

5222 - Albert Bridge House

Flood Risk Assessment

May 2025

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Contents

1 Introduction 3

2 Existing Site 4

3 Proposed Site 4

4 Requirements of National Planning Policy Framework (NPPF) & Local Policies 5

4.1 Summary 5
4.2 Local Policies 6

5 Response to the Blue and Green Infrastructure Strategy for Manchester 7

6 Strategic Flood Risk Assessments 8

6.1 Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA (MST SFRA) 8

7 Sources of Flooding 9

7.1 Sequential Test 9
7.2 Exception Test 9
7.3 Rivers and Sea 10
7.4 Sewers and Local Drainage 10
7.5 Flooding from Groundwater 10
7.6 Flooding from Artificial Sources 11
7.7 River Irwell Breach modelling 11
7.8 Hydraulic Interactions 11
7.9 Flooding from Surface Water 12
7.9.1 Safe Access 14

8 EA Flood Risk Assessment data 15

8.1 River Irwell model data 15

9 Surface Water Drainage 16

9.1 Existing Scheme 16
9.2 Proposed Scheme 16
9.3 Disposal Methods 17
SuDS management train 17
Drainage hierarchy 17
Assessment of SuDS Techniques 17
Summary of the Proposed SuDS Strategy 18

10 Conclusion 19

11 References 19

Appendices

1 Existing Site Topographical Survey
2 Level 2 SFRA Maps of Great Manchester
3 AKT II Desk Study Extract
4 Extract from Landmark Envirocheck Report
5 United Utilities Asset Map
6 SUDS Strategy Options
7 EA Flood Risk Assessment data

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1 Introduction

This Flood Risk Assessment report has been prepared by AKT II to accompany a detailed planning application for the redevelopment of Albert Bridge House, Bridge Street ('the Site') to provide a mixed-use scheme, comprising of office spaces, residential lets and new retail offerings at ground floor as well as a new public realm to the external areas around the building.

This report has been prepared in accordance with the guidance contained in the National Planning Policy Framework (NPPF) and the accompanying Planning Practice Guidance and it is intended to cover only flood risk and to provide guidelines and parameters for the detailed drainage design.

2 Existing Site

Albert Bridge House (the Site) is located in the centre of Manchester on Bridge Street, at the postcode M3 5AH. The national grid reference of the site is 383420 E, 398370 N.

The River Irwell bounds the Site to the north-west, Bridge Street lies to the south of the Site, St. Mary's Parsonage to the east and the Trinity Bridge landing is located to the north-east. The location of the Site is indicated in Figures 2.1 to 2.2.

The site area is approximately 0.89 hectares. The topography of the site slopes from St. Mary's Parsonage in the East down to Albert Bridge to the West and significantly further towards the River Irwell to the North-west. The current levels vary from 33m AOD to the north-east down to 21m AOD on the riverbank to the west.

Albert Bridge Hose was purpose-built in the 1950s as tax office. By virtue of its scale, the building constitutes a prominent feature at the gateway between Manchester City Centre and Central Salford. Part of The Site comprise a Manchester City Council-operated public car park. This is access and egressed via Bridge Street and contains approximately 65 spaces.

Albert Bridge Gardens is located in the north-western corner of the Site. Limited access to the river is offered via Albert Bridge Gardens, this small area of green space is largely of poor quality and is underutilised.

3 Proposed Site

The proposed scheme involves the demolition of all existing structures and will provide a mixed-use scheme, comprising of 3 buildings - 2 residential towers (Block A & Block B), and a office tower (Block C) as well as, a new public realm to the external areas around the buildings.

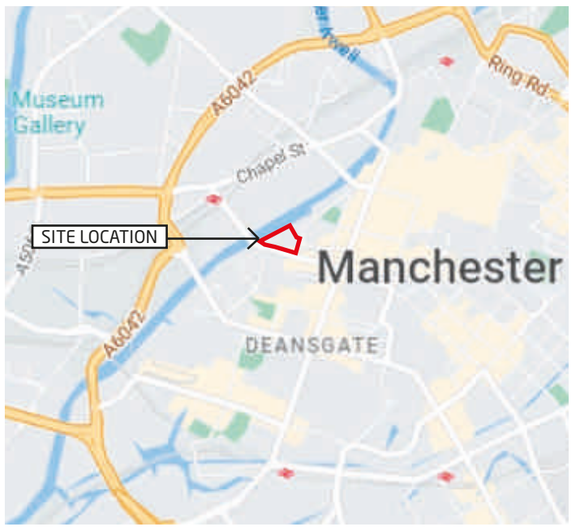


Figure 2.1 Site location

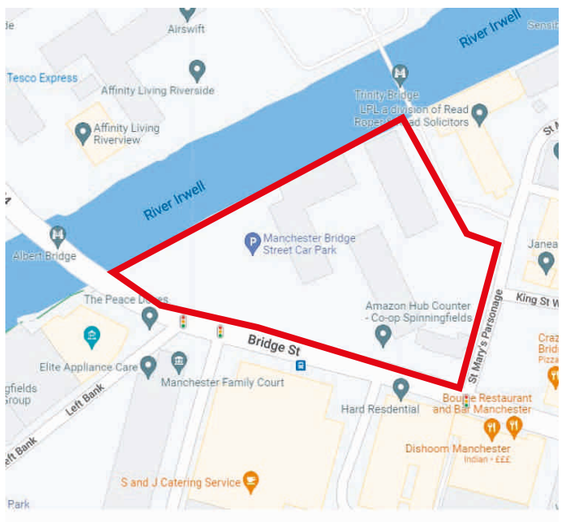


Figure 2.2 Site location - aerial view

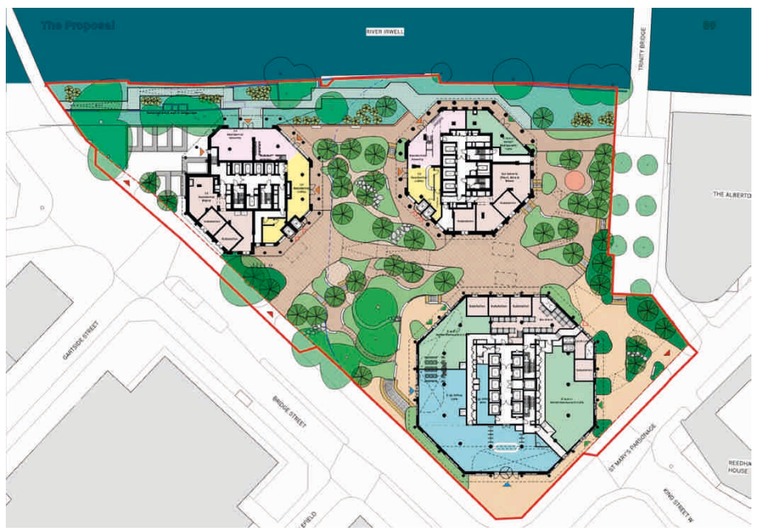


Figure 3.1 Ground floor site plan

4 Requirements of National Planning Policy Framework (NPPF) & Local Policies

4.1 Summary

The National Planning Policy Framework (NPPF) 2024 requires that:

- The susceptibility of land to flooding is a material planning consideration;
- The Environment Agency has the lead role in providing advice on flood issues, at a strategic level and in relation to planning applications;
- Planning decisions should apply the precautionary principle to the issue of flood risk, using a risk-based search sequence to avoid inappropriate development on undeveloped and undefended flood plains etc;
- Developers should fund flood defences and warning measures required because of the development;
- Planning policies and decisions should recognise that the consideration of flood risk and its management needs to be applied on a whole-catchment basis and not only be restricted to flood plains.

With regard to the NPPF, those proposing particular developments are responsible for:

- Providing an assessment of whether any proposed development is likely to be affected by flooding and whether it will increase flood risk elsewhere and the measures proposed to deal with these effects and risks and;
- Satisfying the local planning authority that any flood risk to the development or additional risk arising from the proposal will be successfully managed with the minimum environmental effect thus ensuring the safe development and secure future occupancy of the site.

After this has been addressed, it is then the local planning authority's responsibility (advised as necessary by the Environment Agency on fluvial and tidal flood risk, and the LLFA on surface water flood risk) to determine an application for planning permission after taking into account all material considerations, including the issue of flood risk and how it might be managed or mitigated. Local planning authorities are required to adopt a risk-based approach to proposals for development in flood risk areas. The assessment of risk should take into account:

- The area liable to flooding;
- The probability of it occurring, both now and over time;
- The extent and standard of existing flood defences and their effectiveness over time;
- The likely depth of flooding;
- The rates of flow likely to be involved; and
- The nature of the development proposed and the extent to which it is designed to deal with flood risk.

Local planning authorities in conjunction with the Environment Agency are responsible for determining that the threat of flooding should be managed. This is to ensure that the development is and remains safe throughout its lifetime (i.e. it has an appropriate degree of protection) and does not increase flood risk elsewhere.

Following flooding in December 2000 the Environment Agency (EA) provided indicative flood plain maps to all authorities and published them on the EA website. In addition to these indicative maps (following a national programme adopted by the Agency in 1996), detailed data and maps for priority areas at risk are available, to provide precise information for building developments.

The Government looks to local planning authorities under the NPPF to apply the risk-based approach to their decisions on development control through a sequential test. Under the test, sites are to be categorised under the following zones.

1 Areas with little or no potential risk of flooding (annual probability less than 0.1% for rivers, tidal & coastal). These areas would have no constraints on development other than the need to ensure that the development does not increase run-off from the site to greater than that from the site in its undeveloped or presently developed state. For development proposals on sites located within Flood Zone 1 comprising one hectare or above the vulnerability to flooding from other sources as well as from river and the sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA.

2 Areas with low potential risk of flooding (annual probability between 1.0% - 0.1% for rivers and between 0.5% - 0.1% for tidal & coastal). These areas would be suitable for most developments.

3a Areas with high potential risk of flooding (annual probability greater than 1.0% for rivers and greater than 0.5% for tidal & coastal). These areas will generally be suitable for "Less Vulnerable" uses such as commercial, retail and industrial uses, provided there are adequate flood defences in place, that ensure buildings are designed to resist flooding, there are suitable warning and evacuation procedures in place and the new development does not add to flood risk downstream. "More Vulnerable" uses such as residential, health and education will require the Exception Test to be passed.

3b Areas at highest risk from flooding (including those areas behind defences that offer a standard of defence less than 1% for rivers and less than 0.5% for tidal & coastal or where there is a significant risk that failure could lead to rapid inundation by fast flowing water). These areas may be suitable for recreation, sport and conservation use.

4.2 Local Policies

Manchester Core Strategy (2012) - Policy EN 14 Flood Risk

All new developments should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In Critical Drainage Areas (CDAs), evidence to justify the surface water run-off approach / rates will be required.

New development should minimise the risk of flooding to people, property and the environment within the site, without increasing risk elsewhere; where possible it should also seek to reduce flood risk elsewhere. Development can help to mitigate and manage flood risk by creating storage areas and reducing surface water run-off, and developments should be designed in a way that can contribute to these objectives, incorporating SUDS and GI where possible. Minimising surface water run-off rates from new developments, including through the use of SUDS, is an important part of managing the risk from surface water flooding both in the vicinity of the development site and over a wider area.

Places for Everyone Joint Development Plan (2024) - Policy JP-S4: Flood Risk and Water Environment

This policy sets out plan and managing flood risk by:

- Returning rivers to a more natural state, where practicable;
- Working with natural processes and adopting a natural flood management approach to slow the speed of water drainage and intercept water pollutants;
- Locating and designing development so as to minimise the impacts of current and future flood risk, including retrofitting or relocating existing developments, infrastructure and places to increase resilience to flooding;
- Expecting developments to manage surface water run-off through sustainable drainage systems and as close to source as possible. Development should achieve greenfield run-off rates unless it is demonstrated to be impracticable. District local plans should consider setting more detailed surface water drainage policies to reflect local circumstances, including alternative surface water discharge rates, such as in areas with critical drainage issues.

5 Response to the Blue and Green Infrastructure Strategy for Manchester

The Manchester Green and Blue Infrastructure Strategy called 'Manchester's Great Outdoors' is a comprehensive plan aimed at enhancing the city's natural environments - its parks, rivers, woodlands, and green spaces to foster a healthier, more resilient, and climate-adaptive urban landscape.

Manchester's green infrastructure (GI) has been part of the city's success for a number of years. Five river valleys, three canals, over 160 parks, street trees, woodland, private gardens, and other areas of natural environment are familiar and well-used parts of the city's landscape. It is set within a wider landscape; that of the Greater Manchester city-region and beyond to the Pennines, Peak District and Cheshire Plains, and within easy reach of additional areas in the Lake District and Snowdonia National Parks.

As the city continues to grow over the next decade, existing and new GI will need to continue to be an integrated part of this growth. This strategy has been produced to set out how this will be achieved, drawing together existing commitments on GI and progress achieved to date, to provide a framework for scaling up this good work and the basis for driving new investment over the coming decade.

Four objectives have been established to enable the vision to be achieved:

1. Improve the quality and function of existing green and blue Infrastructure, to maximise the benefits it delivers
2. Use appropriate green and blue infrastructure as a key component of new developments to help create successful neighbourhoods and support the city's growth
3. Improve connectivity and accessibility to green and blue infrastructure within the city and beyond
4. Improve and promote a wider understanding and awareness of the benefits that green and blue infrastructure provides to residents, the economy and the local environment.

Benefits of the Proposed Development

As part of the proposed development, new green infrastructure will be introduced, delivering a range of environmental and community benefits to the Site. Key enhancements will include:

- A reduction in hardstanding areas, allowing for increased permeable surfaces and improved water management;
- The planting of new trees, contributing to urban greening, biodiversity, and climate resilience;
- Improved landscape design that enhances accessibility along the River Irwell, encouraging greater public use and connectivity;
- Upgraded public realm works that will revitalise the river edge, strengthening the visual and ecological character of the embankment;
- Enhanced quality and accessibility of green spaces, which will support the health and wellbeing of local residents and visitors;
- Integration of Sustainable Drainage Systems (SuDS), delivering better water quality and managing surface water run-off more effectively.

6 Strategic Flood Risk Assessments

Strategic Flood Risk Assessments (SFRA) are produced by Local Authorities in order to form the basis for preparing appropriate policies for flood risk management. The Environment Agency advise that Developers "should consult the Strategic Flood Risk Assessment prepared by the local planning authority" when preparing the design.

The Site is the subject of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA dated March 2011. The key findings and recommendations from this report relating to the development Site are summarised in the following section and have been used to inform the preparation of this Site-specific flood risk assessment.

6.1 Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA (MST SFRA)

The MST SFRA (March 2011) highlights that flooding from rivers (River Irk, Medlock, Corn Brook) and surface water (including surcharging sewers) pose the highest risk of more frequent flooding in Manchester City Council. In addition, there is a significant risk of flooding from defence overtopping or breaching.

The main points impacting the development site area are as follows:

- The site lies within a Critical Drainage Area (CDA) identified as Conurbation Core (see Figure 5.2). A Critical Drainage Area is defined as "*an area that has critical drainage problems and which has been notified to the local planning authority as such be the Environment Agency in line with the NPPF*".
- The majority of the site is situated in Zone 1 – land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%).
- The riverbank is situated in flood zone 3 - land assessed as having a annual probability of river flooding higher than 1 in 100 (>1.0%) and sea flooding higher 1 in 200 (0.5%).

  The Environment Agency splits flood zone 3 in flood zone 3a and flood zone 3b - functional floodplain. The site's riverbank seems to be situated in both flood zone 3a and 3b, however the boundary of flood zone 3b is not clearly defined.
- The EA maintains the River Irwell Flood Control Scheme which was designed to provide a 1 in 75 year standard of protection through Kersal and Lower Broughton.
- The majority of the site is not susceptible to future surface water flooding. There are localised areas within the site having low to intermediate susceptibility to surface water flooding. The riverbank within the site has high susceptibility to surface water flooding (See Figure 6.4).

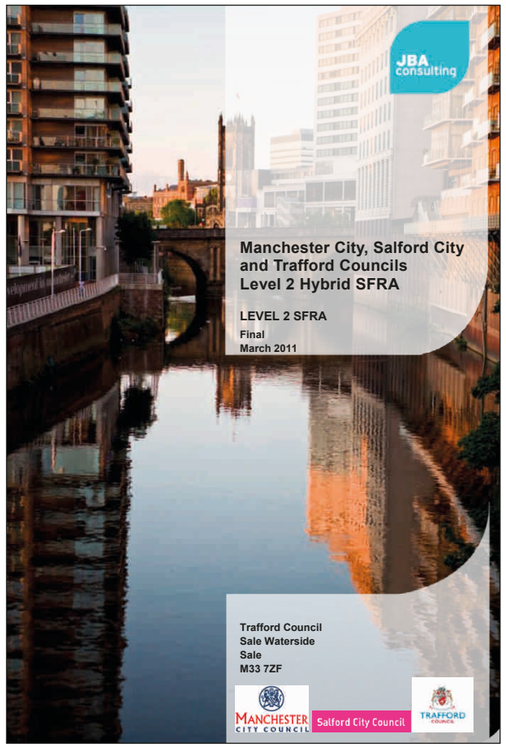


Figure 6.1 Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA cover page

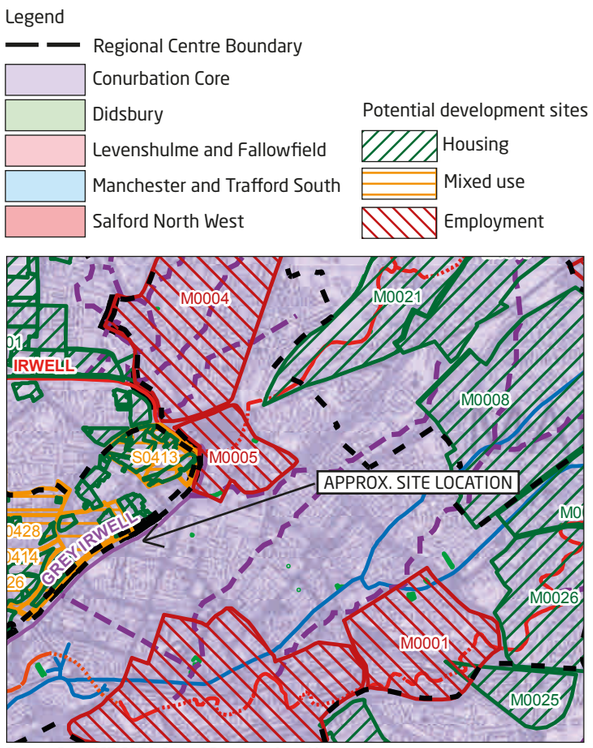


Figure 6.2 MST SFRA Critical Drainage Area Map

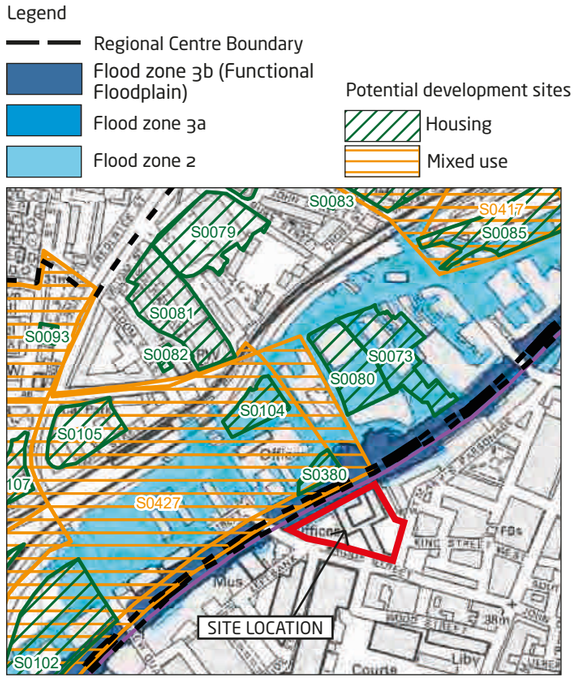


Figure 6.3 MST SFRA PPS25 Flood Zones

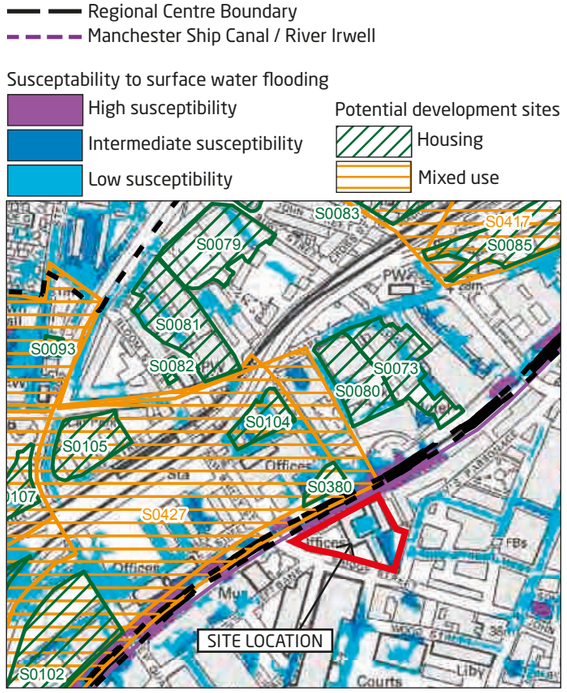


Figure 6.4 MST SFRA Susceptability to Surface Water Flooding - Future Scenario

7 Sources of Flooding

In accordance with the NPPF, it is a requirement to assess the flood risk to the site from all potential sources. For the purpose of this assessment this has been broken down into five potential sources:

- Flooding from rivers and sea
- Flooding from sewers
- Flooding from groundwater
- Flooding from artificial sources (e.g. reservoirs and canals)
- Flooding from surface water

These sources are discussed and assessed in more detail in Sections 6.2 to 6.6 below.

7.1 Sequential Test

A risk-based Sequential test should be applied at all stages of the planning process. Its aim is to steer developments to areas at the lowest probability of flooding (i.e. Flood Zone 1).

Based on the Environment Agency's "Flood Map for Planning (Rivers and Sea)" (refer to Figure 6.1), the majority of the site is situated in Flood Zone 1 – land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%). Part of the site (close to the riverbank) is situated in flood zone 3 - land assessed as having a annual probability of river flooding higher than 1 in 100 (>1.0%) and sea flooding higher 1 in 200 (0.5%).

The proposed development will comprise of:

- Two residential towers (Block A & Block B) with a cafe at ground floor of Block B,
- An office building (Block C) with a retail space at ground floor.

The portion of the riverbank closest to the river seems to be situated in flood zone 3b - functional floodplain. Open space amenities such as a pedestrian river walk are proposed in this area of the site and are considered "water compatible" infrastructures. According to the NPPF Table 3 (reproduced below in Table 6.3) these are suitable land uses in Flood Zone 3b.

In addition, it should be noted that the levels will not be raised in this area to ensure that flood volume is not reduced in the functional floodplain.

A portion of the residential buildings appears to be partially located in Flood Zone 3a. The residential uses are classified as 'More vulnerable" and according to the NPPF Table 3 (reproduced below in Table 7.2) the Exception Test is to be applied.

The office building is located in Flood Zone 1. Office uses are considered "Less vulnerable" and according to the NPPF Table 3 these are suitable in Flood Zone 1.

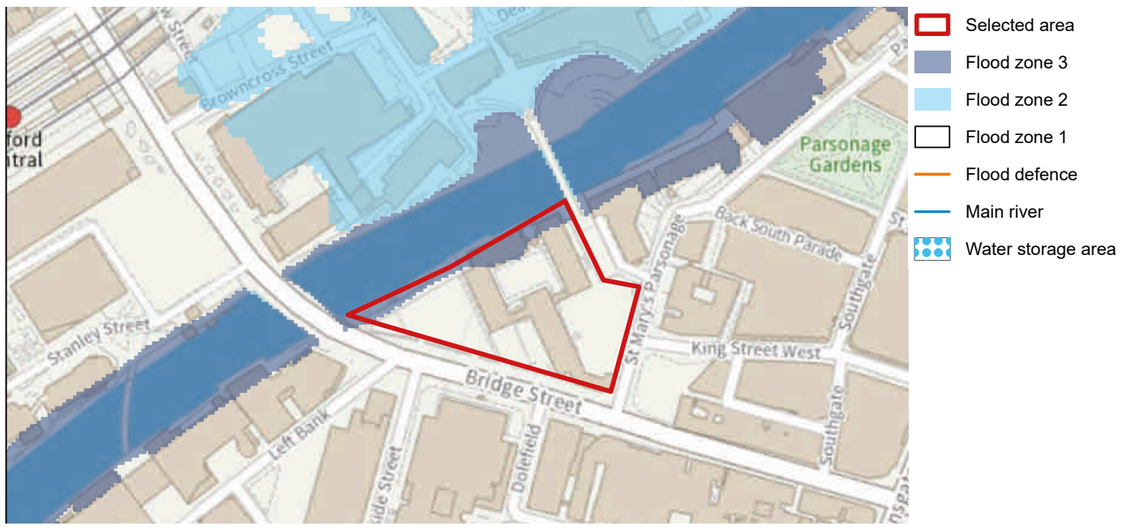


Figure 7.1 Environment Agency indicative flood map

7.2 Exception Test

The NPPF states that:

"If, following application of the Sequential Test, it is not possible or is not consistent with wider sustainability objectives for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. For the Exception Test to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared.
- A Site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
- Within the Site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location.
- Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning. Developments should also give priority to the use of sustainable drainage systems."

There are a number of points that have been considered in respect of providing evidence for the Exception Test:

- The development provided sustainable benefits to the wider community by the reduction in volume of surface water flow in extreme rainfall events by the provision of green/blue roofs and attenuation tanks.
- The more vulnerable uses are located no lower than the 1st floor level and above which is above the maximum water levels of the River Irwell.

It is therefore believed that the more vulnerable uses on the Site pass the requirements of the Exception Test.

Essential infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly vulnerable • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure").
More vulnerable • Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan.*
Less vulnerable • Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible development • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, *subject to a specific warning and evacuation plan.*

Table 7.2 National Planning Policy Framework: Flood Risk Vulnerability Classification

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	✓	✖	✖	✖

Table 7.3 National Planning Policy Framework: Flood Risk Vulnerability and Flood Zone 'Compatibly'

7.3 Rivers and Sea

Fluvial flooding is caused by rivers, watercourses or ditches overflowing. Tidal flooding is caused by elevated sea levels or overtopping by wave action.

Based on the Environment Agency's "Flood Risk from Rivers and Sea" map (refer to Figure 7.4), the majority of the site is at very low risk - an area assessed as having less than 0.1% annual probability (1 in 1000 annual probability) of river or sea flooding. The strip of land facing the River Irwell, to the west, is at medium to high risk - an area assessed as having more than 3.3% annual probability (1 in 30 annual probability) of river or sea flooding. This strip of land is currently a pedestrian area (refer to Figure 7.10) and is believed to be allowed to flood during a extreme fluvial flooding event.

The MST SFRA "Fluvial 1 in 100 Year With Climate Change Flood Depth" map (refer to Appendix 2) shows that only the strip of land adjacent to River Irwell can potentially be affected by a fluvial flooding having a maximum flood depth >2m. The "Fluvial 1 in 1000 Year With Climate Change Flood Depth" map (refer to Appendix 2) shows that the central and south-west area of the site can potentially be affected by a fluvial flooding having a flood depth ranging from less than 0.5m to 2m while the strip of land adjacent to River Irwell can still potentially be affected by a fluvial flooding having a maximum flood depth >2m.

Using all the available evidence it is therefore considered that the majority of the site (excluding the riverbank) has a **very low probability** of fluvial flooding**.** The pedestrian area facing the River Irwell (along the riverbank) has a **low to medium probability** of flooding. This area is not suitable for "Less", "More" and "Highly" vulnerable land uses.

Refer to section 8 for additional information on risk of river flooding.

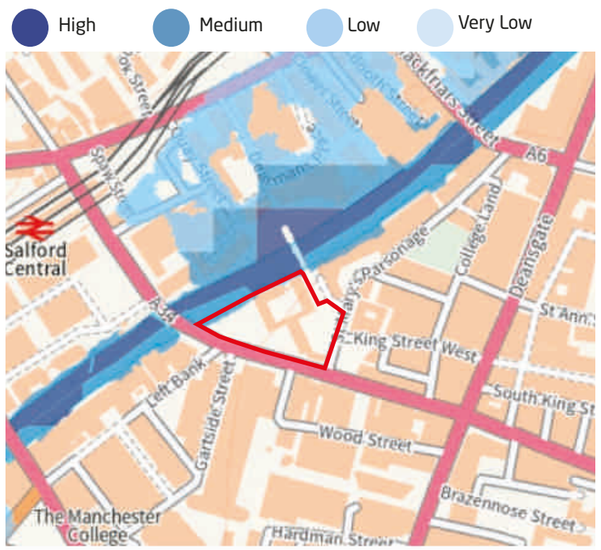


Figure 7.4 Environment Agency Flood Risk Map (Rivers and Sea)

7.4 Sewers and Local Drainage

Sewer and highway drainage flooding occurs when the capacity of systems are exceeded, or the function of the system is impeded (e.g. tide locking), which results in surcharging of the system and water being forced to the surface via gullies, manholes, foul water appliances such as toilets or other dedicated overflows.

The existing United Utilities Asset map contained in Appendix 5 (Figure 7.5) indicates that there are combined sewers in close proximity of the site:

- A 300mm dia. combined sewer running from north to south under St. Mary's Parsonage, to the east of the site. This then increases to 525mm dia. and continues towards west under Bridge St. to the south of the site.
- A 300mm dia. combined sewer running under Bridge St. to the south-west of the site.
- A 530 x 830mm combined water sewer running from the south-east to the south-west under Bridge St., to the south of the site. This increases to 510 x 850mm and successively to 620 x 1010mm.
- A 610 x 860mm combined water overflow running within the site, to the south-west. We assumed that this overflow would take the excess water from the 525mm combined water sewer and discharging it into the River Irwell in extreme rainfall or emergency surcharge events
- A 630 x 870mm combined water overflow crossing the site to the south-west. We assumed that this overflow would take the excess water from the 620 x 1010mm combined water sewer under Bridge St. and discharges it into the River Irwell n extreme rainfall or emergency surcharge events.

