

Flood Risk Assessment & Outline Drainage Strategy

Plot 10b First Street

for

House of Social 1 Ltd



15.02.2023



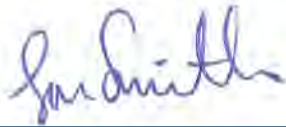
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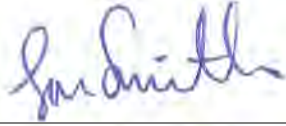
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1.0 Introduction

1.1 Appointment

RoC Consulting has been commissioned by House of Social 1 Ltd to provide a site-specific Flood Risk Assessment and Outline Drainage Strategy in support of a planning application for the development of a medium-rise purpose-built student accommodation scheme.

1.2 Proposed Development

The site comprises an area of land measuring approximately 0.3ha southwest of River Street in Manchester City Centre.

The intention is to construct a new purpose-built student accommodation building that provides 576 bed spaces over 13 storeys alongside a food hall, bar, gym, student amenity space and back of house facilities.

The site is currently vacant and has most recently been utilised as a car park and construction compound for the surrounding First Street regeneration project.

1.3 Aim of the Report

The aim of this report is to undertake a Flood Risk Assessment in accordance with the National Planning Policy Framework (NPPF) and current guidance to support a planning application for the site.

The detail and complexity of a Flood Risk Assessment should reflect the level of risk to the site. The NPPF is the official document and together with local planning standards regulates the assessment of flood risks and their appropriate mitigations to the planning process.

This report assesses flood risk to the site and any impact on flood risk to adjacent land and property due to the development proposals.

This report is intended to provide information and present proposals relating to the following:

- The existing topography, geology, and hydrogeology across the development
- The existing surface and foul water drainage systems within the vicinity of the site
- Identify existing overland flow paths
- Assess the risk of flooding due to fluvial, tidal, groundwater, surface water, flows from surcharged sewers and risks for other possible sources
- Develop mitigation measures for flood risk if required
- Potential constraints imposed by the regulatory bodies including the Environment Agency, Local Water Authority and Lead Local Flood Authority
- Develop an outline foul and surface water drainage strategy



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As part of the development of this FRA, information has been obtained from United Utilities (UU).

The flood mapping information contained within this report has been obtained from the Environment Agency (EA) online flood maps and from further consultation.

1.4 Limitations

This report has been prepared for exclusive use by the client for the purpose of assisting them in evaluating the potential risk of flooding associated with the site, potential constraints imposed by drainage and in making a planning application.

RoC Consulting accepts no liability for any use of this document other than by the client (or its representatives acting on behalf of the client) and only for the purposes, stated in the document, for which it was prepared and provided. No person other than the client may copy (in whole or in part) use or rely on the contents of this document, without the prior written permission of RoC Consulting. Any advice, opinions or recommendations within this document should be read and relied upon only in the context of the document as a whole.

RoC Consulting has endeavoured to assess all information provided to them during this appraisal. The report summarises from several external sources and cannot offer any guarantees or warranties for the completeness or accuracy of information relied upon.

The Flood Risk Assessment addresses the flood risk posed to and from the proposed development, the extent of which is shown on the Tim Groom Architects layout plan within Appendix B. This report has been undertaken with the assumption that the site will be developed in accordance with the above proposals without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Intrusive investigation works have not been completed specifically for the development however, investigations were undertaken for the wider site by Ramboll in February 2020 (Ref: 1620002943-GCLIR-03) to which this report refers alongside the more recent RoC Phase 1 Desk Study Report. Further intrusive ground investigation works are recommended.

Drainage investigation works have also been carried out by Ramboll as part of the wider First Street Masterplan works. It is recommended that further targeted survey works are undertaken at the appropriate time to suit the proposed drainage strategy where necessary.

2.0 Policy & Guidance

In carrying out our assessment and preparing this report, regard has been taken of the provisions of the development plans and a range of other material considerations. However, it is the Governments National Planning Policy Framework, Manchester City Council's Strategic and Preliminary Flood Risk Assessments (PFRA/ SFRA), the Local Flood Risk Management Strategy, LLFA SUDS Requirements for New Developments, CIRIA Guidance and the Non-Statutory Technical Standards for SUDS which provides the most up to date and specific guidance on the scope of Flood Risk Assessments and surface water management.

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in England in March 2012, updated in July 2018 and most recently revised in July 2021.

The key aim of the NPPF is to ensure sustainable development through the planning process, considering the risks from climate change, flood risk and coastal change to avoid inappropriate development in areas at risk and directing development away from areas of high risk.

It advises that where development is necessary in areas of high risk, it should be safe, and that flood resilience should also be incorporated into the design. It also advises of the fact that new developments should not increase flood risk elsewhere and new developments should aid in mitigating flood risk to the wider area.

The NPPF's advice on climate change, flood and coastal change is set out in section 14 paragraphs 152-173, with the approach to planning for flood risk between paragraphs 159-169.

A Technical Guidance document was published in March 2012 to support the NPPF, which provided guidance on how flood risk should be assessed during the planning and development process. This document has been replaced online at www.gov.uk by the Planning Practice Guidance.

2.2 Planning Practice Guidance – Climate Change, Flood Risk & Coastal Change

The guidance on flood risk and coastal change is intended to help local planning authorities in the preparation of Local Plans, and neighbourhoods in preparing neighbourhood plans. It is also relevant to planning applications and, application for prior approval for certain types of permitted development.

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For further guidance, it is recommended that the Environment Agency (EA) be contacted on applications where there is a risk of flooding i.e., sites within Flood Zones 2 and 3. There is also information on the role of Lead Local Flood Authorities (LLFA's) and when their advice may need to be sought in considering planning applications e.g., in critical drainage areas.

The document gives guidance on how flood risk should be assessed and accounted for within the context of the development:

- Flood zones - Table 1
- Flood risk vulnerability classification - Table 2
- Flood risk vulnerability and flood zone compatibility - Table 3
- The sequential test - if required
- The exception test - if required

2.3 Flood and Water Management Act 2010

This Flood Risk Assessment and Preliminary Drainage Strategy has been prepared in consultation with regulatory bodies and third parties. The views, advice and recommendations provided by the regulatory bodies and third parties represent their current standards and procedures.

The Flood and Water Management Act 2010 received Royal Assent on the 8th April 2010. This Act provides duties on the Environment Agency, Local Authorities, developers, and other bodies to manage flood risks. The Act has significant planning and design implications for developers.

The main areas affecting developers are:

- The LLFA became responsible for developing, maintaining, and applying local flood risk strategy, which must be consistent with national strategy and have input from the designated 'Flood Management Authorities' (FMA), which in addition to the council/unitary authority normally include the EA and local water company
- The LLFA is required to approve and may adopt sustainable urban drainage systems (SUDS). The LLFA may be either a Unitary or County Council
- Non-statutory technical standards have been produced by Defra for England and the Welsh government for Wales. There is a requirement that SUDS will be designed and constructed in accordance with these which are consistent with the SUDS Manual. A practice guidance document was produced by the LASOO advisory group in support of the non-Statutory technical standards. In August 2019, LASOO was replaced with the Association of SUDS Authorities (ASA), the 'standards' remain current. A number of local authorities have also produced their own policy and guidance

- The SUDS approval process is with the LLFA and the planning authority as part of the planning application. It should be noted that not all planning authorities are the LLFA and as such approval would be required from both authorities.

2.4 Manchester City Council Strategic Flood Risk Assessment, 2011

Local Planning Authorities are required to produce Local Development Frameworks (LDF), which are a portfolio of local development documents that collectively deliver the spatial planning strategy for the authority area.

The LDF's undergo a Sustainability Appraisal which assists Planning Authorities in ensuring their policies fulfil the principles of sustainability. Strategic Flood Risk Assessments (SFRA's) are one of the documents to be used as the evidence base for planning decisions and are a component of the sustainability appraisal process. Therefore, SFRA's should be used in the review or production of LDF's.

SFRA's assess the risk associated with all types of flooding and provides the information required to identify the amount of development permitted in an area; how the drainage systems in the area should function and how the risks in vulnerable areas can be reduced and/or mitigated. The National Planning Policy Framework states that Regional Planning Bodies (RPB's) or Local Planning Authorities should prepare SFRA's in consultation with the Environment Agency.

Manchester City, Salford City and Trafford Councils in partnership with JBA Consulting, produced the Level 1 and Level 2 SFRA, User Guide and Maps across four separate report volumes.

The SFRA indicates that the site primarily is located in Flood Zone 1 with the northwest corner shown to be in Flood Zone 2.

2.5 Manchester City Council Preliminary Flood Risk Assessment, 2011

The Flood Risk Regulations (the Regulations), which came into force on the 10th December 2009, and the Flood & Water Management Act (FWMA) which gained Royal Assent on the 8th April 2010 require all unitary authorities (such as Stockport Council) as designated Lead Local Flood Authorities to prepare a number of key documents including a Preliminary Flood Risk Assessment (PFRA) which focuses on local flood risk from surface water, groundwater, ordinary watercourses and canals.

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The table below shows the elements of work required under the regulations.

Stage	Assessment of Plan	Description
1.0	Prepare a preliminary assessment report	The PFRA should focus on local flood risk from surface water, groundwater, ordinary watercourses, and canals
2.0	Determination and identification of flood risk areas	Flood risk areas are of significant risk identified on the basis of the findings of the PFRA, national criteria set by the UK Government secretary of state and guidance provided by the Environment Agency
3.0	Prepare flood hazard maps and flood risk maps in relation to each relevant flood risk area	The hazard and risk maps will show the likely extent depth, direction, speed of flow and probability of possible floods and their consequences
4.0	Prepare a flood risk management plan in relation to each relevant flood risk area	The flood risk management plans will set out what the risk management objectives are, the measures proposed to achieve those objectives and how the measures are to be implemented

The PFRA completes the first two stages in the process. The identification of flood risk areas will establish where the final two stages of preparing hazard and risk maps and flood risk management plans are required.

The PFRA, maps and plans form part of the local Flood Risk Management Strategy that Manchester City Council as LLFA are required to prepare under the Flood and Water Management Act. This strategy sets out how the LLFA will manage local flood risk in their area and will cover areas not identified as being significant flood risk under the regulations.

2.6 Manchester City Local Flood Risk Management Strategy, 2014

As Lead Local Flood Authority, Manchester City Council has a duty to develop, maintain, apply, and monitor a strategy for local flood risk management. The local strategy will complement and support the National Flood and Coastal Risk Management Strategy, published by the Environment Agency (2011) and updated in August 2019.

The Manchester City Local Flood Risk Management Strategy (2014) focuses on local flood risk from surface water, groundwater and ordinary watercourses but also considers flooding from rivers. It identifies responsibilities for flooding within the Borough and the action plan identifies flood management actions designed to address flood risk.

The objectives of the strategy are to:

- Ensure that local flood risk is properly managed by using the full range of options in a coordinated way
- Reduce the likelihood, severity, and consequences of flooding from Ordinary Watercourses, from Groundwater, and from Surface Water runoff
- Seek opportunities to improve water quality and biodiversity through flood risk management activities

The LFRMS does not identify the development site as being one of the main areas specifically at risk with the exception of groundwater flooding. However, the mapping is based on a very broadscale approach based largely on geology. The likelihood of groundwater flooding occurring in Manchester is considered to be generally low.

2.7 SUDS Requirement for New Developments, Manchester City Council

The Lead Local Flood Authority have published a document that provides guidance on drainage and flood risk for new developments. A copy of this can be found in Appendix C of this report.

To avoid objection, the following three elements of evidence are required to be submitted:

1. Surface Water Management Statement for the site is submitted that is in line with the requirement of the NPPF Planning Practice Guidance
 - *'New development should only be considered in areas at risk of flooding if priority has been given to the use of sustainable drainage systems. Additionally, and more widely, when considering major development, as defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015, sustainable drainage systems should be provided unless demonstrated to be inappropriate'.*
 - *The strategy should be accompanied by at least an outline layout of the proposed drainage systems with space allocation for the proposed attenuation in line with the relevant flow reduction requirements.*
2. Evidence that drainage hierarchy has been applied in line with NPPF PPG requirements. The aim should be to discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable:
 - *into the ground (infiltration);*
 - *to a surface water body;*
 - *to a surface water sewer, highway drain, or other drainage system;*
 - *to a combined sewer.*

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3. Evidence that one viable solution for draining the site is secured:
- *Results of ground investigation carried out under Building Research Establishment Digest 365. Site investigations should be undertaken in locations and at proposed depths of the proposed infiltration devices. Proposal of the attenuation that is achieving half emptying time within 24 hours. If no ground investigations are possible or infiltration is not feasible on site, evidence of alternative surface water disposal routes (as follows) is required.*
 - *Where surface water is connected to Main Rover, any works within or adjacent to the river that would affect it would require consent from Environment Agency. An email of acceptance of proposed flows and/or new connection will suffice.*
 - *Where surface water is connected to the public sewer, agreement in principle from United Utilities is required that there is adequate spare capacity in the existing system taking future development requirements into account. An email of acceptance of proposed flows and/or new connection will suffice.*
 - *Where surface water is connected to the ordinary watercourse, agreement in principle from Manchester City Council as Lead Local Flood Authority is required. Please note that all new connections to the watercourses shall comply with reduction of flows to Greenfield runoff rates. An email of acceptance of proposed flows and/or new connection will suffice.*
 - *Where surface water is connected to ordinary watercourse, any works within or adjacent to the watercourse that would affect it would require consent from Manchester City Council as Lead Local Flood Authority.*

To avoid or discharge a drainage condition, the following evidence is required.

- Evidence of consideration of green SUDS solution wherever practicable and viable in line with NPPF PPG Paragraph 051. SUDS should be designed to:
 - *reduce the causes and impacts of flooding;*
 - *remove pollutants from urban run-off at source;*
 - *combine water management with green space with benefits for amenity, recreation and wildlife wherever practicable.*
- For Greenfield site developments, details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. to the Greenfield runoff rates;
- For Brownfield site developments, for all sites located within Conurbation Core Critical Drainage Areas, details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. at least a 50% reduction in runoff rate compared to the existing rates with an aim to reduce to Greenfield runoff rates wherever practicable;

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- Where surface water runoff is to be disposed through infiltration, details of surface water attenuation that is adequate for infiltration capacity of the underlying soil is required. This capacity has to be assessed through site investigation carried out in line with Building Research Establishment Digest 365. Site investigations should be undertaken in locations and at proposed depths of the proposed infiltration devices. Half emptying time of proposed attenuation within 24 hours should be achieved.
- Evidence that the drainage system has been designed (unless an area is designated to hold and/or convey water as part of the design) so that flooding does not occur during a 1 in 100 year rainfall event in any part of a building; The NPPF suggests that 'for events with a return-period in excess of 30 years, surface flooding of open spaces such as landscaped areas or car parks is acceptable for short periods, but the layout and landscaping of the site should aim to route water away from any vulnerable property, and avoid creating hazards to access and egress routes. No flooding of property should occur as a result of a one in 100 year storm event (including an appropriate allowance for climate change)'.
- Assessment of overland flow routes for extreme events that is diverted away from buildings providing long and cross sections for the proposed drainage system and finished floor levels.
- Evidence that runoff volume in the 1 in 100 year, 6 hours rainfall shall be constrained to a value as close as is reasonably practical to the Greenfield runoff volume for the same event, but never to exceed the runoff volume from the development site prior to redevelopment;
- Hydraulic calculation of the proposed drainage system;
- Design construction drawings of proposed SUDS elements and flow controls;
- For sites where proposed development would cause unusual pollution risk to surface water (large car park areas (>50 parking spaces) or industrial estates), evidence of pollution control measures (preferably through SUDS) is required.
- Where an application is part of a larger site which already has planning permission it is essential that the new proposal does not compromise the drainage scheme already approved.

2.8 CIRIA Guidance Development & Flood Risk

The CIRIA Guidance publication “C624 Development and Flood Risk – Guidance for the Construction Industry” defines 3 levels of FRA which can be undertaken:

FRA Level	Description / Scope
Level 1	Screening Study to identify whether there are any flooding or surface water management issues related to a development site that may warrant further consideration. This should be based on readily available existing information, including the SFRA, Environment Agency Flood Map and Standing Advice.
Level 2	Scoping Study to be undertaken if the Level 1 FRA indicates that the site may lie within an area that is at risk of flooding or that the site may increase flood risk due to increased run-off. This Study should confirm the sources of flooding which may affect the site and should include the following: • an appraisal of the availability and adequacy of existing information • a qualitative appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere • an appraisal of the scope of possible measures to reduce the flood risk to acceptable levels. The Scoping Study may identify that sufficient quantitative information is already available to complete a FRA appropriate to the scale and nature of the development.
Level 3	Detailed Study to be undertaken if the Level 2 FRA concludes that further quantitative analysis is required to assess flood risk issues related to the development site. The Study should include: • quantitative appraisal of the potential flood risk to the development • quantitative appraisal of the potential impact of development site on flood risk elsewhere • quantitative demonstration of the effectiveness of any proposed mitigation measures

This report will follow the format of a Level 2 Scoping Study.

2.9 C753 The SUDS Manual

This document provides best practice guidance on the planning, design, construction, operation, and maintenance of sustainable drainage systems (SUDS). This document provides detail on all the typical sustainable drainage systems and details on how they can be interconnected to not only provide the required drainage performance but also act as pollution control whilst enhancing the site wide Masterplan proposals.

SUDS should not be thought of as an individual component, but as an interconnected system designed to manage, treat, and make best use of surface water, from where it falls as rain to the point at which it is discharged into the receiving environment beyond the boundaries of the site.

A central design concept for SUDS is the SUDS Management Train. This describes the use of a sequence of components that collectively provides the necessary processes to control the frequency of runoff, the flow rates, and the volumes of runoff, and to reduce concentrations of contaminants to acceptable levels. There are six specific functions provided by SUDS components.

They are not independent, and one component may provide two or more functions.

2.10 Non-Statutory Technical Standards for SUDS, 2015

This document sets out the non-statutory technical standards for sustainable drainage systems.

They should be used in conjunction with the National Planning Policy Framework and associated Planning Practice Guidance.

The technical standards prescribe requirements for both Peak Flow and Volume Control with an emphasis on ensuring that these do not exceed the pre-development case and, where practicable, should not exceed greenfield rates and volumes for the 1 in 1 year and 1 in 100 year rainfall events.

For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

3.0 Site Context

The site is located within Manchester City Centre close to both Deansgate and Oxford Road railway stations and comprises a rectangular plot of land within the First Street Masterplan area.

The site is centred around NGR: SJ 83803 97290. The nearest postcode of M1 5GG. The total site area to be developed is approximately 0.3ha.

A site location plan is within Appendix A of this report.

3.1 Site Characterisation / Land Use

Development Area		The gross site area is approximately 0.30ha. Under the current proposals the site will provide 576 student bedspaces across 14 storeys alongside bar, food hall, kitchen areas, amenity space, laundry facilities, gym, collaboration spaces, cycle store, refuse etc.
Existing Surfacing and Current Use		The site is currently unoccupied hardstanding surfaced with concrete, asphalt and gravel which reflects its most recent use as a temporary car park and site compound. There is limited vegetation on the site which can be found around the site boundary.
Boundaries	North	River Street beyond which lie existing commercial and residential buildings within the First Street development area.
	South	Hulme Street beyond which lies further vacant brownfield land.
	East	River Street beyond which lies vacant brownfield land and the Macintosh Mill apartment building.
	West	A development plot (ASK Real Estate, Plot 9 & 10A) beyond which lies the A5103 Medlock Street. Part of plot 9 is currently under construction.
Access	Vehicles	The site can be accessed from River Street in the North-East corner.
	Pedestrians/Cycles	The site is surrounded by hoarding and can be accessed by the same vehicular entrance from River Street.

A proposed site layout plan is within Appendix B of this report.

3.2 Topography

A topographic survey of the development site has been undertaken, a copy of which is within Appendix D of this report.

The topography of the site is generally level with a general fall from southwest to northeast. Levels in the northeast corner are around 30.68mAOD with levels in the southwest around 33.19mAOD.

3.3 Geology

Reference to the online British Geological Survey (BGS) map for the site indicates the following ground model:

Drift Geology: Glaciofluvial Sheet Deposits – Sand and Gravel

Solid Geology: Chester Formation – Sandstone

Soilscape England describes the soils as ‘slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage’.

A search has also been completed using the BGS Borehole Scans facility to establish what (if any) historic site investigation or borehole data may be available for the development. The table below details the two closest available scans.

BHID	Direction	Distance	Made Ground	Clay	Sand	Clay
SJ89NW102	Southeast	100m	1.07m	2.59m	13.11m	9.45m
SJ89NW1229	North	65m	1.40m	4.0m	-	-

There are no geological faults or features indicated within 500m of the site.

3.4 Hydrogeology

Reference to the DEFRA ‘Magic Map’ online Aquifer Designation Map indicates that the underlying superficial deposits are classed as a Secondary A Aquifer. The underlying Bedrock Geology is described as a Principal Aquifer.

Secondary A classification are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

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Principal aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

3.5 Ground Water Protection Zones

The Environment Agency have defined Source Protection Zones (SPZs) for 2,000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer, and total catchment) and a fourth zone of special interest, which the Environment Agency occasionally applies, to a groundwater source.

The proposed development site is located within Source Protection Zone 3 (Total Catchment).

The site is not located near to any sensitive groundwater abstraction points (e.g., for a potable water supply well). The nearest water abstraction point is indicated 175m to the northwest relating to the now defuncted Dunlop Rubber Works.

The nearest surface water feature is indicated 100m to the north in the form of the river Medlock (culverted). Water quality of this receptor indicates a GQA Grade of "E" (poor) and a flow rate of less than 0.31 cumecs.

There are four active water abstractions at the site or within 500m of the site boundary relating to borehole abstraction wells 384m to the southeast operated by Manchester Metropolitan University for use in heating networks.

There are multiple water discharge consents indicated within 250m of the site all of which relate to United Utilities storm water sewer overflows into the river Medlock associated with periods of high flow.

A number of historic pollution incidents have been noted in close proximity to the site relating to a range of incidents including water pollution incidents into the river Medlock to the north (the majority of which were Category 3 – Minor Incident).

The development of the site would be undertaken in a manner to ensure that no contamination of groundwater occurred.

3.6 Watercourses, Land Drainage, and other Waterbodies

As noted above, the nearest surface water feature is the river Medlock which is located circa 100m to the north of the site and is culverted.

No other water features are present in the vicinity.

3.7 Existing Flood Defences and other Structures

There are no formal flood defences in the vicinity of the site.

