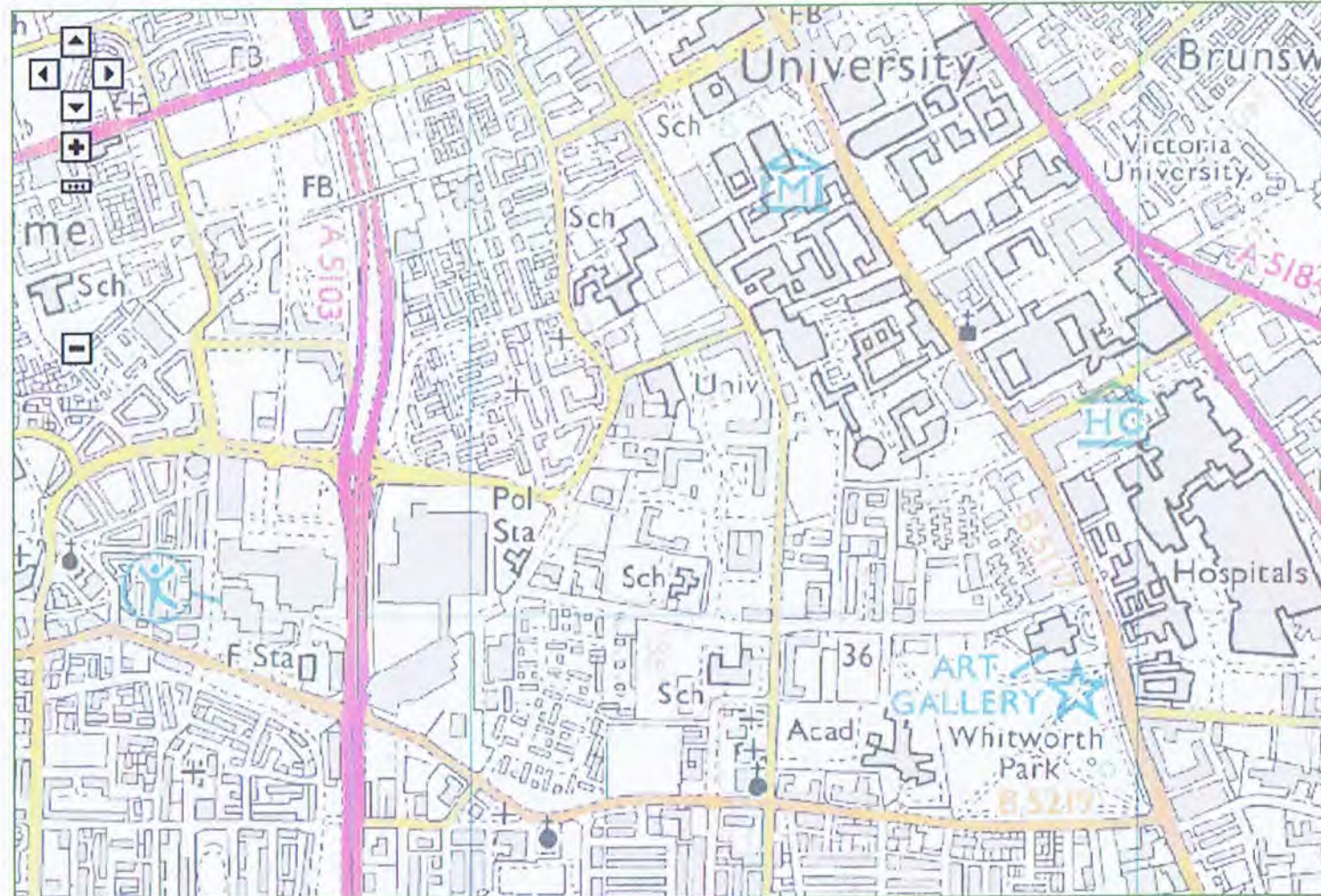
Groundwater



Map legend

- ☒ Groundwater source protection zones
- Inner zone (Zone 1)
- Outer zone (Zone 2)
- Total catchment (Zone 3)
- Special interest (Zone 4)
- ☐ Aquifer Maps - Superficial Deposits Designation
- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unknown (lakes and landslip)
- ☐ Aquifer Maps - Bedrock Designation
- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- ☐ Groundwater Vulnerability Zones
- Major Aquifer High
- Major Aquifer Intermediate
- Major Aquifer Low
- Minor Aquifer High

Map of X: 384,312; Y: 396,239 at scale 1:10,000

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More about Groundwater

British Geological Survey Aquifer data:

The Aquifer Extents are not displayed at scales greater than 1:75,000 (Ordnance Survey 1:250,000 scale) as the data was only modelled to this level and is not accurate past this.