The site lies within a Critical Drainage Area (CDA) identified as Conurbation Core (see Figure 5.2). Therefore, there is the potential for flooding from the sewer network due to failure/ blockage or exceedance events when the storm event is worse than the one the sewer was designed for.

The combined water sewers surrounding the site are connected to either the 610 x 860 mm or the 630 x 870 mm combined water overflow discharging into the River Irwell, therefore, a surcharge of the combined water sewers resulting in combined water overflow at ground level is considered unlikely. However, blockages in the sewers could still result in combined water overflow at ground level and for this reason United Utilities should be contacted as soon as the drainage system is not functioning optimally. In addition, outfalls from the site will be provided with non-return valves if necessary. This is to be investigated at the detailed design stage.

Using all the available information, it is therefore considered that the site has a **low probability** of flooding from sewers and the local drainage network, as long as United Utilities drainage system continues to be adequately maintained and non-return valves are included at the proposed outfall drainage point.

The sewer flooding records from the water authority have not been received yet. This will be received and reviewed at the next design stages.

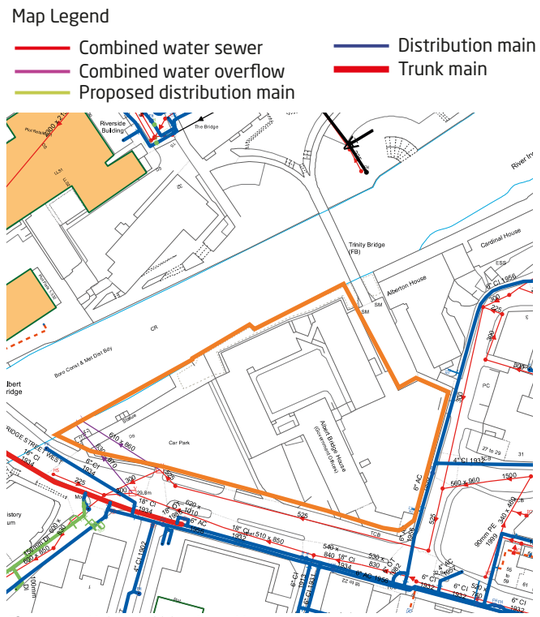


Figure 7.5 United Utilities Asset Map - Sewers

7.5 Flooding from Groundwater

Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata and is often highly localised and complex. After a prolonged period of rainfall, a considerable rise in the water table can result in inundation for extended periods of time. Areas prone to groundwater flooding also often experience surface water flooding problems.

The Groundwater Map of the SFRA by JBA consulting (Figure 6.6) indicates that the site is not situated in an area having groundwater issues.

An extract from the AKT II's Desk Study Report confirms that the majority of the site is located in an area having limited potential for groundwater flooding (see Figure 7.7). In addition, the historical boreholes data did not record ground water on the site. However, there is potential for natural perched water flow through the horizontal bedrock bedding layers which are on the banks of the River Irwell.

Using all the available evidence it is therefore considered that with a suitable waterproofing strategy implemented as part of the proposed development, there is a **low probability** of flooding from groundwater.

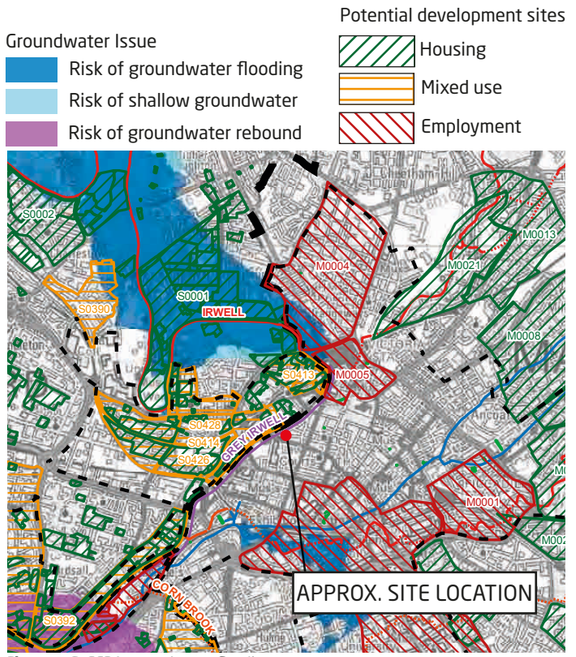


Figure 7.6 SFRA groundwater flooding map

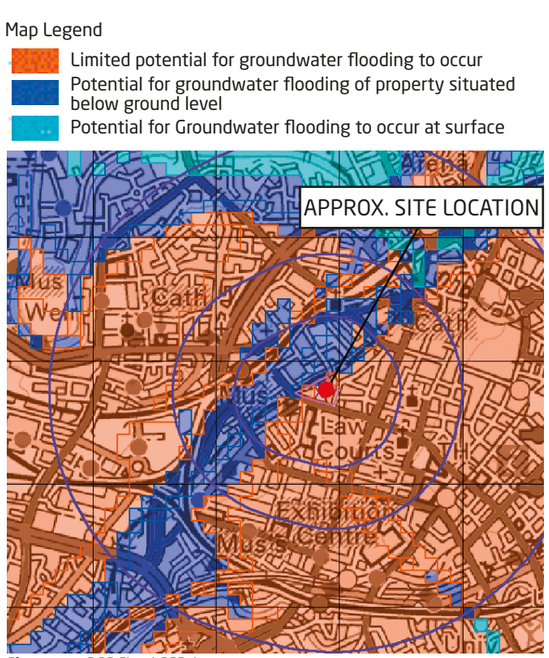


Figure 7.7 BGS Flood GFS data

7.6 Flooding from Artificial Sources

Where infrastructure retains, transmits or controls the flow of water, flooding may result if there is a structural, hydraulic, geotechnical or mechanical failure of the infrastructure.

The United Utilities Asset Map (Figure 7.8) contained in Appendix 5 indicates that the followings water mains are located adjacent to the site:

- A 6" AC Distribution main under St. Mary's Parsonage
- Two 6" AC Distribution mains and a 6" CI Distribution main under Bridge Street

Although unlikely, a water main can burst at anytime, which can result in flooding of adjacent properties. It is expected that, in the event of a water main burst, the flood water would flow south-west along the adjacent roads, following the topography.

To further reduce the flood risk from water mains, any initial sign of a burst water main should be reported to United Utilities as soon as possible and the local highway drainage system should be adequately maintained.

Based on all the information available it is therefore considered that the site is at a **low probability** of flooding from a burst of a water main.

The Environment Agency's Flood Risk from Reservoirs Map, shown in Figure 6.9, shows that the majority of the site is not affected by flooding from reservoir (River Irwell).

The proposed level of the riverbank will be maintained similar to existing, therefore, the risk of flooding (River Irwell) will be similar to existing.

Based on all the information available it is therefore considered that the majority of the site is at a **very low probability** of flooding from artificial sources. The riverbank has a **low to medium probability** of fluvial flooding from the River Irwell. This area is not suitable for "Less", "More" and "Highly" vulnerable land uses.

Refer to section 8 for additional information on risk of river flooding.

7.7 River Irwell Breach modelling

The MST SFRA has considered the residual risk associated with a breach in the flood defences on the Lower Irwell at Lower Kersal and Lower Broughton and the River Mersey at Carrington. These breach locations on the Lower Irwell were chosen at locations that were considered to result in the most extensive flooding. The site is not located in either of these locations.

In addition, there are no formal flood defences in the proximity of the site, therefore, it is not possible for the River Irwell to breach close to the site.

Based on the available information, the site is located in an area that would **not be impacted by a breach in the River Irwell flood defences**.

Furthermore, in the unlikely event of overtopping of the River Irwell's embankment in the proximity of the site, the water would flow along Left Bank street and continue towards Water Street is a south westerly direction, away from the site (based on the topography of the area).

Refer to section 8 for additional information on risk of river flooding.

7.8 Hydraulic Interactions

The area of Manchester is criss-crossed by a network of canals. The interaction between canals and other sources of flooding can have an important impact on the distribution, magnitude and extent of flood risk.

The MST SFRA "Hydraulic Interactions" map (refer to Appendix 2) shows the interactions between different sources of flooding.

From the map it can be seen that the site is not located in an area considered to be affected by hydraulic interactions and therefore it is considered that hydraulic interactions between different sources of flooding will not increase the overall risk of flooding of the site.

The closest area to the site which is affected by hydraulic interactions (Canal / River) is identified as BGW_001 and it is located approx. 900 m to the south-west of the site.

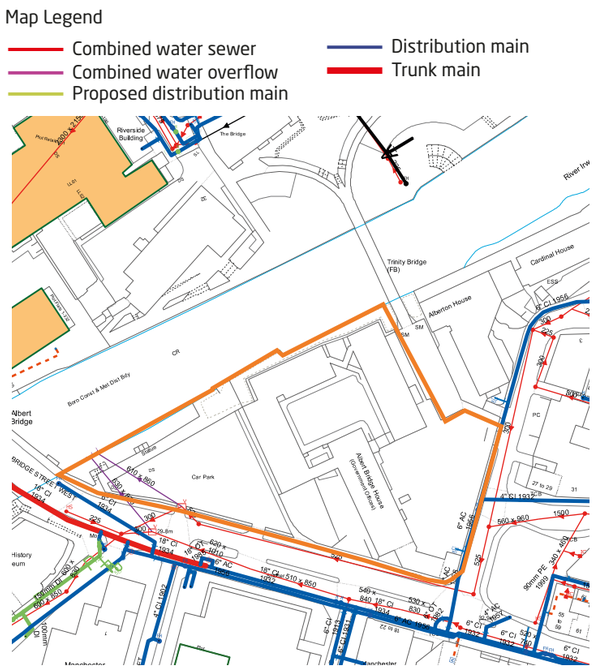


Figure 7.8 Thames Water Asset Map - Water Mains

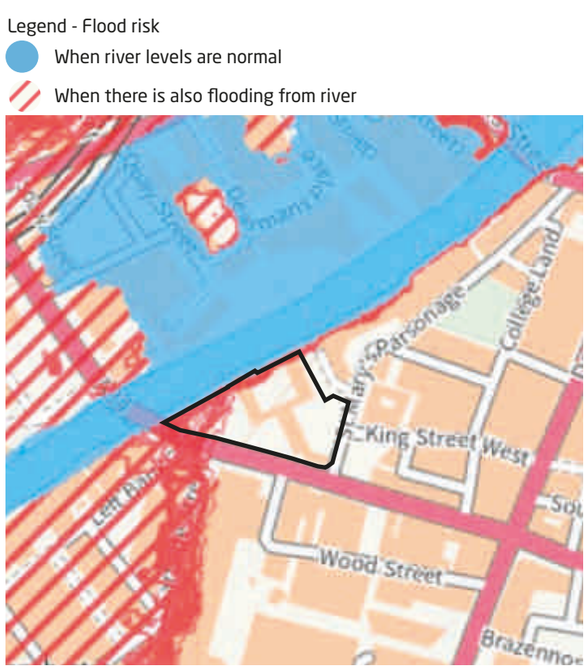


Figure 7.9 Environment Agency Flood Map - Reservoirs

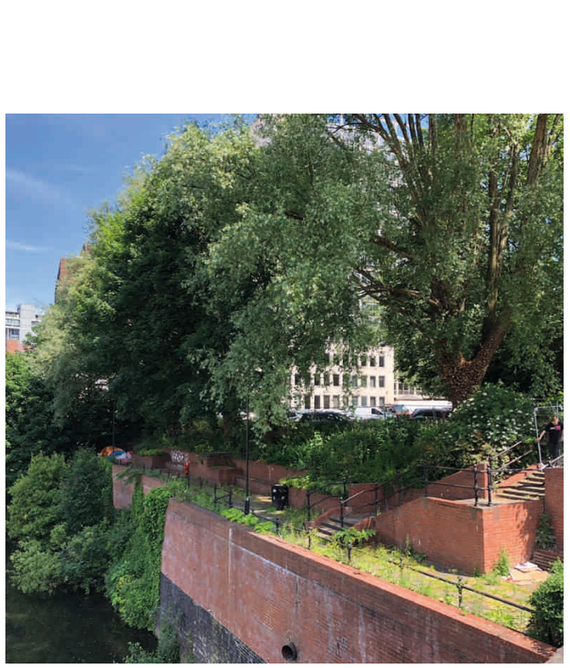


Figure 7.10 Low level pedestrian area facing the River Irwell

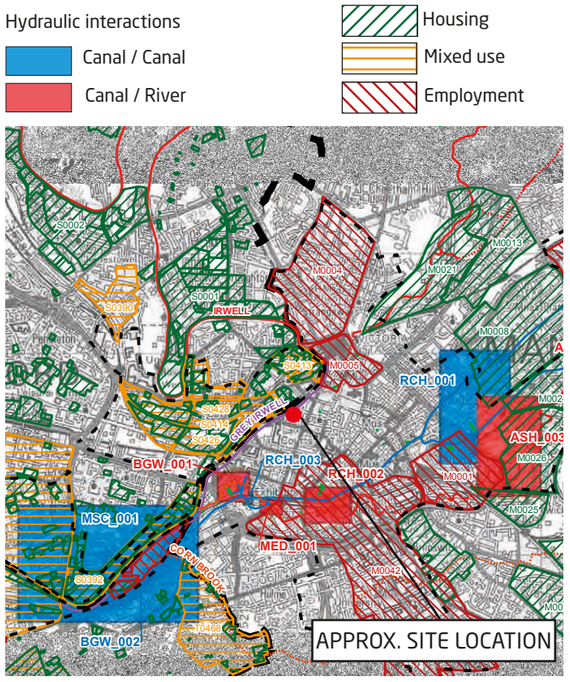


Figure 7.11 Low level pedestrian area facing the River Irwell

7.9 Flooding from Surface Water

Surface water flooding can occur as a result of either overland flow or ponding. Overland flow occurs following heavy or prolonged rainfall, snow melt, or where intense rainfall is unable to soak into the ground or enter drainage systems due to blockages or capacity issues. Unless channelled elsewhere, the run-off travels overland, following the gradient of the land. Ponding occurs as the overland flow reaches low lying areas in the local topography. These flood events tend to have a short duration and depend on factors such as geology, topography, rainfall, saturation, extent of urbanisation and vegetation.

As the surrounding area is highly developed it almost entirely comprises of impermeable hardstanding area which during high intensity storms, will generate large surface water runoff flows.

The Environment Agency's Risk of Flooding from Surface Water map (RoFSW maps) (Figure 7.10) indicates that the Site has a low chance of flooding in any given year (between 0.1% and 1% chance of flooding each year).

The Environment Agency provide further maps which break down this flooding into depths ranging from 20 cm up to 90 cm. The chance of flooding beyond the stated depths is given as follows:

- 'High' - means more than 3.3% (1 in 30) chance of a flood each year,
- 'Medium' - means between 1,0% (1 in 100) and 3.3% (1 in 30) chance of a flood each year,
- 'Low' - means between 0.1% (1 in 1000) and 1% (1 in 100) chance of a flood each year,
- 'Very low' - means less than 0.1% (1 in 1000) chance of a flood each year.

The overview of the RoFSW maps is as follows.

- The "20 cm water depth" map shown in Fig. 7.15 indicates that the Site has a high chance (more than 3.3% chance each year) of flooding beyond the stated depth. The flooding on site is localised and not linked to any areas located outside the Site.
- The "30 cm water depth" map shown in Fig. 7.16 indicates that the Site has a high chance (more than 3.3% chance each year) of flooding beyond the stated depth. The flooding on site is localised and not linked to any areas located outside the Site. The extent of flooding appears to be the same as in Figure 6.15.
- The "60 cm water depth" map shown in Fig. 7.17 indicates that the site has a medium chance (Between 1.0% and 3.3% chance each year) of flooding beyond the stated depth.
- The "90 cm water depth" map shown in Fig. 7.18 indicates that the site has a medium chance (Between 1.0% and 3.3% chance each year) of flooding beyond the stated depth.

The flooding on site indicated on the EA maps will be removed in the final scheme by a provision of a new drainage system allowing for the attenuation of all storm events up to and including the 1 in 100 year + 40% storm event.

The flooding on St. Mary's Parsonage and Bridge Street is assumed to be currently mitigated by the highway drainage system and therefore it is assumed to not increase the risk of flooding at the site.

The existing raised fence to the east of the site provide further protection from potential surface water flooding entering the Site from St. Mary's Parsonage (see Figure 7.13) and it is recommended that a similar protection is provided for the proposed development.

Based on the above and if the proposed mitigation is implemented then it is considered that the site will have **low risk** of surface water flooding from surface water.

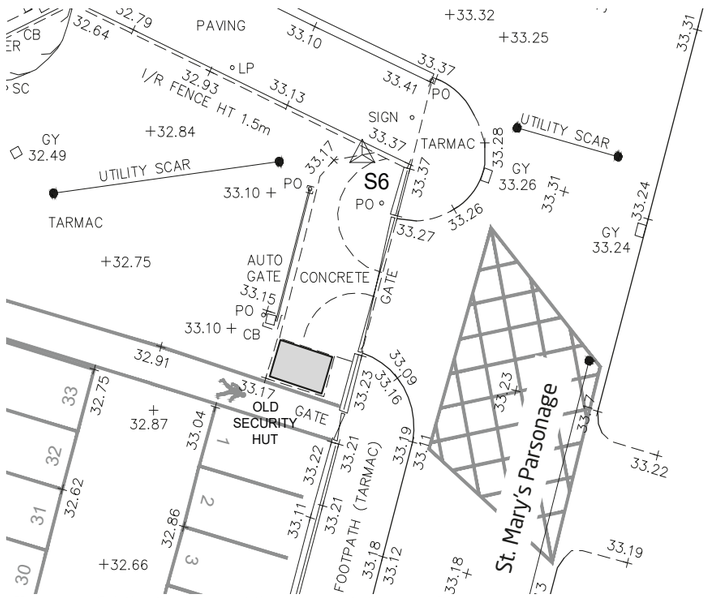


Figure 7.12 Existing topography at the auto gate to St. Mary's Parsonage

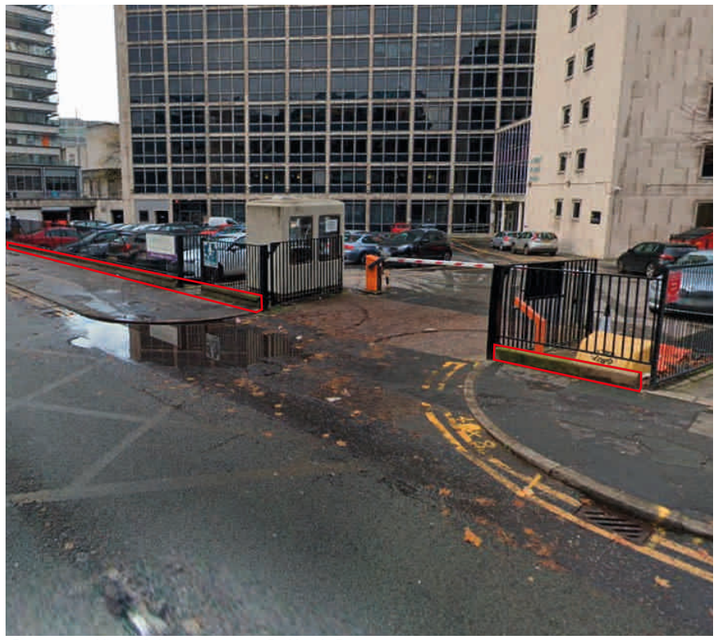


Figure 7.13 View of the auto gate to St. Mary's Parsonage



Figure 7.14 Environment Agency Flood Map - Extent of flooding from surface water



Legend - Chance of flooding

- High chance
- Medium chance
- Low chance
- Very Low chance

Figure 7.15 Environment Agency's Flooding from Surface Water Map (20 cm depth of water)



Legend - Chance of flooding

- High chance
- Medium chance
- Low chance
- Very Low chance

Figure 7.16 Environment Agency's Flooding from Surface Water Map (30 cm depth of water)



Legend - Chance of flooding

- High chance
- Medium chance
- Low chance
- Very Low chance

Figure 7.17 Environment Agency's Flooding from Surface Water Map (60 cm depth of water)



Legend - Chance of flooding

- High chance
- Medium chance
- Low chance
- Very Low chance

Figure 7.18 Environment Agency's Flooding from Surface Water Map (90 cm depth of water)

7.9.1 Safe Access

The occupiers could safely remain in the buildings during any flood in the surrounding area without significant risk.

In the event that occupiers do wish to leave the site during flood events, the EA and Defra published FD2321/TR2 "Flood Risks to People" in March 2006. Guidance Note 2, Figure 7.19 provides details on combinations of flood depth and velocities that cause danger to people. This table shows that people can become endangered in shallow but fast-moving water through to still but deep water (refer to Fig. 7.19 opposite).

The surface water flooding on St. Mary's Parsonage and Bridge Street has a depth of water lower than 300mm. This combination of water depth and velocity would result in a very low hazard to people, therefore, the occupiers could exit the building south onto Bridge Street, east on St. Mary's Parsonage or north and cross Trinity Bridge heading to the other side of River Irwell. These routes are indicated in Figure 7.20 for reference.

Velocity (m/s)	Depth (m)									
	0.25	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**
0.00	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25
0.50	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
1.00	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75
1.50	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
2.00	0.63	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
2.50	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
3.00	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75
3.50	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
4.00	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25
4.50	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50
5.00	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75

Flood Hazard Rating (HR)	**Colour Code**	**Hazard to People Classification**
< 0.75		Very low hazard - Caution
0.75 to 1.25		Danger for some – includes children, the elderly and the infirm
1.25 to 2.00		Danger for most – includes the general public
> 2.00		Danger for all – includes the emergency services

Figure 7.19 FD2321/TR2 "Flood Risk to People" Extract

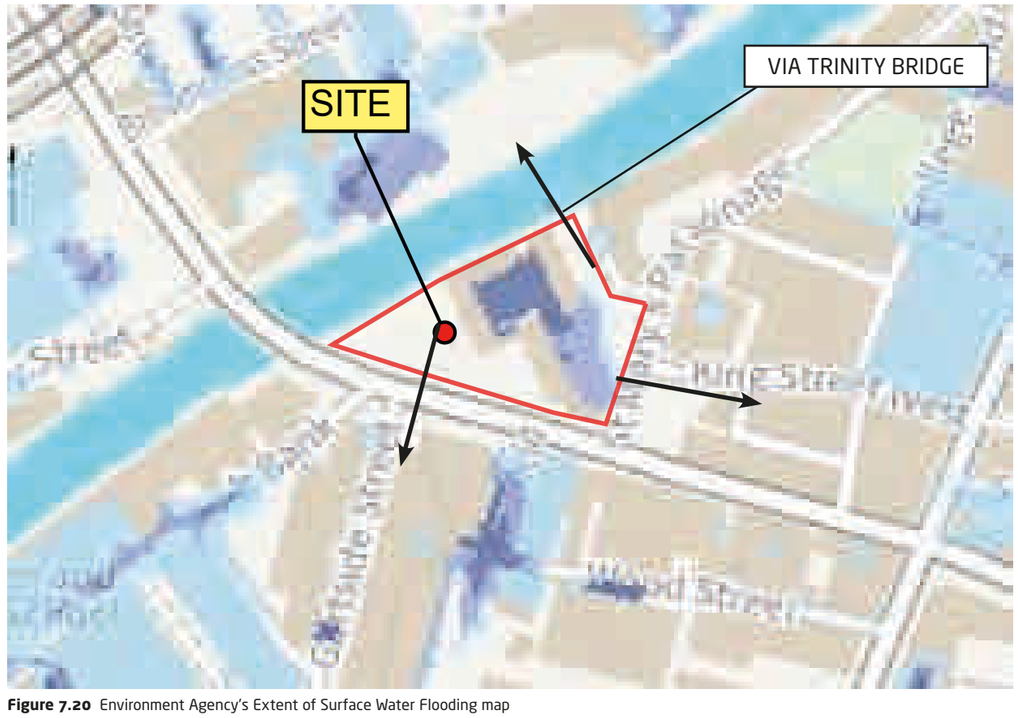


Figure 7.20 Environment Agency's Extent of Surface Water Flooding map

8 EA Flood Risk Assessment data

8.1 River Irwell model data

The Environment Agency have provided the modelled data taken from their model 'Manchester Ship Canal 2016' dated 1st of May 2020 (included in Appendix 7). These data provide the modelled water levels and modelled flow of the River Irwell based upon different Annual Exceedance Probabilities (AEP) for the risk of flooding, for different operational scenario of the River Irwell flood gates.

The modelled water levels and the modelled flows are shown in Table 8.3 and are given in metres above ordinance datum (mAOD) and cubic metres per second (cumecs) respectively.

The modelled data shown in Figure 8.1 and Table 8.3 shows that the maximum water levels in the proximity of the site would reach 27.30 m AOD in location no.3, 27.29 m AOD in location no.4 and 27.14 m AOD in location no.5 for the 0.1% AEP event, when the Latchford Gates are all closed.

As the top level of the proposed riverbank will be higher than 27.30m, the site will not be impacted by the river flooding.

In proximity of the location no.4 (in Figure 8.1) the basement wall interacts with the riverbank as shown in figure 8.2. In this location the water level will reach the basement wall during storm event having a 0.1% AEP, with a maximum water depth of 30cm at the external wall interface. Any opening of the basement towards the riverbank (i.e. air vent, louvres) will be set above the max flood level of 27.30m to ensure no water can enter the basement.

Using all the available evidence it is therefore considered that the site (excluding the riverbank) has a **very low probability** of fluvial flooding**.** The riverbank has **low to medium probability** of flooding and is not suitable for "Less", "More" and "Highly" vulnerable land uses.

The above confirms what was previously discussed in section 7.2 of this report which assessed the risk of flooding from Rivers and Sea based on the Environment Agency's "Flood Risk from Rivers and Sea" map the MST SFRA "Fluvial 1 in 100 Year With Climate Change Flood Depth" map.

There will be no change to the flood plain storage as the result of new development.

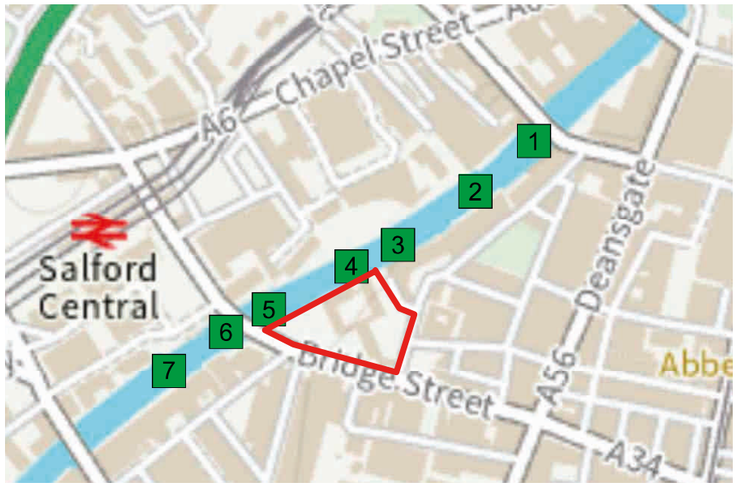


Figure 8.1: Model measurements locations

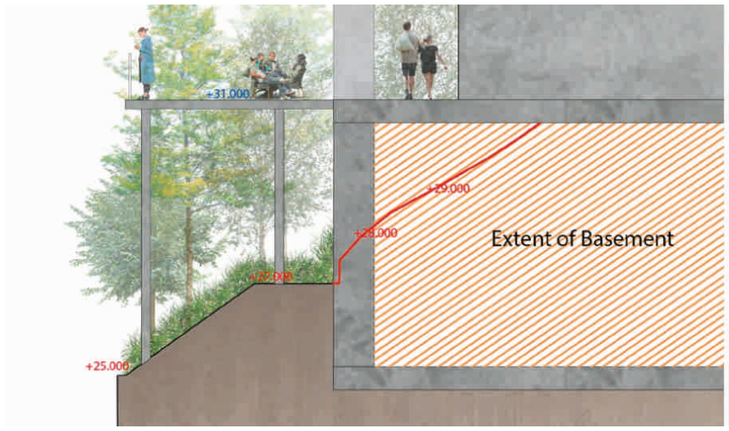


Figure 8.2: Interaction between river bank and propose basement

					Normal Operation (All gates open)											All Latchford Gates closed		Latchford Gate C closed
Map reference	Model Node Reference	Easting	Northing	Data	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 flow	1 % AEP (1 in 100 year) + 35% Increase flow	1 % AEP (1 in 100 year) + 70% Increase flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	1 % AEP (1 in 100 year)	0.1 % AEP (1 in 1000 year)	1 % AEP (1 in 100 year)
1	ea013_0251_RW201_1756	700014	1177876	Modelled Water Level (m aodN)	23,89	24,19	24,61	24,85	24,99	25,19	25,70	25,81	26,98	25,58	27,27	25,19	27,32	25,19
				Modelled Flow (cumecs)	445,09	445,09	445,04	444,99	466,27	495,41	573,03	588,76	742,02	552,58	760,91	573,24	758,69	573,16
2	ea013_0251_RW201_1653	699576	1177437	Modelled Water Level (m aodN)	24,47	24,47	24,48	24,71	24,85	25,05	25,55	25,65	26,80	25,43	27,11	25,05	27,16	25,05
				Modelled Flow (cumecs)	445,09	445,09	445,04	445,04	466,32	495,47	573,09	588,83	742,87	552,66	760,89	573,29	760,35	573,24
3	ea013_0251_RW201_1515	699661	1177523	Modelled Water Level (m aodN)	24,47	24,47	24,47	24,72	24,87	25,08	25,62	25,73	26,95	25,49	27,25	25,08	27,30	25,08
				Modelled Flow (cumecs)	445,09	445,09	445,04	445,09	466,39	495,53	573,16	588,91	736,51	552,74	758,14	573,29	754,44	573,24
4	ea013_0251_RW201_1511	699922	1177784	Modelled Water Level (m aodN)	24,47	24,47	24,47	24,72	24,87	25,08	25,62	25,73	26,94	25,49	27,24	25,08	27,29	25,08
				Modelled Flow (cumecs)	445,09	445,09	445,04	445,09	466,39	495,53	573,16	588,91	736,51	552,74	758,14	573,29	754,44	573,24
5	ea013_0251_RW201_1361	699690	1177555	Modelled Water Level (m aodN)	24,47	24,47	24,45	24,69	24,84	25,03	25,55	25,65	26,81	25,42	27,10	25,03	27,14	25,03
				Modelled Flow (cumecs)	445,09	445,09	445,04	445,16	466,46	495,60	573,24	588,99	744,53	552,84	773,13	573,29	770,10	573,24
6	ea013_0251_RW201_1342	699734	1177651	Modelled Water Level (m aodN)	24,47	24,47	24,37	24,59	24,72	24,90	25,35	25,44	26,42	25,42	26,88	24,90	26,89	24,90
				Modelled Flow (cumecs)	445,09	445,09	445,04	445,16	466,46	495,60	573,24	588,99	744,53	552,84	773,13	573,29	770,10	573,24
7	ea013_0251_RW201_1254	699739	1177591	Modelled Water Level (m aodN)	24,47	24,47	24,17	24,39	24,52	24,69	25,13	25,22	26,20	25,03	26,46	24,69	26,49	24,69
				Modelled Flow (cumecs)	445,09	445,09	445,04	445,21	466,51	495,65	573,29	589,05	744,54	552,91	773,25	573,29	770,19	573,24

Table 8.3: EA modelled data from 'Manchester Ship Canal 2016' model

9 Surface Water Drainage

9.1 Existing Scheme

The available United Utilities record plans indicate that the closest surface water or combined public sewers to the Site are:

- A 300 mm dia. combined sewer running from north to south under St. Mary's Parsonage, to the east of the Site. This then increases to 525 mm dia. and continues towards west under Bridge St. to the south of the Site.
- A 300 mm dia. combined sewer running under Bridge St. to the south-west of the Site.
- A 530 x 830 mm combined water sewer running from the south-east to the south-west under Bridge St., to the south of the Site. This increases to 510 x 850 mm and successively to 620 x 1010 mm.
- A 610 x 860 mm combined water overflow running within the Site, to the south-west. We assume that this overflow would take the excess water from the 525 mm combined water sewer and discharges it into the River Irwell in extreme rainfall or emergency surcharge events.
- A 630 x 870 mm combined water overflow crossing the Site to the south-west. We assume that this overflow would take the excess water from the 620 x 1010 mm combined water sewer under Bridge St. and discharges it into the River Irwell in extreme rainfall or emergency surcharge events.