3.8 Existing Public Sewers

United Utilities Sewer Records show that the highways surrounding the development site are well served by a network of existing combined sewers (refer to Appendix E), these include:

- 600x500 vitrified clay sewer in Hulme Street
- 590x680 brick sewer flowing northward through the adjacent development site before changing to 610mm diameter concrete and turning east where it flows through the Plot10a site just inside the northern boundary. This sewer discharges to a combined sewer overflow (CSO) chamber in River Street
- 630mm diameter vitrified clay in River Street to the east discharging into the CSO chamber
- 300mm diameter vitrified clay outfall from the CSO flowing south along River Street
- 300mm diameter vitrified clay overflow from the CSO to the River Medlock

3.9 Existing Private Sewers

A GPR survey was undertaken by Survey Systems in February 2020 and supplied to RoC for review. This indicates that the site was served by separate foul and surface water drainage networks which are understood to discharge to the public sewer network surrounding the site.

Notwithstanding the above, the GPR survey is limited and only identifies small sections of these networks so is not possible to determine exactly how much of the site these private sewers drained.

A copy of the GPR survey can be found in Appendix E alongside the public sewer records.

3.10 Historical Flood Records

No records of historical flooding in the vicinity are recorded in the SFRA.

An internet-based search did not uncover any flooding incidents at or in the vicinity of the site.

A pre-planning enquiry has been sent to United Utilities which requested any records of DG5 sewer flooding. At the time of writing, a response was awaited and therefore details will be entered into a new revision of this report when received.

3.11 Flood Mapping

3.11.1 EA Flood Zone Map

The Environment Agency Flood Map indicates that the proposed development is primarily located in Flood Zone 1 (low risk) with the northeast corner of the site shown to be in Flood Zone 2 (medium risk).

Flood Zone 1 is land designated as having a greater than 1 in 1,000 annual probability of flooding from rivers.

Flood Zone 2 is land designated as having between a 1 in 100 and 1 in 1000 annual probability of flooding from rivers.

Flood zone designations ignore the presence of any flood defences and only considers flooding from fluvial and tidal sources.

3.11.2 SFRA Flood Zones Map

The Manchester City Council SFRA flood zone map also indicates the site is located in both Flood Zones 1 and 2.

3.11.3 SFRA Groundwater Flood Map

The Manchester City Council SFRA Groundwater Flooding map indicates that the site is in an area at risk of groundwater flooding. However, the mapping is based on a very broadscale approach based largely on geology. The likelihood of groundwater flooding occurring in Manchester is considered to be generally low.

3.11.4 SFRA Surface water Flood Map

The Manchester City Council SFRA surface water flood maps indicate that the site is partly in an area of Low Susceptibility to surface water flooding.

3.11.4 EA Surface water Flood Map

The Environment Agency flood mapping for surface water indicates that whilst the majority of the site is at very low risk of flooding, localised low and medium risk areas exist along the boundary with River Street to the north and east.

4.0 Surface Water Management

4.1 Introduction

The National Planning Policy Framework (NPPF) and accompanying Technical Guidance indicate that surface water runoff should be controlled as near to its source as possible through a sustainable drainage approach to surface water management.

Consideration should therefore firstly be given to using sustainable drainage (SUDS) techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands to reduce flood risk by attenuating the rate and quantity of surface water runoff from a site. This approach can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements. Approved document Part H of the Building Regulations (2015) sets out a hierarchy for the disposal of surface water which encourages a SUDS approach.

4.2 Pre-Development Surface Water Runoff

The total area within the site boundary is approximately 0.30ha. This is currently unoccupied and surfaced with concrete, asphalt and gravel reflecting its former use as a temporary car park and construction compound.

For the purposes of determining the existing rate of surface water runoff the site is considered to be brownfield. The GPR survey is not conclusive enough to allow the existing drainage network to be modelled accurately and therefore a simple four pipe network has been built in Microdrainage based on a small section of the surveyed drainage to allow the existing discharge rate to be assessed.

This method allows estimation of the amount of runoff that is likely to be generated from an urban area based on surveyed pipe sizes and invert depths. Impermeable areas were measured from the topographic survey and can be found alongside a layout of the existing drainage on the drawing in Appendix H of this report.

For the purposes of calculating the existing discharge rate, it is assumed that all the impermeable surfaces across the site contributed to the drainage system.

The table below summarises the existing brownfield runoff rates for the development across a range of storm return periods.

OUTFALL	GROSS AREA	DRAINED AREA	Q ₁ (L/S)	Q ₃₀ (L/S)	Q ₁₀₀ (L/S)
River Street	0.30 ha	0.276 ha	9.7	14.5	15.5

Existing runoff calculations are within Appendix I of this report.

4.3 Methods of Surface Water Management

There are three methods that have been reviewed for the management and discharge of surface water which are detailed below; these may be applied individually or collectively to form a complete strategy. They should be applied in the order of priority as listed.

- Discharge via infiltration
- Discharge to watercourse
- Discharge to public sewerage system

Discharge via Infiltration

Any impermeable areas that can drain to a soakaway or an alternative method of infiltration would significantly improve the sustainability of any surface water systems.

An intrusive investigation for this and the adjacent development site has previously been undertaken by TerraConsult on behalf of ASK Real Estate and provided to RoC for review. In addition, RoC Consulting have undertaken a Phase 1 Desk Study for the site which also provides information on expected ground conditions.

These indicate Made Ground up to depths of around 1.30m, underlain by clays for a further 5-7m. Sandstone bedrock was encountered in one borehole at over 8m.

Variable head permeability testing was undertaken as part of the TerraConsult intrusive investigation. These indicate infiltration rates between $1.06E^{-08}$ m/s to $9.35E^{-09}$ m/s.

Taking this into consideration, infiltration is not considered to be a feasible method of surface water disposal for the development.

Discharge to Watercourse

As indicated earlier in this report, the nearest watercourse to the site is the River Medlock which is located circa 100m to the northeast of the site and is culverted.

No other water features are present in the vicinity.

To obtain a connection to this feature would require a significant off-site connection through third party land and therefore this method of surface water disposal is not considered to be practicable and has not been considered further.

Discharge to Public Sewer

The only public sewerage infrastructure in the vicinity of the site are all combined sewers. On the basis that infiltration is not considered to be viable, there are no surface water sewers or watercourses in the immediate vicinity and the existing development historically discharged to the public combined sewer network then this is the only viable solution.

It is therefore proposed that the development will mimic the existing drainage regime and discharge surface water to the combined sewer network.

To facilitate the development, an existing combined sewer will need to be diverted out of the site boundary and into River Street to the north. As part of this proposal a stub connection will be provided to facilitate a connection. This will be subject to a S185 application which will be submitted to United Utilities at the appropriate time.

A pre-development enquiry was submitted to United Utilities and a copy of their response is appended to this report.

UU have acknowledged that infiltration and discharge to watercourse are both not feasible methods of disposal.

UU have confirmed that a connection to the combined sewer in River Street would be acceptable pending confirmation that there are no highway drains in the vicinity that ultimately connect to the River Medlock.

Further survey work will be required to confirm the connectivity of any highway drainage in the area. However, based on the survey work undertaken to date it is expected that the existing road gully's discharge to the public combined sewer system.

4.4 Proposed Restricted Discharge Rates

Manchester City Council SUDS Requirement for Developers states that:

“For Brownfield site developments, for all sites located within Conurbation Core Critical Drainage Areas, details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. at least a 50% reduction in runoff rate compared to the existing rates with an aim to reduce to Greenfield runoff rates wherever practicable.”

COMPLEX CHALLENGES ... MADE SIMPLE

Given the small development footprint and limited space within which to incorporate SUDS features and attenuation it is not considered practicable to restrict flows to Greenfield runoff rates due to the extremely low flow rate.

It is therefore intended that discharge from the site will be restricted to 50% of the existing Q1 runoff rate subject to agreement with the LLFA. This will ensure that the proposed development will not increase flood risk elsewhere.

Existing brownfield runoff rates have been calculated and are presented in Section 4.2 above. A 50% reduction on the Q1 discharge rate is presented in the table below.

GROSS AREA	IMP. AREA	Q ₁ (L/S)	50% Q ₁ (L/S)
0.30 ha	0.276 ha	9.7	4.85

United Utilities have confirmed in their pre-development enquiry response that they will accept a maximum discharge rate of 5.0 l/s to the combined sewer in River Street

4.5 Attenuation Requirements

The proposed restricted discharge rate above and development runoff generated by proposed impermeable areas results in a storage requirement during periods of intense rainfall.

Microdrainage design software has been used to model the preliminary proposed drainage network and calculate the maximum storage volume required on-site for the Q₁₀₀-year storm events plus an allowance for climate change.

Proposed impermeable areas have been measured from the architect's layout. This may be subject to change pending further development of the site wide landscape proposals. Proposed drainage areas are provided in Appendix J.

Attenuation Volume			
Gross Area (ha)	Imp. Area (ha)	Max. Discharge (l/s)	Q ₁₀₀ +40% Volume (m ³)
0.30	0.30	4.85	158

It should be noted that these figures are indicative only and should not be relied upon for contractual or cost commitment purposes. Proposed drainage calculations are provided in Appendix L.

A copy of the drainage strategy can be found in Appendix K. Alternative solutions for locating the attenuation tank, such as the potential for a blue roof, will be explored at detailed design stage.

4.6 Surface Water Runoff Volume

It is a requirement of the Non-Statutory Sustainable Drainage Technical Standard that:

S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6-hour rainfall event, must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with **S5** above the runoff volume must be discharge at a rate that does not adversely affect flood risk.

Where possible, to comply with the above, SUDS techniques should be used to allow any additional volume to infiltrate naturally, therefore preventing this from discharging to receiving waters.

Where infiltration is not possible then the additional volume should be discharged at flow rates below 2 l/s/ha.

The pre-development discharge volume has been calculated at **137.10 m³**.

UE Ref	Event	Volume (m ³)	Water Depth (mm)	Surfacing Depth (mm)	Flooded Volume (m ³)	Discharge Volume (m ³)	Discharge Flow (l/s)	Summ
1.000.005	360 minute 100 year Winter I+0%	30,960	30,802	-0.038	0.000	45,750	4.1	FLOOD RISK
1.001.006	360 minute 100 year Winter I+0%	30,970	30,106	9.016	0.000	51,875	4.9	FLOOD RISK
1.002.007	360 minute 100 year Winter I+0%	30,980	30,028	9.018	0.000	137.10	12.1	DISCHARGED
1.003.008	360 minute 100 year Winter I+0%	30,820	30,001	-0.103	0.000	137.101	12.1	OK

The post-development discharge volume (including an allowance for climate change) has been calculated at **168.53 m³** which represents an additional **31.43m³**.

COMPLEX CHALLENGES ... MADE SIMPLE

Summary of Results for 360 minute 100 year Winter I+40%

Flow Rate (l/s)	Flow Rate (l/s)	Flow Rate (l/s)	Flow Rate (l/s)	Flow Rate (l/s)	Flow Rate (l/s)	Flow Rate (l/s)	Flow Rate (l/s)	Flow Rate (l/s)	Flow Rate (l/s)
1.000	1.00	360 minute 100 year Winter I+40%	16.650	16.650	0.757	0.000	41.730	4.8	SURCHARGED
1.001	1.01	360 minute 100 year Winter I+40%	16.650	16.650	0.750	0.000	50.732	9.2	SURCHARGED
2.000	1.02	360 minute 100 year Winter I+40%	33.090	33.090	-0.192	0.000	55.433	8.5	OK
3.000	1.03	360 minute 100 year Winter I+40%	33.090	33.090	0.755	0.000	-30.894	47.6	SURCHARGED
4.000	1.04	360 minute 100 year Winter I+40%	33.090	33.090	0.886	0.000	74.600	41.4	SURCHARGED
5.000	1.05	360 minute 100 year Winter I+40%	33.090	33.090	-0.194	0.000	43.903	5.0	OK
6.000	1.06	360 minute 100 year Winter I+40%	33.090	33.090	0.886	0.000	173.779	17.7	SURCHARGED
7.000	1.07	360 minute 100 year Winter I+40%	33.090	33.090	0.886	0.000	168.626	17.5	SURCHARGED
8.000	1.08	360 minute 100 year Winter I+40%	33.090	33.090	-0.172	0.000	168.637	17.5	OK

Compliance with the above can be technically difficult to achieve for sites of this nature and therefore the requirements for any long-term storage would need to be explored further at detailed design stage in consultation with the LLFA.

The LLFA could require discharge to be reduced to greenfield rates (Q_{bar} : 1.51 l/s) where long term storage cannot be provided. This would have the effect of increasing overall attenuation storage volumes with the $Q_{100+40\%}$ figure increasing to circa 200m³ from 158m³.

4.5 SUDS Measures

Current policy and best practice encourage the use of Sustainable Drainage Systems (SUDS) and in particular, infiltration systems.

The Environment Agency recommends that surface water runoff should be controlled as near to its source as possible through a sustainable drainage approach to surface water management.

This approach involves using a range of techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands to reduce flood risk by attenuating the rate and quantity of surface water runoff from a site.

This can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements.

An assessment of potential SUDS measures has been undertaken based on current available site investigation data and the constraints of the proposed development site; this is presented below.

COMPLEX CHALLENGES ... MADE SIMPLE

SUDS MATRIX		
SUDS Technique	Description	Commentary
Wetlands	As ponds, but the runoff flows slowly but continuously through aquatic vegetation that attenuates and filters the flow. Shallower than ponds.	Considered not viable due to urban nature of site
Ponds	Depressions used for storing and treating water. They have a permanent pool and bankside emergent and aquatic vegetation.	Considered not viable due to urban nature of site
Bioretention Areas	Vegetated areas for collecting and treating water before discharge downstream, or to the ground via infiltration.	Potential to introduce into external landscaped areas
Green Roofs	Vegetation roofs that reduce run off volume and rate.	Considered not viable due to scheme layout
Permeable Pavements	Allow inflow of rainwater into underlying construction / soil.	Potential to use in conjunction with bioretention areas to minimise hard drainage channels and gullies
Swales Shallow	Vegetated channels that conduct and / or retain water (and can permit infiltration when un-lined). The vegetation filters particulates.	Considered not viable due to urban nature of site
Infiltration Basins	Depressions that store and dispose of water via infiltration.	Considered not viable due to urban nature of site
Filter Strips	Vegetated steps of gently sloping ground designed to drain water evenly from impermeable areas and filter out silt and other particulates.	Potential to introduce into external landscaped areas
Detention Basin	Dry depressions designed to store water for a specified retention time.	Considered not viable due to urban nature of site
Infiltration Trenches	As filters drain, but allowing infiltration through trench base and sides.	Considered not viable due to ground conditions and poor permeability results returned from site investigation work
Filter Drain	Linear drains / trenches filled with a permeable material, often with a perforated pipe in the base of the trench.	Considered not viable due to ground conditions and poor permeability results returned from site investigation work
Sand Filters	Treatment devices using sand beds as filter media.	Considered not viable due to urban nature of site
Soakaways	Sub-surface structures that store and dispose of water via infiltration.	Considered not viable due to ground conditions and poor permeability results returned from site investigation work
Pipes, Subsurface Storage	Conduits and their accessories as conveyance measures and / or storage. Water quality can be targeted using sedimentation and filter media.	Incorporated as part of drainage strategy for conveyance and volumetric storage of attenuation volumes
Silt Removal Devices	Manhole and / or proprietary devices to remove silt.	Potentially to be incorporated if required by United Utilities/ LLFA
Based on 'The SUDS Manual' CIRIA Guidance		

SUDS will be incorporated into the development drainage system wherever possible. However, based on the encountered ground conditions across the site infiltration-based SUDS are not considered to be technically feasible and therefore non-infiltration components will be incorporated as a method of surface water conveyance and water quality enhancement.

The design of the SUDS features would be undertaken at the detailed design stage in conjunction with the design of the piped drainage systems and other attenuation storage.

5.0 Foul Water Management

5.1 Introduction

It is proposed to install a new foul drainage system to serve the development.

The foul water system will be designed and constructed in accordance with the current Building Regulations, BS EN:752 'Drainage and Sewer Systems Outside Buildings', the Local Authority Building Control specifications and requirements, Sewerage Sector Guidance (included in Appendix C) and the Civil Engineering Specification for the Water Industry.

5.2 Foul Water Capacity & Point of Connection

At the time of writing details of foul flow rates generated by the development were not available. However, an estimate has been undertaken based on appliances shown on the architect's layouts in accordance with BS EN 12056-2:2000 alongside the anticipated maximum number of seats within the food hall using an allowance per seat of 270 l/day.

The approximate peak foul flow generated through this methodology would be in the region of **31.75 l/s**.

Notwithstanding the above, it is recognised that while this method is appropriate for the design of the below ground pipe work it would overstate the actual peak foul flow rate and therefore a further assessment was undertaken using British Water document 'Flows and Loads'.

The approximate peak foul flow generated through this methodology would be in the region of **4.76 l/s**.

Based on the GPR survey it is not possible to utilise an existing connection to the public sewer network and therefore it is proposed to combine with the surface water at the final manhole and discharge to the diverted public sewer which will be located in River Street to the north of the development site.

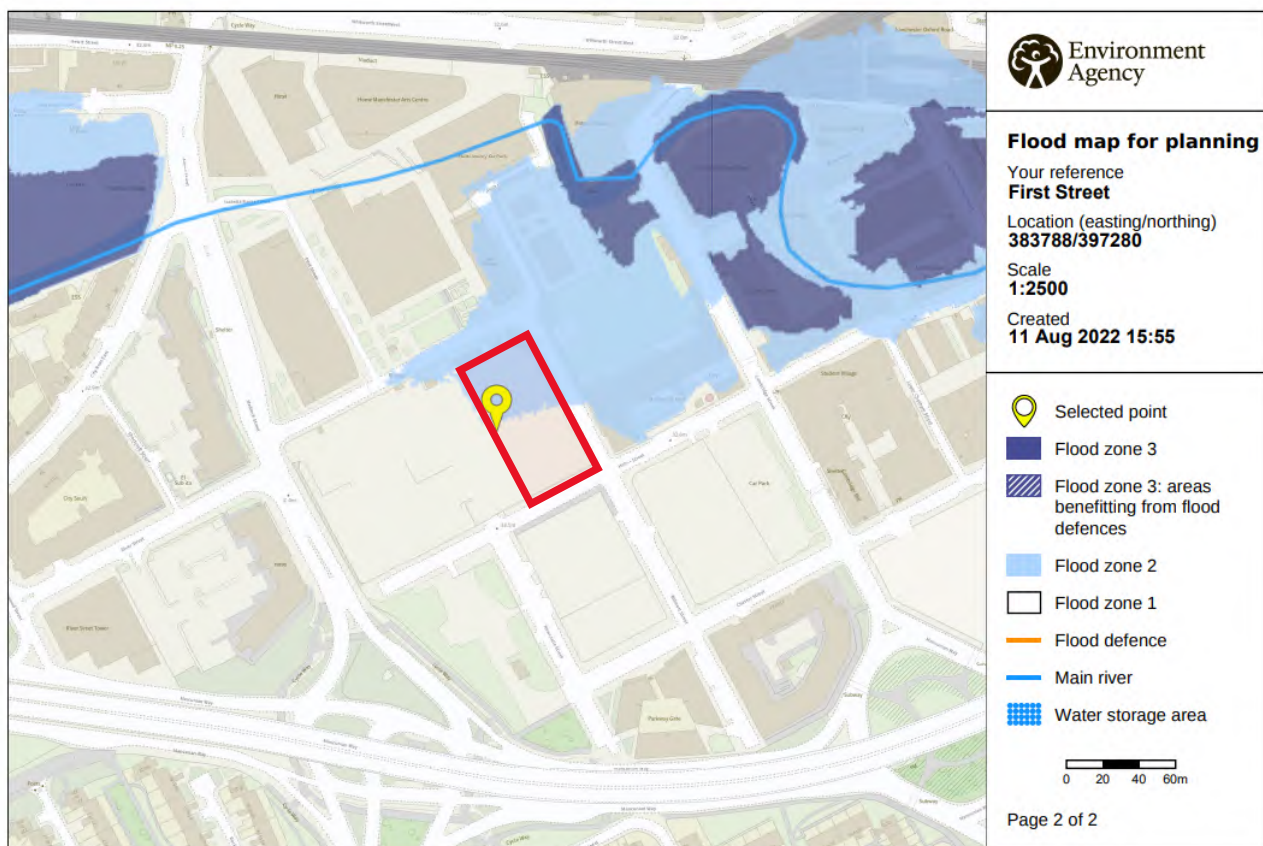
A pre-development enquiry was submitted to United Utilities and a copy of their response is appended to this report.

UU confirmed that they will accept foul flows to the public combined sewer in River Street at an unrestricted rate.

6.0 Sources of Flood Risk

6.1 Fluvial Flood Risk

Information relating to fluvial flood risk at the site has been obtained via the Environment Agency online flood mapping and via a Product 4 data request.



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Examination of the Environment Agency online flood map above indicates that the site is located in both Flood Zone 1 and Flood Zone 2.

Flood Zone 1 is defined within the NPPF as a site to have a greater than 1 in 1000 (> 0.1%) probability of river flooding in any one year.

**COMPLEX CHALLENGES ...
MADE SIMPLE**

Flood Zone 2 is defined within the NPPF as a site to have between a 1 in 100 and 1 in 1000 (1-0.1%) probability of river flooding in any one year.

The nearest water feature to the development is the culverted River Medlock which is located circa 100m to the northeast of the development site.

Flood model data for the area supplied by the Environment Agency can be found in Appendix F. The undefended flood levels for the most appropriate node local to the site is supplied below.

Undefended Model Results						
Node Point	2% AEP +CC	1.33% AEP +CC	1% AEP	1% AEP +35%	0.5% AEP +CC	0.1% AEP
3	29.37	29.51	29.62	30.11	29.92	30.92

A review of these levels against the topographic survey would suggest that the proposed development site is partly located in Flood Zone 2 around the northeast corner where levels are below the 0.1% flood level of 30.92m.

The standing advice for developments in an area at risk of flooding is that Finished Floor Levels should be set a minimum of 300mm above the highest of the following:

- Average ground level of the site
- Estimated river or sea flood level (this should be the 1% level plus climate change)
- Adjacent road level to the building

Setting the FFL for the building around the average existing ground level would not be workable due to the sloping nature of the site so this has been discounted.

The 1% plus climate change flood level is 30.11m so adding 300mm onto this would provide an FFL of 30.41m. However, at the proposed entrance point at the lowest part of the site the existing adjacent road level can be taken as 30.64m. Adding 300mm onto this provides a minimum FFL for the development of 30.94m which is higher than that set by the 1%+CC design flood level. Accordingly the FFL for the development will be set at 30.925m as a minimum.