New BGS Aquifer Designation Maps



Enter a postcode or place name:

Other topics for this area...

Go

Risk of Flooding from Surface Water

[View other Interactive Maps](#)

Risk of Flooding from Surface Water

Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.

The shading on the map shows the risk of flooding from surface water in this particular area.

Click on the map for a more detailed explanation.

Map of X: 384,311; Y: 396,238 at scale 1:10,000

[Data search](#)

Map legend

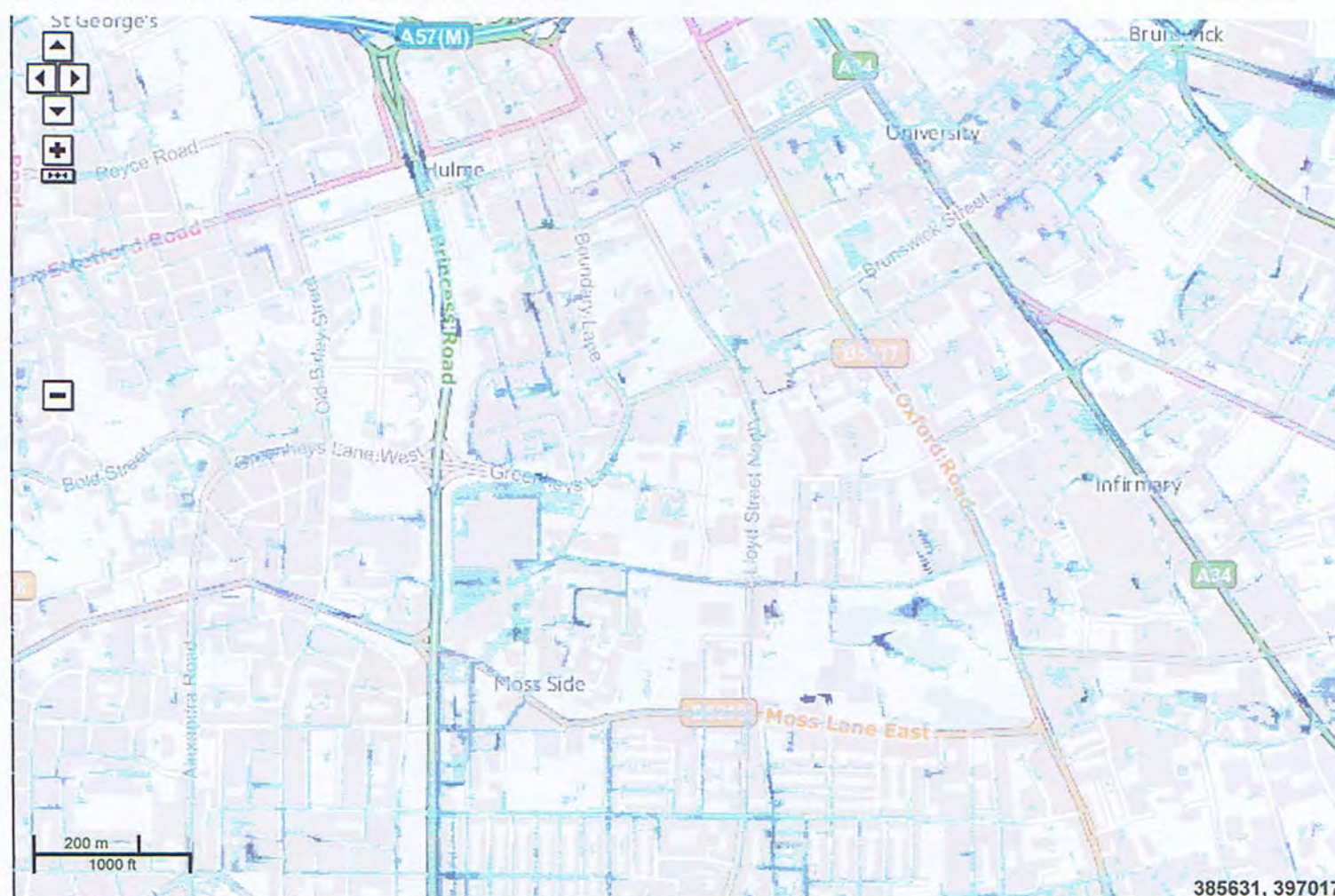
☒ Risk of Flooding from Surface Water

High

Medium

Low

Very Low