An extract from the record plans is shown Figure 3.1 for reference.

It is believed that all surface water from the building currently discharges directly to one of these public sewers without any form of attenuation, but it is not clear which one and it is therefore recommended that a CCTV survey of the existing Site drainage network is undertaken to confirm the location and size of all existing connections from the Site.

In addition, the River Irwell runs adjacent to the Site, to the west. It might be possible that part / all the surface water from the Site is currently discharged into the river with no attenuation, however, this will need to be confirmed via a CCTV survey.

The total Site area is approximately 9,120 m² of which approximately 8,495m² is currently hardstanding. In accordance with the Modified Rational Method, the peak existing run-off from the Site is calculated from the formula:

$Q = 3.61 \times C_v \times A \times i$

where C_v is the volumetric runoff coefficient, A is the catchment area in hectares and i is the peak rainfall intensity in mm / hr.

For the peak 1-in-1-year return period storm event this gives an existing discharge rate from the Site of:

$\mathbf{Q_1}$ = 3.61 × 0.75 × 0.8495 × 31.2 = **71.7 litres / sec**

and for the peak 1-in-100-year return period storm event this gives an existing discharge rate from the Site of:

$\mathbf{Q_{100}}$ = 3.61 × 0.75 × 0.8495 × 82.6 = **190.0 litres / sec**

9.2 Proposed Scheme

The proposed impermeable area used for the surface water coagulations is 6,536 m². This figure excludes any soft landscaping above the basement boxes on the basis that the rainwater from these areas will be captured and attenuated.

Again using the Modified Rational Method, the proposed (unattenuated) peak run-off from the site for the 1-in-1-year return period storm would be:

$\mathbf{Q_1}$ = 3.61 × 0.75 × 0.6536 × 31.2 = **55.2 litres / sec**

and for the peak 1-in-100-year return period storm event:

$\mathbf{Q_{100}}$ = 3.61 × 0.75 × 0.6536 × 82.6 = **146.2 litres / sec**

The Environment Agency updated their guidance on climate change allowance in February 2016 to include an upper and lower allowance to be considered depending on the specific site characteristics. Figure 9.2 shows the revised figures based on various building life spans. Therefore, making an allowance for climate change of 40% this would give an unattenuated design discharge of:

$\mathbf{Q_{1\,(+40\%)}}$ **= 77.3 litres / sec** and $\mathbf{Q_{100\,(+40\%)}}$ **= 204.7 litres / sec**

In accordance with the Environment Agency's guidelines, the Building Regulations and the Water Authority's advice, the preferred means of surface water drainage for any new development is into a suitable soakaway or infiltration drainage system. Sustainable Urban Drainage Systems (SuDS) can reduce the impact of urbanisation on watercourse flows, ensure the protection and enhancement of water quality and encourage recharging of groundwater in a manner which mimics nature.

In addition to this, the National Planning Policy Framework requires that surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic surface water flows arising from the site prior to the proposed development, whilst reducing flood risk to the site itself and elsewhere, taking climate change into account.

Therefore, as an absolute minimum, the proposed site discharge under the 1-in-100-year storm plus climate change should be no greater than the existing 1-in-100-year storm discharge (i.e. mitigate the impact of climate change and any increase in the area of hardstanding). In this case, this would mean that, rather than discharging 204.7 litres / sec, the maximum permissible discharge from the site would be 146.2 litres / sec.

Further to the above, the CIRIA SuDS Manual state that previously developed sites should reduce the site runoff to the greenfield rates wherever possible.

In accordance with the method outlined in the Institute of Hydrology Report 124, the Greenfield runoff for the site is calculated from the formula:

$Q_{BAR} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

where AREA is the site area in km² (pro rata of 50 ha if the site is less than 50 ha), SAAR is the Standard Average Annual Rainfall in mm and SOIL is the Soil Index both read from The Wallingford Procedure maps. This gives a greenfield runoff for the site of:

$\mathbf{Q_{BAR}}$ = 0.00108 × 0.5$^{0.89}$ × 889$^{1.17}$ × 0.45$^{2.17}$ = **290.5 litres / sec (for 50 ha)**

Scaling this for the actual area of the site to be attenuated gives:

$\mathbf{Q_{BAR}}$ = (290.5 × 0.07578) ÷ 50 = **9.16 litres / sec**

Using the Hydrological Growth Curve for north-west England, the growth factor from Q_{BAR} to Q_{100} is 2.081 which gives a value for $\mathbf{Q_{100}}$ = **9.16 litres / sec.**

Based on previous experience, it is likely that the local authority (MCC) will require the site to restrict the discharge to **4.40 litres/sec**. The local authority might accept the site to discharge into the River Irwell at unrestricted rate if this is confirmed acceptable by the Manchester Ship Canal Company Limited (MSCCL) and a surface water discharge agreement is in place with them.

MSCCL have confirmed that discharging at unrestricted rate into the river Irwell could be possible subject to this discharge being documented within a licence agreement.

At the moment of writing this report a licence agreement is not in place with MSCCL, therefore it is assumed that the site will be required to restrict the discharge rate to **4.40 litres/sec** and SuDS options for the development are discussed in the next section.

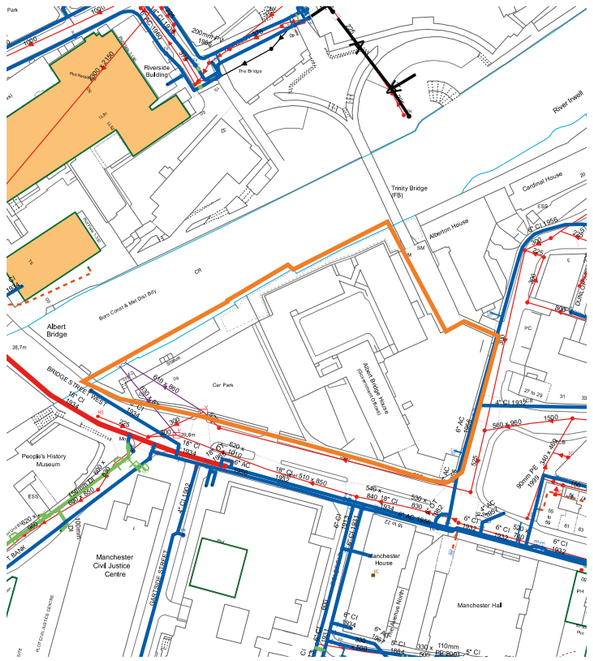


Figure 9.1 Thames Water Sewer Record

Range	Total potential change anticipated for 2010-2039	Total potential change anticipated for 2040-2059	Total potential change anticipated for 2060-2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Figure 9.2 Peak rainfall intensity allowance

9.3 Disposal Methods

SuDS management train

A useful concept used in the development of sustainable drainage systems is the SuDS management train (sometimes referred to as the treatment train). Just as in a natural catchment, drainage techniques can be used in series to change flow and quality characteristics of the runoff in stages. There are a variety of measures that can be implemented to achieve these goals:

Site management / Prevention

Site management procedures are used to limit or prevent runoff and pollution and include:

- Minimising the hardened areas within the Site
- Frequent maintenance of impermeable surfaces
- Minimising the use of de-icing products

Source control

Source control techniques will be used where possible as they control runoff at source in smaller catchments. They can also provide effective pollution control and treatment, thereby improving the quality of the effluent discharged to the receiving waters.

Site control

Where source control techniques do not provide adequate protection to the receiving watercourses in terms of flood protection and pollution control, Site control may be required.

Regional control

Where large areas of public space are available regional control can be incorporated to provide additional 'communal' storage and treatment to runoff from a number of Sites. However, in this case, all storage and treatment will be implemented on Site.

Drainage hierarchy

Based on the above and in line with the Sustainable Drainage Manual published by CIRIA, the following drainage hierarchy will therefore need to be considered when preparing the surface water disposal strategy:

1. Rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2. Rainwater infiltration to ground at or close to source
3. Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4. Rainwater discharge direct to a watercourse (unless not appropriate)
5. Controlled rainwater discharge to a surface water sewer or drain
6. Controlled rainwater discharge to a combined sewer

Assessment of SuDS Techniques

Rainwater harvesting

This involves the capture of rainwater into a tank for re-use (usually non-potable) such as irrigation, toilet flushing or vehicle cleaning. Systems are now available which combine rainwater harvesting with tanked attenuation. This means that water is stored during dry periods for re-use but released ahead of predicted storms in order to ensure that the full attenuation capacity remains available when it is needed.

A rainwater harvesting (RWH) system is viable for this development and is recommended as an integral component of the overall Sustainable Drainage Systems (SuDS) strategy. To maximise water reuse and achieve greater sustainability benefits, it is further recommended that a smart RWH system be implemented in conjunction with attenuation tanks. This will need to be further investigated at the next design stages.

Green / brown / blue roofs

These are used on flat or shallow pitched roofs to provide a durable roof covering which also provides thermal insulation, amenity space, biodiversity habitat as well as attenuation of rainwater. Depending on the design, these roofs can attenuate differing volumes of rainwater. The term 'blue roof' is reserved for those roofs designed to maximise water retention. This is a relatively recent area of increased focus and can involve effectively an attenuation tank at roof level which reduces (or avoids) the need for pumping of basement tanks.

This technique would provide attenuation and water treatment during smaller storm events although during large storm events the impact will be negligible and would have minimal effect on the attenuation tank.

Blue roofs are viable at this development. This will need to be further investigated at the next design stages.

Raingardens

Raingardens are planted areas (usually close to buildings but not immediately adjacent) that allow the diversion of a portion of rainwater from either downpipes or the surrounding paved surfaces. These techniques can be incorporated into the landscaping plans for a Site and are most effective where the landscaping regime is designed with the aim of capturing as much rainfall as possible. They can either allow infiltration into the ground or have tanked systems for water retention, depending on the Site and soil conditions. There are also a number of vertical raingardens attached to building walls with rainwater downpipes diverted through a stacked series of planters.

Raingardens features are proposed at the development.

Bio-retention

This refers to a chain of landscaped features, potentially including reed beds, filter drains, etc. designed to hold and treat surface water. They are often used where there is a high risk of low-level pollution, for example from road run-off. However, it does require areas of open space. The design of a bio-retention system can vary widely depending on Site conditions and available space. At a small scale this could include flow through planters or tree pits.

As the Site is heavily developed and the basement footprint occupies the majority of the Site area it does not seem feasible to provide bio-retention systems within the landscape.

Permeable surfacing

Permeable hard surfaces which work in much the same way as traditional impermeable surfaces apart from the ability to allow rainwater to pass through. Permeable blocks are traditionally used but there are now a range of permeable asphalt and resin bound gravel pavings being used increasingly commonly. Permeable surfaces can either allow infiltration into the ground or have tanked systems for water retention, depending on the Site and soil conditions. They are suitable in even the most densely built-up development. However, they're not well suited to roads carrying heavy or fast motor traffic.

Permeable paving is proposed at this development. However, as there is a proposed basement which covers a big portion of the site and the underlying soil porosity is believed to be low it will be a tanked system for water retention and conveyance rather than disposal. This will be confirmed by the findings of the Soil Investigation.

Swales

These are dry ditches used as landscape features to allow the storage, carriage and infiltration of rainwater and are often used as linear features alongside roads, footpaths or rail lines. They can also be integrated into the design of many open spaces.

As areas of soft and hard landscaping are proposed for the development, there might be an opportunity to incorporate swales for conveyance into the scheme. This will need to be further investigated at the next design stages.

Detention basin / ponds

Landscape features designed to store and in some cases infiltrate rainwater. Detention basins are usually dry, whereas a pond should retain water. These features need areas of open space but can often be combined with other sustainable drainage techniques.

As the Site is heavily developed and the basement footprint occupies the majority of the Site area there is insufficient space to provide a basin or pond.

Infiltration systems

Geological maps from the British Geological Society (Figure 3.4) suggest the underlying bedrock to be Chester Pebble Beds Formation Sandstone. Sandstone is generally classified as having low permeability (hydraulic conductivity (K) ranging between 10^{-10} - 10^{-6} m/s). Therefore, infiltration techniques are limited to the soft landscape areas.

Discharge to tidal river / dock / canals

Discharging clean rainwater directly to tidal rivers, canals or docks isn't normally a sustainable drainage technique. Other more productive techniques should be used first. However, it is generally more sustainable than discharging to the combined or surface drainage systems. Residual surface water can be discharged to tidal / large waterbodies, in some cases with no limitation on volumes. Some storage may be required to allow for outfalls becoming tide locked. Care is needed to prevent scour in the receiving waterbody and potentially to prevent pollution. Consent from the Environment Agency, the asset owner and where applicable the Canal and River Trust is required.

The River Irwell runs adjacent to the Site, to the west. Discharging into the River Irwell could be possible subject to the discharge being documented within a licence agreement, to be confirmed at the next design stages.



Figure 9.3 Bedrock Geology

Discharge to tidal river / dock / canals

Discharging clean rainwater directly to tidal rivers, canals or docks isn't normally a sustainable drainage technique. Other more productive techniques should be used first. However, it is generally more sustainable than discharging to the combined or surface drainage systems. Residual surface water can be discharged to tidal / large waterbodies, in some cases with no limitation on volumes. Some storage may be required to allow for outfalls becoming tide locked. Care is needed to prevent scour in the receiving waterbody and potentially to prevent pollution. Consent from the Environment Agency, the asset owner and where applicable the Canal and River Trust is required.

The River Irwell runs adjacent to the Site, to the north-west. Discharging into the River Irwell could be possible subject to the discharge being documented within a licence agreement with the MSCCL, to be confirmed at the next design stages.

Storage tanks / geocellular storage

Storage tanks are single GRP units usually located (but not necessarily) below ground level which attenuate rainwater for later slow release back into the drainage system but do not provide the wider benefits of green infrastructure sustainable drainage. They can also have the disadvantage that pumping may be required to empty the tank into the drainage system – especially if the tank is located at or below basement level. Where tanks are designed for large storm events, care is needed to ensure that they still perform a useful sustainable drainage function for low order storms.

Geocellular storage tanks are similar to storage tanks except that the volume is made up from multiple units rather than a single tank meaning they can be more flexible in terms of shape to suit constrained Sites.

The table below presents the approximate storage volumes required for a range of discharge rates under the 1-in-100-year (plus 40% climate change) storm event:

Discharge condition	Discharge rate	Storage volume required
Mitigate climate change only (Absolute minimum)	169.4 litres / sec	60 m³
50% reduction on existing	84.70 litres / sec	120 m³
Pre-development 1-year peak flow rate	63.99 litres / sec	140 m³
Greenfield (Environment Agency's preferred rate)	**4.40 litres / sec**	**410 m³**

A storage volume of 410 m³ (Greenfield rate) has been allowed for the development to restrict the discharge rate to 4.40 litres/sec as we believe that United Utilities and Manchester City Council will require the site to discharge at the Greenfield Run-off rate.

The storage volume will be provided via a combination of attenuation tanks, Permavoid, and tanked permeable pavements.

The attenuation tank should be located at a high enough level to allow a connection to be made to the public sewer by gravity. Locating the tank below this level would result in a pumped surface water system which is both unsustainable and uneconomic. A CCTV survey will be required to confirm invert level of existing outfalls from the site, this will provide the level above which the attenuation tank should be located.

Oversized piping

Using larger than necessary pipework creates more room to store rainwater. Potentially more sustainable than storage tanks / geocellular storage if the pipes drain by gravity and do not require pumping. However, lacks the wider benefits of the green infrastructure-based techniques.

As the attenuation storage has been sized to accommodate the 1-in-100 year plus climate change event there is no need for oversized piping.

Design for exceedance

This involves designing areas within a site such that they will flood and hold water during rare storm events (typically a frequency of once in ten years or longer).

As the attenuation storage has been sized to accommodate the 1-in-100 year plus climate change event there is no need to design for exceedance.

Summary of the Proposed SuDS Strategy

It is proposed to limit surface water discharge from the development to the greenfield run-off rate of 4.4 litres/second. The proposed SuDS strategy will incorporate the following measures:

- Unrestricted rainwater discharge from areas adjacent to the River Irwell, consistent with the existing situation;
- Permavoid system located above the basement structure;
- Soft landscaped areas beyond the basement footprint, including rain gardens to promote ground infiltration;
- Permeable pavements designed to support partial infiltration and/or temporary water storage, subject to the results of soakage testing;
- Potential rainwater harvesting and storage via dedicated tanks.

Potential attenuation options can be found in the sketches in Appendix 6 of this report.

The outfall from the site will connect to the existing public sewer either with a new connection or, preferably, by reusing one of the existing connections. Based on the existing utility survey, there is a 225 mm dia. and a 100 mm dia. existing foul water outfall connection into the 525 mm dia. combined sewer under Bridge St. It is proposed to reuse the 225 mm dia. connection to discharge surface water from the site into the 525 mm dia. public sewer subject to levels, condition and size to be confirmed by a CCTV survey.

Once the CCTV and level survey of the existing network has been undertaken the location and layout of the outfall(s) can be determined but due to the depth of the existing public combined sewers it is recommended that, if possible, the existing drainage connection(s) should be reused to prevent the need for constructing a new, deep connection. This would minimise both the cost of the work and the disruption to the surrounding roads which are busy thoroughfares and consequently require significant traffic management to be provided during the work.

Alternatively, it may be possible to discharge at unrestricted rate into the Rirver Irwell subject to a licence agreement with the MSCCL and this will be confirmed at the next design stages.

Schematic SuDS layouts are contained in Appendix 6 for reference.

Element	Management stage	Water quantity	Water quality	Amenity & biodiversity	Potential in scheme
Rainwater harvesting	Prevention	✓	✗	✗	✓
Green / brown / blue roof	Source control	✓	✓	✓	✓
Raingardens	Source control	✓	✓	✓	✓
Bio-retention	Source control	✓	✓	✓	✗
Permeable surfacing	Source control	✓	✓	✗	✓
Swales	Source control	✓	✓	✓	? / ✓
Detention basin / ponds	Source control	✓	✓	✓	✗
Discharge to tidal river / dock / canals	Site control	✓	✗	✗	? / ✓
Storage tanks / Geocellular storage	Site control	✓	✗	✗	✓
Oversized piping	Site control	✓	✗	✗	✗
Design for exceedance	Site control	✓	✗	✗	✗

Figure 9.4 Summary of potential SuDS devices

10 Conclusion

In accordance with the National Planning Policy Framework, we would categorise the majority of the proposed development as lying within Flood Zone 1 - an area with a probability of flooding less than 0.1% (1 in 1000) of occurring each year, and some of the site in flood zone 3.

- In accordance with the NPPF, the land uses of the proposed development are suitable for the site's location under the terms of the Sequential Test and are considered appropriate to the location.
- The majority of the site is considered to have a **very low probability of flooding** from fluvial or tidal sources, the riverbank is considered to have a low to medium probability of flooding from fluvial or tidal sources.
- The site has a **low probability of flooding** from groundwater provided that the recommendations included in this report are implemented.
- The site has a **low probability of flooding** from artificial sources as it is situated at a considerable distance away from artificial water features.
- The site has a **low probability of flooding** from sewers and the local drainage network, as long as they continue to be adequately maintained and non-return valves are included at the proposed outfall drainage points of the scheme.
- The site has been assessed as being at **low risk from surface water flooding** provided that the recommendations included in this report are implemented.
- The site does not currently cause flooding to adjacent sites and SUDs measure are proposed, therefore, the risk to adjacent properties will be limited. A sustainable drainage system is to be specified to reduce the peak surface water discharge from the proposed development. In order to reduce the risk of flooding from sewer to the site and other properties downstream and in order to comply with legislative requirements the existing surface water discharge should be reduced as described in Section 9.2.
- The proposed development has an acceptable flood risk within the terms and requirements of National Planning Policy Framework.

11 References

Site Specific Document

- Landmark Envirocheck Report, July 2018
- Desk Study Report, AKT II, April 2022
- Drainage Strategy Report, AKT II, April 2025
- United Utilities Asset Map, February 2022
- EA Flood Risk Assessment Data, June 2022 Technical Guidance and Planning Policy Documents
- BS 8533:2011, Assessing and managing flood risk in development: Code of Practice, October 2011
- CIRIA Report C624, Development and flood risk: guidance for the construction industry, 2004
- The Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA, March 2011
- DEFRA / Environment Agency Flood and Coastal Defence R&D Programme, Phase 2 FD2321/TR1 The Flood Risks to People Methodology, March 2006
- Greater Manchester Level 2 Hybrid Strategic Flood Risk Assessment, October 2020
- Local Flood Risk Management Strategy, March 2014
- Level 1 Strategic Flood Risk Assessment for Greater Manchester, March 2019
- Manchester Core Strategy 2012

Appendix 1

Existing Site Topographical Survey



Notes:

1. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR REMOVED.
2. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.

Coordinate Table

Station	Description	Easting	Northing	Level
S1	Road Nail	383396.807	398380.950	30.350
S10	Road Nail	383425.184	398451.724	23.893
S11	Hilti Nail	383336.803	398365.559	26.802
S12	Road Nail	383377.850	398386.710	26.886
S13	Hilti Nail	383330.455	398360.992	29.096
S2	Road Nail	383349.454	398354.370	29.445
S3	Hilti Nail	383406.913	398329.697	31.122
S4	Road Nail	383450.083	398330.079	32.109
S5	Hilti Nail	383488.398	398306.723	33.255
S6	Hilti Nail	383493.422	398382.521	33.210
S7	Road Nail	383461.826	398354.873	31.560
S71	Hilti Nail	383469.298	398351.457	31.996
S8	Road Nail	383439.403	398401.425	31.191
S9	Road Nail	383464.134	398420.502	31.127

TOPOGRAPHICAL KEY

GENERAL ABBREVIATIONS

SURVEY STATION		AIR CONDITIONING UNIT	ACU
		AIR VALVE	AV
BANKING	TOP MOTOR BOTTOM	AVERAGE	Av.
		BACK OF KERB	BK
		BASE LEVEL	BL
		BELISHA BEACON	BB
		BOLLARD	BOL
HEDGE SPREADS		BOLLARD LIGHT	BOL
		BOTTOM	BOT
		BUS STOP	BS
WOODLAND CANOPY		CABLE RISER	CR
		CABLES TO COUNTER	CTC
ARROW ON STEPS / RAMPS INDICATES DIRECTION UPWARDS		CABLES TO GROUND	CTG
		CATCH PIT	CP
		CONTROL BOX	CB
		COVER LEVEL	CL
TREES	SPREAD & GIRTH SHOWN TO SCALE	CROSSING CONTROL BUTTON	CCB
		DAMP PROOF COURSE	DPC
		DRAINAGE CHANNEL	DCH
		DRAWING	DR
		ELECTRICITY POLE	EP
GATE		EARTH ROD	ER
		FINISHED FLOOR	FF
KERB CHANNEL		FLOOR LEVEL	FL
		FOOTPATH	FP
ROAD UNKERBED		FOUL WATER	FW
		GAS RISER	GR
FOOTPATH		GRILLE	GR
		GULLY	GY
CHANGE IN SURFACE		HARD BED	HB
		INSPECTION COVER	IC
		INVERT LEVEL	IL
FENCE		KERB OUTLET	KO
		LAMP POST	LP
WALL		MANHOLE	MH
		MARKER POST	MP
OVERHEAD ELECTRIC		METER	MT
		NO PIPES VISIBLE	NPV
OVERHEAD TELECOM		ORDNANCE SURVEY BENCH MARK	OSBM
		PIPE	PC
FOUL SEWER		POST	P
		POST BOX	P.BOX
SURFACE SEWER		RODDING EYE	RE
		RAIL LINE	RL
P-TRAP		RAIN WATER PIPE	RWP
BACK DROP (EXTERNAL)		RETAINING WALL	RW
		SOFT BED	SB
BACK DROP (INTERNAL)		STOP COCK	SC
		STOP COCK COVER PLATE	SCP
		STOP VALVE	SV
BUILDING		SOIL PIPE	SP
		SURFACE WATER PIPE	SWP
		SURFACE WATER	SW
OPEN SIDED BUILDING		TACTILE PAVING	TAC
		TELECOM POLE	TP
OVERHANG / CANOPY		TELECOM INSPECTION COVER	TEL
		TELECOM JUNC. BOX	TJB
GLASSHOUSE		TICKET MACHINE	TM
		TOP OF WALL	TOW
		TRAFFIC LIGHT	TL
		TRAFFIC LIGHT COVER	TLC
CONTOUR	25.00	THRESHOLD LEVEL	THL
SPOT LEVEL	+ 127.13	UNABLE TO LOCATE	UTL
SONAR LEVEL	127.13	UNABLE TO RAISE	UTR
BORE HOLE	BH	UNDER GROUND SURVEY	UGS
	BH	VENT PIPE	VP
TRIAL HOLE	TH	WATER LEVEL	WL
		WATER MAIN	WM
		WASH OUT	WO
		WATER RISER	WR
		WATER TAP	WT

FENCE ABBREVIATIONS

BARBED WIRE FENCE	B/W	IRON RAILINGS	I/R
CLOSE BOARDED FENCE	C/B	LARCH LAP FENCE	L/L
CONCRETE POST FENCE	C/P	PALISADE FENCE	PAL
CORRUGATED IRON FENCE	C/I	POST AND WIRE FENCE	P/W
CHAIN LINK FENCE	C/L	WIRE MESH FENCE	W/M
CHESTNUT PALING	CHP		

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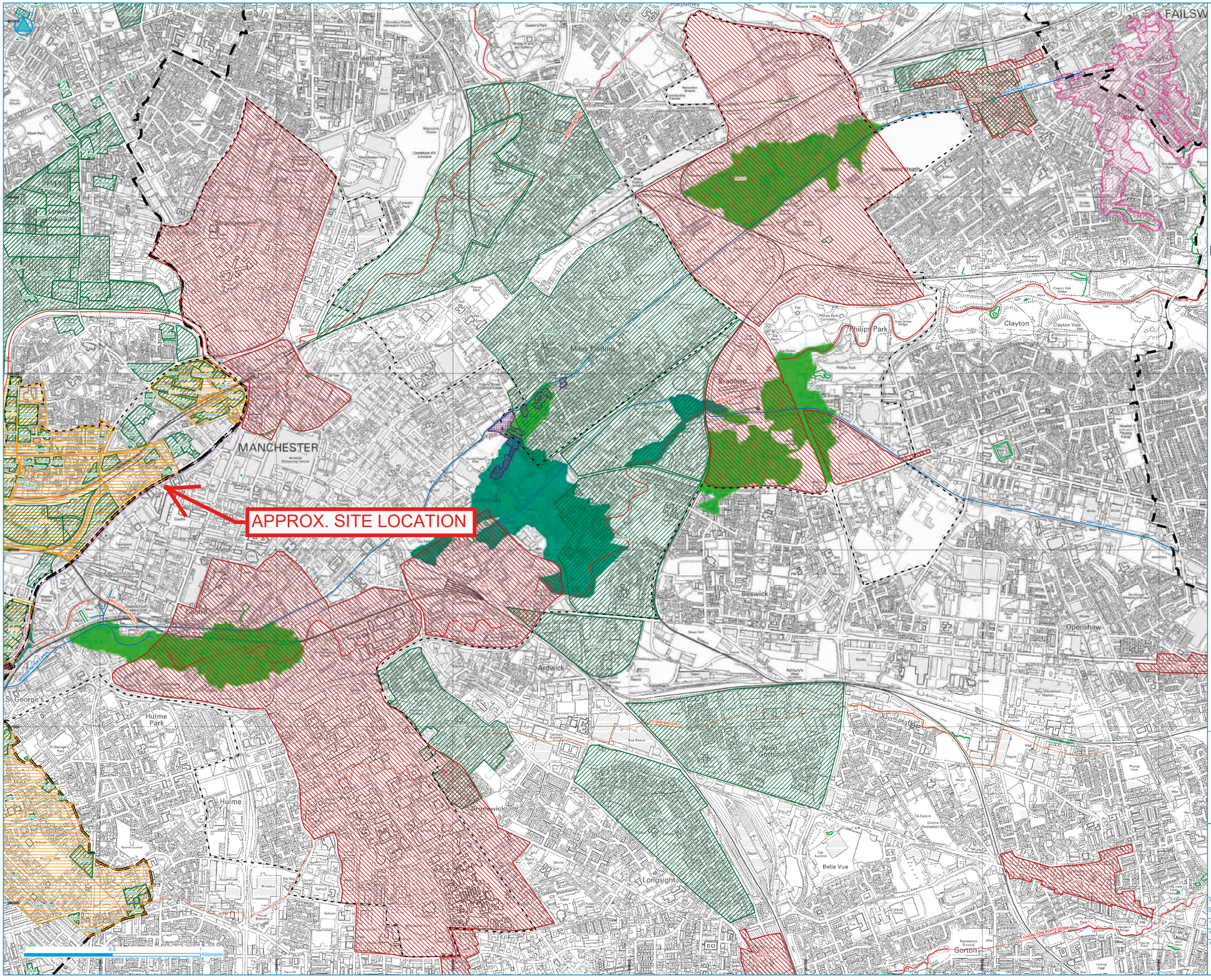
Albert Bridge House
St Mary's Parsonage
Manchester
M3 2RD

Provisional Topographical Survey

Scale	Sheet Size:	Sheet Number:	Date:
1:200	A0	1	October 2018
Project Number:	Rev:	Surveyed By:	Approved By:
26100	-	AMG	AJ / TJF

Appendix 2

Level 2 SFRA Maps of Great Manchester



Council Boundary

Canal Overtop Hazard Zone

Canal Overtop Hazard Zone

Canal Breach Hazard Zone

Canal Breach Zone A

Canal Breach Zone B

Oldham SFRA Canal Hazard Zone

Potential Development Sites / Locations

Employment

Housing

Mixed Use

Other

Regional Centre Boundary

Ashton, Bridgewater and Rochdale Canals

Manchester Ship Canal / Grey Irwell

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.