Taking all of the above into consideration, on the basis that the site is located partially within Flood Zone 2 based on the Environment Agency modelled flood data the risk of fluvial flooding to the site is considered to be **MEDIUM** but can be mitigated to **LOW** by raising the proposed FFL above the 0.1% AEP event as outlined above.

6.2 Pluvial Flood Risk

Pluvial flooding is defined as flooding resulting from rainfall generated overland flow before runoff enters any watercourse or sewer.

It is usually associated with high intensity rainfall events but can also occur with low intensity rainfall or melting snow where ground is saturated, frozen, developed or otherwise has low permeability resulting in overland flow and ponding in depressions in the topography. Large catchment areas are particularly prone to this type of flooding.



The Environment Agency pluvial flood map indicates that the site is not an area potentially susceptible to pluvial flooding.

The only flows that are therefore likely to be present on site are from direct rainfall on areas of hardstanding.

Overland flow paths on site and exceedance events will be catered for within the detailed design/levels strategy. This in conjunction with a new drainage system would be sufficient to maintain a **LOW** level of risk from pluvial flooding.

6.3 Tidal Flood Risk

The site is not considered to be at risk of tidal flooding due to its inland location.

6.4 Groundwater Flood Risk

In general terms, groundwater flooding can occur from three main sources, raised water tables, seepage and percolation, and groundwater recovery or rebound. If groundwater levels are naturally close to the surface, then this can present a flood risk during intense rainfall.

The Manchester City Council SFRA identifies that the site is in an area at risk of groundwater flooding. However, the mapping is based on a very broadscale approach based largely on geology. The likelihood of groundwater flooding occurring in Manchester is considered to be generally low.

Intrusive investigation works are intended to be undertaken in advance of detailed design to establish exact ground water levels. However, the site investigation undertaken by TerraConsult on behalf of ASK Real Estate indicates that ground water was encountered between 3.44m and 6.25m below ground level.

If required, measures would need to be introduced into the drainage scheme to deal with high groundwater to ensure that flooding to property does not occur. Given the development proposals do not include any basement then no such measures should be required.

Taking the above into consideration it is expected that any groundwater issues can be mitigated as required at the detailed drainage design stage. The risk to the site from groundwater flooding is therefore considered to be **LOW**.

6.5 Artificial Source – Canal Flood Risk

Generally, canals are owned and operated by the Canals & Rivers Trust (CRT). Water levels are regulated between normal and statutory levels by means of weirs and sluice gates and whilst a breach or overtopping of the structure is unlikely, the possible flood risk needs to be assessed.

There are no canals in close proximity to the site.

There is not considered to be any risk of flooding to the site from canals.

6.6 Artificial Source – Sewer Flood Risk

Given the topography of the site and the surrounding area it is unlikely that flooding from existing surcharged public sewers would impact on the proposed development site as it would likely be limited to the surrounding highway network and directed away from the development.

COMPLEX CHALLENGES ... MADE SIMPLE

A response was awaited with respect to DG5 sewer flooding in the area and the response, when received, will be entered into a further revision of this report.

The new development proposed site surface water drainage system will be designed to maintain surface water flows below ground for up to and including the 1 in 100 year return period as a minimum. Flows above this and up to 100 year plus 40% allowance for climate change will be retained safely within the site.

Given then constraints of the site it is expected that surface flooding will need to be minimised and therefore it is likely all attenuation will be provided for below ground.

It is considered that the risk of flooding to the site from surcharged sewers can be considered as **LOW**.

6.7 Artificial Source – Reservoir Flood Risk

Review of the below Environment Agency reservoir flood map indicates that the site could be affected by reservoir flooding.



However, despite this the risk of reservoir flooding in the UK is very low as reservoirs are inspected regularly and any essential maintenance is carried out. Furthermore, the likelihood of this occurring at the same time as a fluvial flood event is experienced in the area are very remote. The risk of flooding from reservoirs is therefore considered **LOW**.

6.8 Flood Risk Vulnerability Classification

The proposed development is primarily residential and can be considered as 'More Vulnerable' within Table 2: Flood Risk Vulnerability Classification in the NPPF.

Table 3: Flood Vulnerability 'compatibility'

This type of
would be wholly
Flood Zone 1 & 2.

Flood risk (vulnerability) classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✗	✗	✗

Key: ✓ Development is appropriate.
✗ Development should not be permitted.

**risk
and flood zone**

development
appropriate for

7.0 Residual Risks and Impacts

7.1 Flood Risk Management Measures

The surface water drainage management measures outlined above would ensure that runoff from the proposed development would not exceed the existing scenario and a betterment would be provided for larger return periods.

As a result of the restricted flow rate and proposed impermeable area, attenuation is required in the form of site control measures. Any new private drainage system will be designed in accordance with current design guidance and standards and attenuation will be provided along with potential SUDS measures such as permeable pavements, filter strips and bio-retention.

The use of SUDS measures, with controlled release of surface water to the combined sewer network will help to mitigate any potential flood risk impact from the development on the public sewer system.

Finished site levels will be engineered to provide positive drainage where required and prevent ponding. The accumulation of standing water will therefore not occur and thus not pose a risk.

Gradients of the hardstanding areas, where possible, will be designed to fall away from buildings such that any overland flow resulting from extreme events would be channelled away from entrances.

7.2 Off Site Impacts

The existing site primarily comprises areas of hardstanding with limited soft landscaping. It is anticipated through the introduction of soft landscaping within areas of public realm, impermeable areas will reduce slightly.

A survey of the existing drainage network, whilst not complete, indicates that the existing site discharges flows unrestricted to the public sewer network surrounding the site.

To ensure that the proposed development will not increase flood risk elsewhere, surface water drainage discharge will be restricted. This restricted discharge in conjunction with surface water attenuation on site and a reduction in impermeable areas will mitigate against flood risk to the site and other land.

By reducing the post development peak runoff prior to its point of discharge from the site, this will reduce the potential for surface water flooding on the downstream network.

7.3 Residual Risks

The development and its drainage system will be designed to cope with the intense storm events up to and including the 100 year return period rainfall event with an allowance for climate change. If an extreme rainfall event exceeds the design criteria for the drainage network, it is likely that there will be some overland flows which are unable to enter the system.

Any overland flows generated by the proposed development will be directed away from any adjacent properties surrounding the site and towards the road network where it can follow natural flow paths.

As with any drainage system, blockages within the surface water system have potential to cause flooding or disruption. An appropriate maintenance regime is to be scheduled with a management company appointed to carry out the works.

7.4 Pollution Control

In accordance with CIRIA C753 publication 'The SUDS Manual' (2015), residential roofs and other roofs (applicable to high rise student accommodation) have a very low and low pollution hazard level respectively.

No parking or service yards are to be provided on the site and so this has not been considered.

The table below indicates the pollution hazard indices which is based on Table 26.2 from the SUDS Manual.

Pollution Hazard Indices				
Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05

Surface water treatment (removal of oils / silts, metals etc) may be required prior to discharge to the combined sewer system; this will be discussed further with United Utilities at detailed design stage.

If required, where possible, SUDS components will be used to provide the necessary level of treatment. Where this is not achievable then proprietary treatment systems will be included such as Bypass, Full Retention of Hydrodynamic Separators.

8.0 Summary

The proposed development proposes the construction of 576 student bedrooms alongside resident and public facilities across a gross site area of approximately 0.30ha.

The site is in an area identified as having a low to medium probability of flooding on the Environment Agency Flood Map and is located in both Flood Zone 1 and 2.

Flood level data obtained for the culverted River Medlock indicates that the site partially located in Flood Zone 2 around the northeast corner of the development where levels are below 30.92mAOD. It is proposed to mitigate this risk by setting the building FFL above this, therefore taking it into Flood Zone 1.

The Flood Risk Assessment (FRA) has reviewed all sources of flood risk to both the proposed development and to existing adjacent properties as a result of the development proposals, including fluvial, tidal, pluvial, groundwater, sewers and flooding from artificial sources. This report demonstrates that the development site is not at significant flood risk, nor does it increase flood risk off-site.

A pre-development enquiry was submitted to United Utilities and their response is appended to this report. They have confirmed that foul water can discharge unrestricted to the public combined sewer system in River Street. Surface Water is also able to discharge to this sewer pending confirmation that there is no existing highway drainage system in the area that is able to convey flows direct to the River Medlock.

The primary option for surface water disposal would ordinarily be via infiltration. However, based on encountered ground conditions, permeability testing and constraints of the site this is not considered to be feasible and therefore discharge will be to the public combined sewer network as per the existing site regime. This will be subject to agreement in principle with the LLFA.

Discharge from the site would be restricted to 4.85 l/s which represents the existing calculated Q_1 brownfield runoff rate with a 50% betterment applied in accordance with local planning policy. UU have confirmed they will accept a maximum discharge of 5.0 l/s to the combined sewer system.

Foul water drainage is intended to combine with the surface water drainage system at the final outfall and will discharge to the diverted 610mm dia. combined sewer in River Street. As noted above, UU have confirmed this as acceptable.

This Flood Risk Assessment and Outline Drainage Strategy is considered to be commensurate with the development proposals and in summary, the development can be considered appropriate for Flood Zone 1 in accordance with the NPPF.



COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX A – LOCATION PLAN



Site Location Plan

COMPLEX CHALLENGES ... MADE SIMPLE

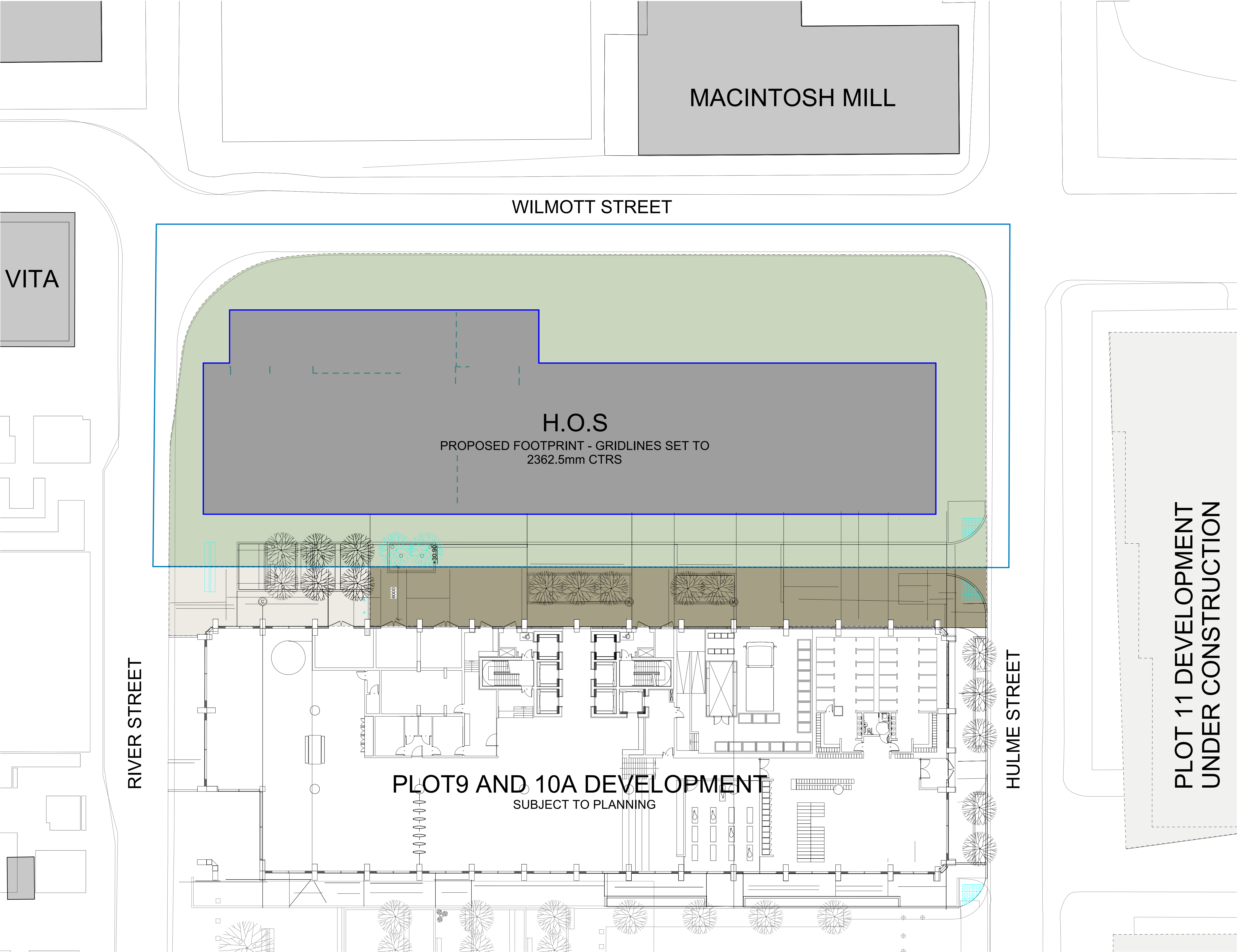
Project No: 4513
Date: OCTOBER 2022
Ref: 4513/ROC/XX/XX/RP/FRA001





COMPLEX CHALLENGES ...
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APPENDIX B – DEVELOPMENT LAYOUT



General Notes

Use figured dimensions only. Do not scale off this drawing. All dimensions must be set out and checked by the contractor on site prior to commencement of construction. Any variations between drawings and site must be reported to TGA before work proceeds.

Drawings to be read in conjunction with Architectural Specification, Structural Engineer's Drawings and Specifications, Mechanical & Electrical Engineer's Drawings and Specifications, all Supplemental Information, including but not limited to, Detailed Fire Strategy, Acoustic Report, Thermal Report & Overheating Report.

No portion of the Works to commence without acceptance of the required submittals by the Employer.

Main Contractor to submit relevant documents to building regulation and legislation approval authorities as required to comply with the Specification.

- Legend and Notes**
- Restrictive Height Covenant
 - North West Square
 - South West Service Area
 - Public Realm
 - Hoarding line
 - Demise line

Rev	Description	Date	By
P01	Issued following DTM	21.09.22	SD
P02	Amended as per Vita commentary. Issued following workshop	04.10.22	SD

Title Site Constraints - Demise Plan	
Drawing No. 1172-TGA-XX-XX-DR-A-02004	Revision P02
Status Information	Scale As indicated@A1
Project 1172 - First Street	Client VITA

TIM GROOM ARCHITECTS

Eastgate, 2 Castle Street, Manchester, M3 4LZ 0161 870 1152

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APPENDIX C – LLFA SUDS GUIDANCE

Lead Local Flood Authority - Manchester City Council

SuDS Requirements for New Developments

The Government has strengthened planning policy on the provision of sustainable drainage systems (SuDS) for 'major' planning applications which is being introduced from 6 April 2015 (Paragraph 103 of National Planning Policy Framework and Ministerial Statement on SuDS).

Changes were made to the Town and Country Planning Policy and Guidance to give Local Authority Planning Departments the responsibility for ensuring that new developments are drained in a sustainable way, through the planning process, in consultation with the Lead Local Flood Authorities. As per the guidance issued by the Department of Communities and Local Government (DCLG), all 'major' planning applications being determined from 6 April 2015, must consider sustainable drainage systems.

Decisions about the suitability of sustainable drainage provision are made by the Local Planning Authority. However, under the new consultation arrangements Manchester City Council, in its role as Lead Local Flood Authority, is a statutory consultee for all major applications with regards to sustainable drainage. All 'major' planning applications submitted from 15 April 2015 are required to include a Surface Water Drainage Statement.

Developers submitting the planning application to Manchester City Council are advised to:

- Assess the suitability of sustainable drainage systems in accordance with: paragraphs 051, 079 and 080 of the revised NPPF Planning Practice Guidance (PPG) for Flood Risk and Coastal Change.

Design sustainable drainage systems in line with national Non-Statutory Technical Standards for SuDS: <https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards>

and local policies DM1, EN08, EN14 and EN17 of the Core Strategy.

- Assess surface water attenuation requirements that offer a reduction in surface water runoff rate in line with the 'Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA, User Guide, Final, dated May 2010'. (Section 3.4.1 Critical Drainage Areas, page 31). Please note that all new connections to the watercourses shall comply with reduction of flows to Greenfield runoff rates.

http://www.manchester.gov.uk/downloads/download/3871/strategic_flood_risk_assessment-manchester_salford_trafford

- Submit hydraulic calculations and drawings to support the design along with proposed standards of operation and maintenance in accordance with paragraph 081 of NPF (PPG).
- It will be essential that the type of sustainable drainage system for a site, along with details of its extent/position, is identified at the design stage of the whole scheme. This information will be required for both outline and full applications so it is clearly demonstrated that the SuDS can be accommodated within the development that is proposed. It will no longer be acceptable to leave the design of SuDS to a later stage to be dealt with by planning conditions.

- Surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management. SuDS seek to mimic natural drainage systems and retain water on or near to the site, when rain falls, in contrast to traditional drainage approaches, which tend to pipe water off-site as quickly as possible. SuDS therefore offer significant advantages over conventional piped drainage systems.

Applicants are strongly advised to discuss their proposals with relevant planning officers at the pre-application stage to ensure that an acceptable SuDS scheme is submitted.

Minimum requirements for approval

In order to avoid objection, the following three elements of evidence are required:

- Surface Water Management Statement for the site is submitted that is in line with requirement of NPPF PPG Paragraph 079:
 - “New development should only be considered appropriate in areas at risk of flooding if priority has been given to the use of sustainable drainage systems. Additionally, and more widely, when considering major development, as defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015, sustainable drainage systems should be provided unless demonstrated to be inappropriate”.
 - The strategy should be accompanied by at least an outline layout of the proposed drainage systems with space allocation for the proposed attenuation in line with relevant flow reduction requirements.
- Evidence that drainage hierarchy has been applied in line with NPPF PPG Paragraph 080. The aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:
 - into the ground (infiltration);
 - to a surface water body;
 - to a surface water sewer, highway drain, or another drainage system;
 - to a combined sewer.
- Evidence that one viable solution for draining the site is secured:
 - Results of ground investigation carried out under Building Research Establishment Digest 365. Site investigations should be undertaken in locations and at proposed depths of the proposed infiltration devices. Proposal of the attenuation that is achieving half emptying time within 24 hours. If no ground investigations are possible or infiltration is not feasible on site, evidence of alternative surface water disposal routes (as follows) is required.
 - Where surface water is connected to Main River, any works within or adjacent to the river that would affect it would require consent from Environment Agency. An email of acceptance of proposed flows and/or new connection will suffice.
 - Where surface water is connected to the public sewer, agreement in principle from United Utilities is required that there is adequate spare capacity in the existing system taking future development requirements into account. An email of acceptance of proposed flows and/or new connection will suffice.

Where surface water is connected to the ordinary watercourse, agreement in principle from Manchester City Council as Lead Local Flood Authority is required. Please note that all new connections to the watercourses shall comply with reduction of flows to Greenfield runoff rates. An email of acceptance of proposed flows and/or new connection will suffice.

- Where surface water is connected to ordinary watercourse, any works within or adjacent to the watercourse that would affect it would require consent from Manchester City Council as Lead Local Flood Authority. Consent forms can be obtained on the website at:

http://www.manchester.gov.uk/downloads/download/5567/land_drainage_consent_and_guidance.com

Avoiding or discharging drainage condition

- Evidence of consideration of green SuDS solution wherever practicable and viable in line with NPPF PPG Paragraph 051. SuDS should be designed to:
 - reduce the causes and impacts of flooding;
 - remove pollutants from urban run-off at source;
 - combine water management with green space with benefits for amenity, recreation and wildlife wherever practicable.
- For Greenfield site developments, details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. to the Greenfield runoff rates;
- For Brownfield site developments, for all sites located within Conurbation Core Critical Drainage Areas, details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. at least a 50% reduction in runoff rate compared to the existing rates with an aim to reduce to Greenfield runoff rates wherever practicable;
- Where surface water runoff is to be disposed through infiltration, details of surface water attenuation that is adequate for infiltration capacity of the underlying soil is required. This capacity has to be assessed through site investigation carried out in line with Building Research Establishment Digest 365. Site investigations should be undertaken in locations and at proposed depths of the proposed infiltration devices. Half emptying time of proposed attenuation within 24 hours should be achieved.
- Evidence that the drainage system has been designed (unless an area is designated to hold and/or convey water as part of the design) so that flooding does not occur during a 1 in 100 year rainfall event in any part of a building; The NPPF suggests that ‘for events with a return-period in excess of 30 years, surface flooding of open spaces such as landscaped areas or car parks is acceptable for short periods, but the layout and landscaping of the site should aim to route water away from any vulnerable property, and avoid creating hazards to access and egress routes. No flooding of property should occur as a result of a one in 100 year storm event (including an appropriate allowance for climate change)’.
- Assessment of overland flow routes for extreme events that is diverted away from buildings providing long and cross sections for the proposed drainage system and

finished floor levels;

- Evidence that runoff volume in the 1 in 100 year, 6 hours rainfall shall be constrained to a value as close as is reasonably practical to the Greenfield runoff volume for the same event, but never to exceed the runoff volume from the development site prior to redevelopment;
- Hydraulic calculation of the proposed drainage system;
- Design construction drawings of proposed SuDS elements and flow controls;
- For sites where proposed development would cause unusual pollution risk to surface water (large car park areas (>50 parking spaces) or industrial estates), evidence of pollution control measures (preferably through SuDS) is required.
- Where an application is part of a larger site which already has planning permission it is essential that the new proposal does not compromise the drainage scheme already approved.

SuDS Maintenance

Maintenance of SuDS is essential for its proper operation and a clear management and maintenance plan for the lifetime of the development is required as part of the planning application.

In considering a development that includes a sustainable drainage system, Manchester City Council as local planning authority will want to be satisfied that the proposed minimum standards of operation are appropriate and that there are clear arrangements in place for ongoing maintenance. Information sought by Manchester City Council would be no more than necessary, having regard to the nature and scale of the development concerned in line with NPPF Paragraph 081.

In some instances where no clear adoption of the drainage system is proposed, a drainage maintenance condition could be attached to the planning applications. In order to discharge this condition, the following evidence should be provided following *construction*:

- Verification report providing photographic evidence of construction as per design drawings;
- As built construction drawings if different from design construction drawings;
- Management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.

Applicants are strongly advised to discuss their proposals with relevant planning officers at the pre-application stage to ensure that an acceptable SuDS scheme is submitted.



COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX D – TOPOGRAPHIC SURVEY



COMPLEX CHALLENGES ...
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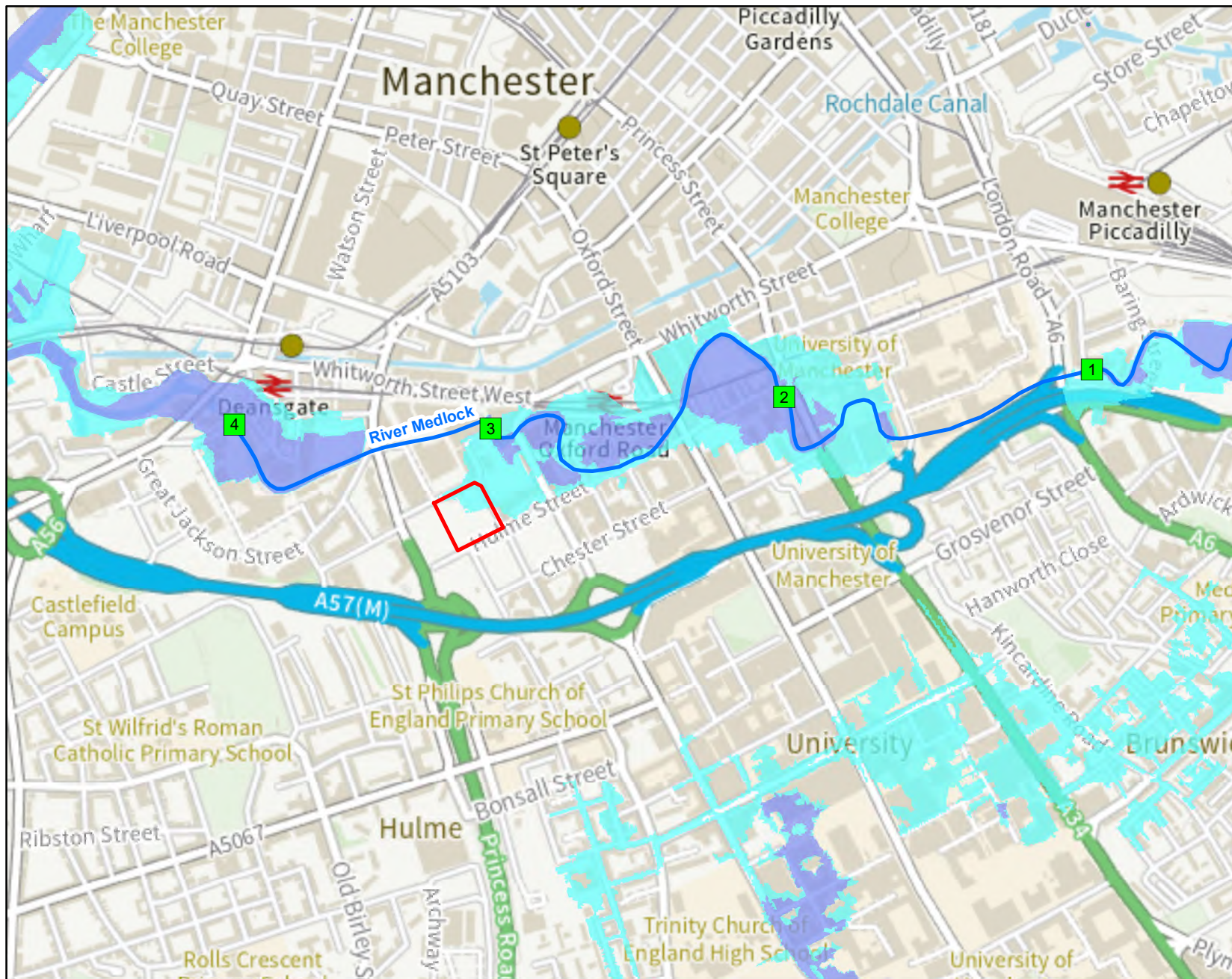
APPENDIX E – SEWER RECORDS



COMPLEX CHALLENGES ...
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APPENDIX F – EA DATA

Detailed Flood Map centred on Hulme Street, Manchester, M15GG.
Created on 04/10/2022 [GMMC275048AB F5JGBGB71YNW]



1:10,001



Legend

-  Site Location
-  Model Measurements
-  Main River
-  Flood Zone 3
-  Flood Zone 2

				Latchford 3 Gates Closed Scenario		Latchford 1 Gate Closed Scenario	Normal Operation											
Map Reference	Model Node Reference	Easting	Northing	Data	1 % AEP (1 in 100 year)	0.1 % AEP (1 in 1000 year)	1 % AEP (1 in 100 year)	20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	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) + 30% increase in flow	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)
1	ea013_0251_MEDL01_2104	384888	97539	Modelled Water Level (m aodN)	33.43	35.44	33.43	32.02	32.19	32.40	32.60	33.01	33.43	34.50	34.62	35.24	34.24	35.44
				Modelled Flow (cumecs)	56.12	110.80	56.12	29.65	34.61	40.90	47.51	52.19	56.12	71.41	73.94	95.27	87.16	110.80
2	ea013_0251_MEDL01_1379	384343	397491	Modelled Water Level (m aodN)	32.43	33.90	32.43	29.86	30.32	30.89	31.59	32.02	32.43	33.35	33.41	33.66	33.19	33.90
				Modelled Flow (cumecs)	57.32	117.17	57.32	30.28	35.35	41.75	48.52	53.30	57.32	72.97	75.56	93.15	68.59	117.17
3	ea013_0251_MEDL01_0532	383824	397435	Modelled Water Level (m aodN)	29.62	30.92	29.62	28.78	28.96	29.17	29.37	29.51	29.62	30.04	30.11	30.59	29.92	30.92
				Modelled Flow (cumecs)	60.92	122.90	60.92	32.18	37.58	44.38	51.59	56.64	60.92	77.65	80.40	101.99	72.88	122.90
4	ea013_0251_MEDL01_0000u	383370	397442	Modelled Water Level (m aodN)	29.19	30.12	29.19	28.59	28.73	28.88	29.03	29.12	29.19	29.46	29.51	29.81	29.39	30.11
				Modelled Flow (cumecs)	62.30	128.24	62.30	32.90	38.43	45.39	52.76	57.93	62.30	79.44	82.26	104.14	74.52	127.68

Model data taken from Manchester Ship Canal 2016

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Climate Change Scenario - 30%, 35% and 70% increases in flow calculated for the 2080's (2070 - 2115). Please see <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> for more information regarding the new climate change guidance. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any flood risk assessment.

Notes:

For the Manchester Ship Canal Model, we provide the following three scenarios:

1. Normal Operation: All sluice gates operate automatically to maintain a navigable ponded water level upstream of each set of sluice gates. During times of high flow the gates are opened automatically to allow excess water pass downstream. During extreme conditions the sluice gates can be manually overridden to extend the opening heights.

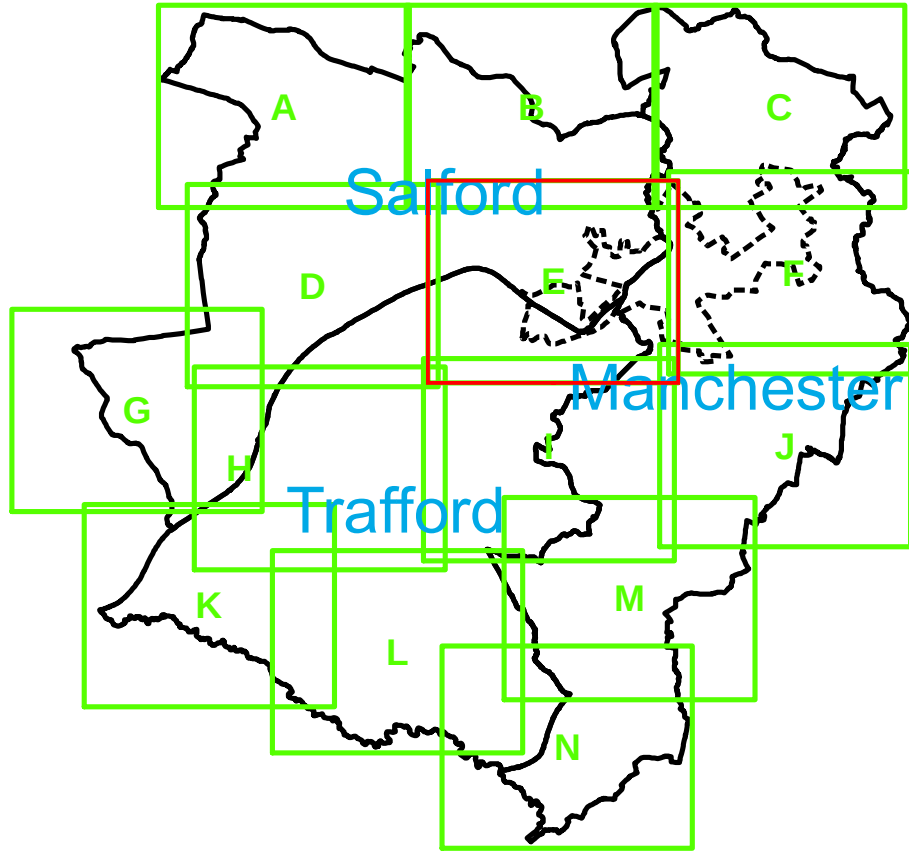
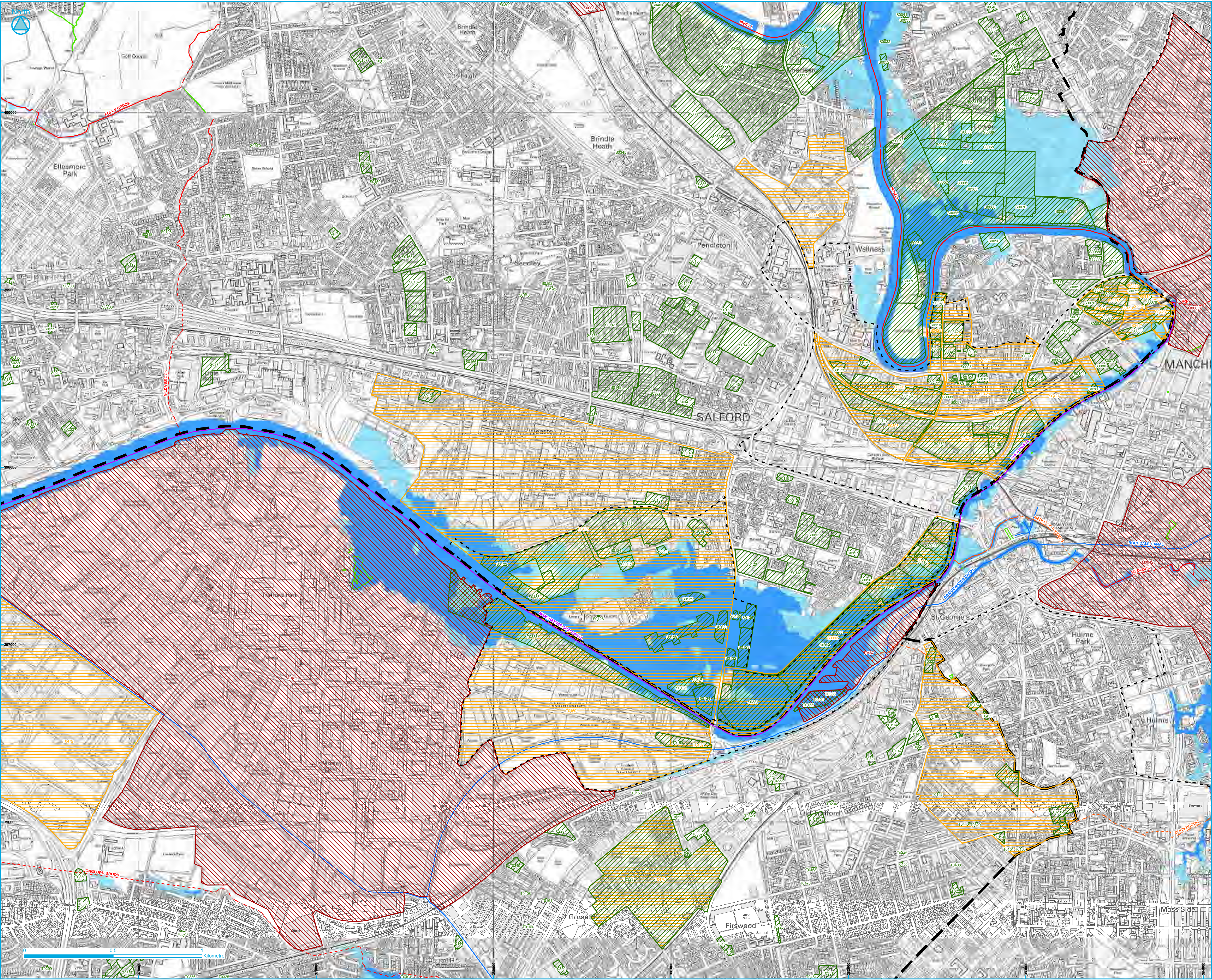
2. Latchford 1 Gate Closed Scenario: This scenario represents a single operational sluice gate at Latchford Locks fixed closed. Therefore, only operational movements from 2 active sluice gates.The model setup removes the gate from PID controller setup and an IED file is used to define the sluice gate as fixed in the closed position.

3. Latchford 3 Gates Closed Scenario: This scenario has been defined as the removal of operational rules at all three sluice gates at Latchford Locks, thus, all gates are fixed in the closed position resulting in no regulation of upstream water levels. The model setup removes each of the gates from PID controller setup and an IED file is used to define sluice gates fixed in the closed position.



COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX G – SFRA MAPS



- Council Boundary**
- Ashton, Bridgewater and Rochdale Canals
 - Manchester Ship Canal / Grey Inwell
 - Other Waterbodies
- Fluvial Flood Extent**
- 1 in 100 Year
 - 1 in 100 Year With Climate Change
- Potential Development Sites / Locations**
- Employment
 - Housing
 - Mixed Use
 - Other
- Main Rivers (V8.0)**
- Culverted
 - Open
- Digitised River Lines**
- Culverted
 - Open
- Regional Centre Boundary**

This map has been produced in accordance with PPS25: Development and Flood Risk and its Practice Guide.

The map shows estimated flood extents using the modelling outputs produced for this SFRA on the River Inwell, Grey Inwell, Irk, Medlock, Corn Brook, Mersey at Carrington and the Manchester Ship Canal. Beyond the modelled reaches, recent EA modelling or the Flood Zones have been used. Where climate change outlines do not exist, Flood Zone 2 was used as a proxy to represent how flood risk might increase in the future. The SFRA modelled reaches are shown on Figure 1.1 of the Maps Index.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Inwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

These maps should be used as an indication of areas in which fluvial flooding may increase in the future. These maps should be used to apply the Sequential Test and are also useful when reviewing which sites may require the Exception Test by Spatial Planners, Development Management and developers in assessing possible future fluvial risks. Emergency planners may also find them useful while designating access and egress routes.

The map should be used to apply the Sequential Test and Exception Test.

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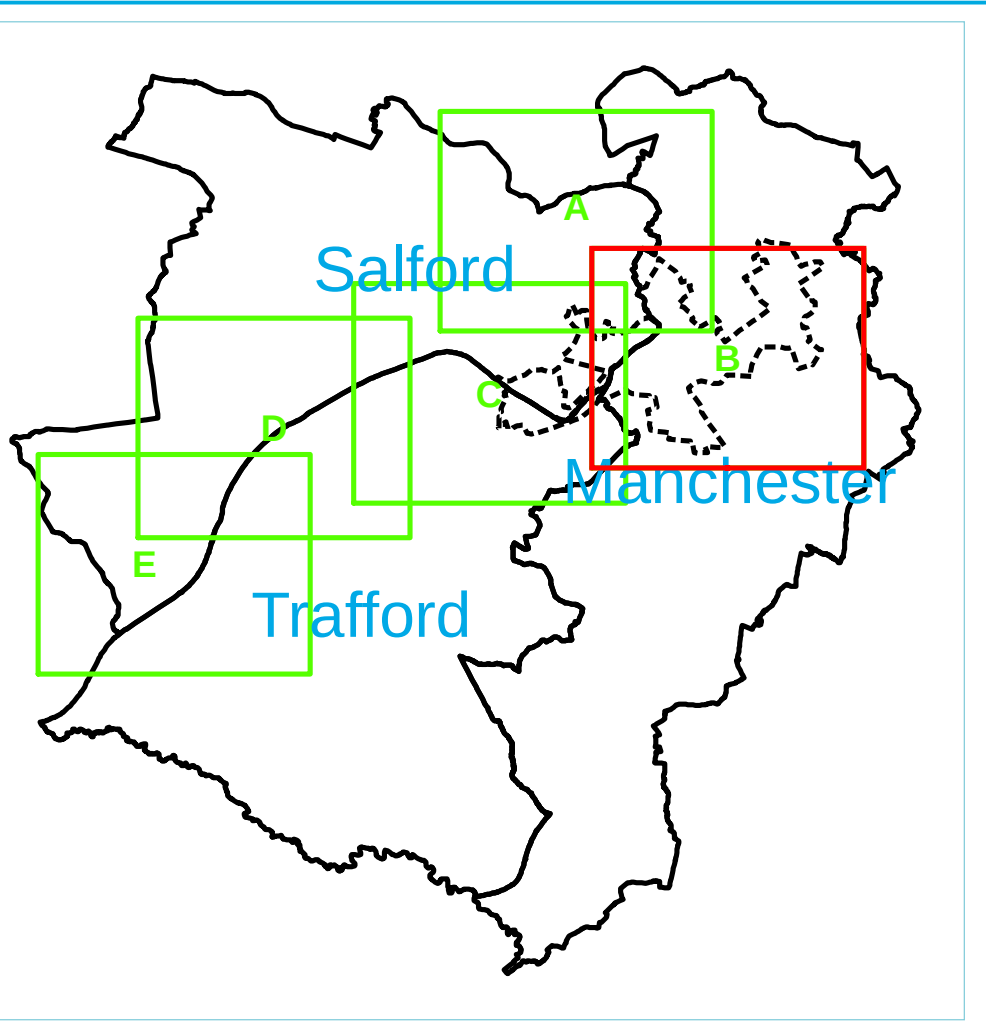
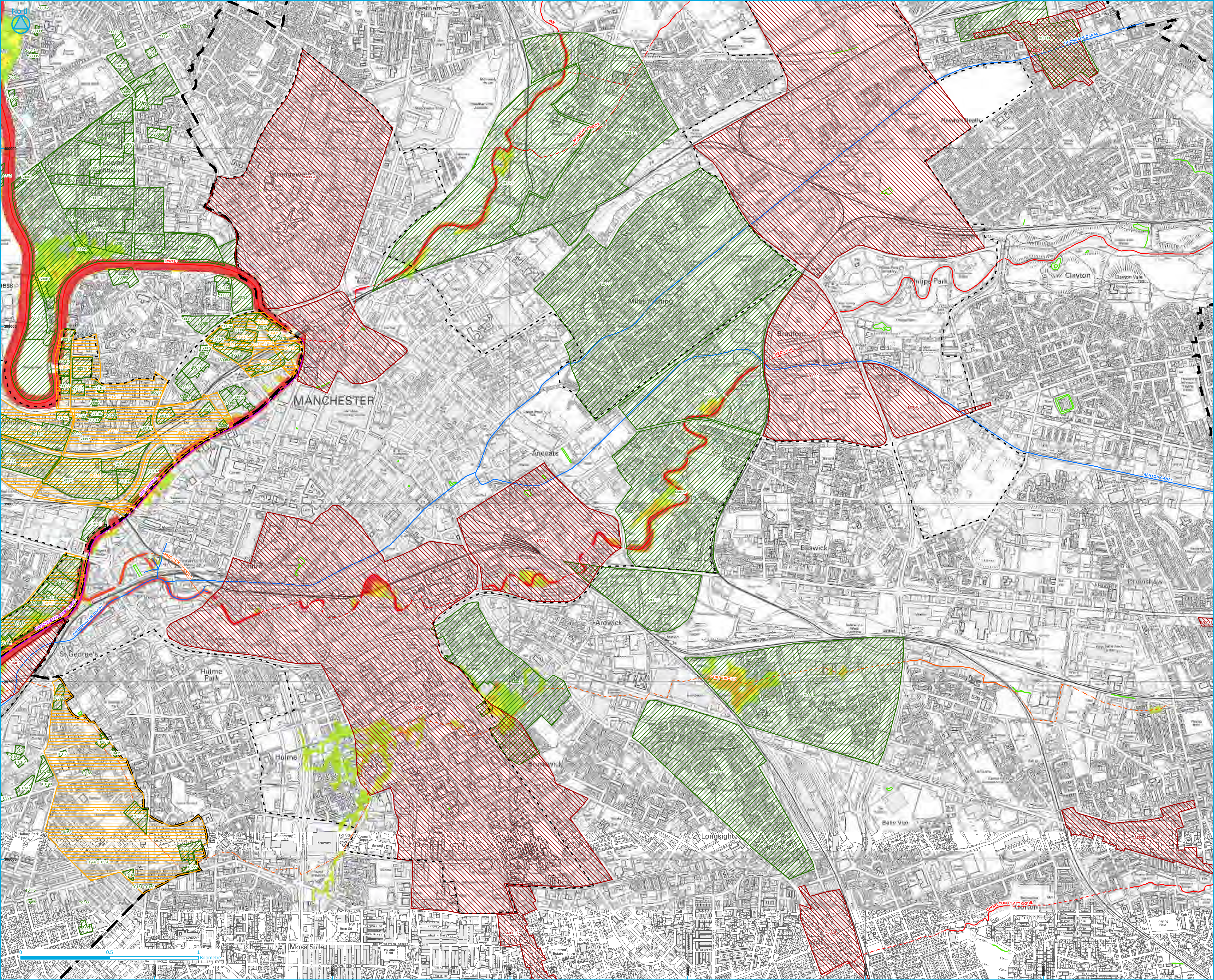
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

1 in 100 Year and 1 in 100 Year With Climate Change Flood Extents

Drawn by: J Cheetham	Date: 17/11/2010	This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence number: 100016666 2011.
Checked by: J Dimelew	Date: 22/11/2010	
Approved by: H O'Callaghan	Date: 22/11/2010	
File Name: ...ArcViewMapping\Level2\MST_Fluvial_Q100_extnt_V1.2.mxd		
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- Council Boundary**
- Maximum Flood Hazard**
 - Very Low Hazard
 - Dangerous For Some
 - Dangerous For Most
 - Dangerous For All
- Potential Development Sites / Locations**
 - Employment
 - Housing
 - Mixed Use
 - Other
- Regional Centre Boundary**
- Main Rivers (V8.0)**
 - Culverted
 - Open
- Ashton, Bridgewater and Rochdale Canals**
- Manchester Ship Canal / Grey Irwell**
- Other Waterbodies**
- Digitised River Lines**
 - Culverted
 - Open

This map has been produced in accordance with PPS25: Development and Flood Risk and its Practice Guide.