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Enter a postcode or place name:

Other topics for this area...

Go

Risk of Flooding from Reservoirs

[View other Interactive Maps](#)

Risk of Flooding from Reservoirs

Reservoir flooding is extremely unlikely to happen.

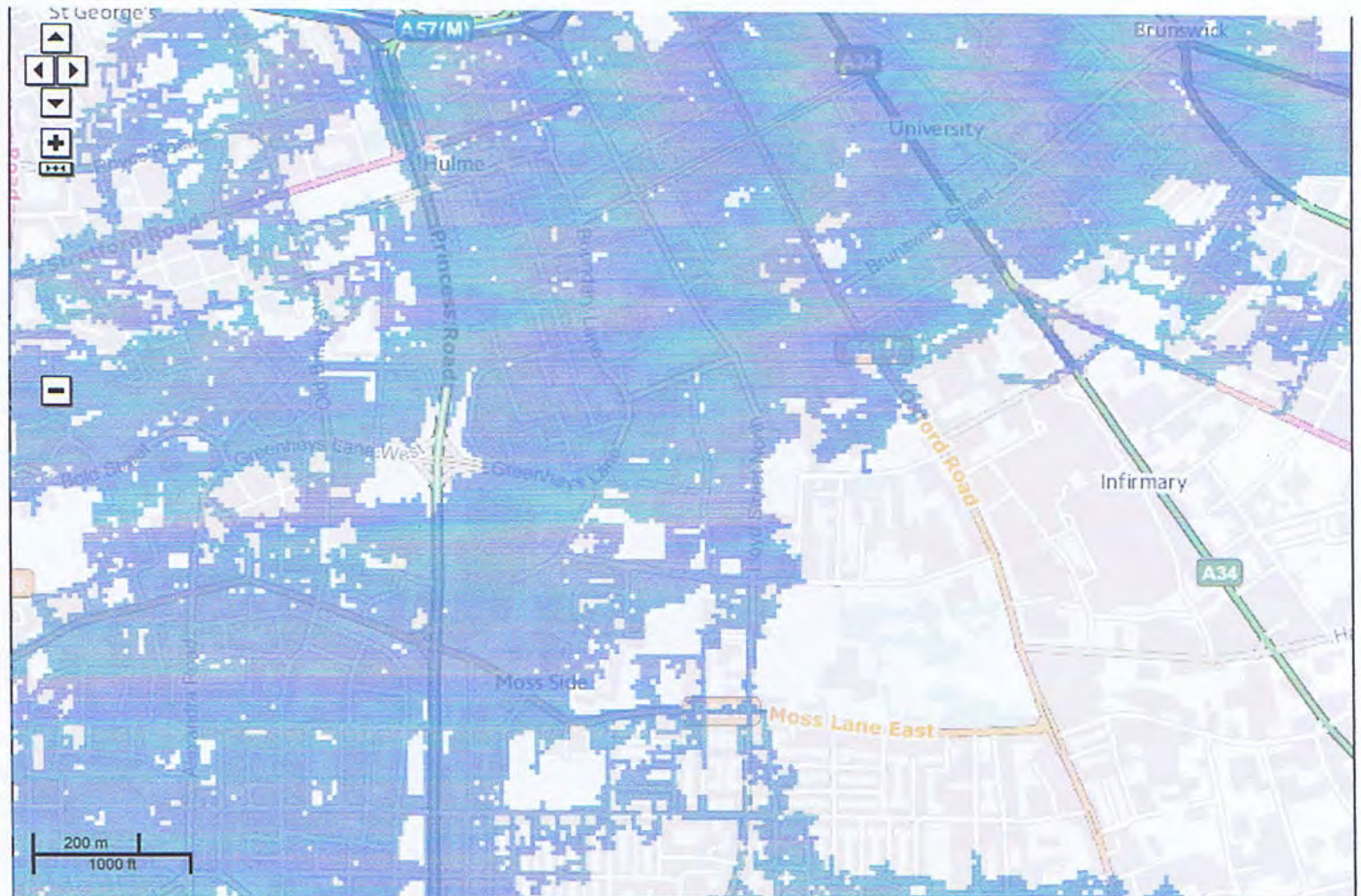
The shading on the map shows the area that could be flooded if a large reservoir were to fail and release the water it holds. A large reservoir is one that holds over 25,000 cubic metres of water, equivalent to approximately 10 Olympic sized swimming pools. Since this is a worst case scenario, it's unlikely that any actual flood would be this large.