Two indicative "Canal Hazard Zones" have been created for the Bridgewater, Ashton and Rochdale Canals. These have been generated using broadscale 2D modelling to show areas that could potentially be affected by flooding in the event of
•Canal Overtop Hazard Zone
•Canal Breach Hazard Zone.

The potential breach locations / areas were sub-divided into two Canal Breach Zones:
•Canal Breach Zone A. A walkover survey of the canal was undertaken to identify the embankments more likely to breach, based on their height and width. This zone shows those areas that would be affected by a breach of one of these embankments. In this zone a detailed examination of canal breach flood risks is required in a site specific FRA.
•Canal Breach Zone B. Less likely breach locations, such as at wide, low or very low embankments, were identified by a walkover survey of the canal. At such locations it is more likely that this source of risk could be scoped out within any site specific FRA.

It should be noted that these outlines are based on broadscale modelling techniques and should only be taken as an indication of areas that might be at risk and inform Flood Risk Assessments. There are a number of uncertainties associated with the simulation of flooding from canals in either overtopping or breach conditions. The assumptions behind the modelling should be considered when using and reviewing the hazard zones that have been produced. Full details of the methodology used to derive Canal Hazard Zones is provided in Chapter 3 of the Level 2 SFRA and guidance on the use of the Canal Hazard Zones is provided in Chapter 3 of the SFRA User Guide.

The Canal Hazard Zone resulting in a breach from the Rochdale Canal in Oldham has also been included on the map and has been taken from the Oldham SFRA (2010). This was based on a similar broadscale methodology.

Interactions between the Bridgewater Canal and the River Medlock in Castlefield may result in overtopping of the Canal during severe weather events, as shown elsewhere in the SFRA.

For further information please see the Level 2 SFRA Chapter 3.

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 considered when applying the Sequential Test and used to scope the inclusion of canal flood risk within a site specific FRA.

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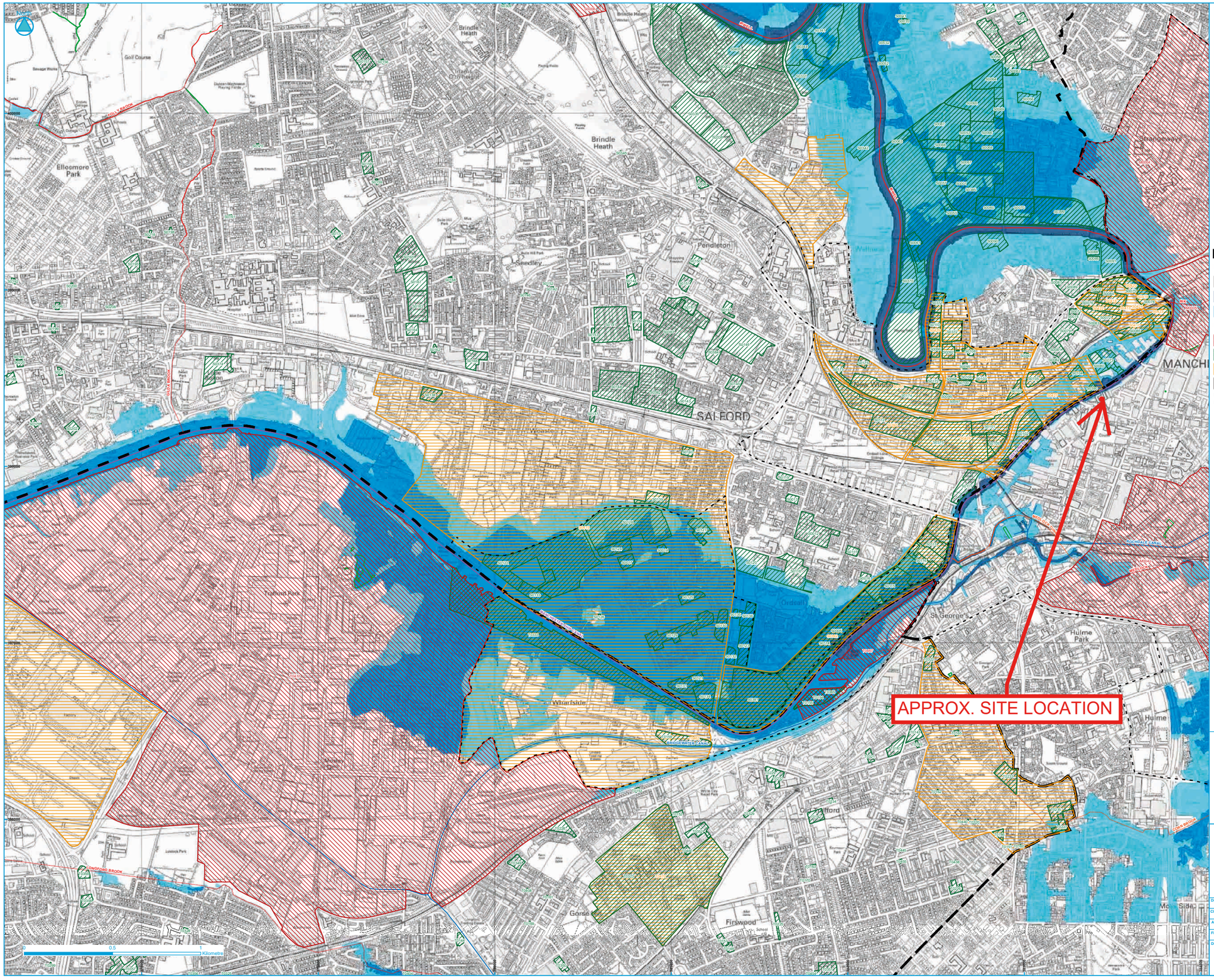
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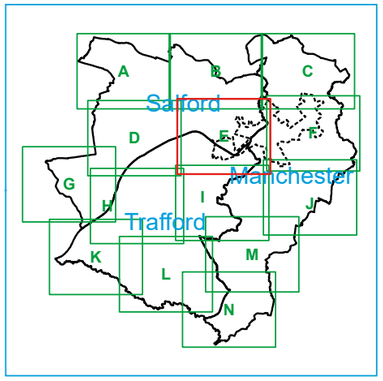
Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Canal Hazard Zones

Drawn by: J Cheetham	Date: 15/03/2011	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: 100019568 2011.	
Checked by: J Dimelow	Date: 01/02/2011		
Approved by: J Cooper	Date: 01/02/2011		
File Name: ...ArcView\Mapping\Level2\MST_Canal_Hazard_V1.3.mxd			
Drawing Number: MM_3.2B	Status: FINAL	Scale: 1:10,000	

Original @ A1





Council Boundary

Flood Zones

- Flood Zone 3b (Functional Floodplain)
- Flood Zone 3a (V3.15)
- Flood Zone 2 (V3.15)

Potential Development Sites / Locations

- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- 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 and its Practice Guide.

It is a Level 1 SFRA key output which shows Main Rivers, other watercourses and Flood Zones, including the Functional Floodplain (as defined in annex D table D.1 of PPS25), overlaid by previously allocated development sites or sites to be considered in the future.

PPS25 divides the country into three basic Flood Zones; Flood Zones 1, 2 and 3, corresponding to areas of low, medium and high flood risk, respectively. The Flood Zones provided are based upon the Environment Agency's Flood Map (version 3.15 issued in September 2009). They refer to the probability of flooding from rivers and ignore the presence of defences because these can be breached, overtopped or fail to operate during the lifetime of the development. They do not consider other forms of flooding and do not take account of climate change.

The Flood Zone maps also contain the undefended modelled outlines for the Manchester Ship Canal and outlines for the Grey Irwell. It is understood that the Grey Irwell outlines were integrated into the national Flood Map in March 2010 and the undefended model outlines for parts of the Sinderland and Timperley Brooks will become integrated into the national Flood Map in June 2010.

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 facilitate the undertaking of the Sequential Test by planners and developers. The SFRA has produced a further suite of flood maps following its assessment of other sources of flooding and the implications of climate change and these should be used in conjunction with this map.

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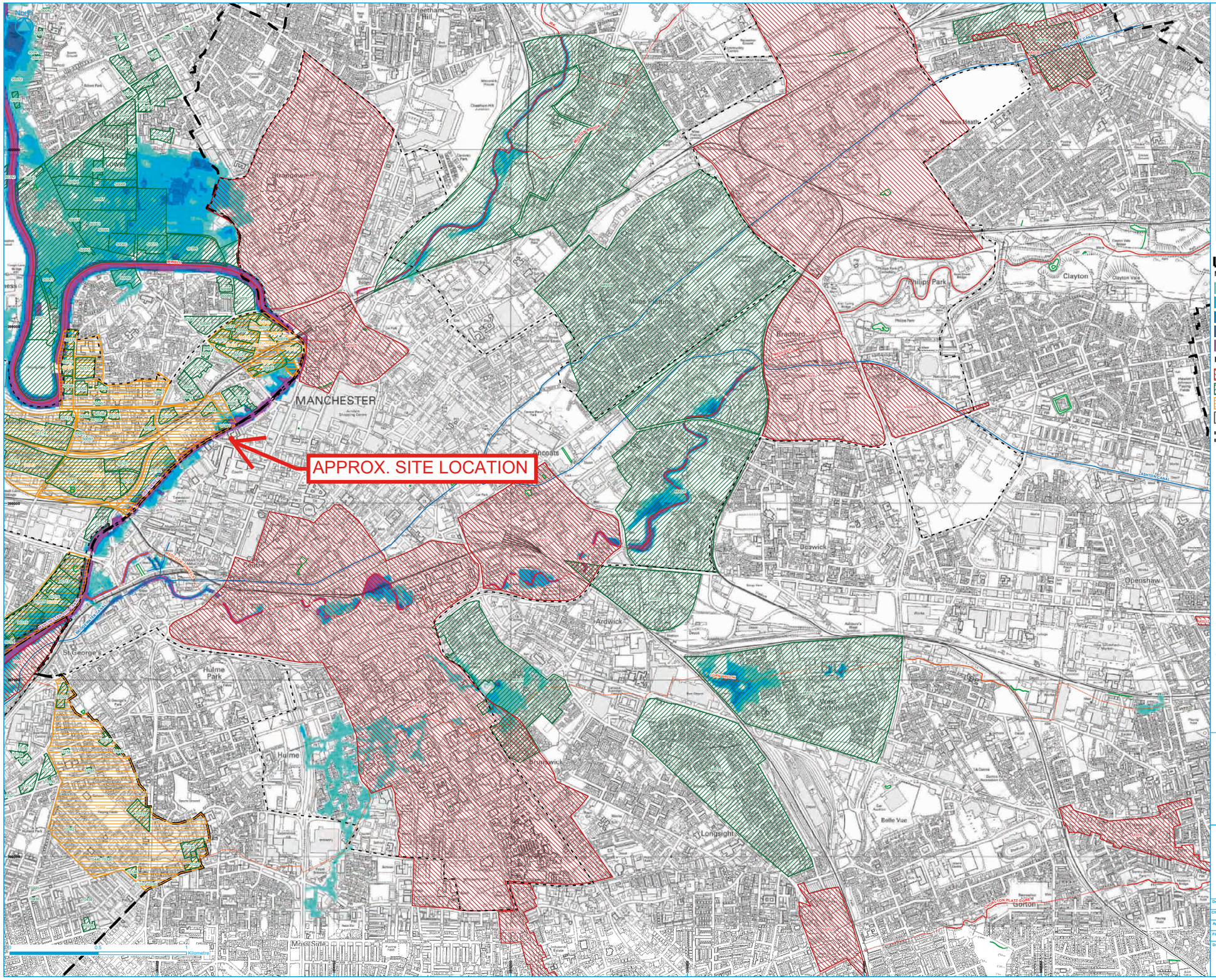
Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

PPS25 Flood Zones

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Approved by:	H O'Callaghan	Date:	22/11/2010
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Drawing Number:	FL_1.2 E	Status:	FINAL
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Original @ A1



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

The map identifies the estimated flood depths using the modelling outputs produced for this SFRA. The SFRA modelled reaches are shown on Figure 1.1 of the Maps Index. This map can used to identify those areas sensitive to increases in flood depth in the future.

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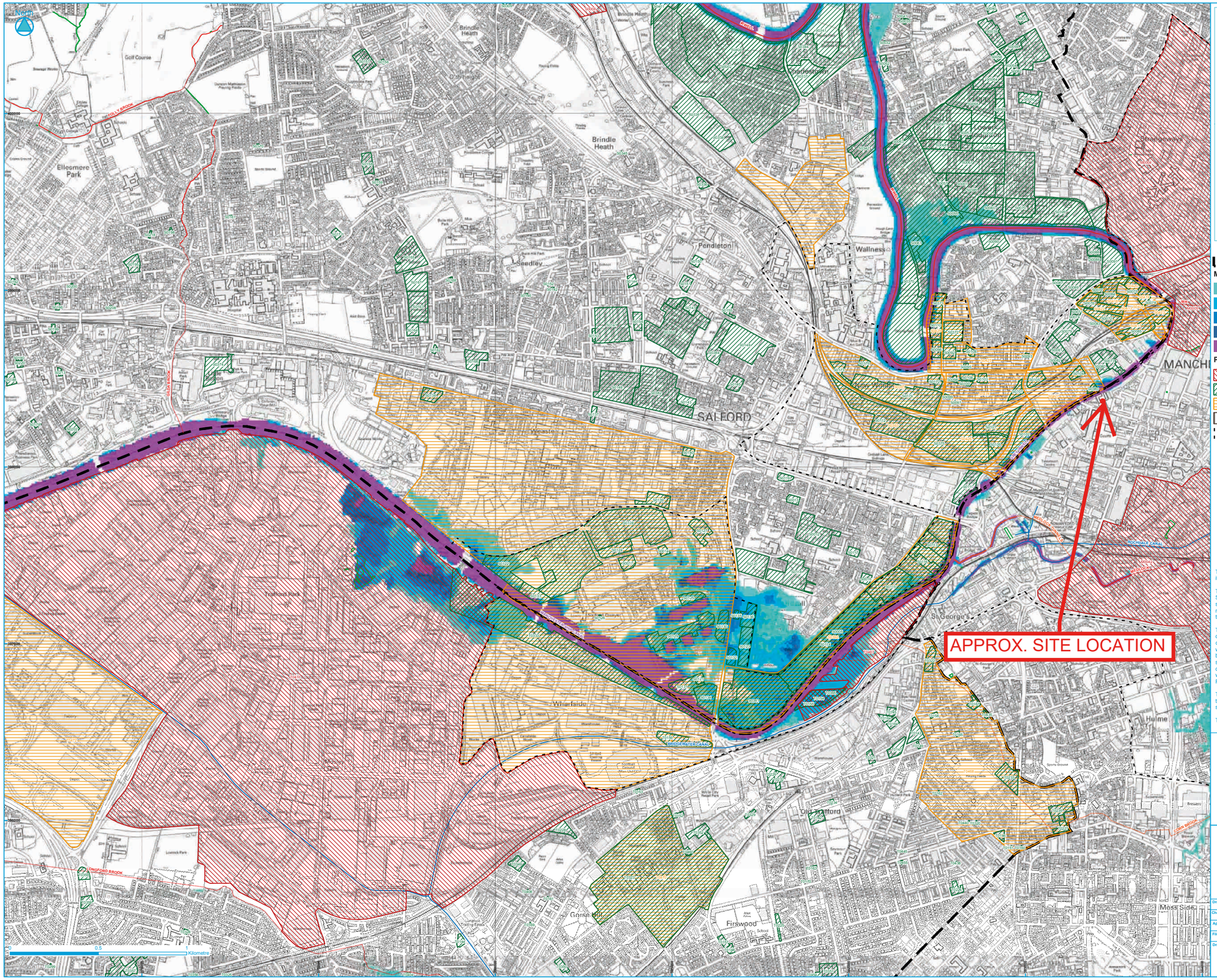
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Fluvial 1 in 100 Year With Climate Change Flood Depth

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Approved by:	J Cooper	Date:	13/01/2011	
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Drawing Number:	FL_1.7B	Status:	FINAL	Scale: 1:10,000

Original @ A1



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

The map identifies the estimated flood depths using the modelling outputs produced for this SFRA where this has been undertaken. Outside the modelled reaches this map uses a strategic indication of flood depths within Flood Zone 3. For the Sinderland Brook recently modelled extents are used. This broadscale method has been applied as discussed within the 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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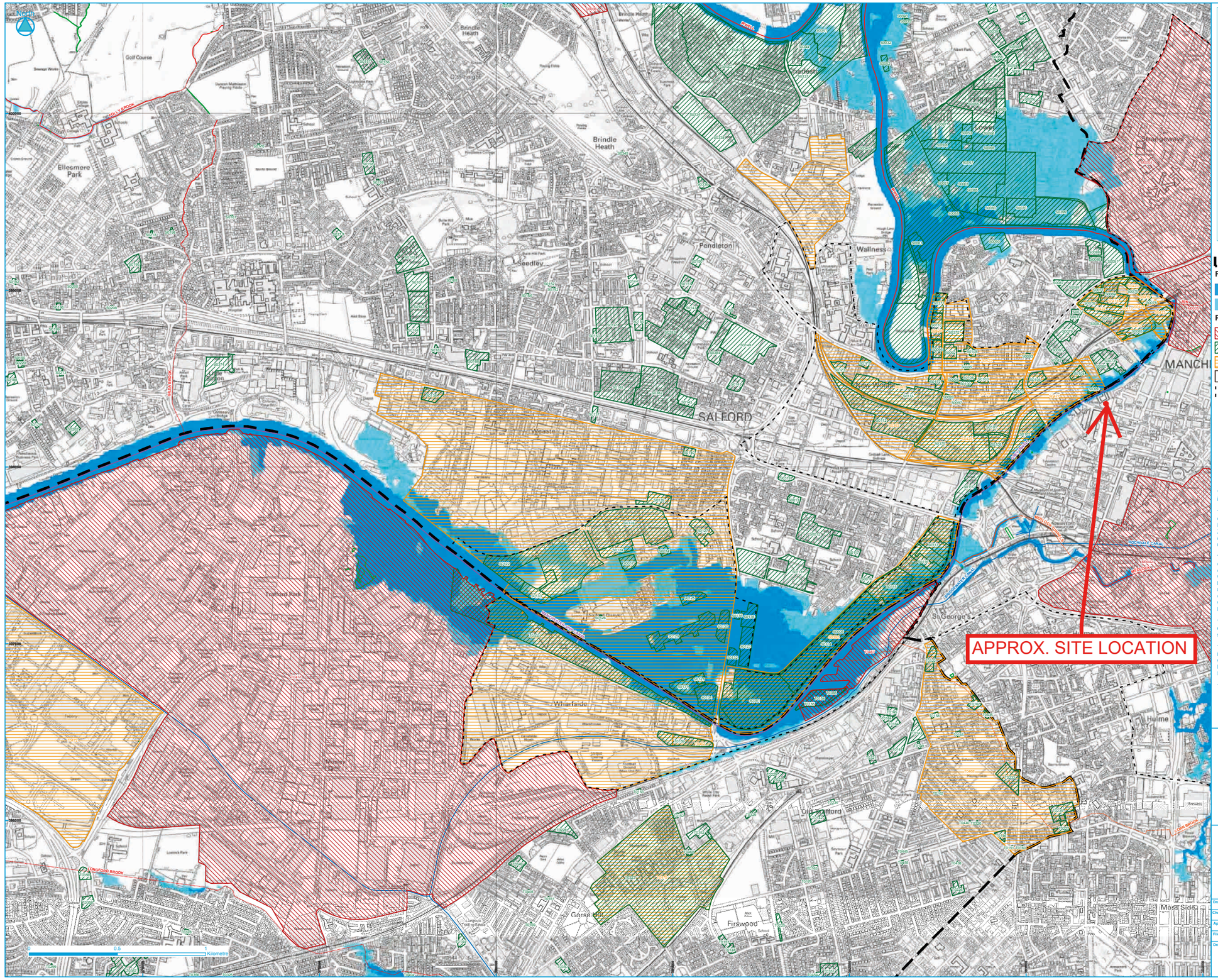
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Fluvial 1 in 100 Year Depths

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Drawing Number:	FL_1.5E	Status:	FINAL	Scale: 1:10,000

Original @ A1



Council Boundary

Fluvial Flood Extent

- 1 in 100 Year
- 1 in 100 Year With Climate Change

Potential Development Sites / Locations

- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- 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 and its Practice Guide.

The map shows estimated flood extents using the modelling outputs produced for this SFRA on the River Irwell, Grey Irwell, 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 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.

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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for

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

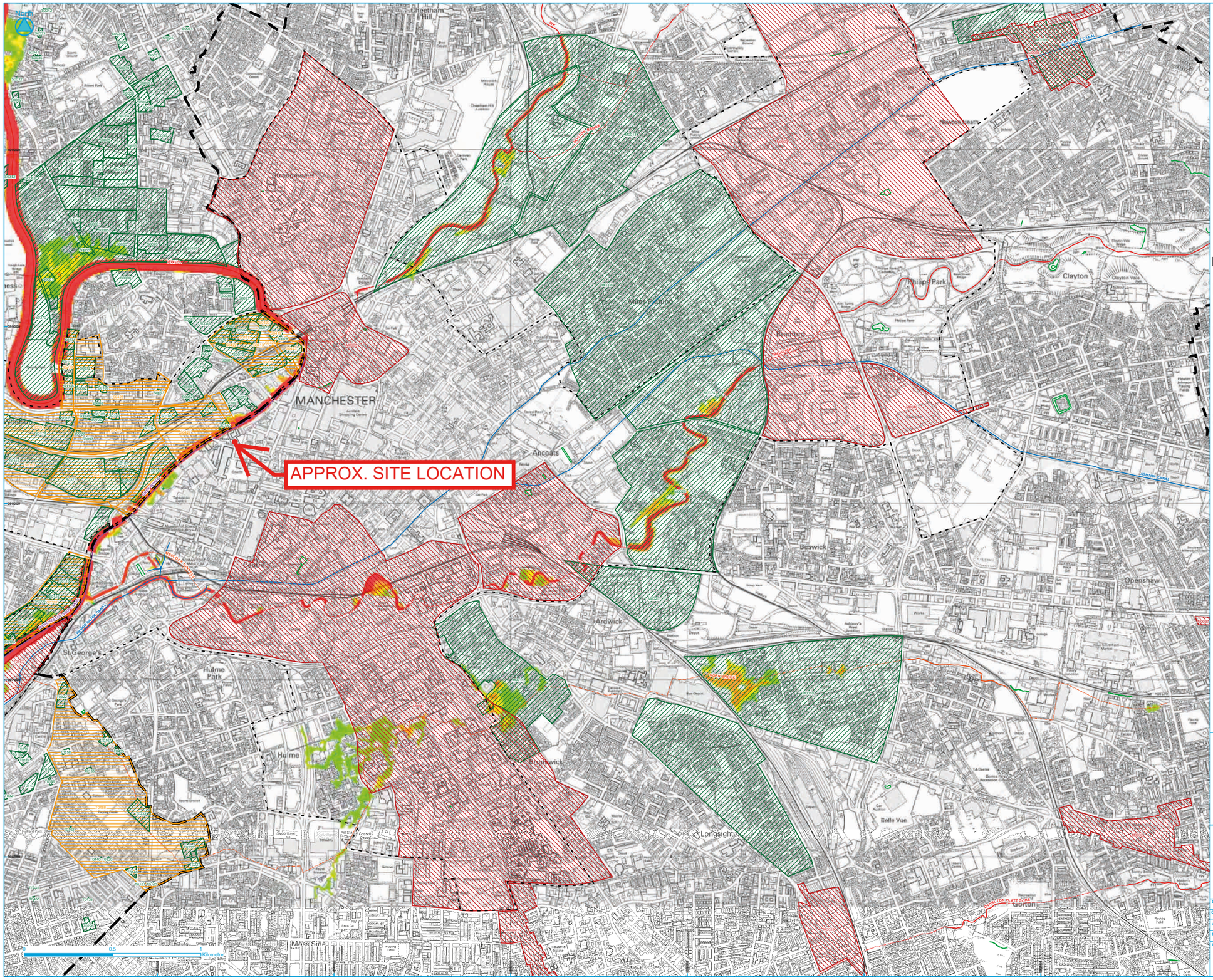
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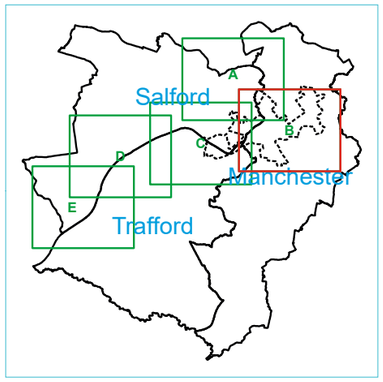
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Original @ A1





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

Main Rivers (V8.0)

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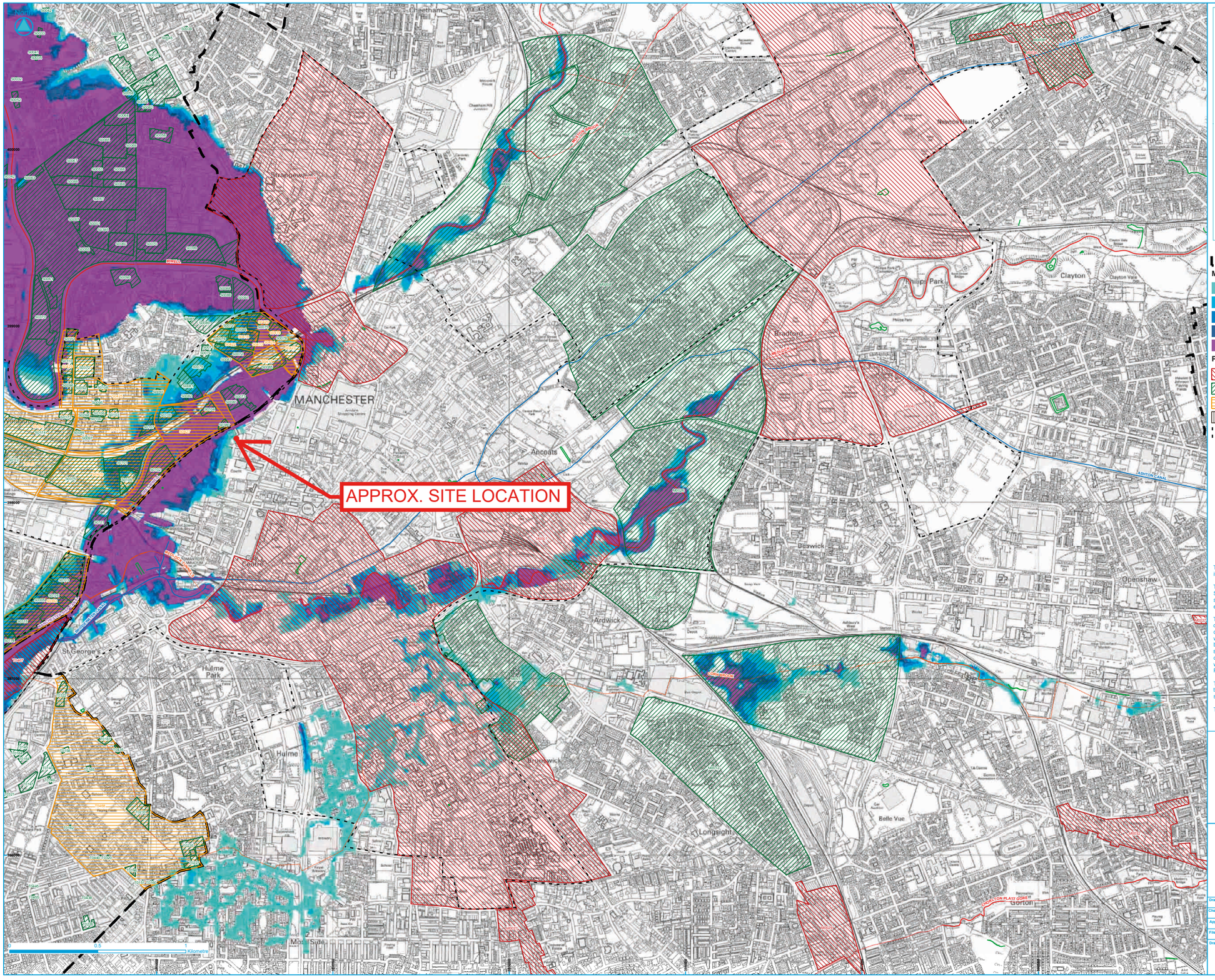
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Fluvial 1 in 100 Year Flood Hazard

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Original @ A1



Council Boundary

Maximum Flood Depth (m)

- <0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- >2

Potential Development Sites / Locations

- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- 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 and its Practice Guide.