The map identifies the estimated flood hazard using the modelling outputs produced for this SFRA. The SFRA modelled reaches are shown on Figure 1.1 of the Maps index.

The Main River information shown in the SFRA is provided by the Environment Agency, the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

The map should be used to apply the Sequential Test and Exception Test.



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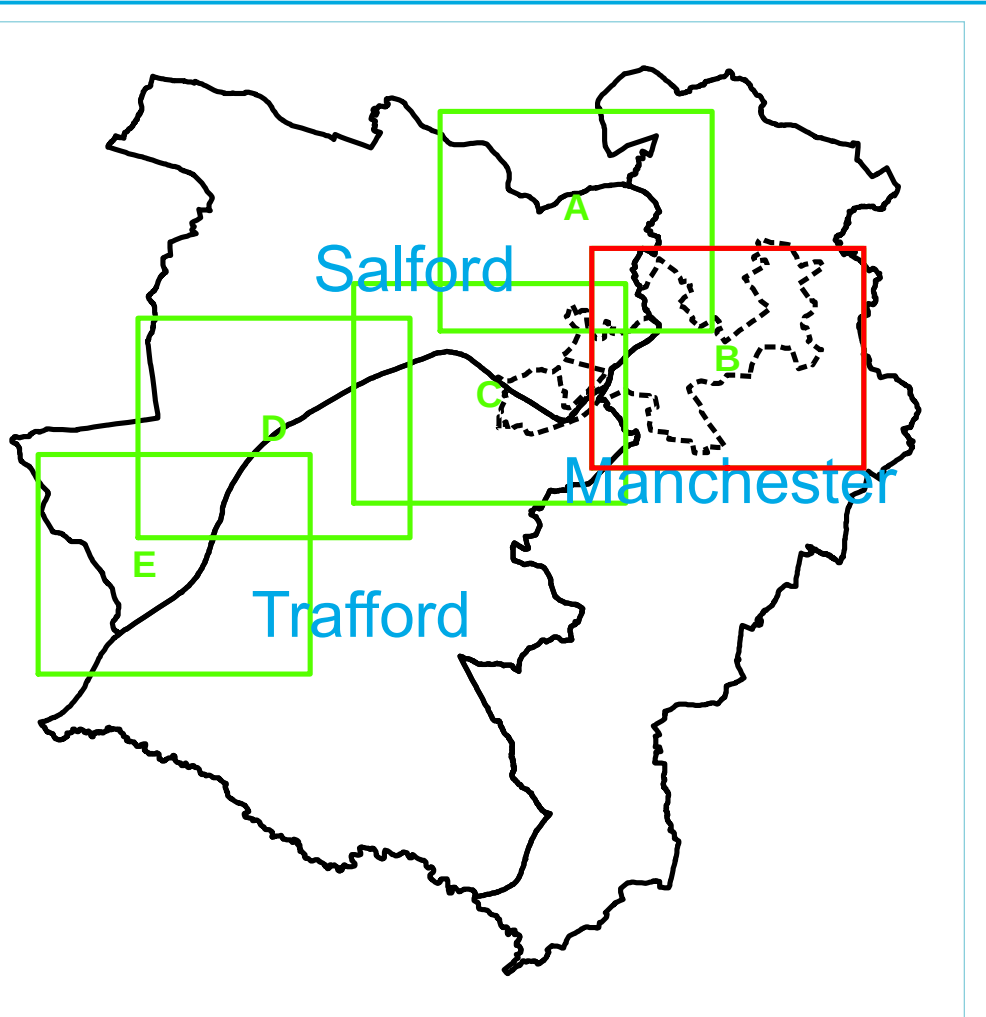
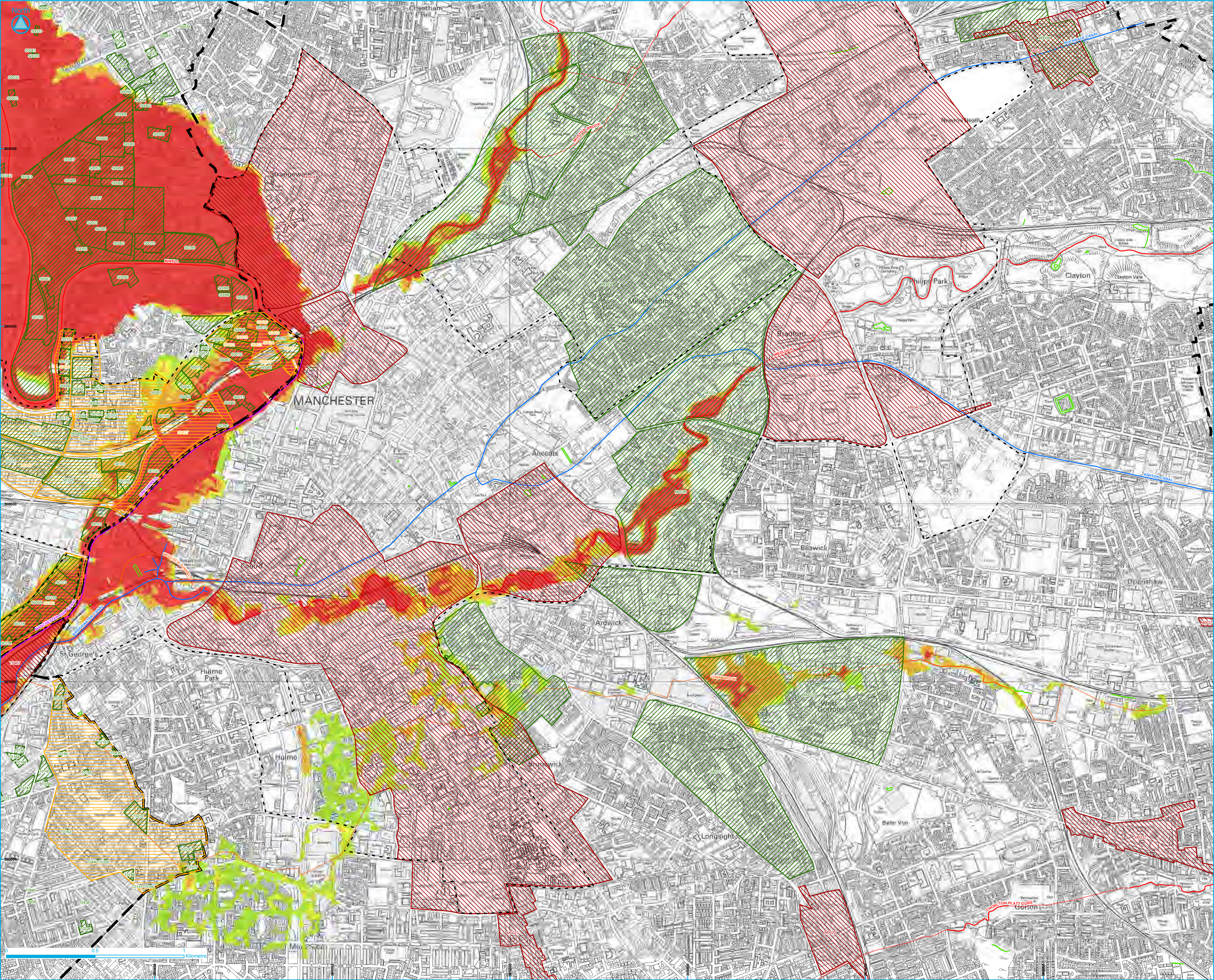
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Fluvial 1 in 100 Year Flood Hazard

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Approved by: J Cooper	Date: 13/01/2011	
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- Council Boundary
- Maximum Flood Hazard**
 - Very Low Hazard
 - Dangerous For Some
 - Dangerous For Most
 - Dangerous For All
- Potential Development Sites / Locations**
 - Employment
 - Housing
 - Mixed Use
 - Other
 - Regional Centre Boundary
- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- Other Waterbodies
- Waterbodies**
 - Culverted
 - Open
- Digitised River Lines**
 - Culverted
 - Open

This map has been produced in accordance with PPS25: Development and Flood Risk and its Practice Guide.

The map identifies the estimated flood hazards using the modelling outputs produced for this SFRA. The SFRA modelled reaches are shown on Figure 1.1 of the Maps Index. The map shows a worst case example and is useful in understanding residual risk to life for an extreme event, considering climate change.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

The map should be used to apply the Sequential Test and Exception Test.



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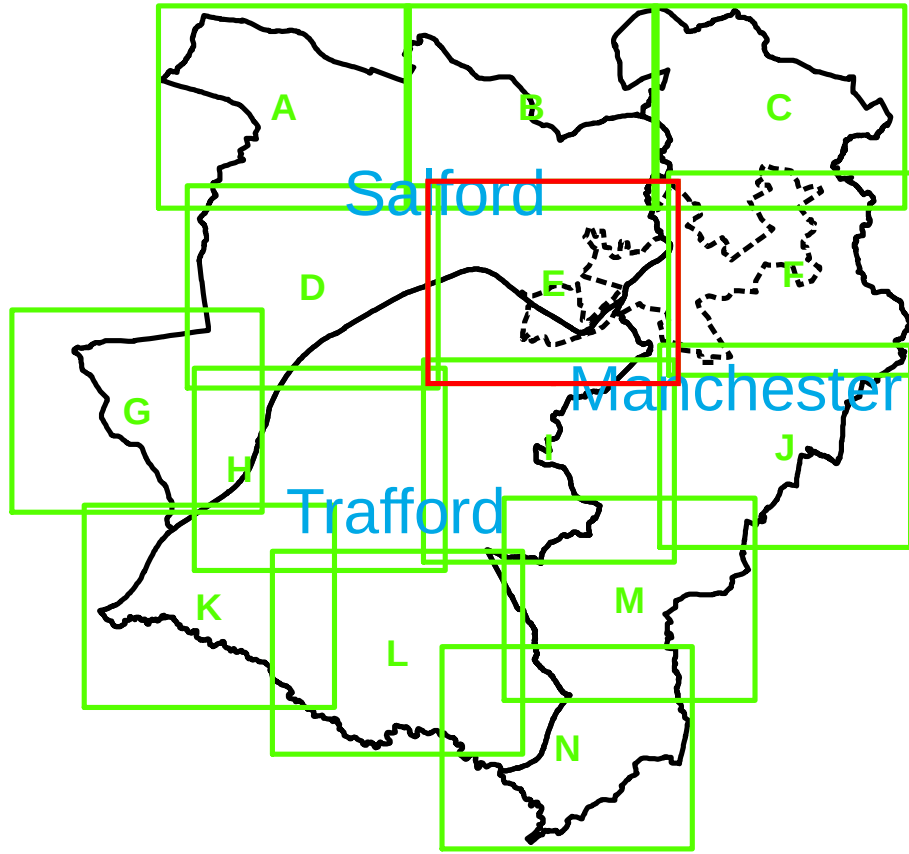
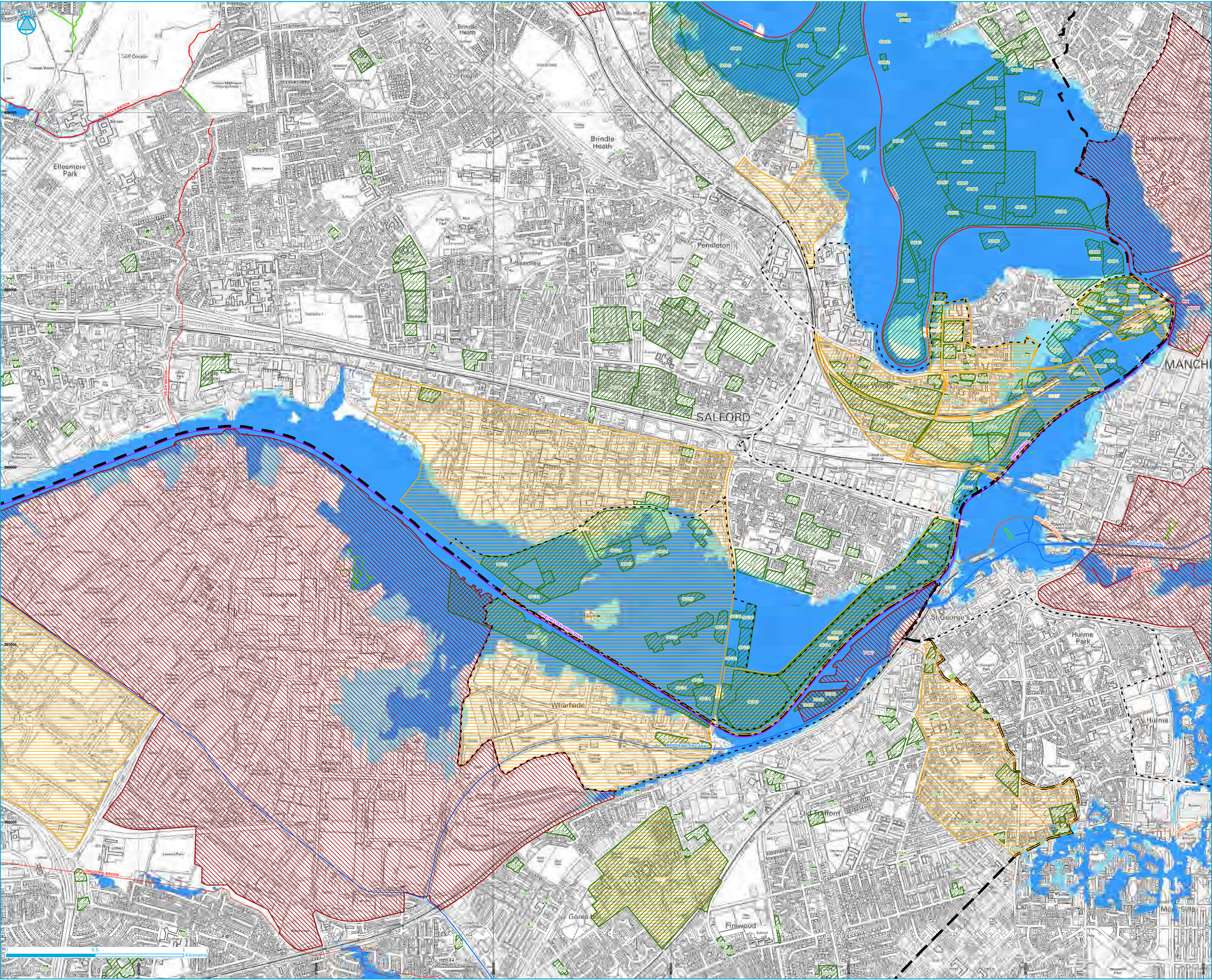
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Fluvial 1 in 1000 Year With Climate Change Flood Hazard

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Checked by: J Dimelew	Date: 01/02/2011	
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Original © A1		



- Council Boundary**
- Ashton, Bridgewater and Rochdale Canals
 - Manchester Ship Canal / Grey Inwell
 - Other Waterbodies
- Fluvial Flood Extent**
- 1 in 1000 Year
 - 1 in 1000 Year With Climate Change
- Potential Development Sites / Locations**
- Employment
 - Housing
 - Mixed Use
 - Other
- Main Rivers (V8.0)**
- Culverted
 - Open
- Digitised River Lines**
- Culverted
 - Open
- Regional Centre Boundary**

This map has been produced in accordance with PPS25: Development and Flood Risk and its Practice Guide.

The map identifies the estimated flood extents in an extreme flood event using the modelling outputs produced for this SFRA where this has been undertaken. Beyond the modelled reaches, either recent Environment Agency modelling or Flood Zone 2 has been used for the 1 in 1,000 year event. The SFRA modelled reaches are shown on Figure 1.1 of the Maps Index.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Inwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

The map should be used to apply the Sequential Test and Exception Test.



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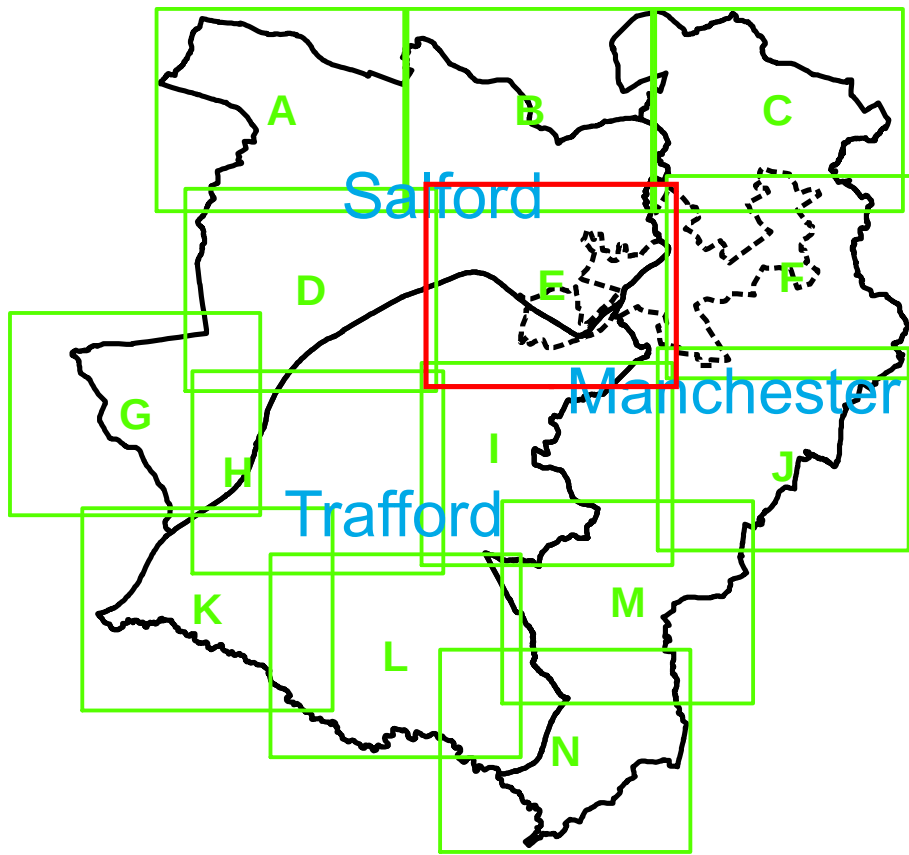
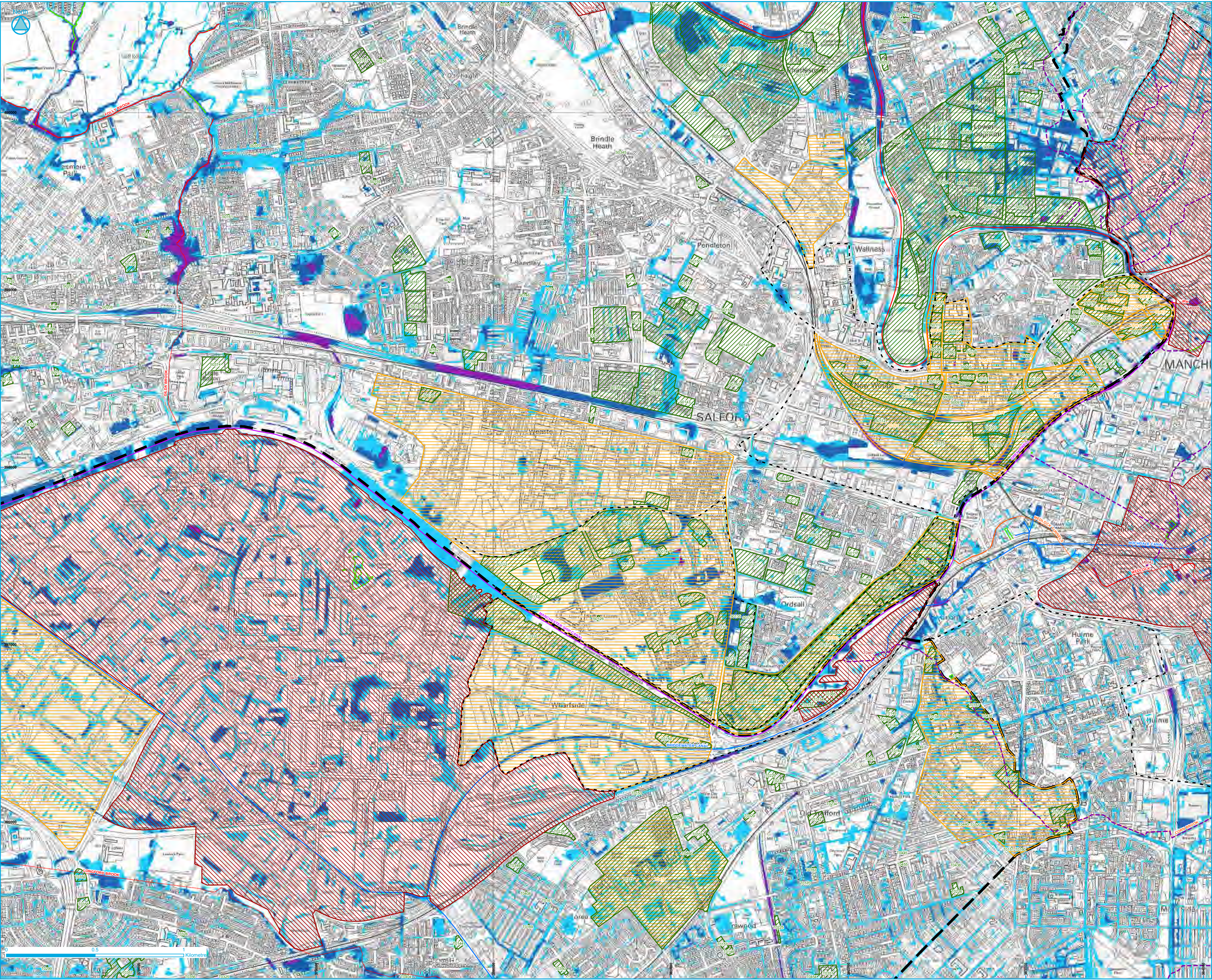
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

1 in 1000 Year And 1 in 1000 Year With Climate Change Flood Extents

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Approved by:	H O'Callaghan	Date:	22/11/2010	
File Name: ArcViewMappingLevel2MST_Fluvial_Q1000_extnt_V1.2.mxd				
Drawing Number:	FL_1.4E	Status:	FINAL	Scale: 1:10,000
				Original © A1



- Council Boundary
- Lost Watercourses
- High Susceptibility
- Intermediate Susceptibility
- Low Susceptibility
- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary
- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Inwell
- Other Waterbodies
- Main Rivers (V8.0)**
 - Culverted
 - Open
- Digitised River Lines**
 - Culverted
 - Open

This map has been produced in accordance with PPS25: Development and Flood Risk.