Click on the shading to see details of reservoirs that could cause flooding in this area.

Map legend

- ☒ Risk of Flooding from Reservoirs
- ☐ Maximum extent of flooding

Map of X: 384,311; Y: 396,238 at scale 1:10,000

[Data search](#)

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Interactive Maps

Risk of Flooding from Reservoirs for X:384142, Y:396360

Below are the reservoirs that could affect this area.

Audenshaw No. 3				
Risk Designation: To be determined We define a reservoir as high risk, if peoples' lives would be in danger as a result of an uncontrolled release of water from the reservoir.				
Reservoir Owner: United Utilities Water plc				
Reservoir location (grid reference): 390934, 396835	Environment Agency Area: South Area in North West Region	Local Authority: Tameside	Additional Comments: If you have questions about local emergency plans for this reservoir you should contact the named Local Authority	View map

Audenshaw No.2				
Risk Designation: To be determined We define a reservoir as high risk, if peoples' lives would be in danger as a result of an uncontrolled release of water from the reservoir.				
Reservoir Owner: United Utilities Water plc				
Reservoir location (grid reference): 391643, 396093	Environment Agency Area: South Area in North West Region	Local Authority: Tameside	Additional Comments: If you have questions about local emergency plans for this reservoir you should contact the named Local Authority	View map

Audenshaw No.1				
Risk Designation: To be determined We define a reservoir as high risk, if peoples' lives would be in danger as a result of an uncontrolled release of water from the reservoir.				
Reservoir Owner: United Utilities Water plc				
Reservoir location (grid reference): 391852, 396483	Environment Agency Area: South Area in North West Region	Local Authority: Tameside	Additional Comments: If you have questions about local emergency plans for this reservoir you should contact the named Local Authority	View map

Gorton Upper				
Risk Designation: To be determined We define a reservoir as high risk, if peoples' lives would be in danger as a result of an uncontrolled release of water from the reservoir.				
Reservoir Owner: United Utilities Water plc				
Reservoir location (grid reference): 389893, 396254	Environment Agency Area: South Area in North West Region	Local Authority: Manchester	Additional Comments: If you have questions about local emergency plans for this reservoir you should contact the named Local Authority	View map

Further information

Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, we ensure that reservoirs are inspected regularly and essential safety work is carried out.

However, in the unlikely event that a reservoir dam failed, a large volume of water would escape at once and flooding could happen with little or no warning. If you live or work in an area that could be affected, you should plan in advance what you would do in an emergency. You may need to evacuate immediately. Consider where you would go to safety, and be ready to follow the advice of emergency services.

To find out about local emergency plans, contact the local authority listed above. Be aware that they may not be able to give you any specific information immediately as developing reservoir emergency plans is a new responsibility.

If you would like to see information on how deep the water could get or how fast it could flow

[View the estimates of the depth of flooding from reservoirs for this area.](#)

[View the estimates of the speed of flooding from reservoirs for this area.](#)

This area may be at risk from other types of flooding.

[Check your risk of flooding from rivers and sea.](#)

[Check your risk of flooding from surface water.](#)