The map identifies the estimated flood depths 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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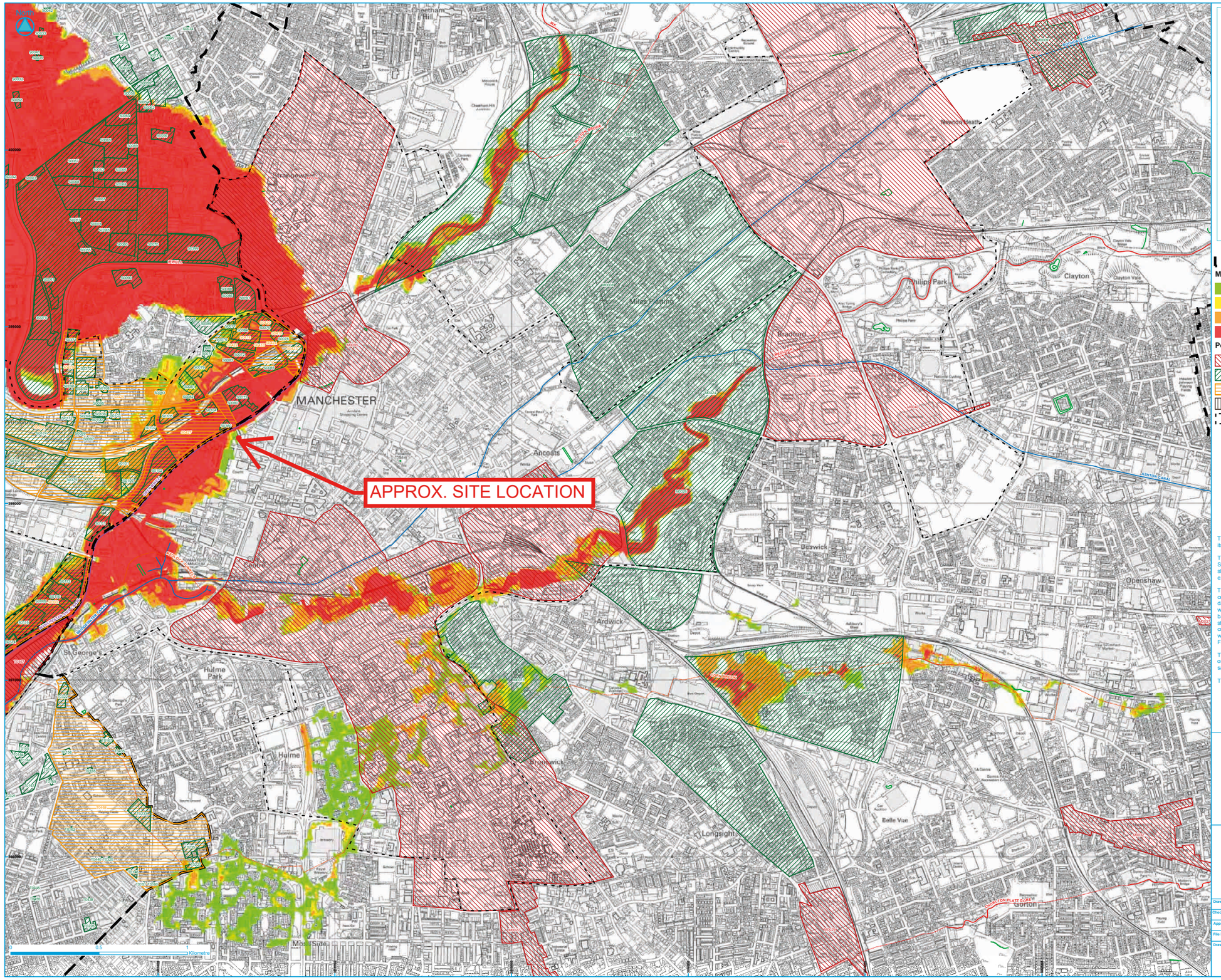
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Fluvial 1 in 1000 Year With Climate Change Flood Depth

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Original @ A1



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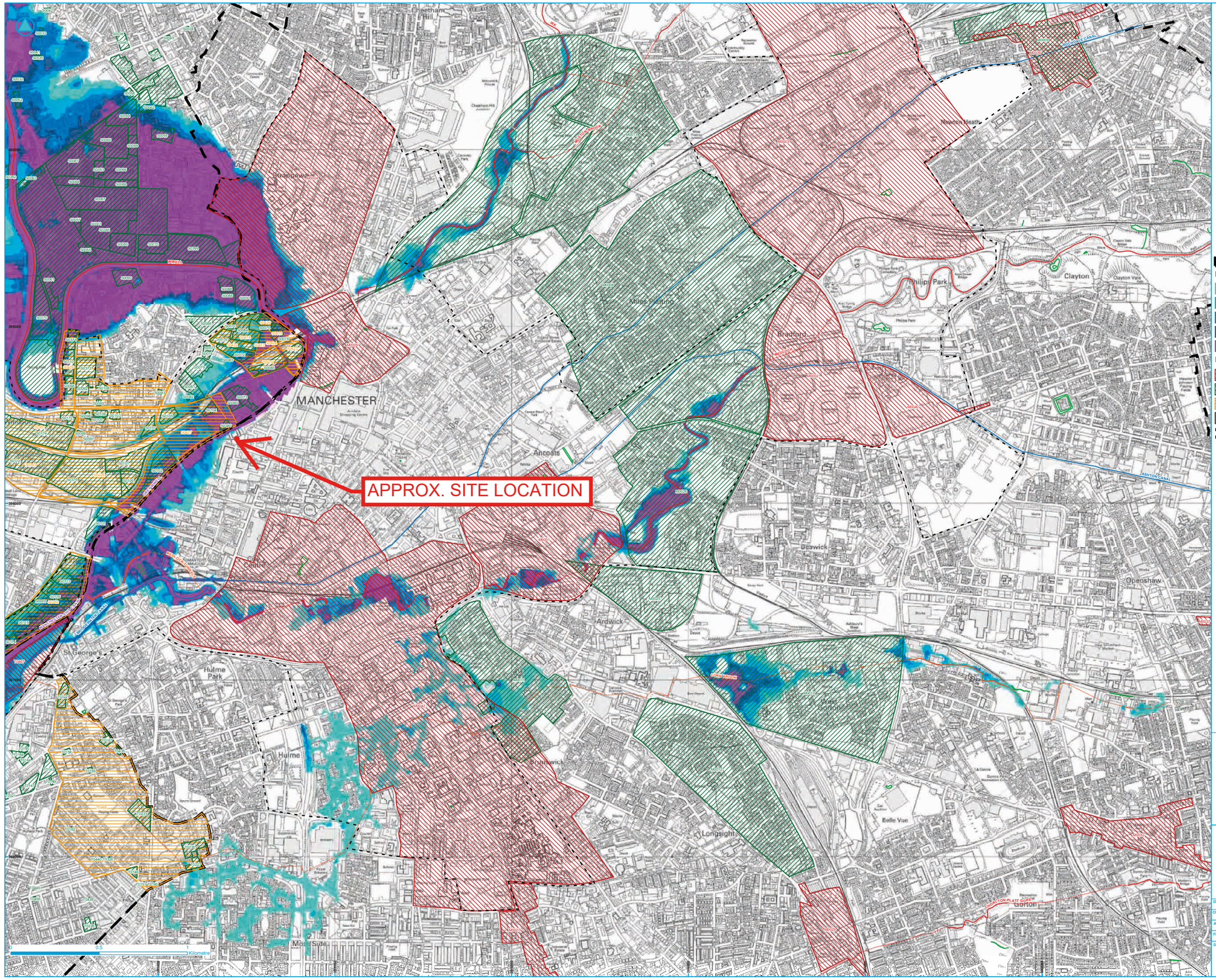
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Fluvial 1 in 1000 Year With Climate Change Flood Hazard

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Drawing Number: FL_1.10B	Status: FINAL	Scale: 1:10,000	

Original @ A1



Council Boundary

Maximum Flood Depth (m)

- <0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- >2

Potential Development Sites / Locations

- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- 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 and its Practice Guide.

The map identifies the estimated flood depths 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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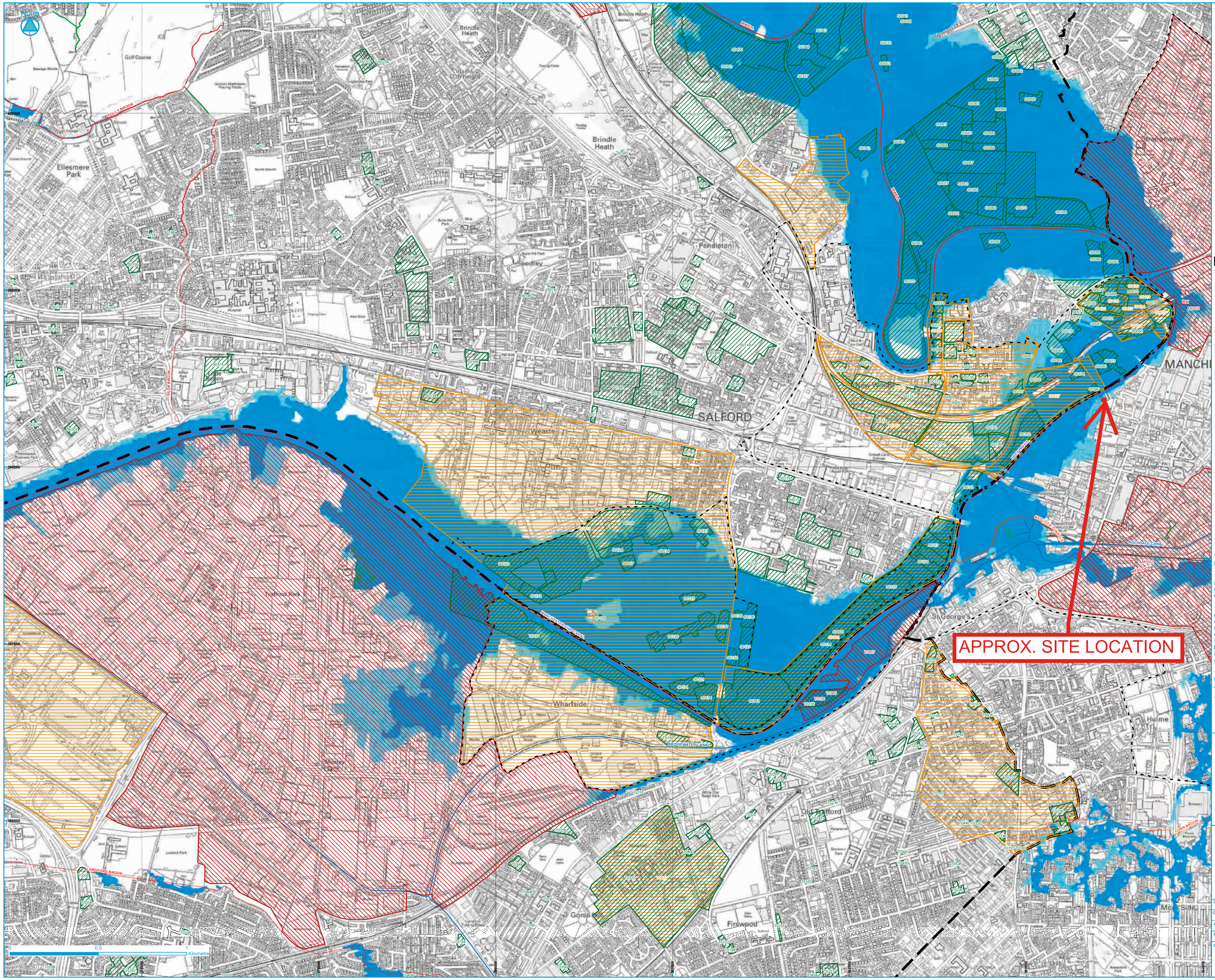
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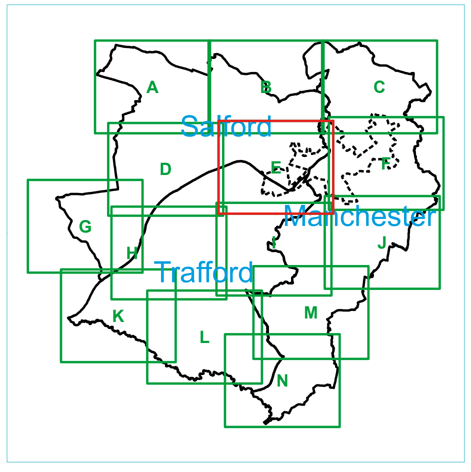
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Fluvial 1 in 1000 Year Flood Depth

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Original @ A1





Council Boundary

Fluvial Flood Extent

1 in 1000 Year

1 in 1000 Year With Climate Change

Potential Development Sites / Locations

Employment

Housing

Mixed Use

Other

Regional Centre Boundary

Ashton, Bridgewater and Rochdale Canals

Manchester Ship Canal / Grey Irwell

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 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 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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for

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

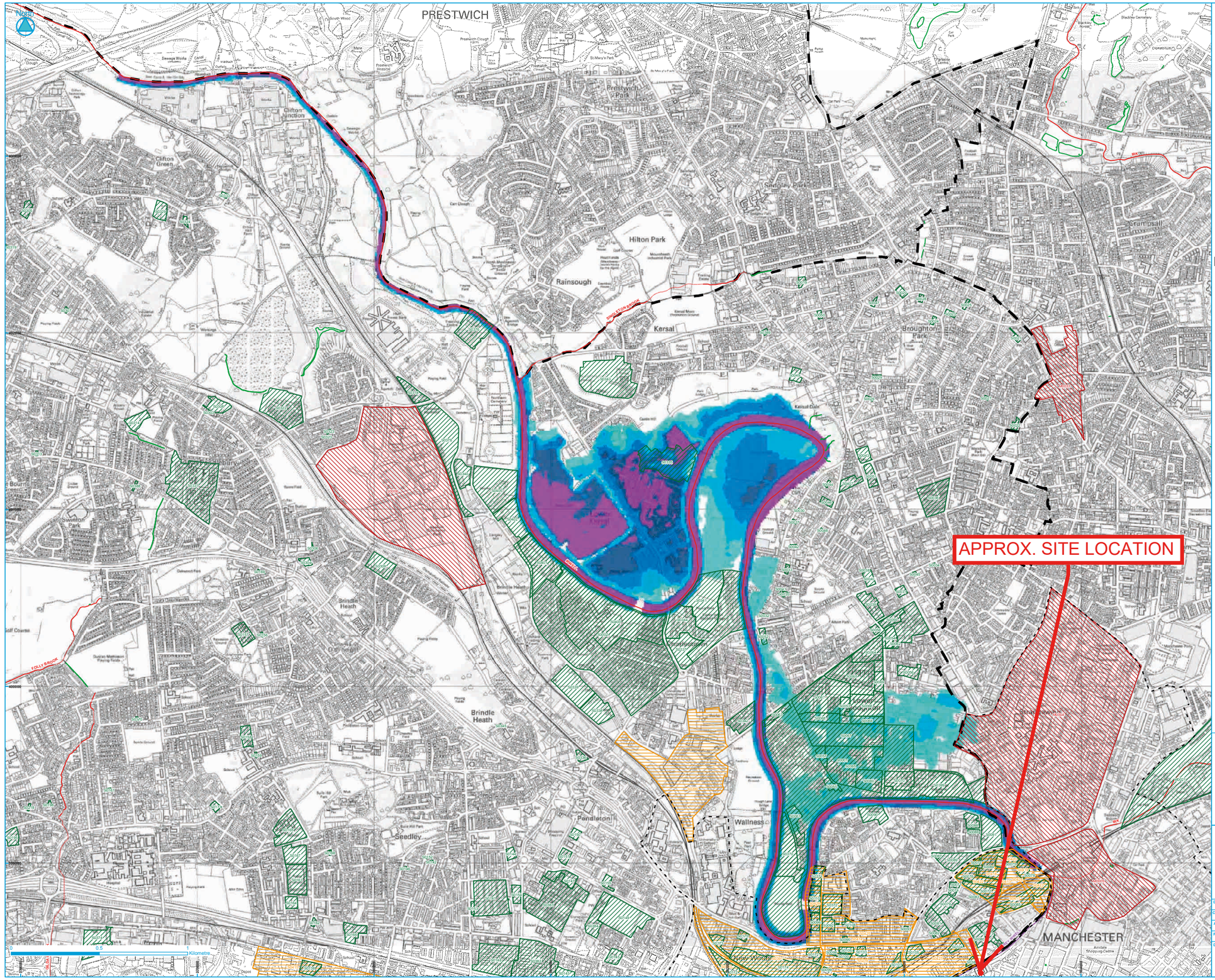
1 in 1000 Year And 1 in 1000 Year With Climate Change Flood Extents

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Original @ A1





Council Boundary

Maximum Flood Depth (m)

- <0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- >2

Potential Development Sites / Locations

- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- 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 and its Practice Guide.

The map identifies the estimated flood depths during a breach of the flood defences at defined locations on the River Irwell using the linked 1D ISIS - 2D TUFLOW modelling outputs produced for this SFRA. Section 2.3 of the Level 2 SFRA explains how this modelling was carried out. The map is useful in understanding the residual risk to life for a breach event.

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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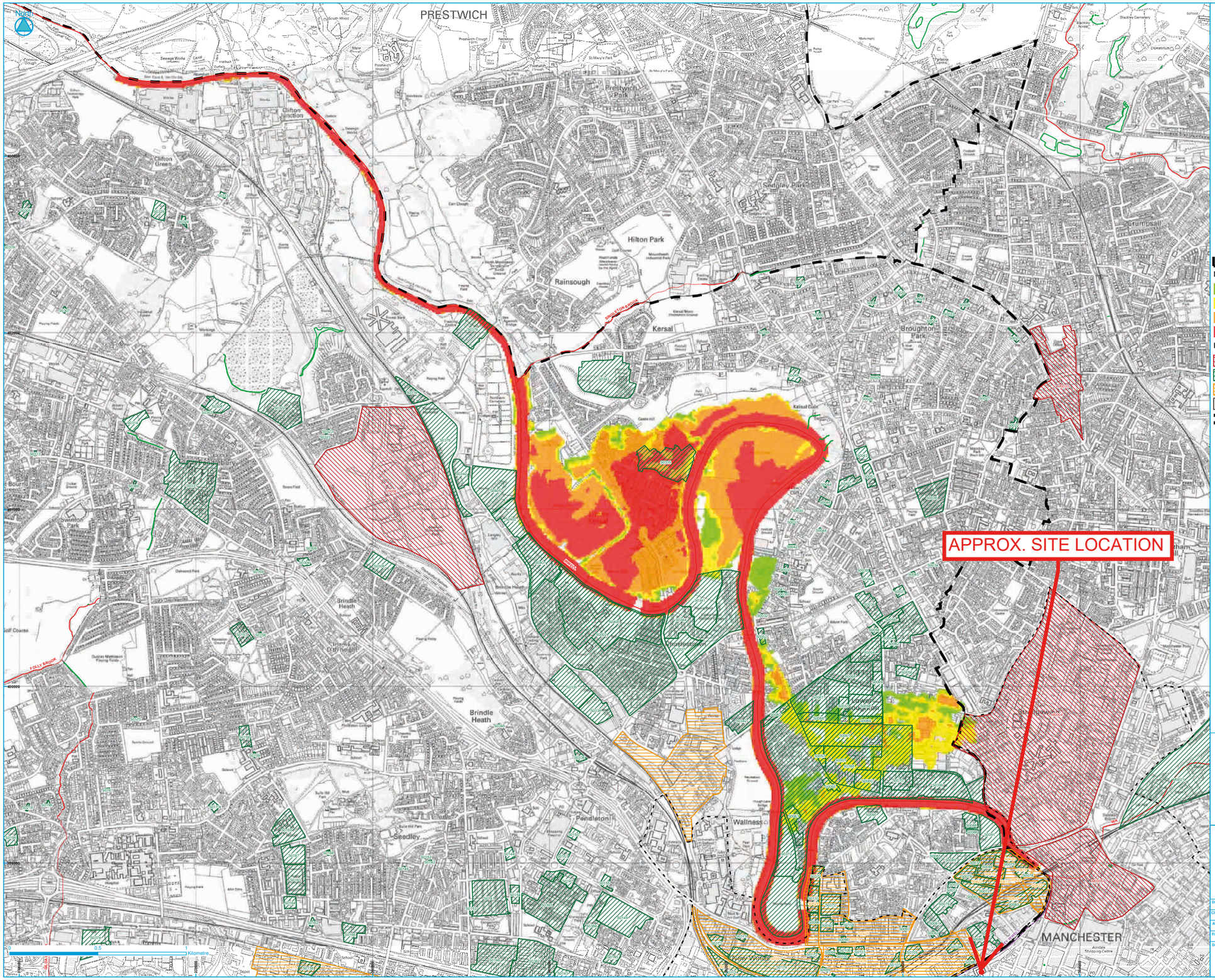
for

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

1 in 100 Year Flood Depth for a breach on the Lower Irwell at Lower Kersal and Lower Broughton

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Checked by: J Dimelow	Date: 01/02/2011		
Approved by: J Cooper	Date: 01/02/2011		
File Name: _ArcView\Mapping\Level2\MST_Irwell_Breach_Q100_Depth_V2.2.mxd			
Drawing Number: FL_1.11	Status: FINAL	Scale: 1:10,000	

Original @ A1





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

Main Rivers (V8.0)

- 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 during a breach event on the Lower Irwell at Lower Kersal and Lower Broughton using the linked 1D ISIS - 2D TUFLOW modelling outputs produced for this SFRA. The map is useful in understanding the residual risk to life for a breach event.

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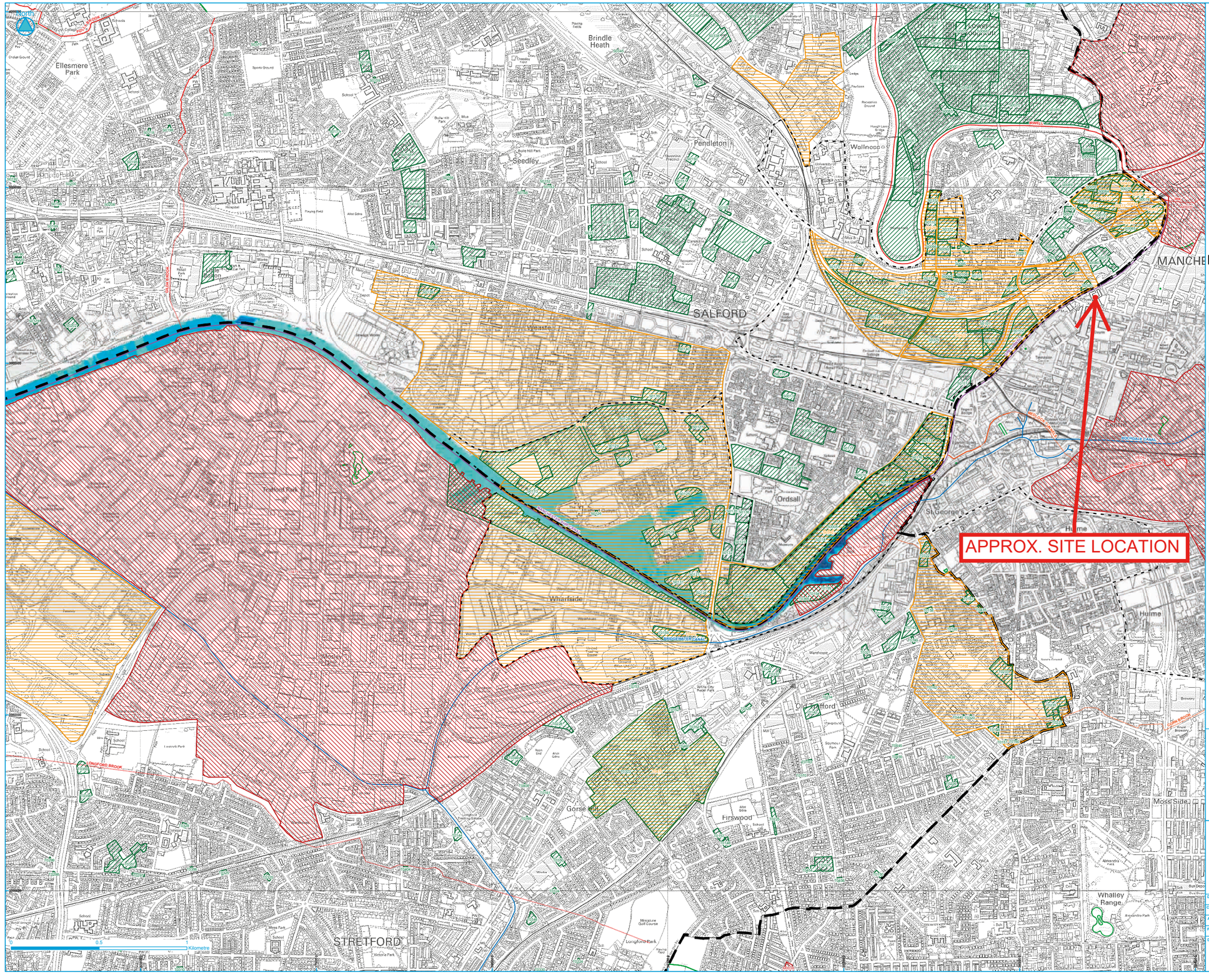
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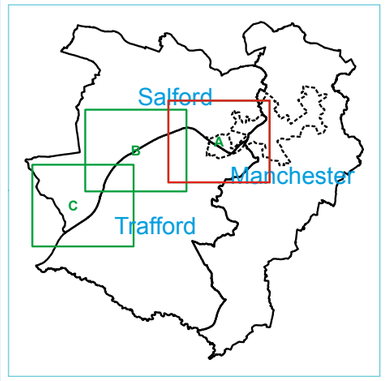
Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

1 in 100 Year Flood Hazard for a breach on the Lower Irwell at Lower Kersal and Lower Broughton

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Drawing Number: FL_1.12	Status: FINAL	Scale: 1:10,000	

Original @ A1





Council Boundary

Maximum Flood Depth (m)

- <0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- >2

Potential Development Sites / Locations

- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- 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 and its Practice Guide.

The map identifies the estimated flood depths for the defended 1 in 100 flood event and are taken from the EA Areas Benefitting from Defences ISIS model (2009). In accordance with PPS25 this provides an understanding of the range of residual risks associated with the operation of the Manchester Ship Canal. It is only one of a number of risk scenarios used in the SFRA, and together with Maps 1.14 and 1.15 provides flood information to determine a spatial and mitigation response for development within the EA Flood Zones.

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.