The map refines the Environment Agency's map of 'Areas Susceptible to Surface Water Flooding' based on more detailed modelling outputs produced for this SFRA.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

This map should be used to apply the Exception Test and to scope what the Flood Risk Assessment should consider in its placement of surface development and the management of runoff.

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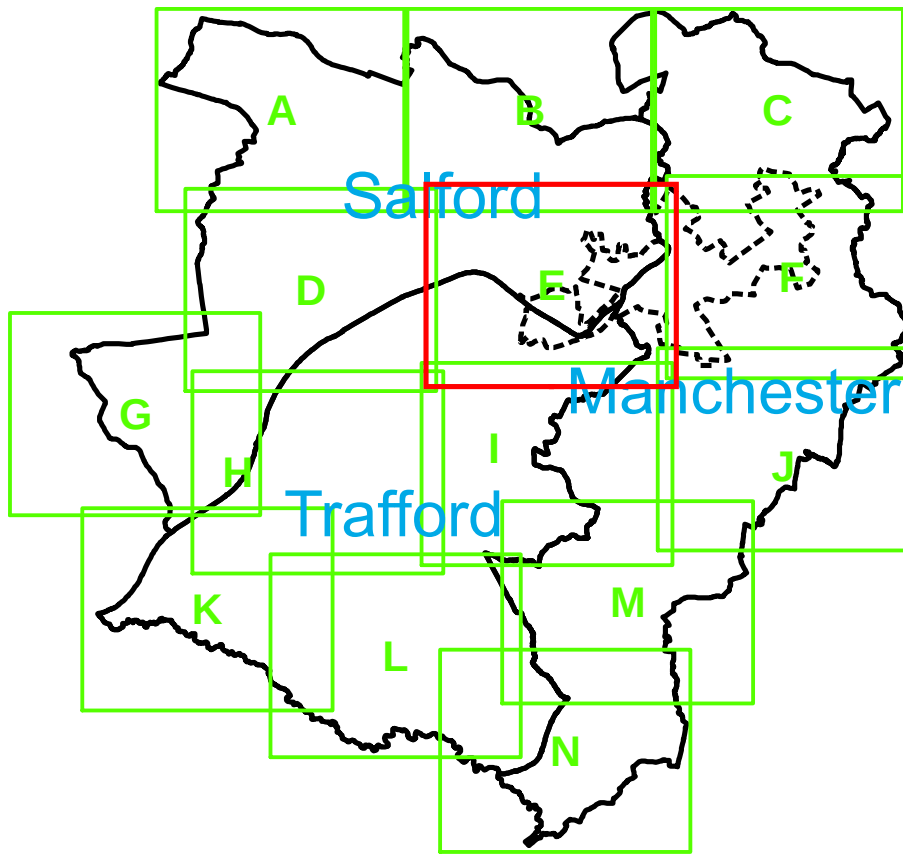
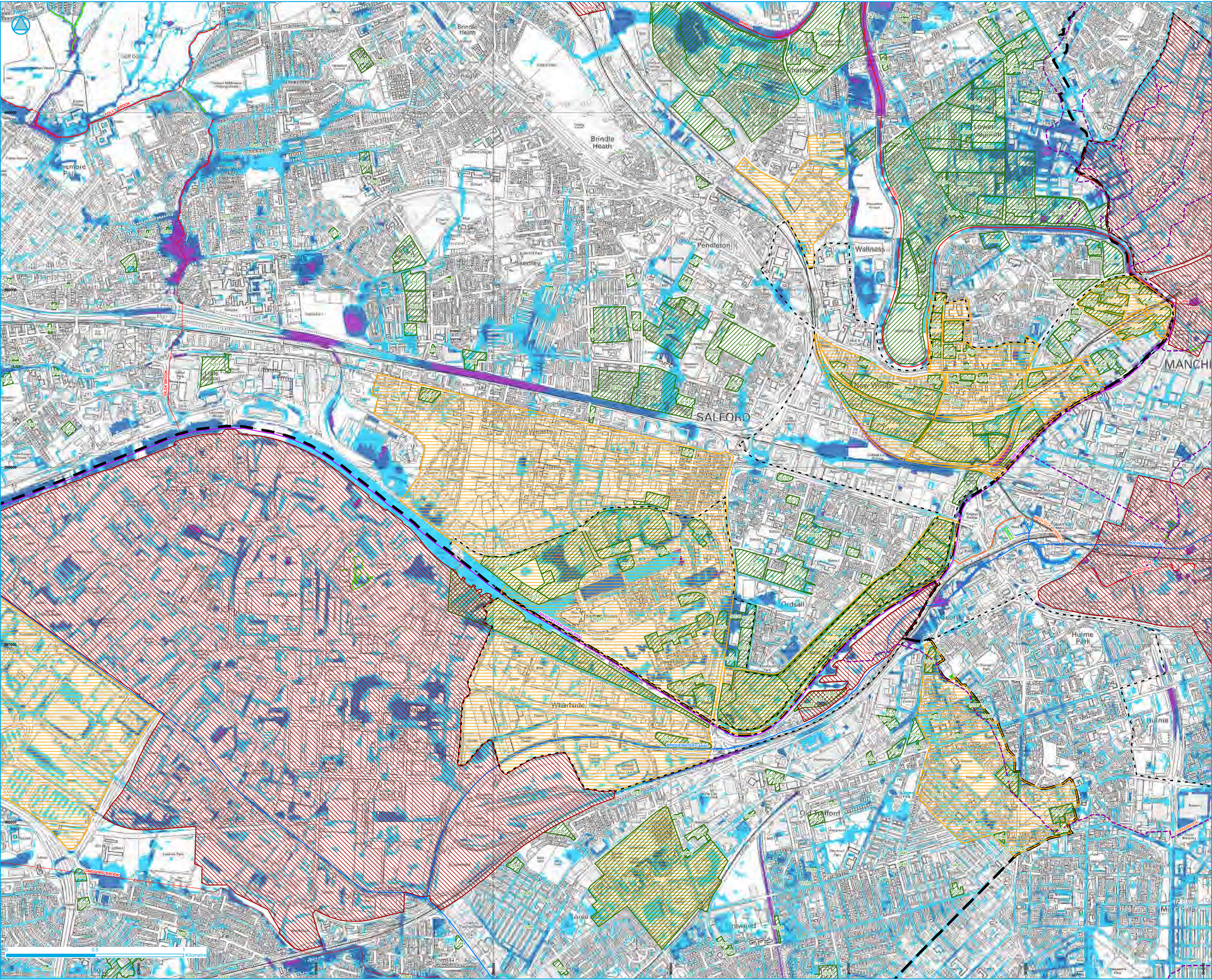
for

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

Susceptibility to Surface Water Flooding - Current Scenario

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Approved by: J Cooper	Date: 01/02/2011	
File Name: ...ArcViewMapping\Level2\MST_SurfaceWaterFlooding_Current_V1.1.mxd		
Drawing Number:	Status:	Scale:
SS_4.1 E	FINAL	1:10,000

Original @ A1



- Council Boundary
- Lost Watercourses
- High Susceptibility
- Intermediate Susceptibility
- Low Susceptibility
- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary
- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Inwell
- Other Waterbodies
- Main Rivers (V8.0)**
 - Culverted
 - Open
- Digitised River Lines**
 - Culverted
 - Open

This map has been produced in accordance with PPS25: Development and Flood Risk.

The map refines the Environment Agency's map of 'Areas Susceptible to Surface Water Flooding' based on more detailed modelling outputs produced for this SFRA. This map can be used to assess the sensitivity of surface water flooding to climate change and urban development.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

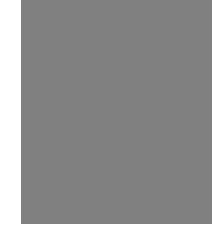
This map should be used to apply the Exception Test and to scope what the Flood Risk Assessment should consider in its placement of surface development and the management of runoff.



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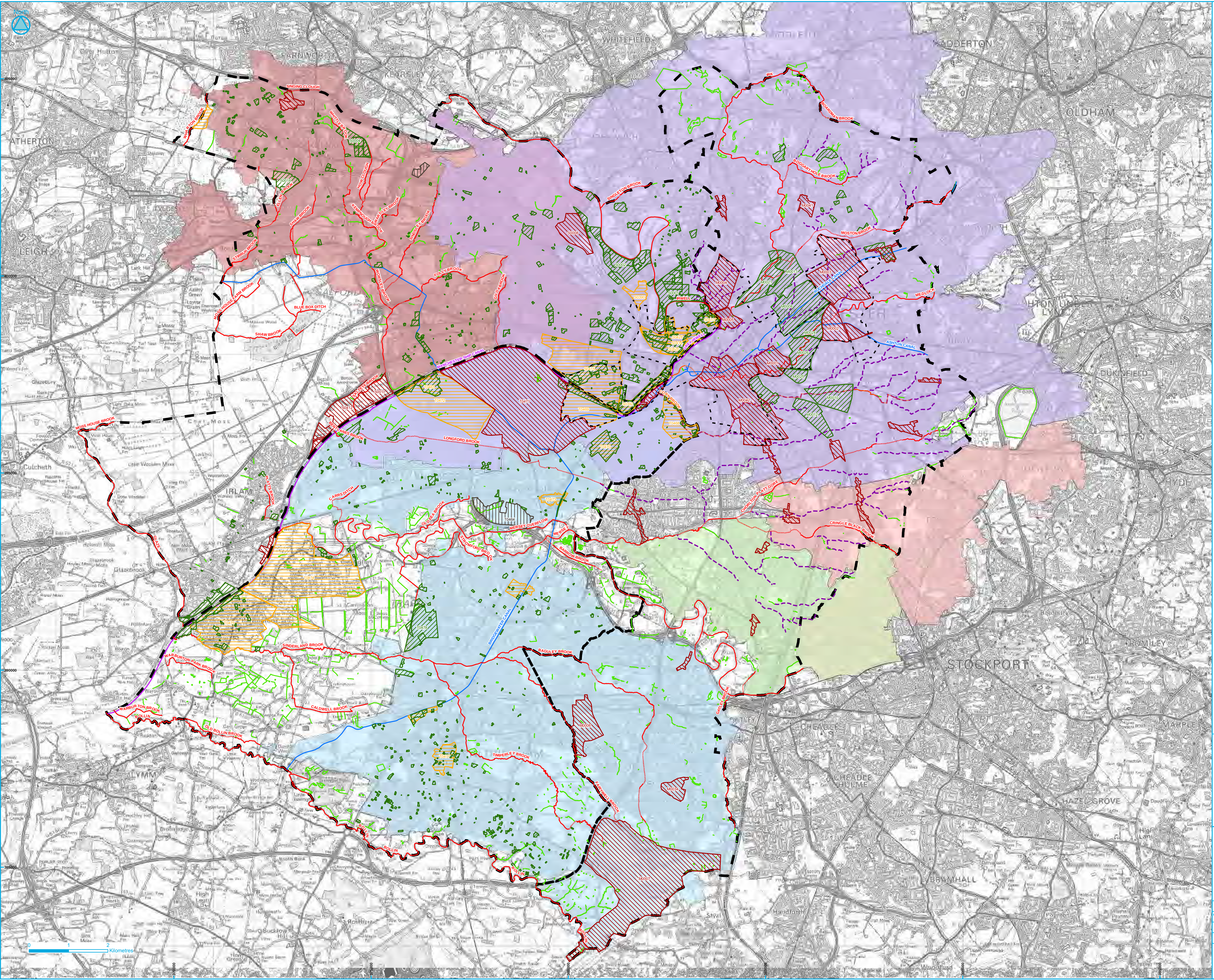


for

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

Susceptibility to Surface Water Flooding - Future Scenario

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Approved by: J Cooper	Date: 01/02/2011	
File Name: ArcViewMapping\Level2MST_SurfaceWaterFlooding_Current_V1.1.mxd		
Drawing Number: SS_4.2 E	Status: FINAL	Scale: 1:10,000
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- Council Boundary
- - - Lost Watercourses
- Critical Drainage Areas**
- Conurbation Core
- Didsbury
- Levenshulme and Fallowfield
- Manchester and Trafford South
- Salford North West
- Potential Development Sites / Locations**
- Employment
- Housing
- Mixed Use
- Other
- - - Regional Centre Boundary
- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Inwell
- Other Waterbodies
- Main Rivers (V8.0)**
- Culverted
- Open
- Digitised River Lines**
- Culverted
- Open

This map has been produced in accordance with PPS25: Development and Flood Risk.

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 Critical Drainage Areas in the SFRA. Specific drainage requirements are required in these areas to help reduce local flood risk.

Chapter 5 of the Level 2 SFRA covers the flooding from surface water and sewers and how Critical Drainage Areas have been defined.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Inwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.



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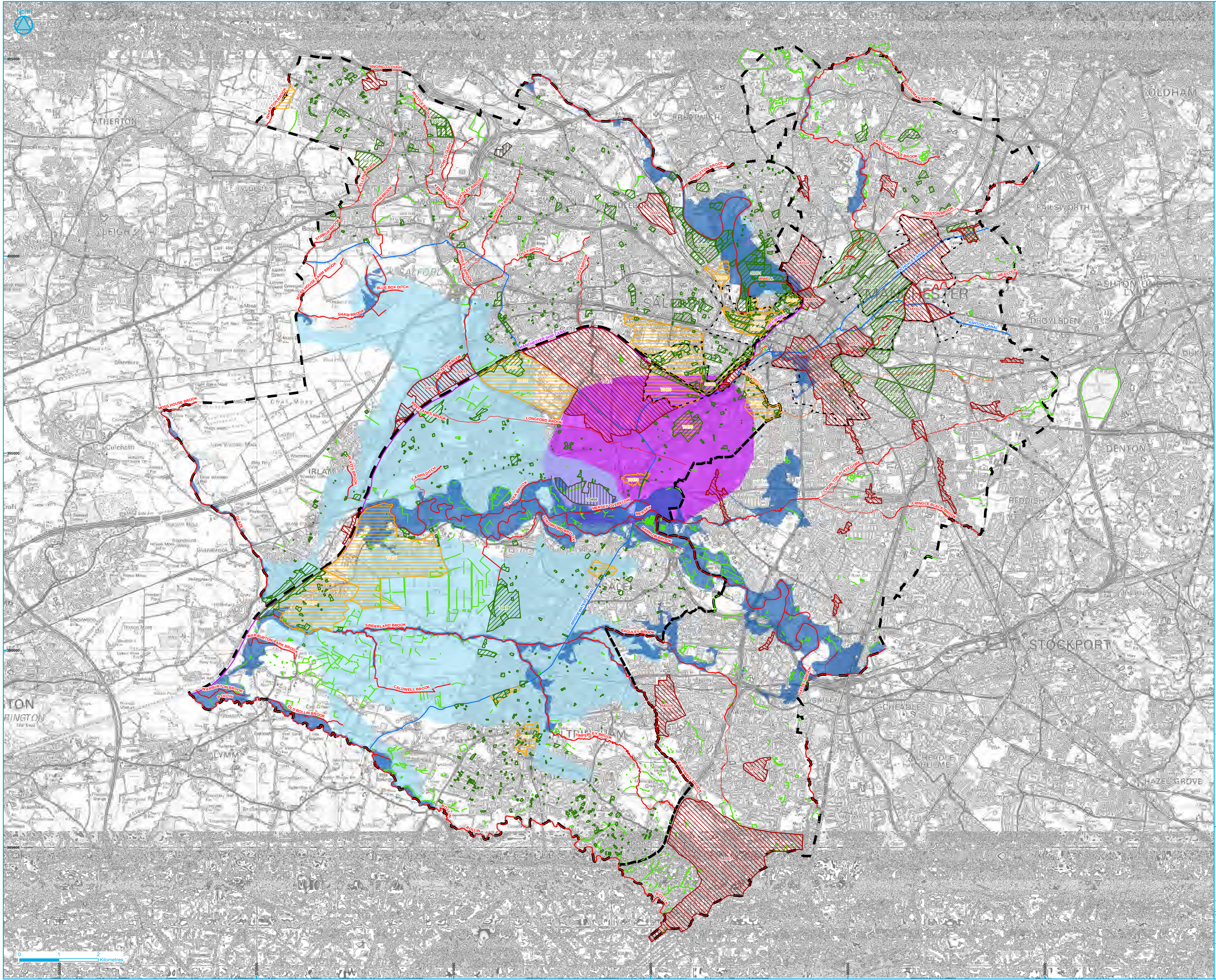
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Critical Drainage Areas

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File Name: ...ArcViewMapping\Level2MST_CDA_Current_V1.2.mxd					
Drawing Number:	SS_4.5	Status:	FINAL	Scale:	1:45,000

Original @ A



Legend

- Council Boundary
- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- Other Waterbodies
- Main Rivers (V8.0)**
 - Culverted
 - Open
- Digitised River Lines**
 - Culverted
 - Open
- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

The map has been produced in accordance with PPS25: Development and Flood Risk and its Practice Guide. This map shows areas that are potentially at risk from groundwater flooding and should be used to scope suitable mitigation measures in a site specific Flood Risk Assessment.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The information on the map is based on Environment Agency potential groundwater rebound areas, data from the Coal Authority, BGS drift geology mapping and Defra Groundwater Emergence Maps.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

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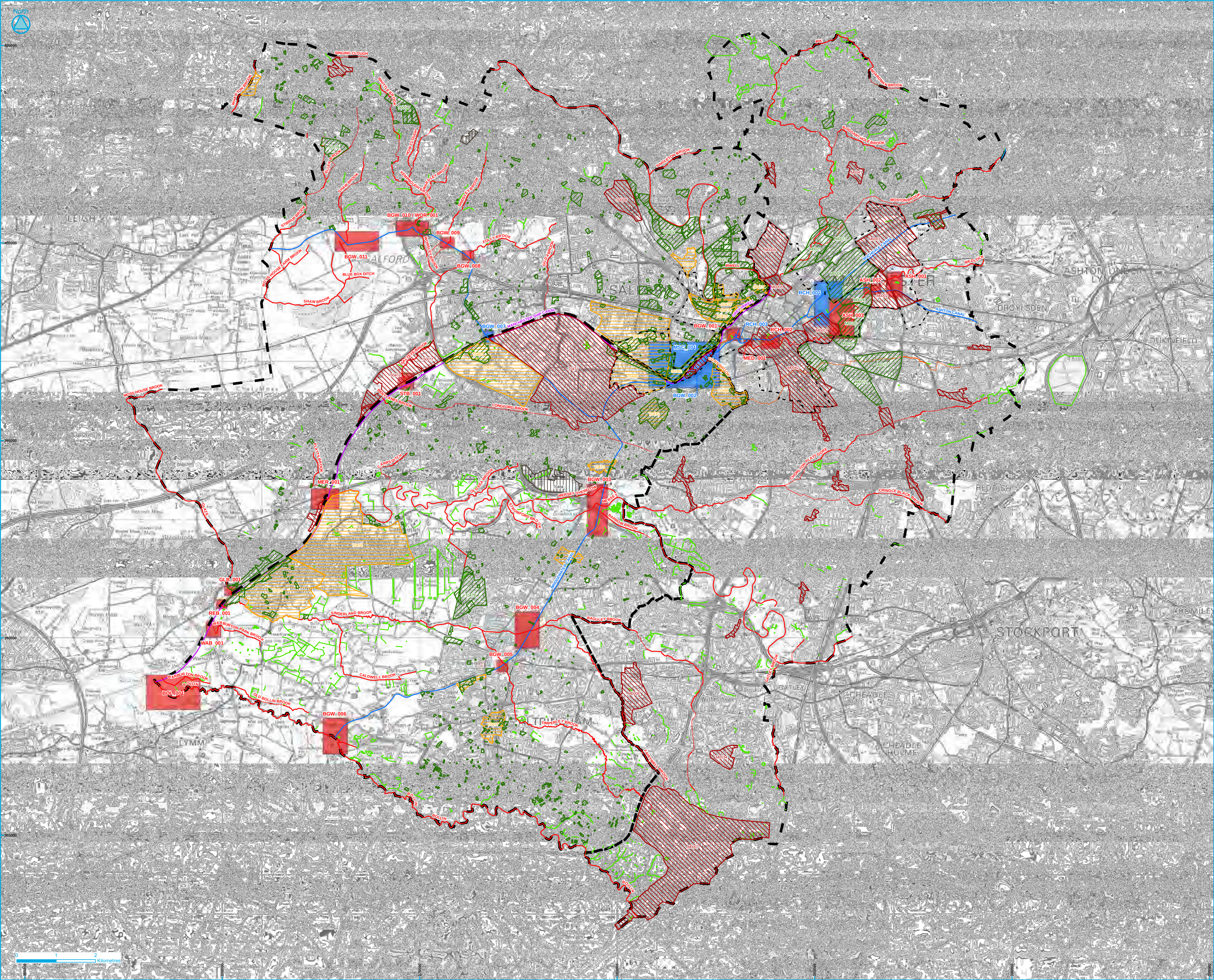
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Groundwater Flooding

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Approved by: J Cooper	Date: 01/02/2011	
File Name: ...ArcViewMapping\Level1\MST_GroundwaterFlooding_V1.3.mxd		
Drawing Number: GW_2.1	Status: FINAL	Scale: 1:45,000

Original @ A1



- Council Boundary
- Hydraulic Interactions**
 - Canal/Canal
 - Canal/River
- Potential Development Sites / Locations**
 - Employment
 - Housing
 - Mixed Use
 - Other
- Main Rivers (V8.0)**
 - Culverted
 - Open
- Digitised River Lines**
 - Culverted
 - Open
- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- Other Waterbodies
- Regional Centre Boundary

This map has been produced in accordance with PPS25: Development and Flood Risk.

The map shows the interactions between different sources of flooding. This identifies where further consideration of hydraulic interactions is required in site specific FRAs.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment. The River Irwell downstream from Victoria Station and the Manchester Ship Canal function as a single (hydraulically linked) watercourse. The rectangles represented on this map show an indicative area over which hydraulic interactions are considered possible.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.



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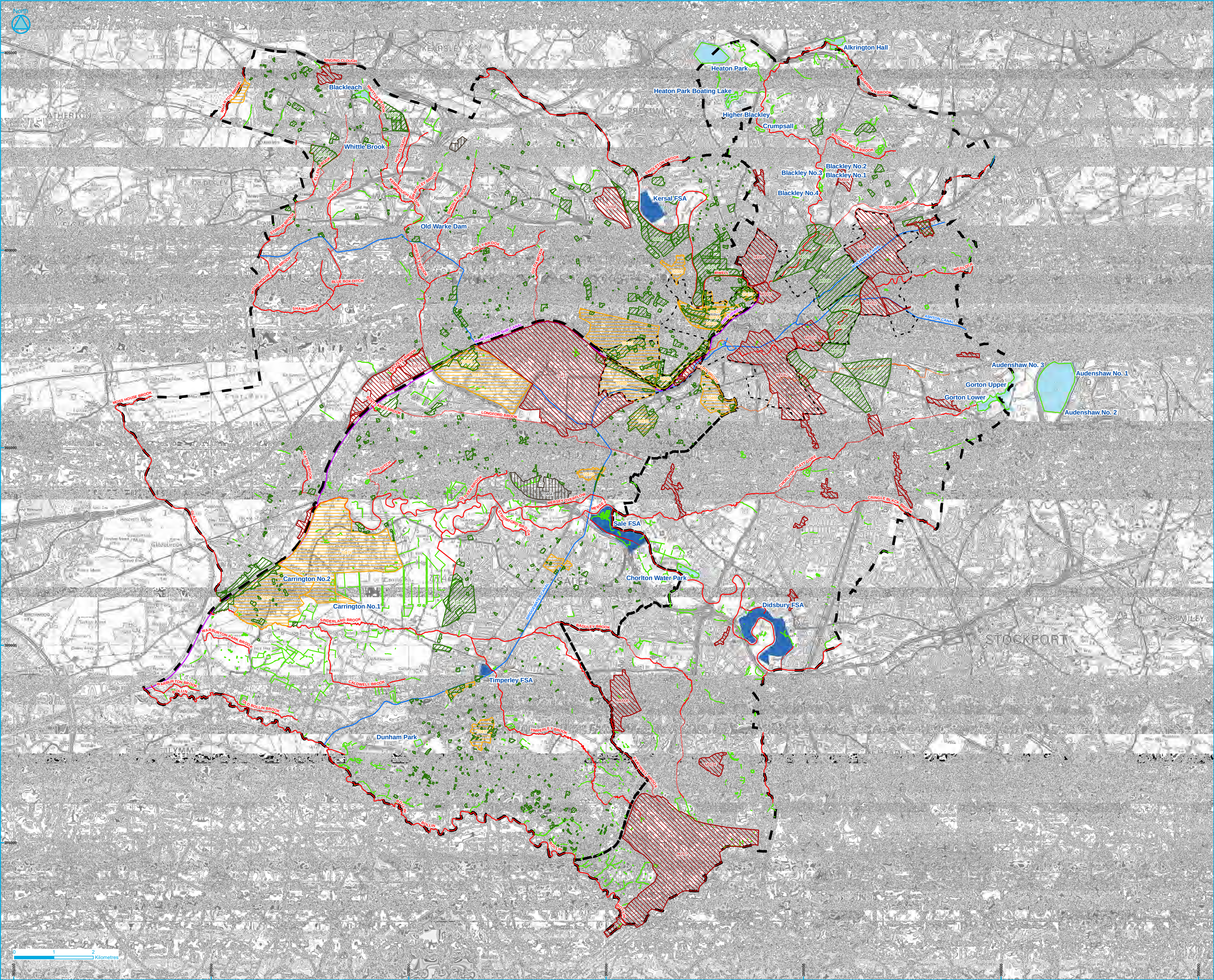
for

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

Hydraulic Interactions

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Approved by: J Cooper	Date: 01/02/2011	
File Name: ArcViewMapping\Level2\MST_Hydraulic_Interactions_V1.1.mxd		
Drawing Number: HI_5.1	Status: FINAL	Scale: 1:45,000

Original @ A1



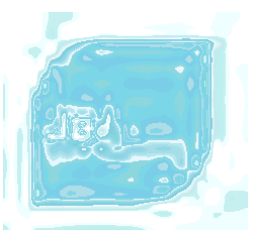
- Legend**
- Council Boundary**
 - Black dashed line
 - Reservoirs**
 - Blue solid line: Flood Storage Area
 - Light blue solid line: Reservoir
 - Potential Development Sites / Locations**
 - Red hatched: Employment
 - Green hatched: Housing
 - Orange hatched: Mixed Use
 - White hatched: Other
 - Black dashed line: Regional Centre Boundary
 - Main Rivers (V8.0)**
 - Red dotted line: Culverted
 - Red solid line: Open
 - Digitised River Lines**
 - Orange dotted line: Culverted
 - Orange solid line: Open
 - Other Waterbodies**
 - Green solid line: Ashton, Bridgewater and Rochdale Canals
 - Purple solid line: Manchester Ship Canal / Grey Irwell

This map has been produced in accordance with PPS25: Development and Flood Risk and its Practice Guide. The reservoirs within and near to proposed development sites have been mapped to show their location only. The information is based on OS MasterMap and data gathered in the AGMA Sub-regional Level 1 SFRA.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overlapping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The River Irwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

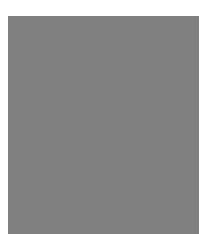
This map should not influence the spatial placement of development during the Sequential Test; however, it should inform the need for emergency planning to take account of the risk within community plans.



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

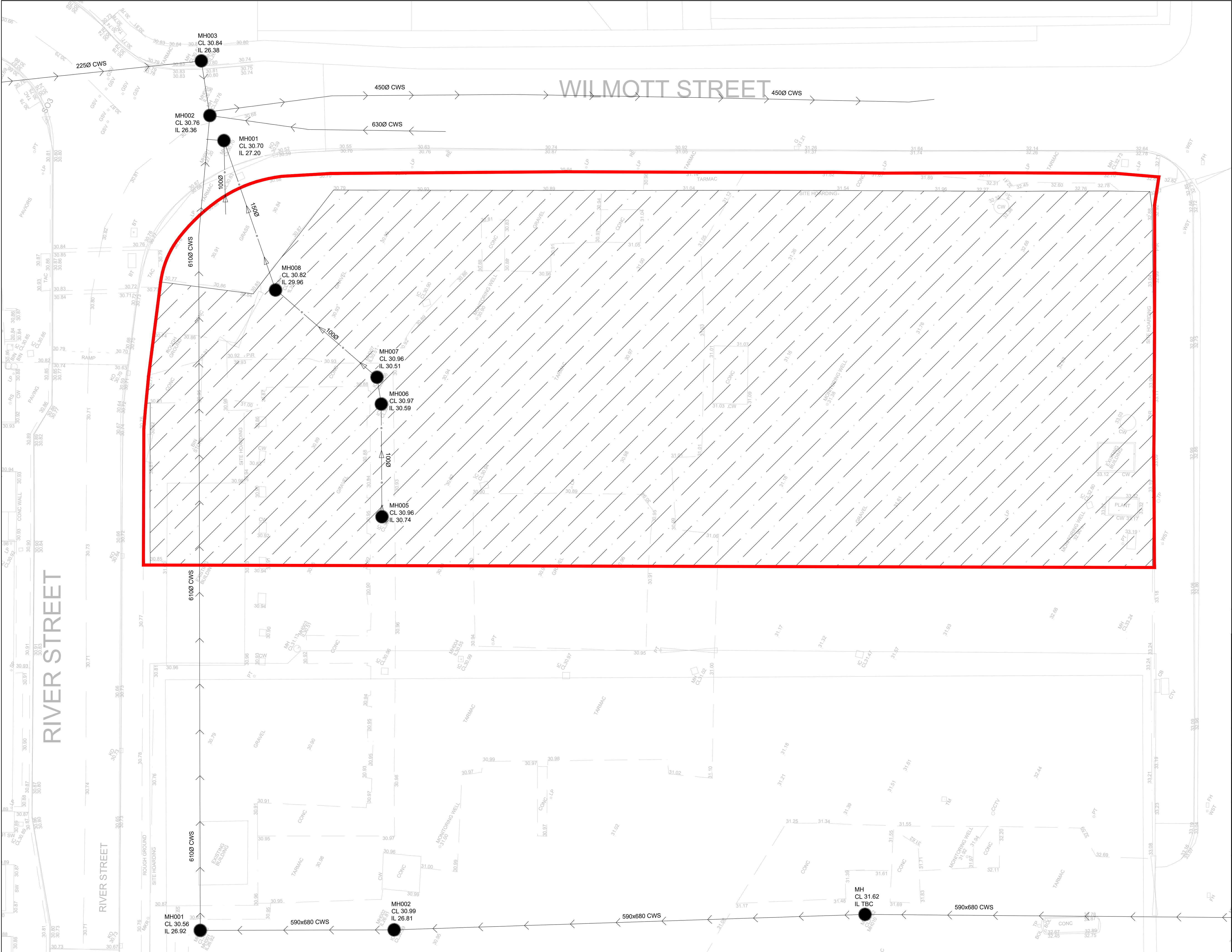
Reservoir Screening

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Approved by: J Cooper	Date: 01/02/2011	
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Drawing Number: MM_3.1	Status: FINAL	Scale: 1:45,000
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COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX H – EXISTING DRAINAGE AREAS



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- BEFORE STARTING ANY WORKS, CONTRACTOR TO CHECK INVERT LEVELS AND POSITIONS OF EXISTING DRAINS, SEWERS, INSPECTIONS CHAMBERS AND MANHOLES AGAINST INFORMATION SHOWN ON THIS DRAWING.

LEGEND

- SITE BOUNDARY
- EXISTING COMBINED SEWER
- EXISTING COMBINED DRAIN
- EXISTING DRAINAGE CATCHMENT (0.276 ha)

REV	DATE	DETAILS	DRN	CHK
DRAWING STATUS PRELIMINARY				
RIBA STAGE RIBA STAGE 2				
DRAWN ARJ				
DATE OCT 22				
SCALES 1:150				
CHECKED JAS				
DATE OCT 22				
THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE -DO NOT SCALE--				
APPRVD. JAS				
DATE OCT 22				
EMAIL FOR DRAWINGS info@roconsulting.com				
CLIENT VITA GROUP				
PROJECT TITLE PLOT 10B FIRST STREET				
DRAWING TITLE FLOOD RISK ASSESSMENT EXISTING DRAINAGE AND CATCHMENT AREAS				
DRAWING No. 4513-ROC-XX-ZZ-SK-C-0100				REV. P01
4513				RgCp Ltd.



COMPLEX CHALLENGES ...
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APPENDIX I – EXISTING DRAINAGE CALCULATIONS

ROC Consulting		Page 1
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Date 09/10/2022 18:11 File 221006 Storm.MDX	Designed by andyj Checked by	
XP Solutions Network 2020.1		

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for EX SW

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.358	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	20	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for EX SW

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.259	4-8	0.017

Total Area Contributing (ha) = 0.276

Total Pipe Volume (m³) = 0.430

Network Design Table for EX SW

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	9.841	0.150	65.6	0.092	4.00	0.0	0.600	o	100	Pipe/Conduit	
S1.001	2.368	0.080	29.6	0.092	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.002	11.722	0.500	23.4	0.092	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.003	13.723	2.685	5.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	20.00	4.17	30.740	0.092	0.0	0.0	0.0	0.95	7.5	5.0
S1.001	20.00	4.20	30.590	0.184	0.0	0.0	0.0	1.42	11.2	10.0
S1.002	20.00	4.12	30.510	0.000	10.0	0.0	0.0	1.60	12.6	10.0
S1.003	20.00	4.17	29.960	0.000	10.0	0.0	0.0	4.49	79.3	10.0

ROC Consulting		Page 2
Commercial Wharf 6 Commercial Street Manchester M15 4PZ		
Date 09/10/2022 18:11 File 221006 Storm.MDX	Designed by andyj Checked by	
XP Solutions Network 2020.1		

Network 2020.1

Area Summary for EX SW

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.092	0.092	0.092
1.001	-	-	100	0.092	0.092	0.092
1.002	-	-	100	0.092	0.092	0.092
1.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.276	0.276	0.276

Free Flowing Outfall Details for EX SW

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	-----------	--------

S1.003	S	30.700	27.275	0.000	0	0
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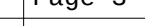
Simulation Criteria for EX SW

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

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Commercial Wharf 6 Commercial Street Manchester M15 4PZ		
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1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for EX SW

Simulation Criteria

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH		Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
	Name	Storm						
S1.000	S005	120 Winter	1	+0%	100/30 Winter			
S1.001	S006	120 Winter	1	+0%	30/15 Winter			
S1.002	S007	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
S1.003	S008	15 Winter	1	+0%				

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)	
S1.000	S005	30.778	-0.062	0.000	0.30			2.1	FLOOD RISK
S1.001	S006	30.638	-0.052	0.000	0.47			3.7	OK
S1.002	S007	30.580	-0.030	0.000	0.82			9.7	OK
S1.003	S008	29.996	-0.114	0.000	0.13			9.7	OK

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<u>1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for EX SW</u>																	
<table> <tr> <th>PN</th><th>US/MH Name</th><th>Level Exceeded</th></tr> <tr> <td>S1.000</td><td>S005</td><td></td></tr> <tr> <td>S1.001</td><td>S006</td><td></td></tr> <tr> <td>S1.002</td><td>S007</td><td>2</td></tr> <tr> <td>S1.003</td><td>S008</td><td></td></tr> </table>			PN	US/MH Name	Level Exceeded	S1.000	S005		S1.001	S006		S1.002	S007	2	S1.003	S008	
PN	US/MH Name	Level Exceeded															
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S1.001	S006																
S1.002	S007	2															
S1.003	S008																
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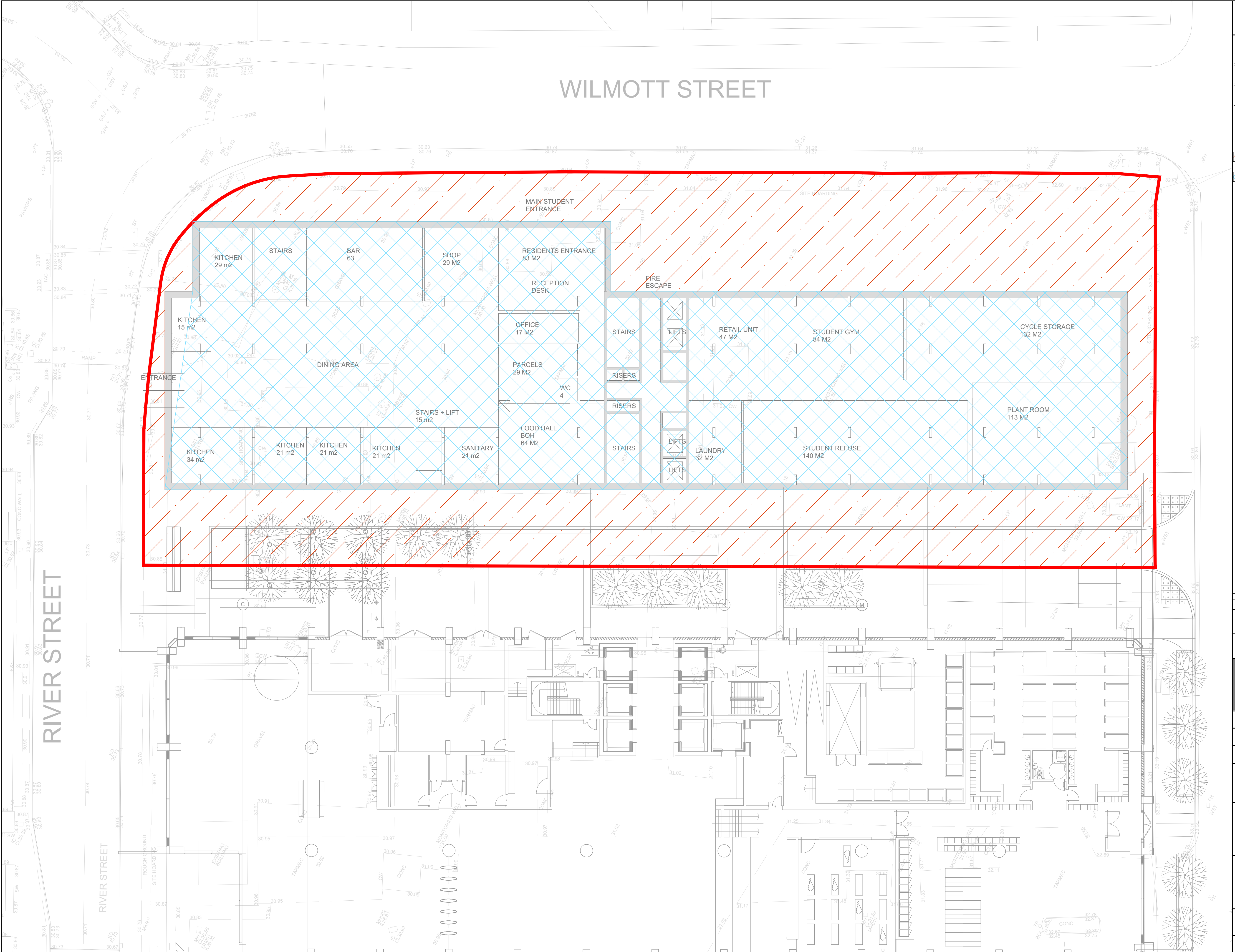
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<u>30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for EX SW</u>																	
<table> <thead> <tr> <th>PN</th><th>US/MH Name</th><th>Level Exceeded</th></tr> </thead> <tbody> <tr> <td>S1.000</td><td>S005</td><td></td></tr> <tr> <td>S1.001</td><td>S006</td><td></td></tr> <tr> <td>S1.002</td><td>S007</td><td>2</td></tr> <tr> <td>S1.003</td><td>S008</td><td></td></tr> </tbody> </table>			PN	US/MH Name	Level Exceeded	S1.000	S005		S1.001	S006		S1.002	S007	2	S1.003	S008	
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S1.000	S005																
S1.001	S006																
S1.002	S007	2															
S1.003	S008																
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<u>100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for EX SW</u>																	
<table> <thead> <tr> <th>PN</th><th>US/MH Name</th><th>Level Exceeded</th></tr> </thead> <tbody> <tr> <td>S1.000</td><td>S005</td><td></td></tr> <tr> <td>S1.001</td><td>S006</td><td></td></tr> <tr> <td>S1.002</td><td>S007</td><td>2</td></tr> <tr> <td>S1.003</td><td>S008</td><td></td></tr> </tbody> </table>			PN	US/MH Name	Level Exceeded	S1.000	S005		S1.001	S006		S1.002	S007	2	S1.003	S008	
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S1.000	S005																
S1.001	S006																
S1.002	S007	2															
S1.003	S008																
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COMPLEX CHALLENGES ...
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APPENDIX J – PROPOSED DRAINAGE AREAS



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- BEFORE STARTING ANY WORKS, CONTRACTOR TO CHECK INVERT LEVELS AND POSITIONS OF EXISTING DRAINS, SEWERS, INSPECTIONS CHAMBERS AND MANHOLES AGAINST INFORMATION SHOWN ON THIS DRAWING.

SITE BOUNDARY

PROPOSED LANDSCAPE CATCHMENT
(0.130 ha)

PROPOSED ROOF CATCHMENT
(0.165 ha)

P1	11.10.22	FIRST ISSUE	ARJ	JAS
REV	DATE	DETAILS	DRN	CHK

DRAWING STATUS

PRELIMINARY

RIBA STAGE

RIBA STAGE 2

DRAWN	ARJ	DATE	OCT 22	SCALES	1:150
CHECKED	JAS	DATE	OCT 22	THE ABOVE SCALES APPLY WHEN PLOTTED AT 1:150 -DO NOT SCALE-	
APPRVD.	JAS	DATE	OCT 22	EMAIL FOR DRAWINGS info@roconsulting.com	

CLIENT

VITA GROUP

PROJECT TITLE

PLOT 10B

FIRST STREET

DRAWING TITLE

FLOOD RISK ASSESSMENT

PROPOSED DRAINAGE AREAS

DRAWING No.	4513-ROC-XX-ZZ-SK-C-0101	REV.	P01
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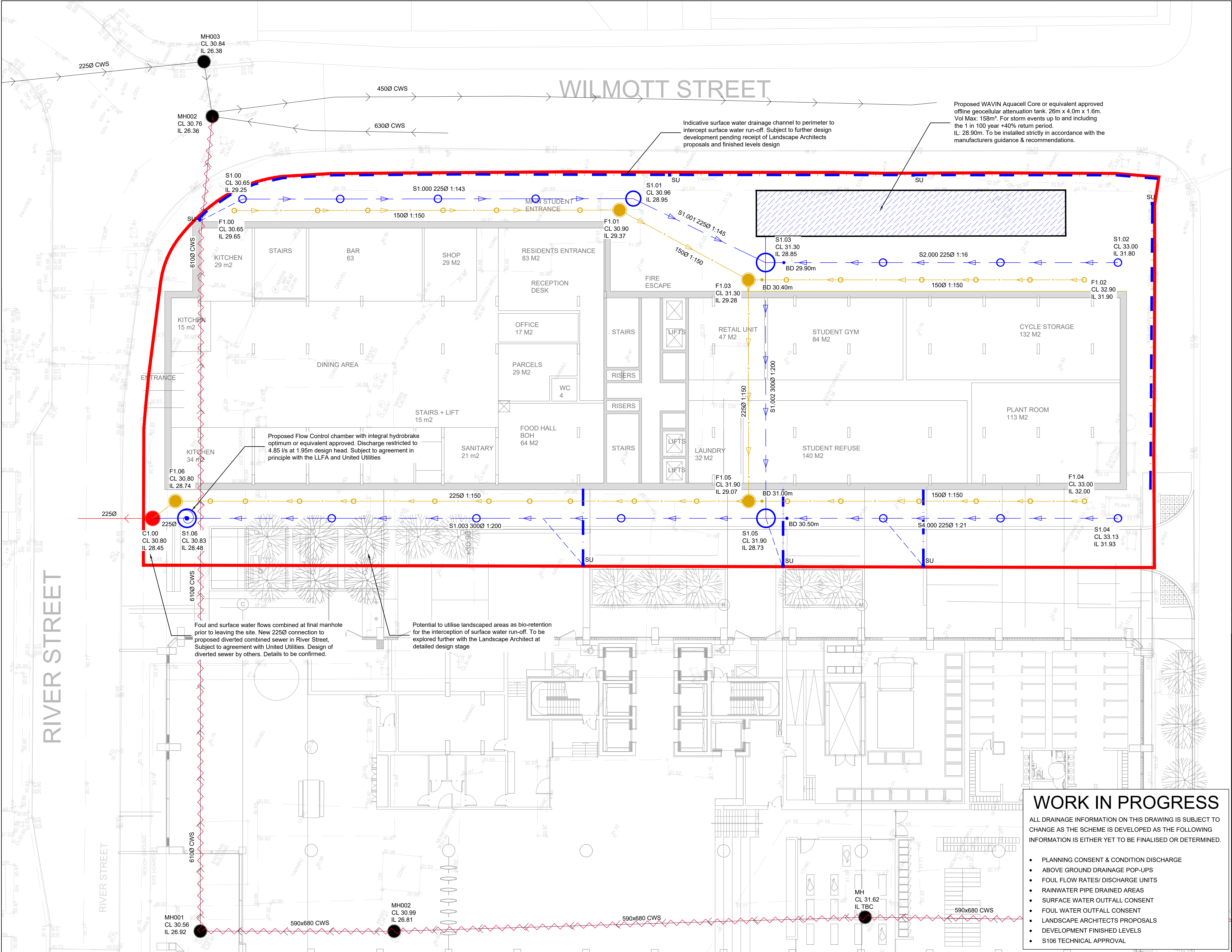
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APPENDIX K – DRAINAGE STRATEGY