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

Manchester Ship Canal Defended 1 in 100 Year Flood Depth

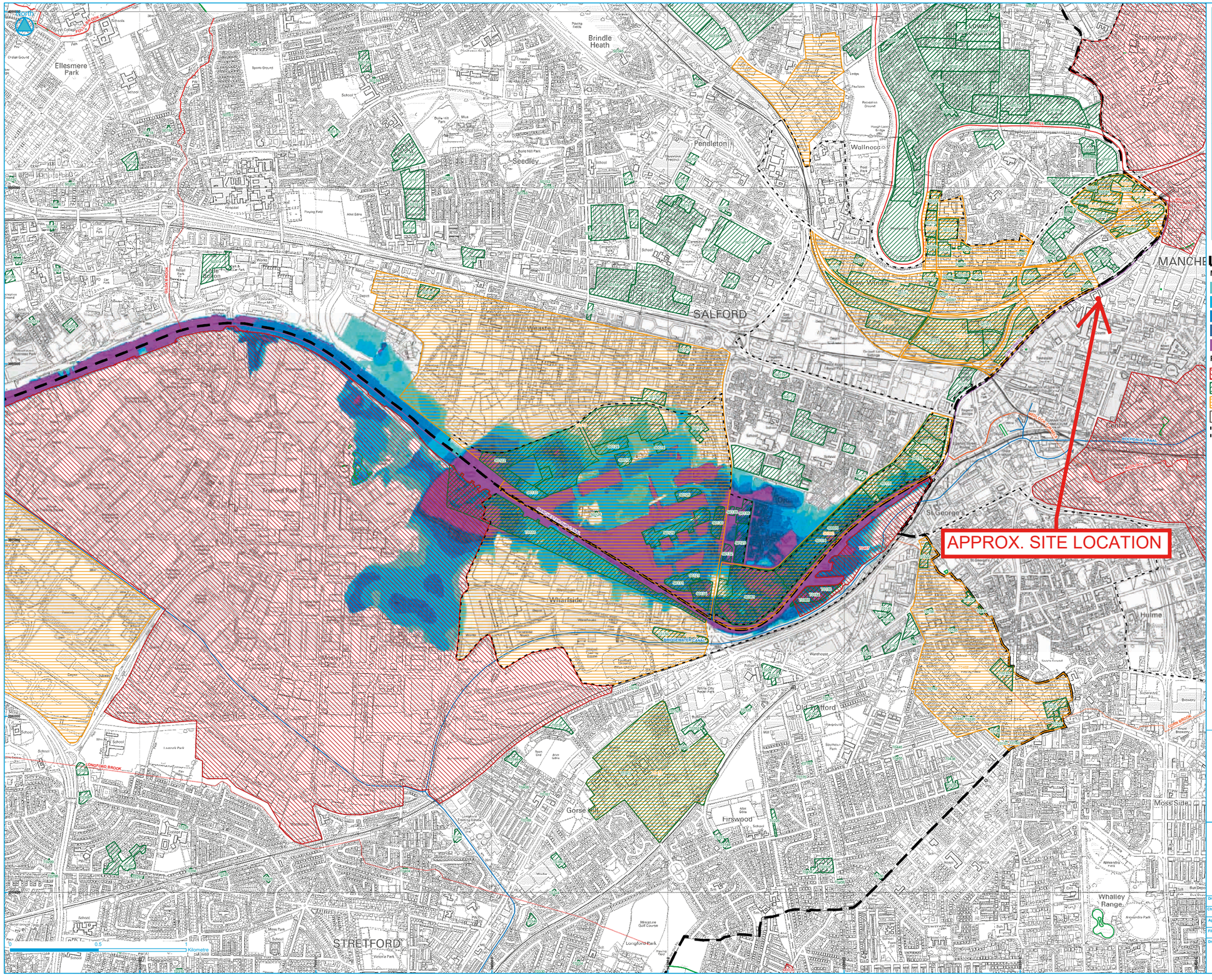
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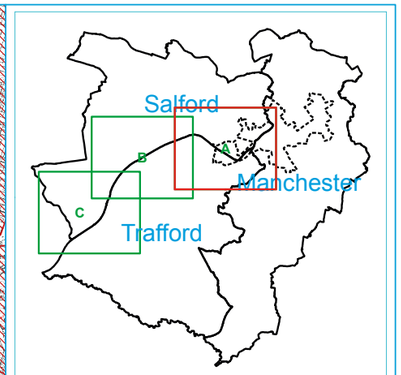
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FL_1.13A	FINAL	1:10,000

Original @ A1





Council Boundary

Maximum Flood Depth (m)

- <0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- >2

Potential Development Sites / Locations

- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- 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 and its Practice Guide.

The map identifies the estimated flood depths for the undefended 1 in 100 flood event and are taken from the EA Flood Zones ISIS model (2009). In accordance with PPS25 this provides an understanding of the range of residual risks associated with the operation of the Manchester Ship Canal. It is only one of a number of risk scenarios used in the SFRA, and together with Map 1.13 and 1.15 provides flood information to determine a spatial and mitigation response for development within the EA Flood Zones.

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.

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for

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

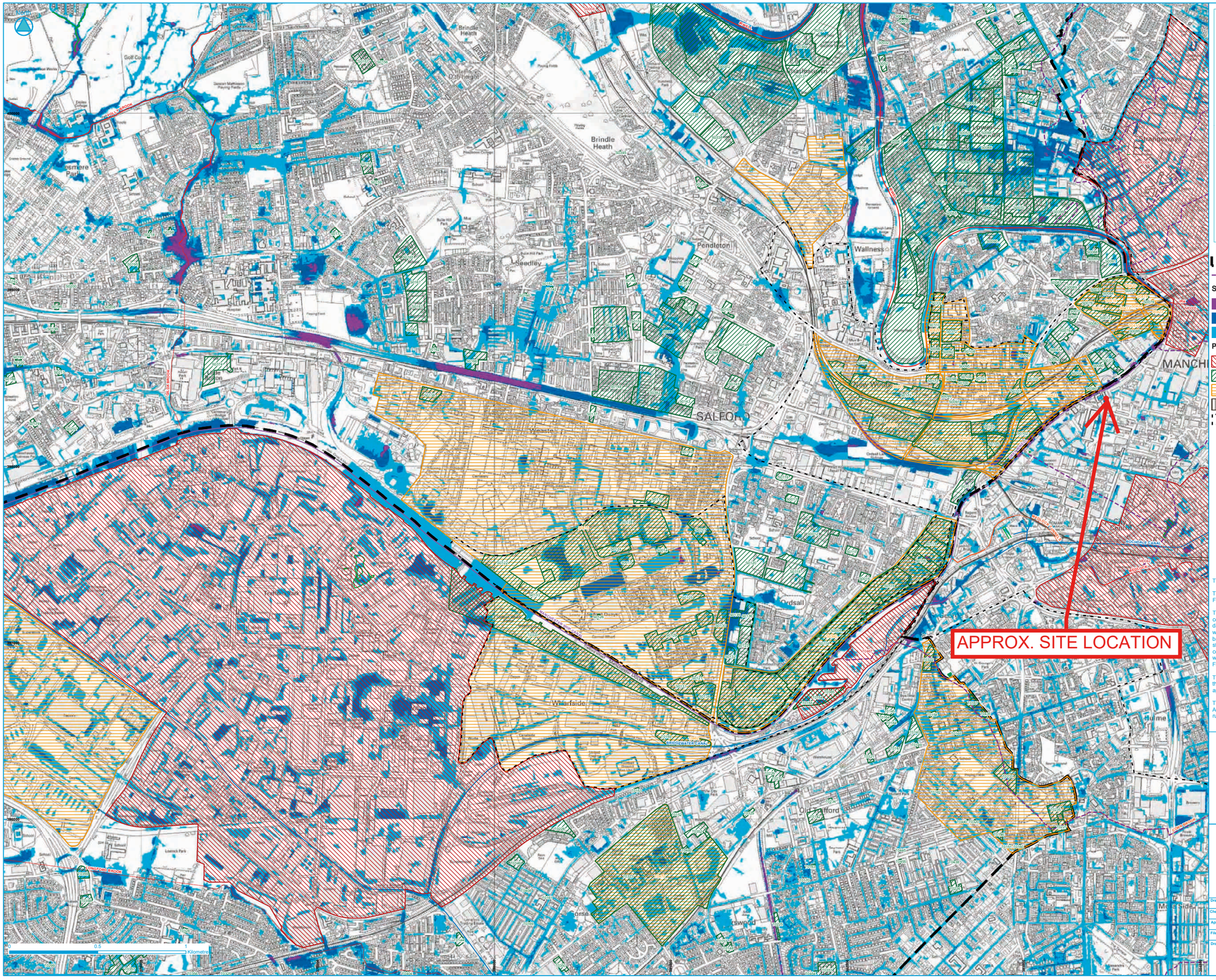
Manchester Ship Canal Undefended 1 in 100 Year Flood Depth

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FL_1.14A	FINAL	1:10,000

Original @ A1



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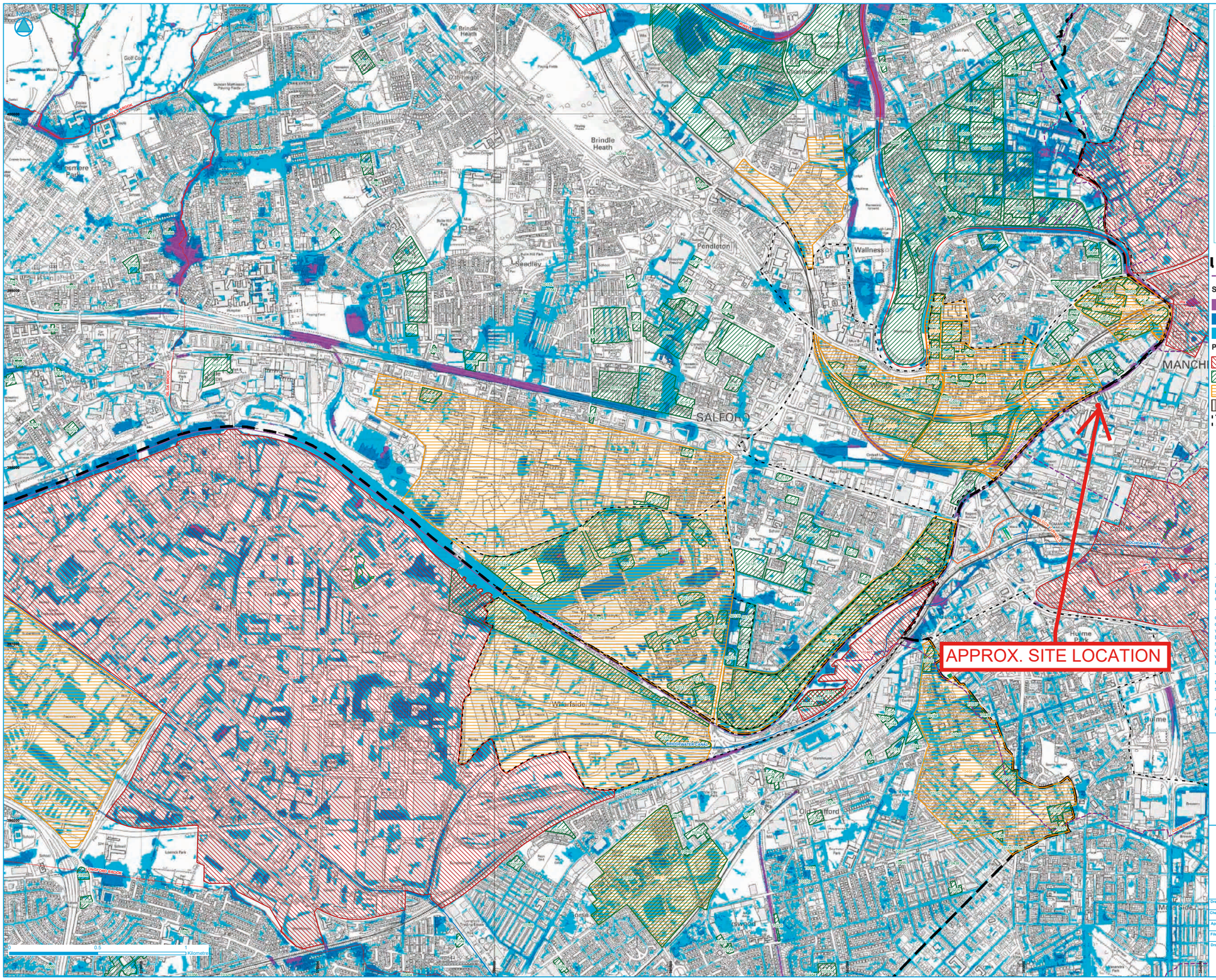
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Susceptibility to Surface Water Flooding - Current Scenario

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Drawing Number:	SS_4.1 E	Status:	FINAL	Scale: 1:10,000

Original @ A1



Council Boundary
Lost Watercourses

Susceptibility to Surface Water Flooding

High Susceptibility
Intermediate Susceptibility
Low Susceptibility

Potential Development Sites / Locations

Employment
Housing
Mixed Use
Other
Regional Centre Boundary

Ashton, Bridgewater and Rochdale Canals
Manchester Ship Canal / Grey Irwell
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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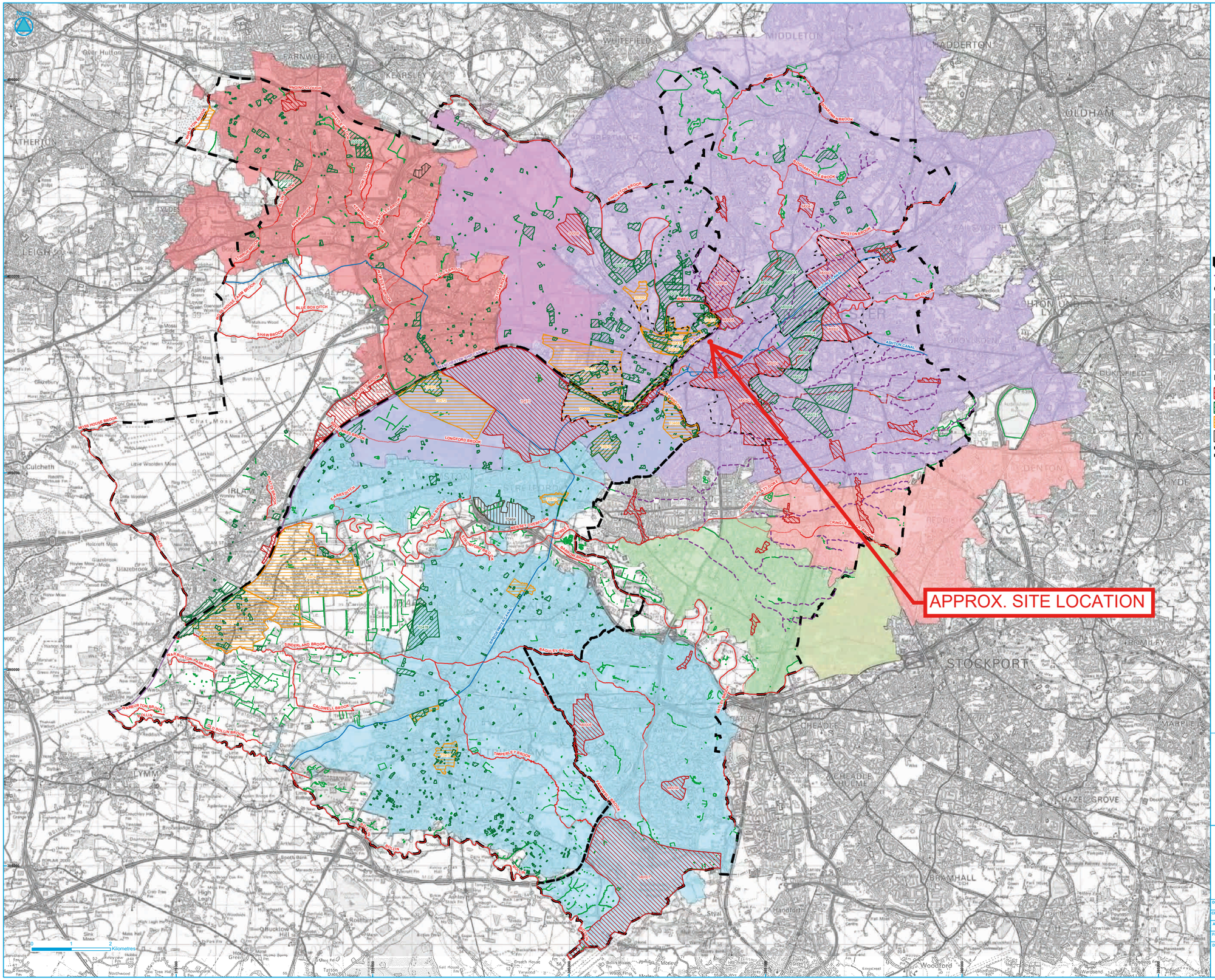
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Susceptibility to Surface Water Flooding - Future Scenario

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Approved by:	J Cooper	Date:	01/02/2011	
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Drawing Number:	SS_4.2 E	Status:	FINAL	Scale: 1:10,000

Original @ A1





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 Irwell
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 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

Critical Drainage Areas

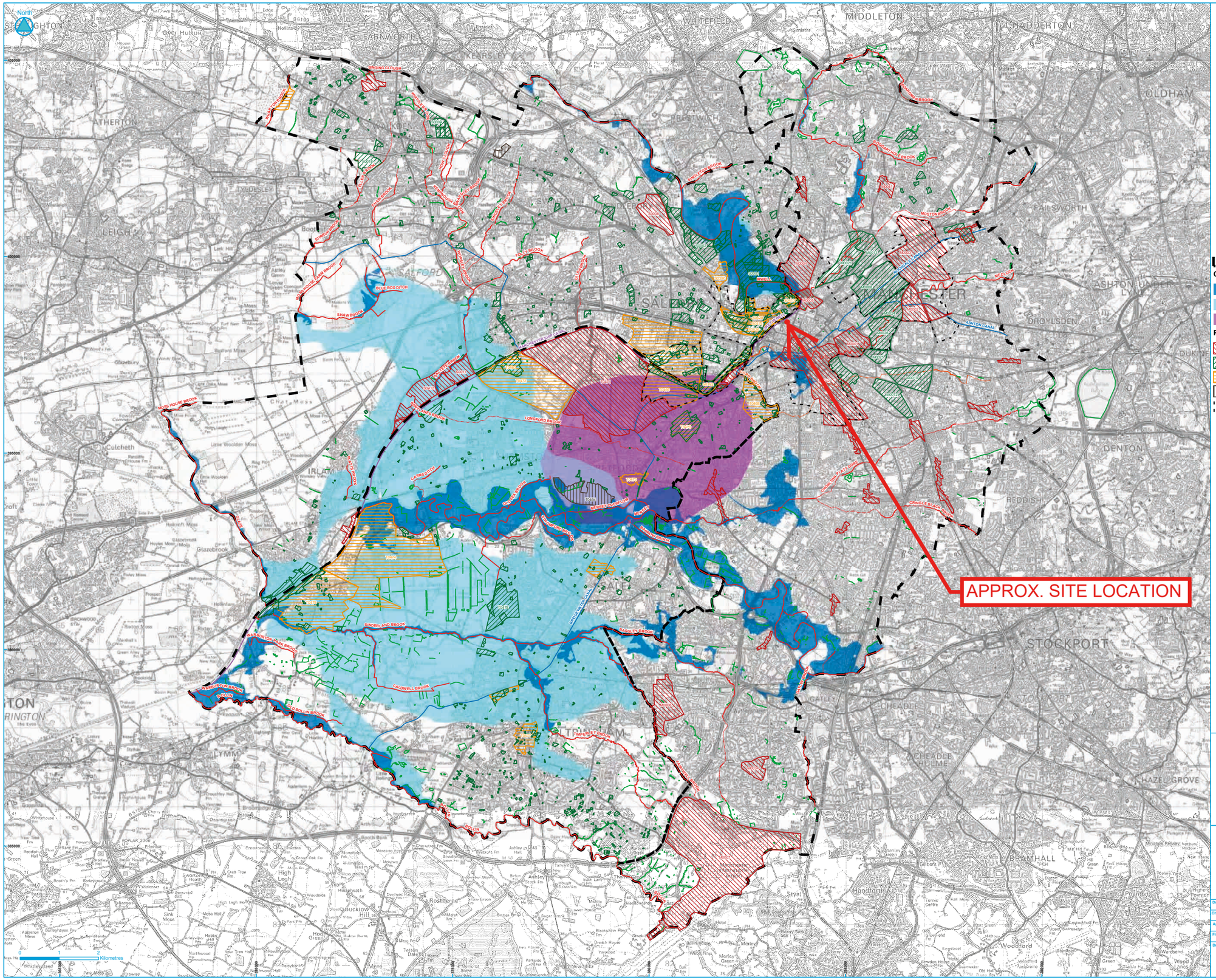
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SS_4.5	FINAL	1:45,000

Original @ A1





Council Boundary

Groundwater Issue

- Areas at risk of GW Flooding
- Areas of shallow GW
- Areas at risk of GW rebound

Potential Development Sites / Locations

- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- Other Waterbodies

Main Rivers (V8.0)

- Culverted
- Open

Digitised River Lines

- Culverted
- Open

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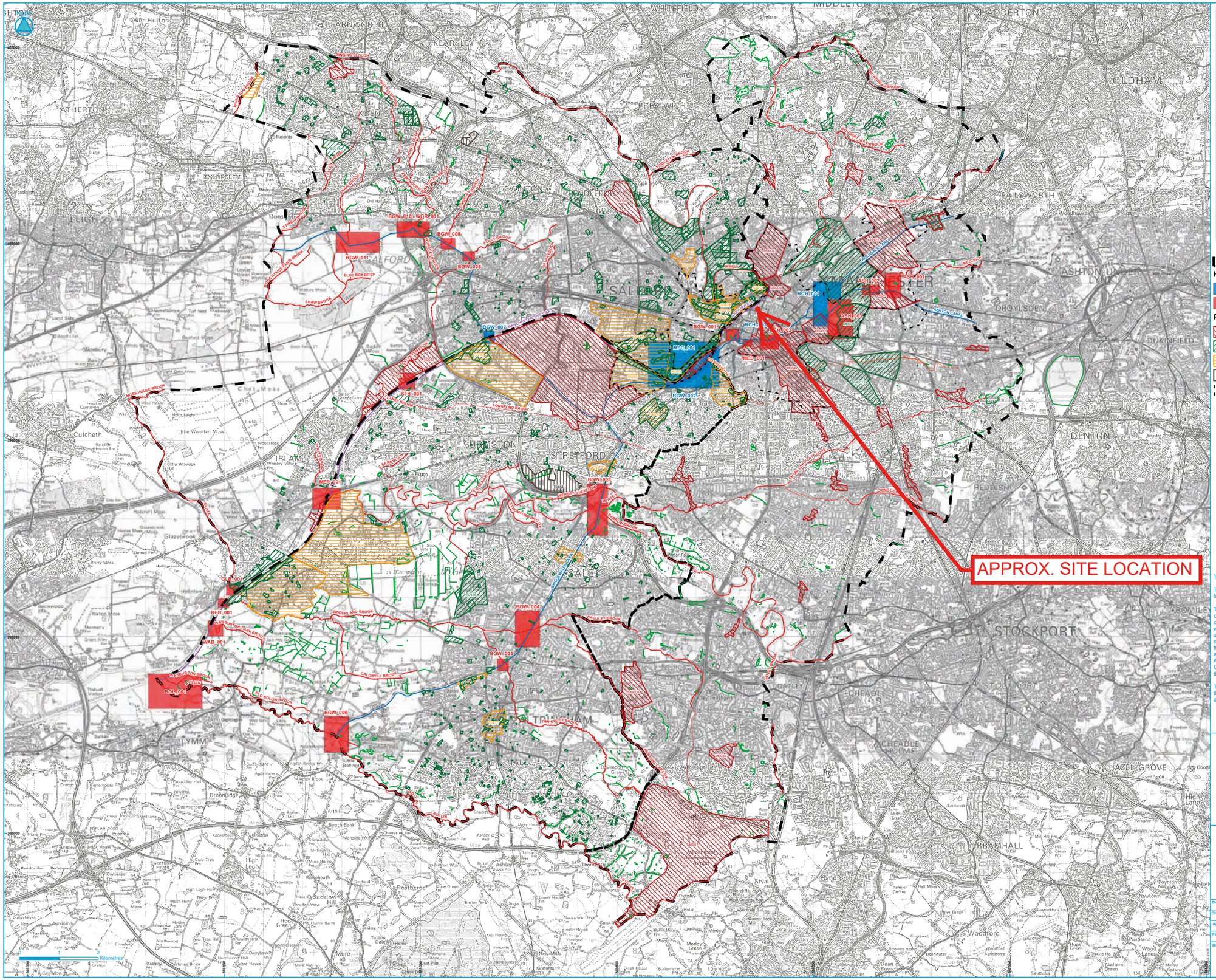
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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Groundwater Flooding

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

Original @ A1



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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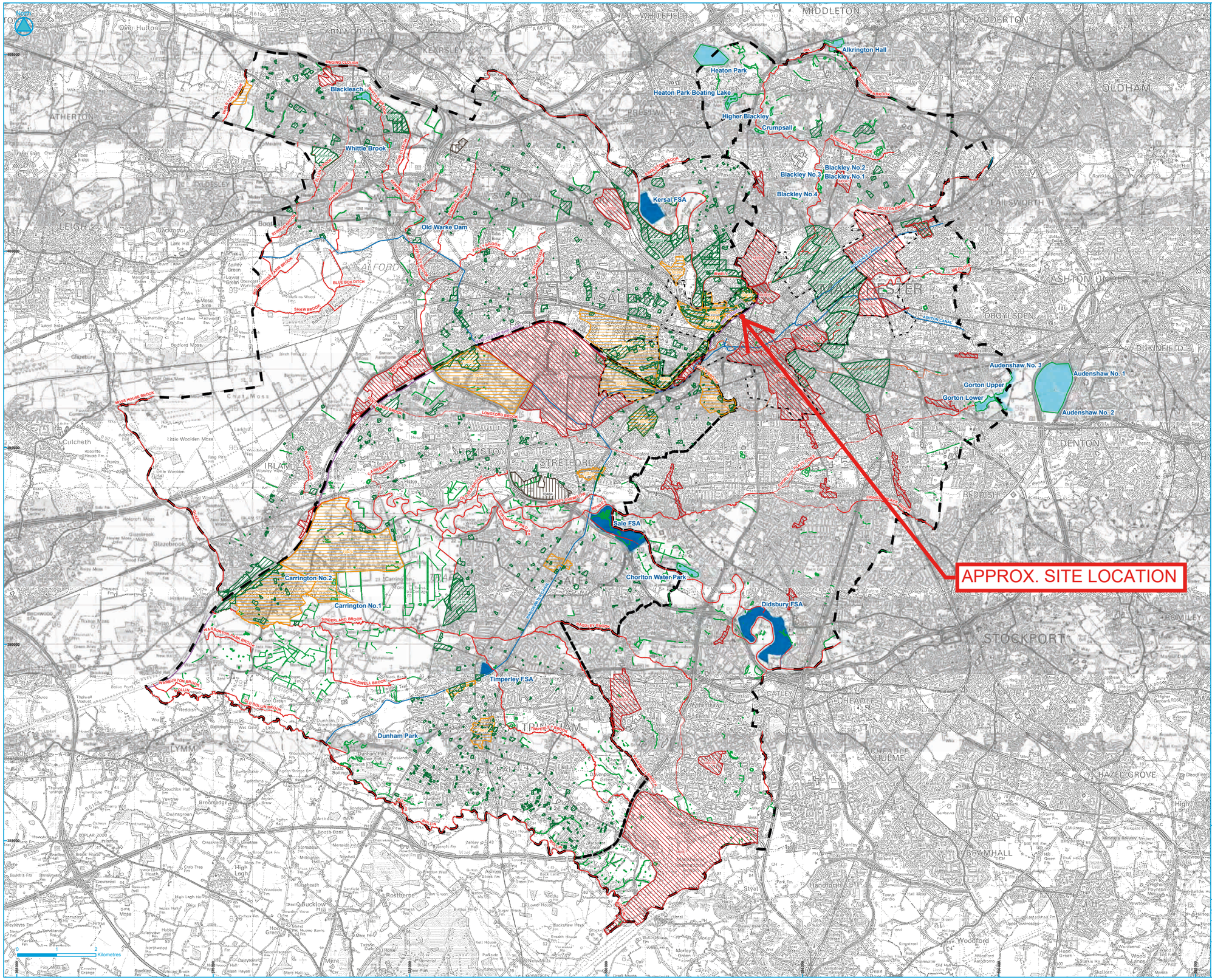
for

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

Hydraulic Interactions

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Drawing Number:	HI_5.1	Status:	FINAL	Scale: 1:45,000

Original @ A1



Council Boundary

Reservoirs

- Flood Storage Area
- Reservoir

Potential Development Sites / Locations

- Employment
- Housing
- Mixed Use
- Other
- Regional Centre Boundary

- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Irwell
- 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 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 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 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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for

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

Reservoir Screening

Drawn by:	J Cheetham	Date:	08/03/2011	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: 100019568 2011.
Checked by:	J Dimelow	Date:	01/02/2011	
Approved by:	J Cooper	Date:	01/02/2011	
File Name:	...ArcView\Mapping\Level1\MST_ReservoirScreening_V1.2.mxd			
Drawing Number:	MM_3.1	Status:	FINAL	Scale: 1:45,000

Original @ A1

Appendix 3

AKT II Desk Study Extract

6 Ground model

The purpose of this section of the report is to highlight any risks associated with geotechnical studies and underground structures.

6.1 Published Geology

According to mapping by the British Geological Survey (BGS), the site is underlain by a bedrock of Chester Pebble Beds Formation Sandstone with no notable artificial ground recorded on the site. There is some Made Ground on the other side of the river, North east of the site as shown in figures below.

Geological maps from Envirocheck show there is no recorded superficial geology covering the site as shown in figure 6.3 which indicates the shallow depth of the sandstone bedrock.

A 'fault' is recorded as running to the south-west of the site boundary where Albert Bridge exists. This fault is a natural vertical bedding plane within the sandstone.

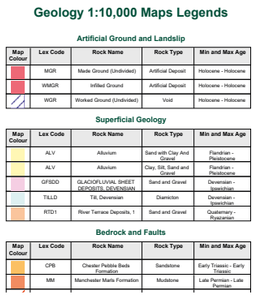


Figure 6.1 Artificial ground and landslip

6.2 Previous Ground Investigations

Based on the BGS borehole information for surrounding areas, Geological maps and information from the borehole logs, the geology has been identified and described in the following sections (for BGS borehole logs refer to Appendix C).