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- ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
- BEFORE STARTING ANY WORKS, CONTRACTOR TO CHECK INVERT LEVELS AND POSITIONS OF EXISTING DRAINS, SEWERS, INSPECTIONS CHAMBERS AND MANHOLES AGAINST INFORMATION SHOWN ON THIS DRAWING.
- ROCKER PIPES ARE TO BE PROVIDED AT ALL CONCRETE CASED INTERFACES.
- CLASS 2 CONCRETE SURROUND TO BE PROVIDED FOR PIPES WITH COVER LESS THAN 1.2m ABOVE THE CROWN OF THE PIPE FOR ROADS AND 0.6m FOR SOFT AND PEDESTRIAN AREAS ONLY AND UNDER ALL FOUNDATIONS AND WHERE PIPES LAID WITHIN 1m OF FOUNDATIONS.
- CONNECTIONS TO EXISTING PUBLIC SEWERS IN ACCORDANCE WITH UNITED UTILITIES REQUIREMENTS, TO BE APPROVED / AGREED WITH THE WATER AUTHORITY.
- PROPOSED COVER LEVELS ARE APPROXIMATE AND SHALL BE CHECKED BY THE CONTRACTOR ON SITE TO SUIT THE EXACT FINISHED LEVEL AND GRADIENT.
- ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY AND IN CONJUNCTION WITH ALL RELEVANT BRITISH STANDARDS, CODES OF PRACTICE AND SEWERS FOR ADOPTION 7th EDITION.
- ACCESS COVERS AND FRAMES SHALL COMPLY WITH THE LOADINGS SPECIFIED AND TO BS EN 124 AND KITEMARKED OR IF RECESSED COVERS ARE SPECIFIED THEN IN ACCORDANCE WITH FACTA ASSOCIATION EQUIVALENT. ALLOW FOR RECESS MANHOLE COVERS TO ACCEPT LANDSCAPE ARCHITECT FINISHES TO ALL NON-ASPHALT EXTERNAL AREAS.
- THE PROPOSED BUILDING LAYOUTS SHOWN ON THIS DRAWING ARE FOR INFORMATION ONLY. REFER TO ARCHITECTS PLANS FOR PRECISE LOCATION SETTING OUT INFORMATION AND DETAILS.
- FOR SETTING OUT DIMENSIONS OF SSS, SVPS, RWPS, FLOOR GULLYS & OTHER DRAINAGE POP UP LOCATIONS, REFER TO ARCHITECTS OR MECHANICAL & ELECTRICAL ENGINEERS DRAWINGS.
- ALL DRAINAGE PIPEWORK SHOWN SHALL BE 100mm DIAMETER FOR FOUL AND 150mm FOR SURFACE WATER UNLESS NOTED OTHERWISE. ALL DRAINAGE PIPEWORK SHALL BE LAID SOFFIT TO SOFFIT UNLESS OTHERWISE STATED.
- ALL UNDERSLAB DRAINAGE SHALL BE LAID AT GRADIENTS OF 1:80 MIN. FOR FOUL PIPEWORK AND 1:100 MIN. FOR SURFACE WATER UNLESS NOTED OTHERWISE. ALL UNDERSLAB DRAINAGE SHALL BE CLEAR OF FOUNDATIONS UNLESS SHOWN OTHERWISE. USE OF SHORT LONG RADIIUS BENDS IS ACCEPTABLE PROVIDED THEY ARE KEPT TO A MINIMUM AND USED WHERE UNAVOIDABLE.
- AT LEAST ONE SOIL PIPE AT THE HEAD OF EACH FOUL RUN SHALL BE VENTED TO THE ATMOSPHERE. ALL RAINWATER PIPES SHALL HAVE ABOVE GROUND RIDDING ACCESS.
- ALL PRIVATE DRAINAGE PIPEWORK FOR FOUL AND SURFACE WATER SYSTEMS HAVE BEEN DESIGNED ON THE BASIS OF UPVC TO BS EN 1401-1, UNLESS NOTED OTHERWISE.
- CONCRETE ENCASMENT OF THE PIPEWORK SHALL BE REQUIRED WHERE THE VERTICAL CLEARANCE BETWEEN TWO PIPES CROSSING IS LESS THAN 300MM.
- WHERE NEW DRAINAGE IS SITUATED WITHIN 5 METRES OF NEW OR EXISTING TREES THE PIPEWORK SHALL BE ENCASED IN CONCRETE TO REDUCE THE RISK OF ROOT INGRESS.
- ALL NEW DRAINAGE INSTALLATIONS TOGETHER WITH ANY EXISTING DRAINAGE RETAINED SHALL BE JETTED AND CCTV SURVEYED UPON COMPLETION. CONTRACTOR TO ENSURE THAT THE DRAINAGE SYSTEM IS FULLY OPERATIONAL, FREE OF EXCESS DEBRIS, T AND ALL IDENTIFIED FAULTS RECTIFIED.
- ATTENUATION STORAGE CALCULATIONS INCLUDE CLIMATE CHANGE ALLOWANCE OF 40% IN ACCORDANCE WITH CURRENT ENVIRONMENT AGENCY GUIDELINES.

P1	11.10.22	FIRST ISSUE	ARJ	JAS
REV	DATE	DETAILS	DRN	CHK

DRAWING STATUS
PRELIMINARY

RIBA STAGE
RIBA STAGE 2

DRAWN	DATE	SCALES
ARJ	OCT 22	1:150
CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT 1:150 -DO NOT SCALE-
JAS	OCT 22	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JAS	OCT 22	info@roconsulting.com

CLIENT
VITA GROUP

PROJECT TITLE
PLOT 10B

FIRST STREET

DRAWING TITLE
FOUL & SURFACE DRAINAGE

GENERAL ARRANGEMENT

DRAWING No.	REV.
4513-ROC-XX-ZZ-DR-C-0600	P01

4513

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WORK IN PROGRESS

ALL DRAINAGE INFORMATION ON THIS DRAWING IS SUBJECT TO CHANGE AS THE SCHEME IS DEVELOPED AS THE FOLLOWING INFORMATION IS EITHER YET TO BE FINALISED OR DETERMINED.

- PLANNING CONSENT & CONDITION DISCHARGE
- ABOVE GROUND DRAINAGE POP-UPS
- FOUL FLOW RATES/ DISCHARGE UNITS
- RAINWATER PIPE DRAINED AREAS
- SURFACE WATER OUTFALL CONSENT
- FOUL WATER OUTFALL CONSENT
- LANDSCAPE ARCHITECTS PROPOSALS
- DEVELOPMENT FINISHED LEVELS
- S106 TECHNICAL APPROVAL



COMPLEX CHALLENGES ...
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APPENDIX L – DRAINAGE CALCULATIONS

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STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.202	4-8	0.095

Total Pipe Volume (m³) = 10.150

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
S1.000	34.113	0.237	143.9	0.059	4.00	0.0	0.600	o	225	Pipe/Conduit		
S1.001	12.826	0.088	145.8	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit		
S2.000	30.749	1.900	16.2	0.079	4.00	0.0	0.600	o	225	Pipe/Conduit		

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow
S1.000	62.15	4.52	29.250	0.059	0.0	0.0	0.0	1.09	43.2	9.9
S1.001	61.11	4.72	29.013	0.073	0.0	0.0	0.0	1.08	43.0	12.2
S2.000	64.18	4.16	31.800	0.079	0.0	0.0	0.0	3.27	130.0	13.7

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Network Design Table for PR SW

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.000	4.411	0.050	88.2	0.000	4.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	22.321	0.112	199.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	30.748	1.430	21.5	0.061	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	50.509	0.253	199.6	0.084	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	3.000	0.030	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	6.521	0.065	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.000	64.83	4.04	28.900	0.000	0.0	0.0	0.0	1.67	118.4	0.0
S1.002	59.45	5.06	28.850	0.153	0.0	0.0	0.0	1.11	78.5	24.6
S4.000	64.04	4.18	31.930	0.061	0.0	0.0	0.0	2.83	112.7	10.6
S1.003	56.05	5.81	28.738	0.298	0.0	0.0	0.0	1.11	78.4	45.2
S1.004	64.87	4.04	28.485	0.000	4.9	0.0	0.0	1.31	52.0	4.9
S1.005	64.38	4.12	28.455	0.000	4.9	0.0	0.0	1.31	52.0	4.9

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Area Summary for PR SW

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.059	0.059	0.059
1.001	User	-	100	0.015	0.015	0.015
2.000	User	-	100	0.079	0.079	0.079
3.000	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.061	0.061	0.061
1.003	User	-	100	0.084	0.084	0.084
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.298	0.298	0.298

Free Flowing Outfall Details for PR SW

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	-----------	--------

S1.005	S	30.730	28.390	0.000	0	0
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Simulation Criteria for PR SW

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

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Online Controls for PR SW

Hydro-Brake® Optimum Manhole: S1.06, DS/PN: S1.004, Volume (m³): 7.6

Unit Reference	MD-SHE-0091-4900-1950-4900
Design Head (m)	1.950
Design Flow (l/s)	4.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	91
Invert Level (m)	28.485
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.950	4.9	Kick-Flo®	0.817	3.3
Flush-Flo™	0.400	4.1	Mean Flow over Head Range	-	3.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.9	1.200	3.9	3.000	6.0	7.000	8.9
0.200	3.8	1.400	4.2	3.500	6.4	7.500	9.2
0.300	4.0	1.600	4.5	4.000	6.9	8.000	9.5
0.400	4.1	1.800	4.7	4.500	7.2	8.500	9.8
0.500	4.1	2.000	5.0	5.000	7.6	9.000	10.1
0.600	4.0	2.200	5.2	5.500	8.0	9.500	10.3
0.800	3.4	2.400	5.4	6.000	8.3		
1.000	3.6	2.600	5.6	6.500	8.6		

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Storage Structures for PR SW

Cellular Storage Manhole: STANK, DS/PN: S3.000

Invert Level (m) 28.900 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	108.0	108.0	1.501	0.0	201.0
1.500	108.0	201.0			

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for

PR SW

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Offline Controls 0

Number of Time/Area Diagrams 0

Number of Online Controls 1

Number of Storage Structures 1

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.358

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.000

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status OFF

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880

Return Period(s) (years) 2, 30, 100

Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1.00	15 Winter	2	+0%	100/15	Summer			29.325
S1.001	S1.01	15 Winter	2	+0%	2/15	Summer			29.253
S2.000	S1.02	15 Winter	2	+0%					31.849
S3.000	STANK	60 Winter	2	+0%	30/30	Summer			29.058
S1.002	S1.03	15 Winter	2	+0%	2/15	Summer			29.235
S4.000	S1.04	15 Winter	2	+0%					31.977
S1.003	S1.05	15 Summer	2	+0%	2/15	Summer			29.297
S1.004	S1.06	15 Summer	2	+0%	2/15	Summer			29.323
S1.005	SC1.00	30 Summer	2	+0%					28.505

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for
PR SW

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1.00	-0.150	0.000	0.24			9.7	OK	
S1.001	S1.01	0.015	0.000	0.42			15.4	SURCHARGED	
S2.000	S1.02	-0.176	0.000	0.11			13.2	OK	
S3.000	STANK	-0.142	0.000	0.06		44	3.6	OK	
S1.002	S1.03	0.085	0.000	0.28			19.3	SURCHARGED	
S4.000	S1.04	-0.178	0.000	0.10			10.2	OK	
S1.003	S1.05	0.259	0.000	0.38			27.9	SURCHARGED	
S1.004	S1.06	0.613	0.000	0.14			4.1	SURCHARGED	
S1.005	SC1.00	-0.175	0.000	0.11			4.1	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for PR SW																																																																																																																	
Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000 Foul Sewage per hectare (l/s) 0.000																																																																																																																	
Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0																																																																																																																	
Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.358 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 18.000 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status OFF DVD Status OFF Inertia Status OFF																																																																																																																	
Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880 Return Period(s) (years) 2, 30, 100 Climate Change (%) 0, 0, 40																																																																																																																	
<table><tr><th></th><th>US/MH</th><th></th><th>Return</th><th>Climate</th><th>First (X)</th><th>First (Y)</th><th>First (Z)</th><th>Overflow</th><th>Water</th></tr><tr><th>PN</th><th>Name</th><th>Storm</th><th>Period</th><th>Change</th><th>Surcharge</th><th>Flood</th><th>Overflow</th><th>Act.</th><th>Level</th></tr><tr><td>S1.000</td><td>S1.00</td><td>15 Summer</td><td>30</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>29.473</td></tr><tr><td>S1.001</td><td>S1.01</td><td>15 Summer</td><td>30</td><td>+0%</td><td>2/15 Summer</td><td></td><td></td><td></td><td>29.430</td></tr><tr><td>S2.000</td><td>S1.02</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>31.869</td></tr><tr><td>S3.000</td><td>STANK</td><td>120 Winter</td><td>30</td><td>+0%</td><td>30/30 Summer</td><td></td><td></td><td></td><td>29.377</td></tr><tr><td>S1.002</td><td>S1.03</td><td>180 Winter</td><td>30</td><td>+0%</td><td>2/15 Summer</td><td></td><td></td><td></td><td>29.416</td></tr><tr><td>S4.000</td><td>S1.04</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>31.995</td></tr><tr><td>S1.003</td><td>S1.05</td><td>15 Summer</td><td>30</td><td>+0%</td><td>2/15 Summer</td><td></td><td></td><td></td><td>29.550</td></tr><tr><td>S1.004</td><td>S1.06</td><td>15 Summer</td><td>30</td><td>+0%</td><td>2/15 Summer</td><td></td><td></td><td></td><td>29.618</td></tr><tr><td>S1.005</td><td>SC1.00</td><td>480 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>28.505</td></tr></table>					US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level	S1.000	S1.00	15 Summer	30	+0%	100/15 Summer				29.473	S1.001	S1.01	15 Summer	30	+0%	2/15 Summer				29.430	S2.000	S1.02	15 Winter	30	+0%					31.869	S3.000	STANK	120 Winter	30	+0%	30/30 Summer				29.377	S1.002	S1.03	180 Winter	30	+0%	2/15 Summer				29.416	S4.000	S1.04	15 Winter	30	+0%					31.995	S1.003	S1.05	15 Summer	30	+0%	2/15 Summer				29.550	S1.004	S1.06	15 Summer	30	+0%	2/15 Summer				29.618	S1.005	SC1.00	480 Winter	30	+0%					28.505
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water																																																																																																								
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for PR SW

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1.00	-0.002	0.000	0.46			18.5		OK
S1.001	S1.01	0.192	0.000	0.79			29.4	SURCHARGED	
S2.000	S1.02	-0.156	0.000	0.21			24.9		OK
S3.000	STANK	0.177	0.000	0.76		124	46.5	SURCHARGED*	
S1.002	S1.03	0.266	0.000	0.60			41.7	SURCHARGED	
S4.000	S1.04	-0.160	0.000	0.18			19.3		OK
S1.003	S1.05	0.512	0.000	0.40			29.4	SURCHARGED	
S1.004	S1.06	0.908	0.000	0.14			4.1	SURCHARGED	
S1.005	SC1.00	-0.175	0.000	0.11			4.1		OK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for PR SW

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1.00	0.617	0.000	0.15			6.2	SURCHARGED	
S1.001	S1.01	0.853	0.000	0.20			7.5	SURCHARGED	
S2.000	S1.02	-0.130	0.000	0.37			45.0	OK	
S3.000	STANK	0.842	0.000	0.79			48.2	SURCHARGED*	
S1.002	S1.03	0.940	0.000	0.56			38.9	SURCHARGED	
S4.000	S1.04	-0.136	0.000	0.33			34.9	OK	
S1.003	S1.05	1.158	0.000	0.23			16.8	SURCHARGED	
S1.004	S1.06	1.561	0.000	0.15			4.5	SURCHARGED	
S1.005	SC1.00	-0.172	0.000	0.13			4.6	OK	



COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX M – CORRESPONDENCE

Wastewater pre-development enquiry

Please complete this form for enquiring about drainage strategies and points of connection for new developments.

You can fill in this form, just save a copy, complete it and email it to **WastewaterDeveloperServices@uuplc.co.uk** alternatively you can print the form and post it to us at this address **United Utilities Developer Services, Second Floor, Grasmere House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP**

All fields are required unless otherwise stated. Please note incomplete information may cause delays to your application. When answering the yes/no questions please tick in the appropriate box. Please keep a copy of the completed application for your records.

If you need any help completing the form please call us on **0345 072 6067** and we'll be happy to help.

We aim to respond to enquiries within 15 working days from receipt of your completed enquiry form.

Section 1: Your details			
Are you (please tick)	Developer ☐ Consultant ☒ Land owner ☐ Other (please state) ☐		
Name	Andy James		
Company Name (if applicable)	RoC Consulting		
Address (including post code)	Commercial Wharf 6 Commercial Street Manchester M15 4PZ		
Telephone number	0161 214 5390		
Email address	andy.james@rocconsulting.com		
Section 2: Development details			
Do you intend to offer any of the sewers for adoption by United Utilities under S104?			Yes ☐ No ☒
Please provide as much of the site address that is available. This address must contain a road name, town/city.			
Address (including nearest postcode)	River Street Manchester M15 4AA		
Site name	Plot 10b, First Street		
The grid reference is a 12 digit grid reference split into two 6 digit numbers (X and Y).			
Grid reference number	X: 383806, Y:397290		
Development type	Commercial ☐ Residential ☒		
Approx. number units	668 bedrooms (Student accomm.) alongside bar, food hall, kitchen areas, laundry facilities, gym etc.		
Total site area (hectares)	0.30		
Does this site have planning permission?			Yes ☐ No ☒
Planning reference number			
Council area	Greater Manchester		
Have you approached us about this site previously?	Yes ☐ No ☒	If yes, please provide reference number	
Is the development part of a larger site that will be developed in phases?			Yes ☐ No ☒

Section 3: Previous land use

Please confirm what the land was previously used for and provide the following information:

Greenfield	☐	Brownfield Evidence of positive drainage to the public sewer must be provided (Drawings showing connecting pipe sizes, permeable/impermeable areas)	☒
------------	--------------------------	--	-------------------------------------

Section 4: Drainage strategy

Foul connection: How are you proposing to drain foul flows from the site?

Via an existing connection to the public sewer?	☐	Via a new connection to the public sewer?	☒
---	--------------------------	---	-------------------------------------

Do your drainage proposals involve pumping to the public sewer network?	Yes ☐ No ☒
---	---

Surface water connection: How are you proposing to drain your site, following the surface water hierarchy, as outlined in National Planning Policy Guidance? Please indicate below and provide evidence to support your strategy

Infiltration ☐ Surface water body ☐ Surface water sewer/Highway Drain ☐ Combined sewer ☒

SuDS: Have SuDS features been considered in the surface water drainage strategy?	Yes ☒ No ☐
---	---

Section 5: Supporting Information

Please confirm that the following list of information has been provided to support with your enquiry:

• Site location plan including site boundary and road/street names	Yes ☒ No ☐
• Preferred drainage outfall route(s) and point(s) of access etc.	Yes ☒ No ☐
• Topographical survey	Yes ☒ No ☐
• Ground investigation report	Yes ☒ No ☐
• Evidence of existing drainage connections and estimated rates of discharge (for Brownfield sites)	Yes ☒ N/A ☐
• Full calculations to show pre-development surface water rates for Greenfield sites	Yes ☐ N/A ☒

Section 6 : Declaration

I understand that the submission of this form is to be treated as a preliminary enquiry and the information may be subject to change. In particular, I understand that the information United Utilities Water Limited provides in response is only valid in conjunction with the information provided in relation to this enquiry, any changes to regulation or development layout will invalidate our response.

Signature		Date	14.10.22
Print Name	Andy James	Position	Principal Engineer

About us

United Utilities is the North West's water company. We keep the taps flowing and toilets flushing for seven million customers every day. From Crewe to Carlisle, we work hard behind the scenes to help your life flow smoothly.

Andy James

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 01 November 2022 15:52
To: Andy James
Subject: PDE for: Plot 10b, First Street UU Ref : 02985624

Categories: Filed by Newforma

Good afternoon Andy

Pre Development Enquiry for: Plot 10b, First Street UU Reference Number : 02985624

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 6723 723 or refer to the link below:

<https://www.unitedutilities.com/builders-developers/working-near-our-assets/>

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

Our preferred point of discharge would be to the 610mm diameter public combined sewer within River Street located to the North of your proposed development at an unrestricted rate.

If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.

Please ensure all proposed manhole chambers cover levels and finished floor levels are higher than the receiving public sewer.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**
2. **to a surface waterbody;**
3. **to a surface water sewer or highway drain;**

4. to a combined sewer.

For guidance, The [North West SuDS Pro-Forma](#) provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

According to the provided document ref: 4302R001-3, dated 01/2020, prepared by Terra Consult, we are satisfied that infiltration is not feasible, we accept the provided sufficient evidence to discount infiltration.

Waterbody

United Utilities acknowledge that the nearest watercourse is a significant distance off-site.

Highway Drainage

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 610mm diameter public combined sewer within River Street located North of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 5l/s.

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the public sewerage network under any circumstances

Existing Wastewater Assets Crossing the Site

According to our public sewer records there are public sewers located within your site boundary. We will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe unless there happens to be a formal easement agreement in place, in which case the specified easement width would apply. If you cannot achieve this then you may wish to consider diverting and or abandoning the public sewer.

Please be aware that any proposed diversion may require modelling. This process may take up to 6 months in order to reach an acceptable design. Please submit your \$185 as soon as possible to avoid delaying your planning application.

Please refer to the link below to obtain full details of the processes involved with sewer diversions:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/>

Please refer to the link below to obtain full details of the processes involved with sewer closure:

<https://www.unitedutilities.com/builders-developers/wastewater-services/close-a-sewer/sewer-closures/>

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/>

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

<https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/>

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

Many thanks and kind regards,



Mohammed Aljafarawi (He/Him)
Developer Engineer
Developer Services & Metering
Customer Services
M: 07950474499
unitedutilities.com

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