Made Ground and Clay layer

The local borehole logs indicate there is a mix of Made Ground and occasionally clay layers to approximately 3-4m below ground. Made Ground is land consisting of artificial fill that has been man made, usually from previous building work on the site. Clays may be deposited adjacent to the River Irwell due to the alluvial conditions which the river supports. The information from the bore holes appears to contradict the BGS geology maps for the site. This could be either as the BGS maps can often be 'generalised' or perhaps due to these bore holes not being on the site itself.

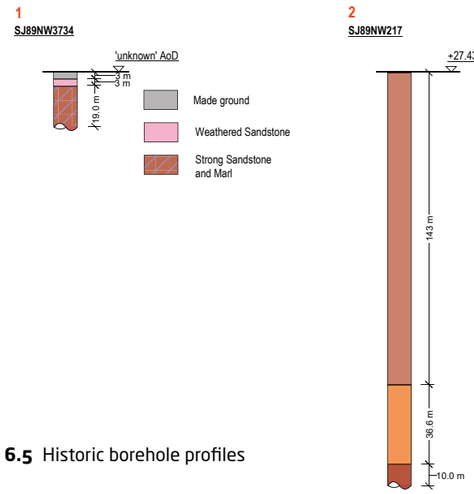


Figure 6.5 Historic borehole profiles

Triassic Sandstone

The borehole record on site SJ89NW217 shows the sandstone bedrock to lie approximately 6m below ground level down to 143m from recorded information. This bedrock covers the whole local area as shown in figure 6.2. It is a principle aquifer in the UK and typically a red colour.

It is important and pertinent to state that the river will affect the bedrock profile very quickly along the bank and therefore these records (for the upper levels) are indicative of the main area of the site but not representative of the area neighbouring the river bank.

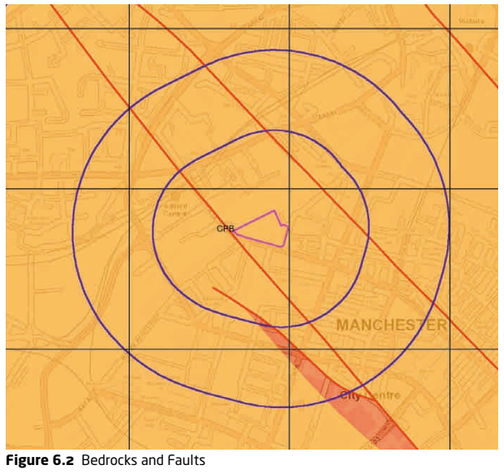


Figure 6.2 Bedrocks and Faults

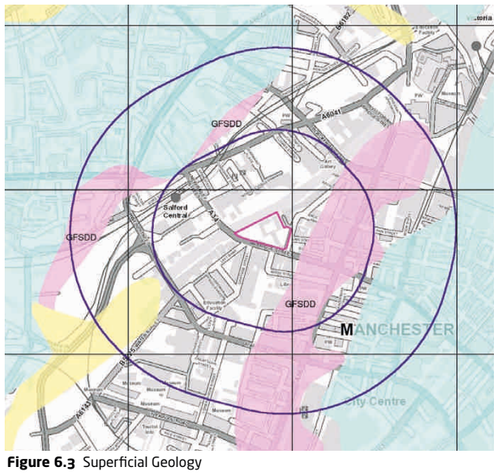


Figure 6.3 Superficial Geology

6.3 Anticipated Ground Conditions

The geological data is not anticipated to differ significantly across the site from the BGS bore holes taken from the surrounding areas. However, the majority of borehole logs available are relatively old logs from nearby sites dating back to 1950s. There are a number of shallow bore holes taken 1955 prior to construction of the current buildings on the site itself however the logs are not in readable detail and are only shallow (to circa 3-4m below ground level). This may suggest the existing buildings on the site are built on shallow foundations rather than piles to depth.

A a number of indicative borehole profiles can be seen in figure 6.5 with slightly varying ground conditions but it can be seen that in general sandstone underlies all soil strata under the whole site in general. It is recommended that more data is collected in the next stage of the project with the use of full site specific geoenviromental site investigations. In this way a good polarised section through the site can be gained to validate assumptions at this stage.

It is important to consider the erosion of sandstone on the site due to the flow of water in the ground. Piled foundations may be required for extra strength into the sandstone bedrock.

Borehole	Grids	Location relative to site	Estimated distance from site	Date
SJ89NW3734	383320, 398330	South west	50m	2004
SJ89NW218	383290, 398330	West	30m	1918
SJ89NW217	383309, 398408	North West	50m	NA
SJ89NW3289	383440, 398410	on site	on site	1955
SJ89NW3290	383420, 398380	on site	on site	1955

Table 5 - Borehole records



Figure 6.4 Borehole location map

6.4 Hydrogeology and hydrology

6.4.1 Environment Agent Classification

The Environment Agency's new aquifer designation map indicates that the site and surrounding area is underlain by a Principal Bedrock Aquifer and a Secondary A superficial aquifer. Figure 6.6 also shows that there is a Secondary Undifferentiated Aquifer lying east and directly west of the site location. A Secondary superficial aquifer is defined by the EA as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important part source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. Maps indicating this information are shown in Figures 6.6 and 6.7.

Principal Aquifers are defined by the Environmental Agency as 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.

As shown in Figure 6.8 this entirety of the site is defined as a major aquifer and as such 'highly permeable' which means we must be mindful of residual contamination and pathways through (possible) piling bores - refer to Section 7.6.2 for further information.

The EA has defined Groundwater Source Protection Zones (SPZs) for sources used in the supply of public drinking water. The site is not located within a SPZ and the closest outer zone to the site is approx 1km South of the site.

6.4.2 Groundwater Level

Groundwater levels are subjected to variations caused by changes in the local drainage conditions and also by seasonal effects. Perched water levels can vary seasonally and are prone to rapid changes through heavy rain events on permeable surfaces, accidental events (such as burst water mains) and the introduction of new underground construction causing blockages to natural perched water flow.

It should be noted that the movement of ground water may be increased by the recorded 'fault' line which runs to the south-west of the site boundary. Whilst this is beyond the site boundary it may contribute to higher ground water velocities in the local vicinity to the fault.

There is also the potential for natural perched water flow through the horizontal bedrock bedding layers which are on the banks of the Irwell.

Ground water levels were not recorded on any of the immediate logs according to the available BGS borehole information. It is recommended that in the following stages of the project the ground water levels are measured/monitored as part of a full site specific geoenvironmental site investigation.

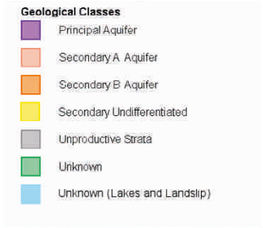
6.4.3 Hydrology

The 'lost river' drawings have been displayed in section 8.4 of the report.

As shown in figure 6.9 the majority of the site has 'limited potential' for groundwater flooding to occur with the North Western boundary having 'potential groundwater flooding' for areas of the property located below Ground level. There will be a higher flooding risk on this boundary of the site as it is located on the River Irwell.

Refer to Section 9 for Flood Risks in the area.

Aquifer map legend



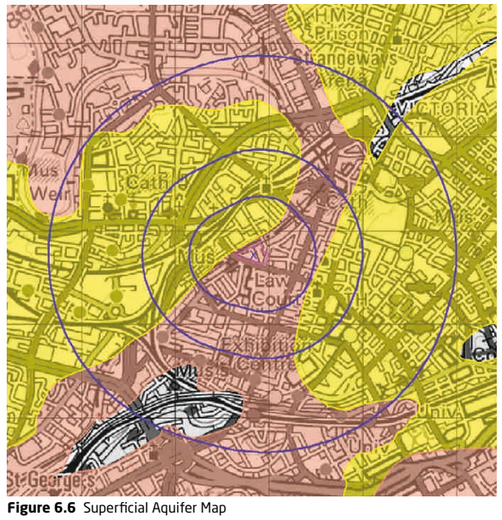


Figure 6.6 Superficial Aquifer Map

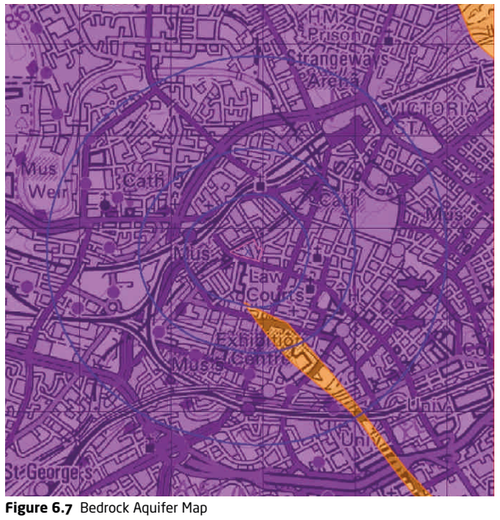
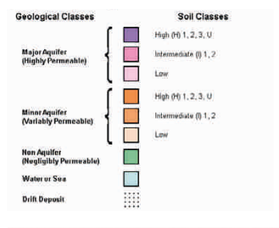


Figure 6.7 Bedrock Aquifer Map

Groundwater vulnerability legend



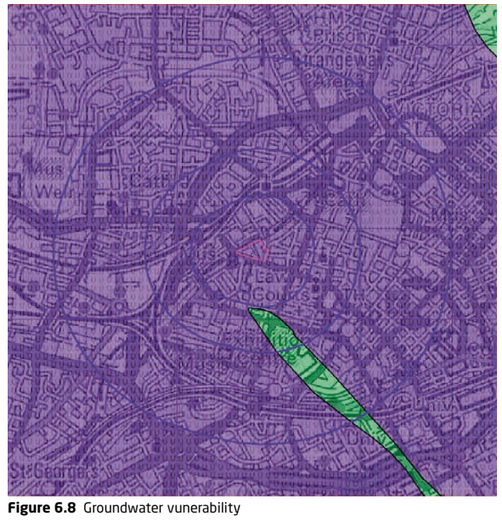
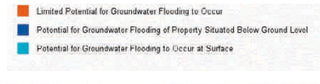


Figure 6.8 Groundwater vunerability

Groundwater Flooding legend



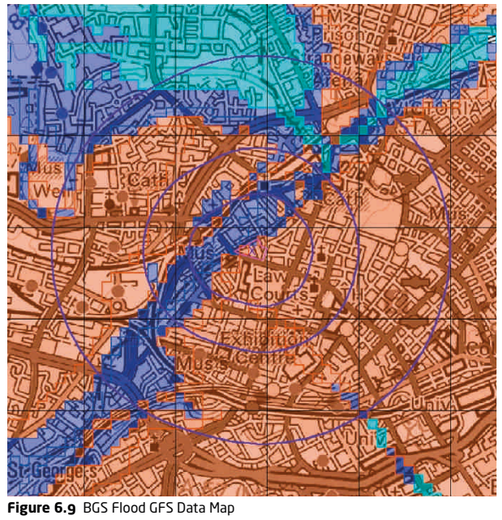
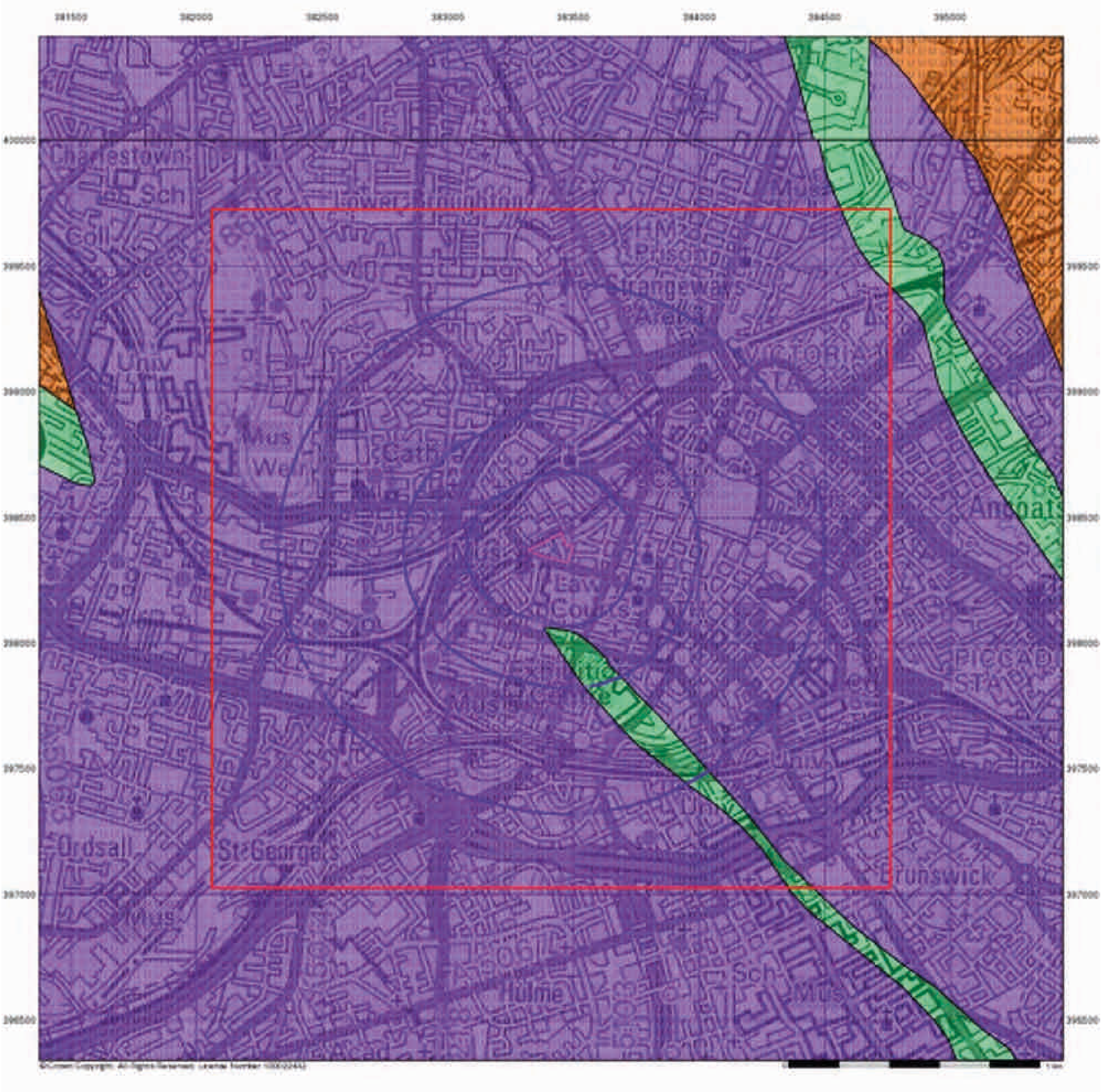


Figure 6.9 BGS Flood GFS Data Map

Appendix 4

Extract from Landmark Envirocheck Report



Water and Hydrology

General

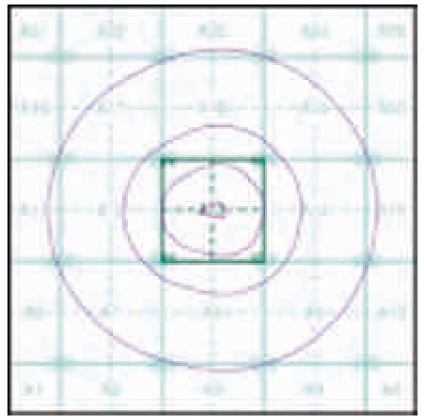
Specified Site — Specified Buffer(s) — X Bearing Reference Point

Slice — Map ID

Groundwater Vulnerability

Geological Classes	Soil Classes
Major Aquifer (Highly Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Minor Aquifer (Variably Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Non Aquifer (Negligibly Permeable)	
Water or Sea	
Drift Deposit	

Groundwater Vulnerability - Slice A



N

Order Details

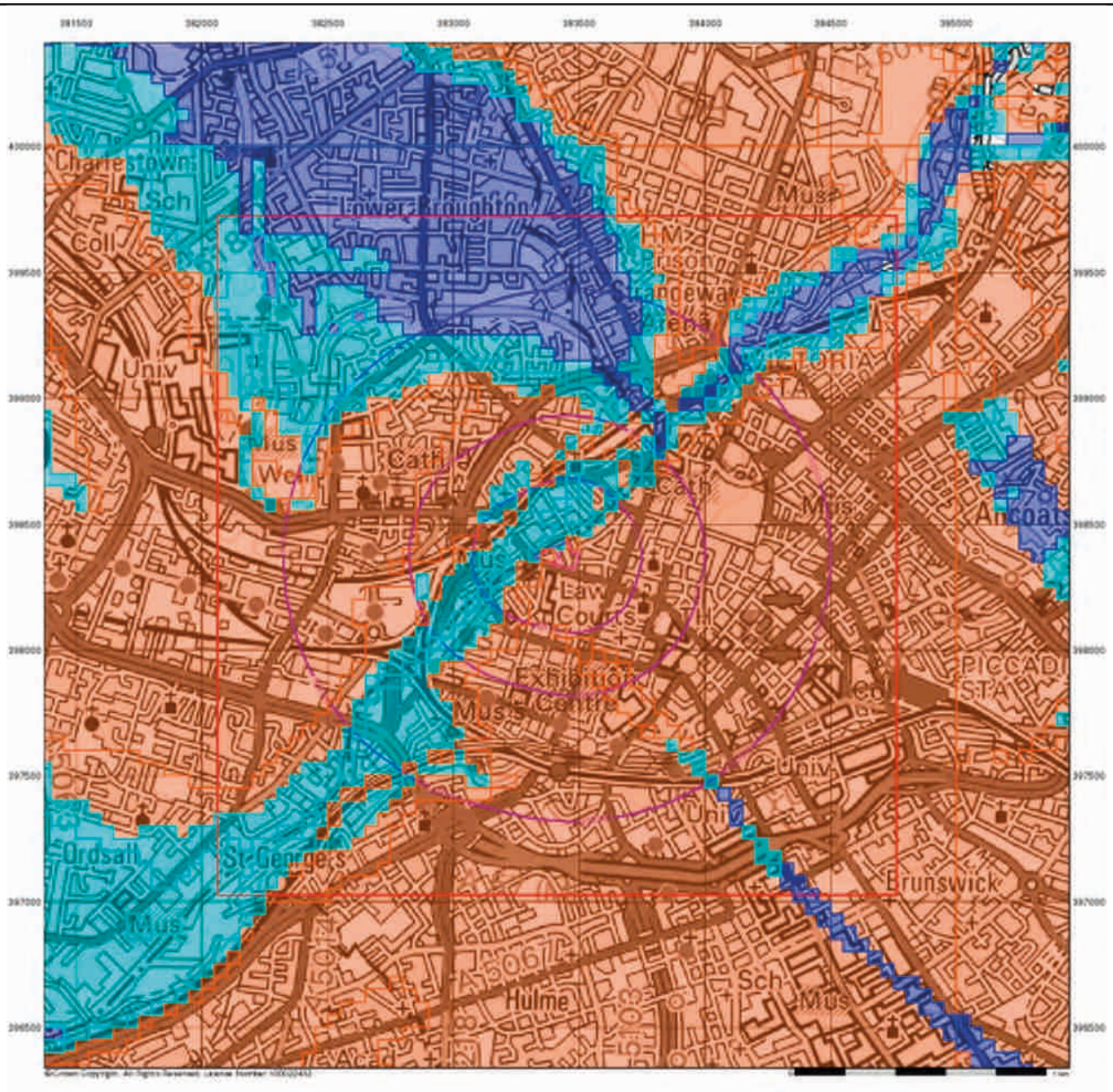
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Site Area (Ha):	1.04
Search Buffer (m):	1000

Site Details

Brother UK Ltd, Bridge House, Bridge Street, AUDENSHAW, M34 5JD

Landmark INFORMATION GROUP

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Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Water and Hydrology

General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

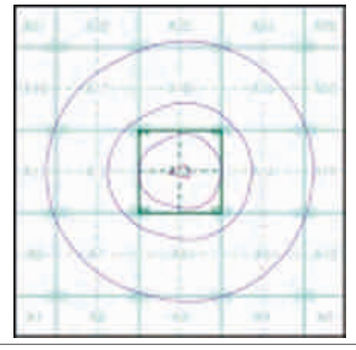
Groundwater Flooding Susceptibility

Potential for Groundwater Flooding to Occur at Surface

Potential for Groundwater Flooding of Property Situated Below Ground Level

Limited Potential for Groundwater Flooding to Occur

Groundwater Flooding Susceptibility - Slice A

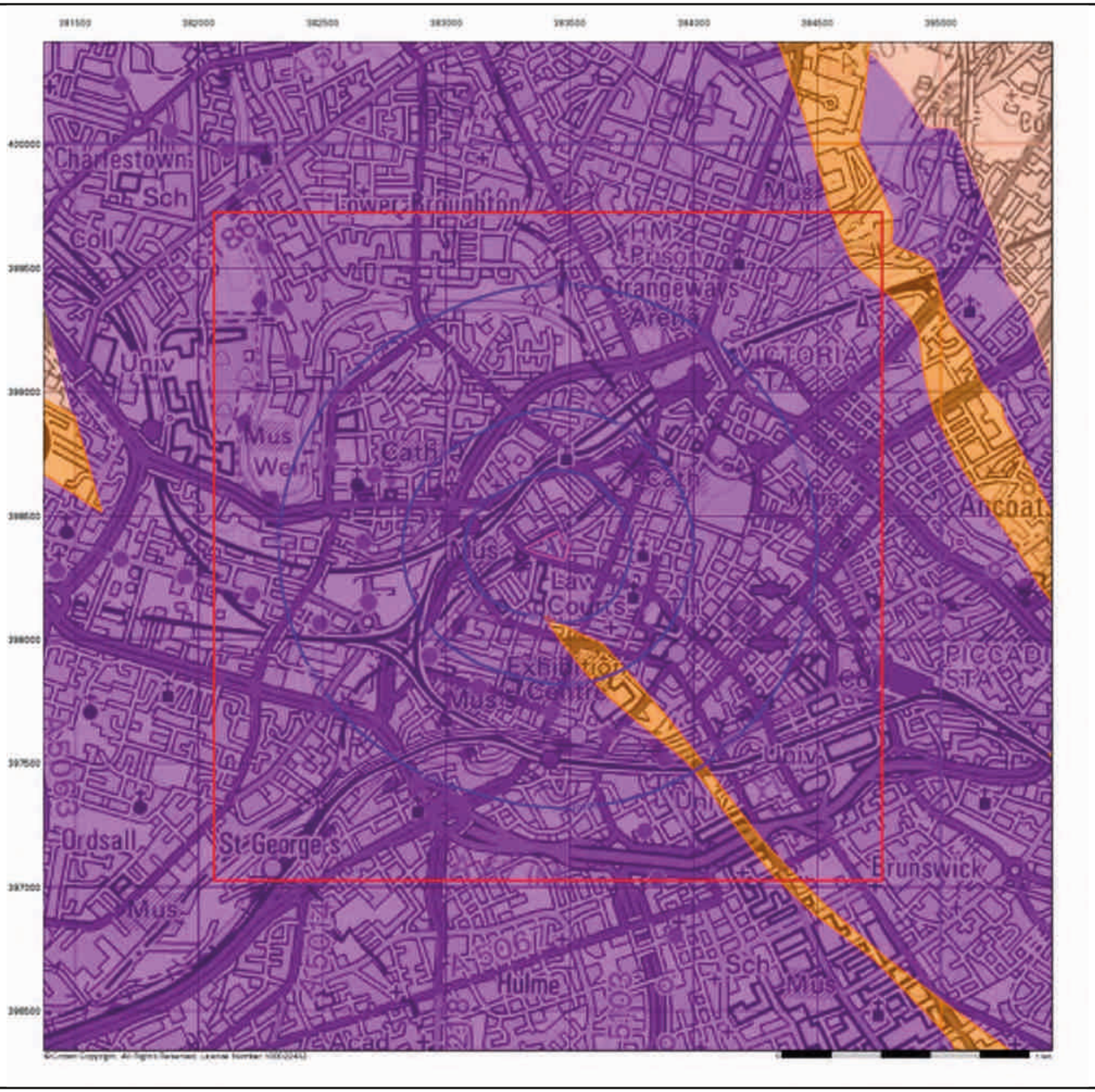


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Site Area (Ha):	1.04
Search Buffer (m):	1000

Site Details

Brother UK Ltd, Bridge House, Bridge Street, AUDENSHAW, M34 5JD



akt II

Water and Hydrology

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

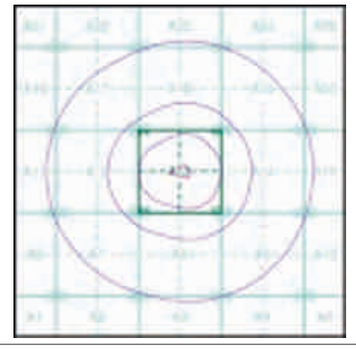
Slice | Map ID

Bedrock Aquifer Designations

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown

Bedrock Aquifer Designations - Slice A



N

Order Details

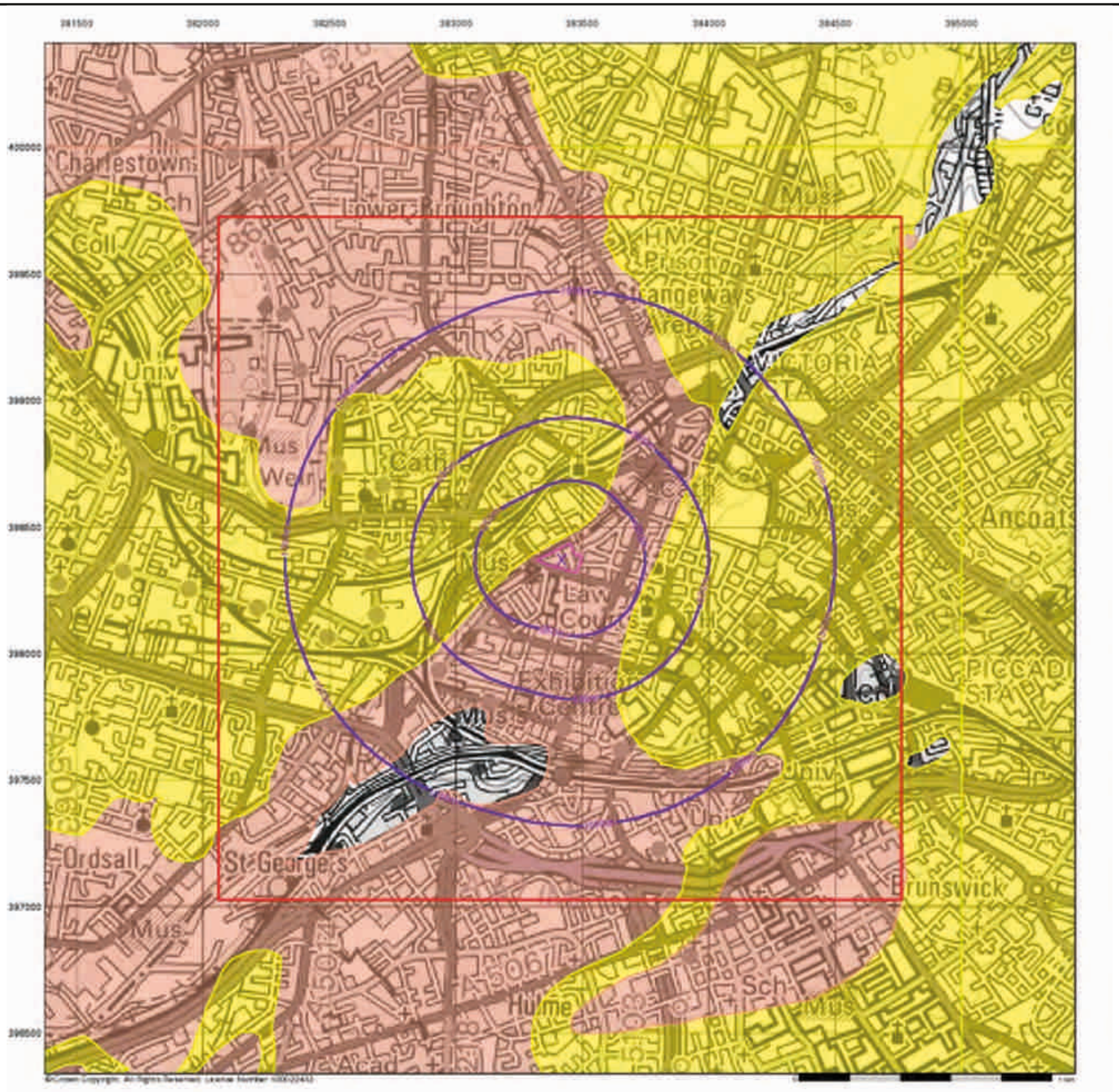
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Search Buffer (m):	1000

Site Details

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akt II

Water and Hydrology

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

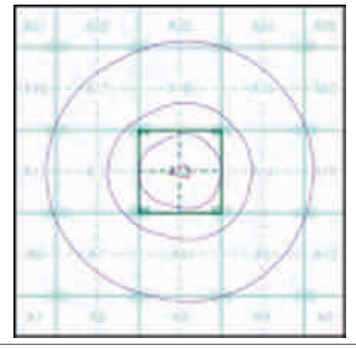
Slice | Map ID

Superficial Aquifer Designations

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown

Superficial Aquifer Designations - Slice A



Order Details

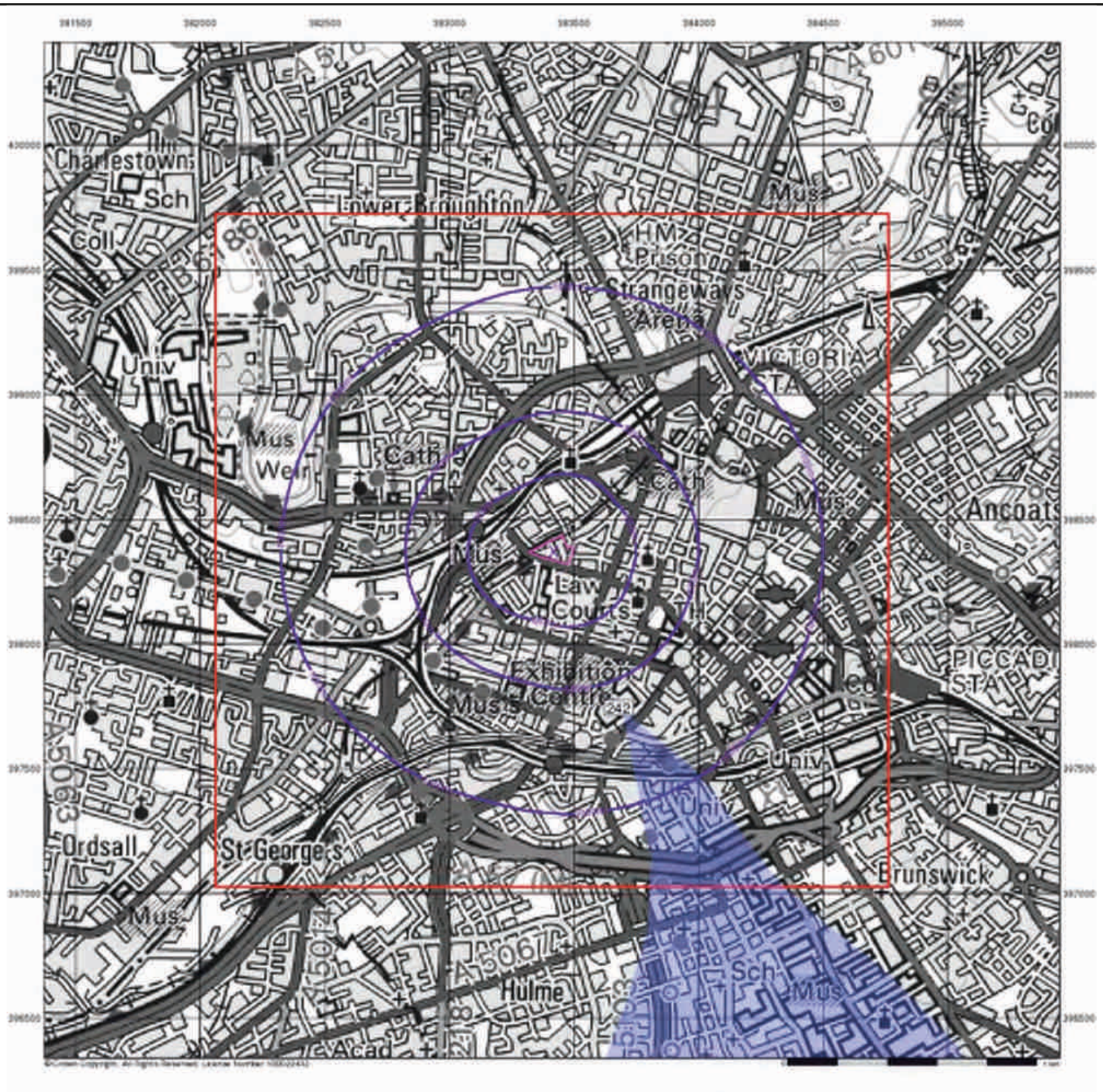
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Water and Hydrology

General

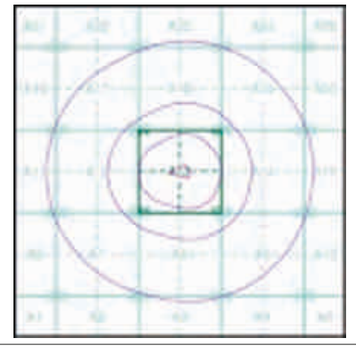
Specified Site | Specified Buffer(s) | Bearing Reference Point

Slice | Map ID

Source Protection Zones

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)

Source Protection Zones - Slice A



N

Order Details

Order Number:	173200128_1_1
Customer Ref:	4387
National Grid Reference:	383420, 398370
Slice:	A
Site Area (Ha):	1.04
Search Buffer (m):	1000

Site Details

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Appendix 5

United Utilities Asset Map

United Utilities

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Overflow
Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

Abandoned Pipe
MainSewer
Rising Main
Highway Drain
Sludge Main

Foul Surface Combined
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined
WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
WW Pumping Station

Foul Surface Combined
Sludge Pumping Station
Sewer Overflow
T Junction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works

Foul Surface Combined Overflow
Screen Chamber
Discharge Point
Outfall
Control Kiosk
Unspecified

Legend

MANHOLE FUNCTION		SEWER SHAPE			
FO	Foul	CI	Circular	TR	Trapezoidal
SW	Surface Water	EG	Egg	AR	Arch
CO	Combined	OV	Oval	BA	Barrel
OV	Overflow	FT	Flat Top	HO	HorseShoe
		RE	Rectangular	UN	Unspecified
		SQ	Square		

SEWER MATERIAL			
AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	VC	Vitrified Clay
CO	Concrete	PP	Polypropylene
CSB	Concrete Segment	PF	Pitched Fibre
CSU	Concrete Segment	MA	Masonry, Coursed
CC	Concrete Box Culverted	MA	Masonry, Random
PSC	Plastic / Steel	RP	Reinforced Plastic
GR	Glass Reinforced	CI	Cast Iron
GRP	Glass Reinforced	SI	Spun Iron
PVC	Polyvinyl Chloride	ST	Steel
PE	Polyethylene	U	Unspecified

CLEAN WATER SYMBOLOGY

PIPE WORK

Live Proposed

Trunk Main - PressurisedMain
Raw Water Aqueduct - PressurisedMain
Raw Water Aqueduct - GravityMain
LDTM Raw Water Distribution - PressurisedMain
LDTM Raw Water Distribution - GravityMain
LDTM Treated Water Distribution - PressurisedMain
LDTM Treated Water Distribution - GravityMain
Private Pipe - LateralLine
Distribution Main - PressurisedMain
Comms Pipe - LateralLine
Concessionary Service - LateralLine

ABANDONED PIPE

Trunk Main
Raw Water Aqueduct
LDTM Raw Water Distribution
LDTM Treated Water Distribution
Private Pipe
Distribution Main
Comms Pipe
Concessionary Service

NODES/FURNITURES

Live Proposed

End Cap
CC Valve
AC Valve
Air Valve
Sluice Valve
Non Return Valve
Pressure Management Valve
Change of Characterstic
Anode
Chlorination Point
De Chlorination Point
Bore Hole
Inlet Point
Bulk Supply Point
Fire Hydrant
Hydrant

Live Proposed

Private Fire Hydrant
Pump
Site Termination
Service Start
Service End
Process Meter
Stop Tap
Monitor Location
Strainer Point
Access Point
Hatch Box
IP Point
Route Marker
Sampling Station
Logger Box

PROPERTY TYPES

Live Proposed

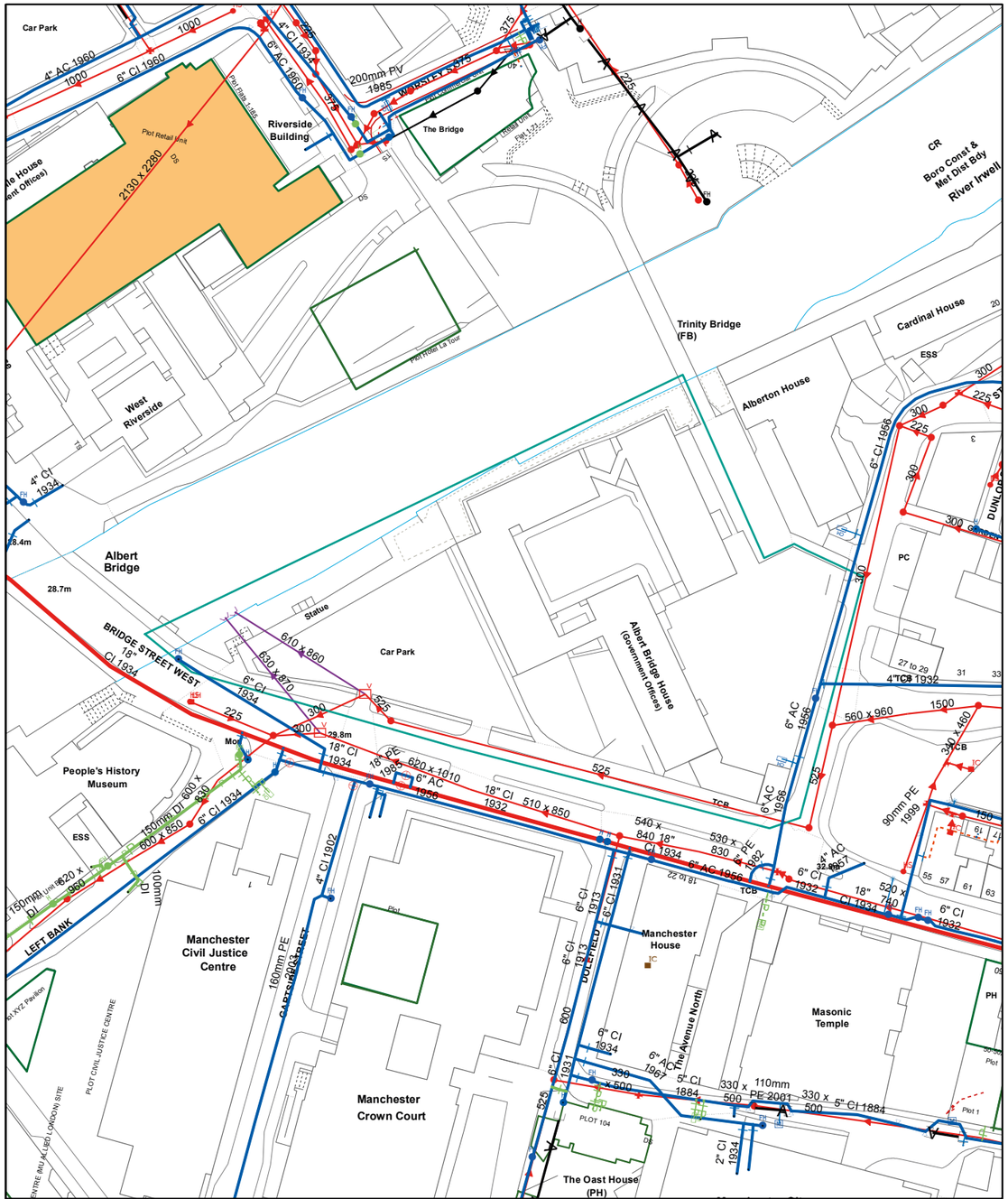
Condition Report
Pipe Bridges
Tunnels (non carrier)
Pumping Station
Water Treatment Works
Private Treatment Works

Live Proposed

Valve House
Water Tower
Service Reservoir
Supply Reservoir
Abstraction Point
Domestic meter
Commercial meter
Telemetry Outstation

Legend

MATERIAL TYPES		LINING TYPES	
AC	ASBESTOS CEMENT	CL	CEMENT LINING
CI	CAST IRON	TB	TAR OR BITUMEN
CU	COPPER	ERL	EPOXY RESIN
CO	CONCRETE		
DI	DUCTILE IRON	INSERTION TYPES	
GI	GALVANISED IRON		
GR	GREY IRON	DD	DIE DRAWN
OT	OTHERS	DR	DIRECTIONAL DRILLING
PB	LEAD	MO	MOLING
PV	uPVC	PI	PIPELINE
SI	SPUN IRON	SL	SLIP LINED
ST	STEEL		
UN	UNKOWN		
PE	POLYETHYLENE		



Date: 24/07/2018 **Extract from maps of public sewers and water mains**

Printed By:
Property Searches

Site off Bridge Street Audenshaw

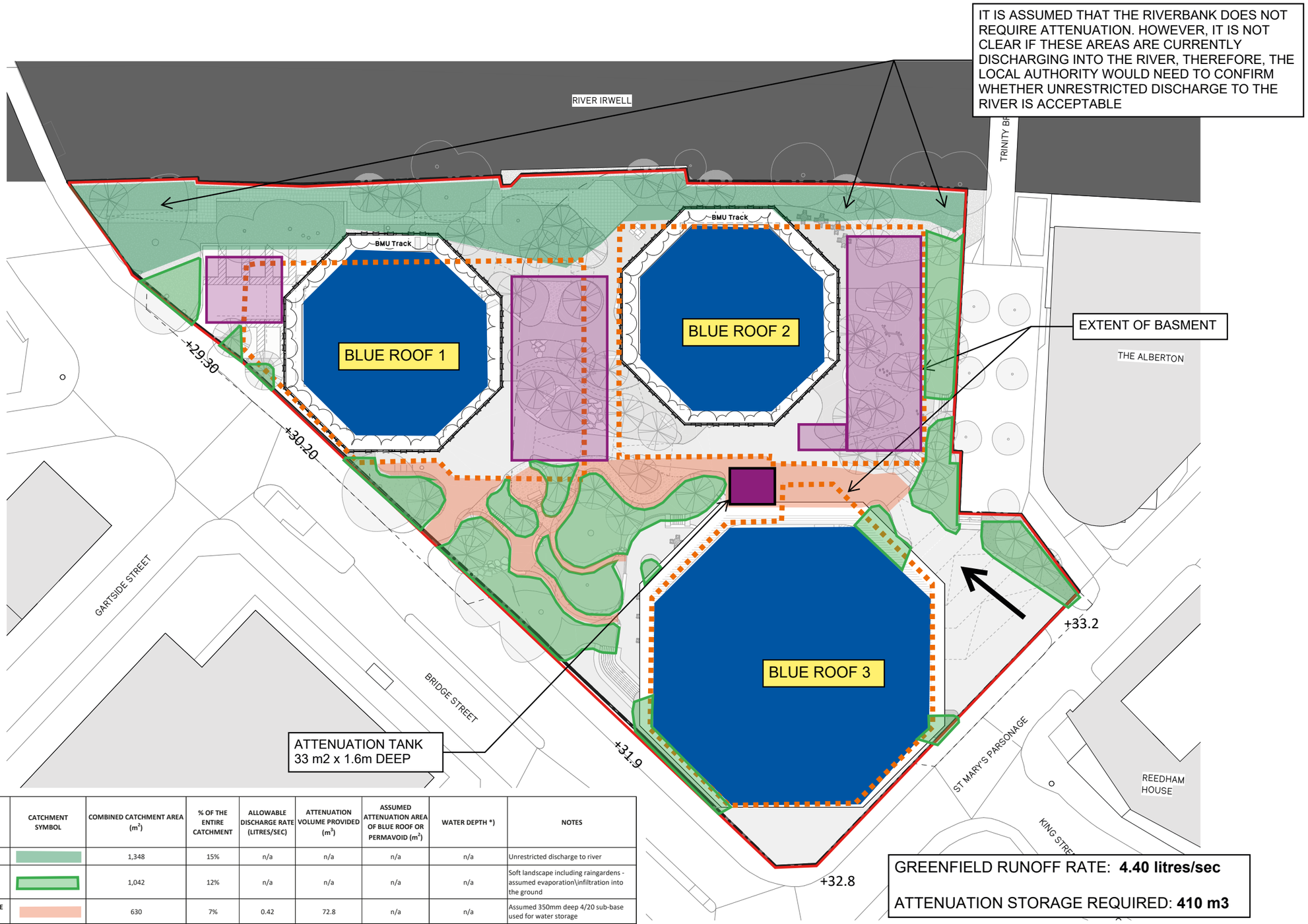
United Utilities helping life flow smoothly

The position of this underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. Private service pipes may be shown where a known record is available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown. Crown copyright and database rights [2016] Ordnance Survey 100022432.

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Appendix 6

SUDS Strategy Options

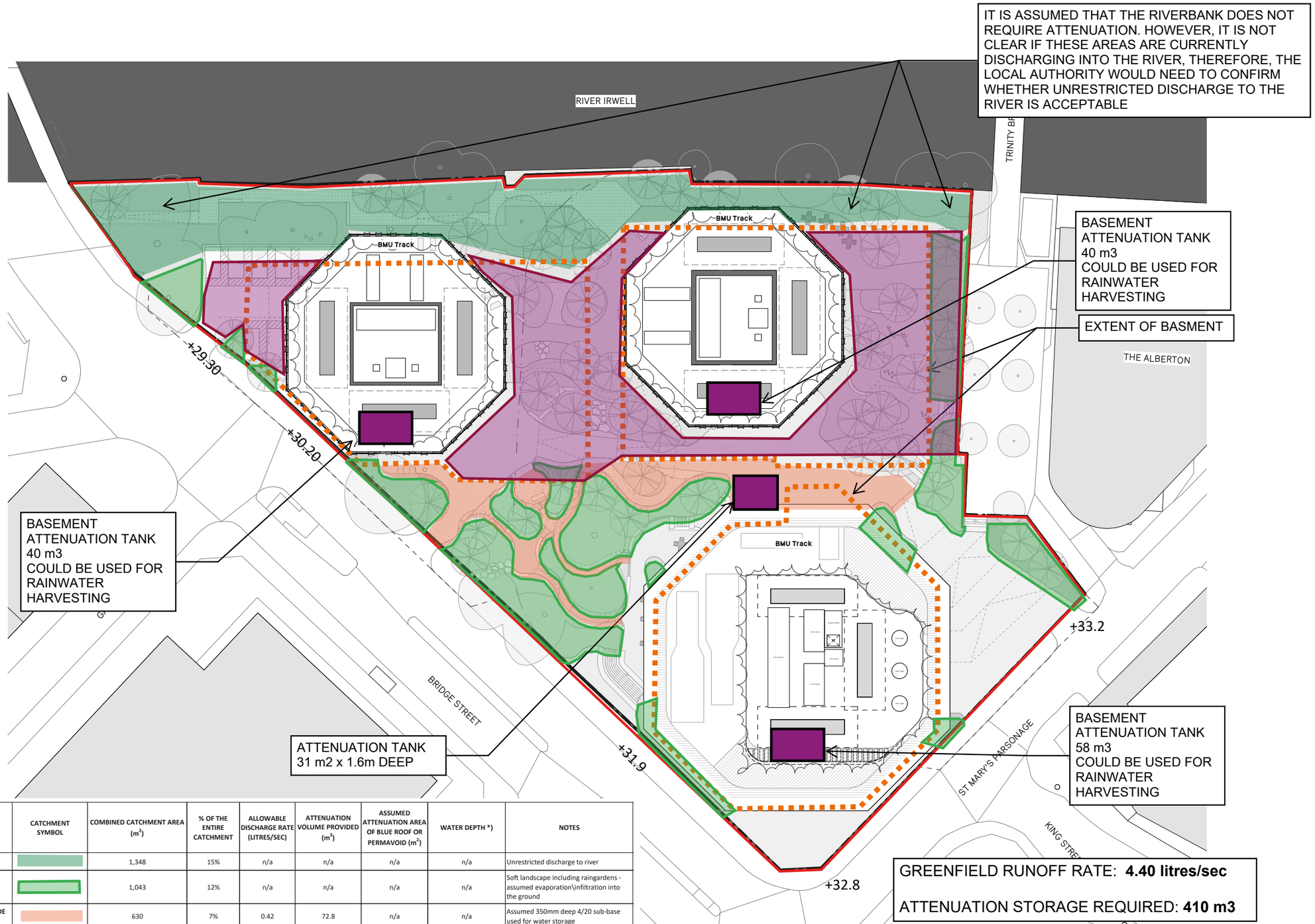


ATTENUATION FEATURE	CATCHMENT SYMBOL	COMBINED CATCHMENT AREA (m^2)	% OF THE ENTIRE CATCHMENT	ALLOWABLE DISCHARGE RATE (LITRES/SEC)	ATTENUATION VOLUME PROVIDED (m^3)	ASSUMED ATTENUATION AREA OF BLUE ROOF OR PERMAVOID (m^2)	WATER DEPTH *)	NOTES
UNRESTRICTED		1,348	15%	n/a	n/a	n/a	n/a	Unrestricted discharge to river
SOFT LANDSCAPING		1,042	12%	n/a	n/a	n/a	n/a	Soft landscape including raingardens - assumed evaporation\infiltration into the ground
PERMEABLE PAVING OUTSIDE BASEMENT BOX		630	7%	0.42	72.8	n/a	n/a	Assumed 350mm deep 4/20 sub-base used for water storage
BLUE ROOF 1		760	9%	0.51	47.7	650	77	Assumed 100mm deep system
BLUE ROOF 2		730	8%	0.49	45.8	630	77	Assumed 100mm deep system
BLUE ROOF 3		1,615	18%	1.09	101.3	1,400	76	Assumed 100mm deep system
PERMAVOID ABOVE BASEMENT BOX		1,560	17%	1.05	97.9	700	147	Assumed 150mm deep Permavoid
ATTENUATION TANKS		1,241	14%	0.84	50.0	N/A	n/a	Could be used for rainwater harvesting
TOTAL		8,926		4.40	415.4			

*) Assumed 95% void ratio

akt II

PROJECT ALBERT BRIDGE HOUSE		TITLE ATTENUATION STRATEGY - BLUE ROOF, EXTERNAL ATTENUATION TANKS AND PERMAVOID	
DATE 25/04/2025	SCALE N.T.S.	CAD FILENAME -	STATUS FOR DISCUSSION
DRAWN SZ	CHECKED DN	PROJECT No. 5222	DRAWING No. 5222-CSK05	REV P6



ATTENUATION FEATURE	CATCHMENT SYMBOL	COMBINED CATCHMENT AREA (m^2)	% OF THE ENTIRE CATCHMENT	ALLOWABLE DISCHARGE RATE (LITRES/SEC)	ATTENUATION VOLUME PROVIDED (m^3)	ASSUMED ATTENUATION AREA OF BLUE ROOF OR PERMAVOID (m^2)	WATER DEPTH *)	NOTES
UNRESTRICTED		1,348	15%	n/a	n/a	n/a	n/a	Unrestricted discharge to river
SOFT LANDSCAPING		1,043	12%	n/a	n/a	n/a	n/a	Soft landscape including raingardens - assumed evaporation\infiltration into the ground
PERMEABLE PAVING OUTSIDE BASEMENT BOX		630	7%	0.42	72.8	n/a	n/a	Assumed 350mm deep 4/20 sub-base used for water storage
PERMAVOID ABOVE BASEMENT BOX		2,500	28%	1.68	156.8	1,350	122	Assumed 150mm deep Permavoid
ATTENUATION TANKS		3,405	38%	2.29	185.0	N/A	n/a	Could be used for rainwater harvesting
TOTAL		**8,926**		**4.40**	**414.6**			

*) Assumed 95% void ratio

akt II

PROJECT	ALBERT BRIDGE HOUSE	TITLE	ATTENUATION STRATEGY - EXTERNAL ATTENUATION TANKS AND PERMAVOID (NO BLUE ROOFS)
DATE	25/04/2025	SCALE	N.T.S.
CAD FILENAME	-	STATUS	FOR DISCUSSION
DRAWN	SZ	CHECKED	DN
PROJECT No.	5222	DRAWING No.	5222-CSK14
REV	P3		

Appendix 7

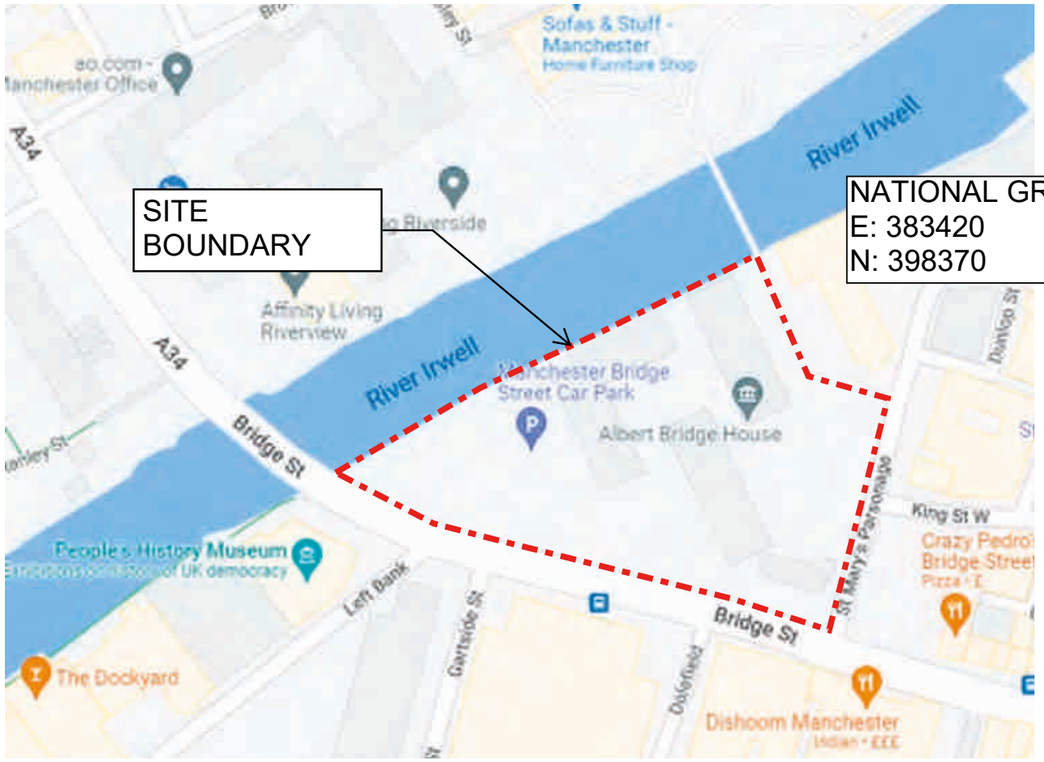
EA Flood Risk Assessment data

Flood risk assessment data

Environment Agency

Location of site: 383415/398372 (shown as easting and northing coordinates) **Document created on:** 13 June 2022
This information was previously known as a product 4. Customer reference number: GMMC266479AB/JUF627FX6AUK

Map showing the location that flood risk assessment data has been requested for.



How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

We recommend that you work with a flood risk consultant to get your flood risk assessment.

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- modelled data
- climate change modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Information that's unavailable

This document **does not** contain:

- flood defences and
- attributes

We aren't able to display flood defence locations and attributes as there are no formal flood defences in the area of interest.

Surface water and other sources of flooding

Use the long term flood risk service to find out about the risk of flooding from:

- surface water
- ordinary watercourses
- reservoirs

For information about sewer flooding, contact the relevant water company for the area.

About the models used

Model name: Manchester Ship Canal 2016
Scenario(s): No defences exist fluvial, no defences exist climate change fluvial
Date: 1 May 2020
These models contain the most relevant data for your area of interest.

Terminology used

Annual exceedance probability (AEP) This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1%chance of occuring in any one year, is described as 1% AEP.

Metres above ordnance datum (mAOD) All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

Flood map for planning (rivers and the sea) Your development is in flood zone 1.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

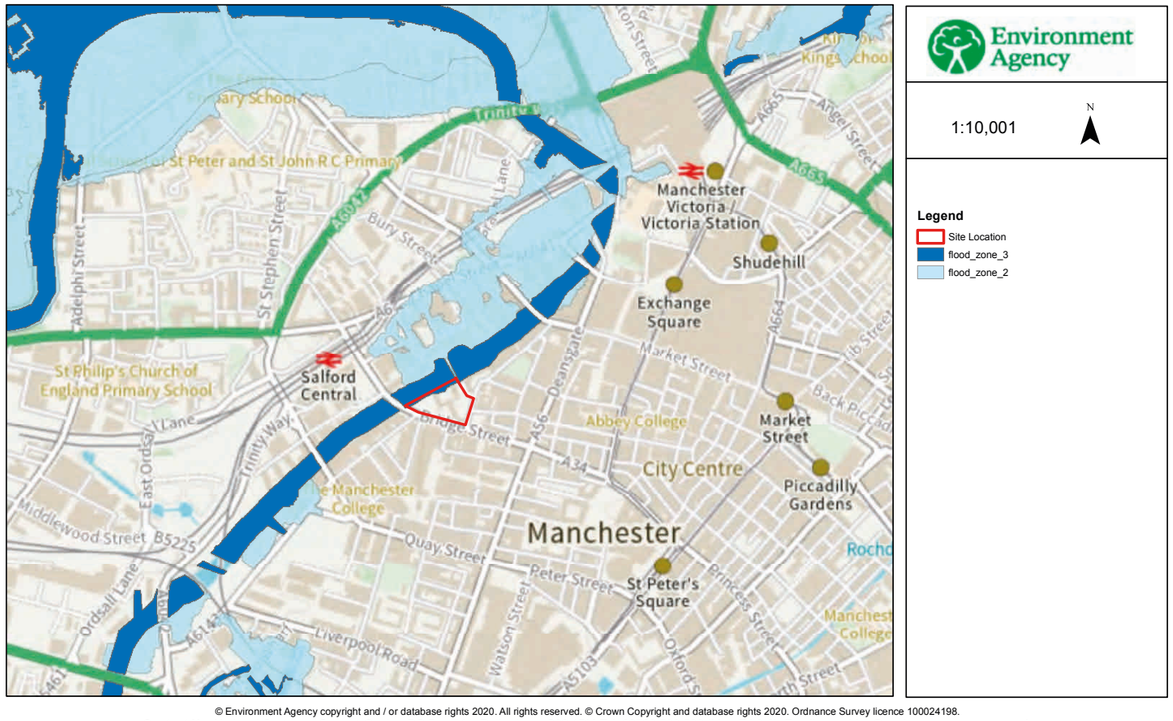
- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change

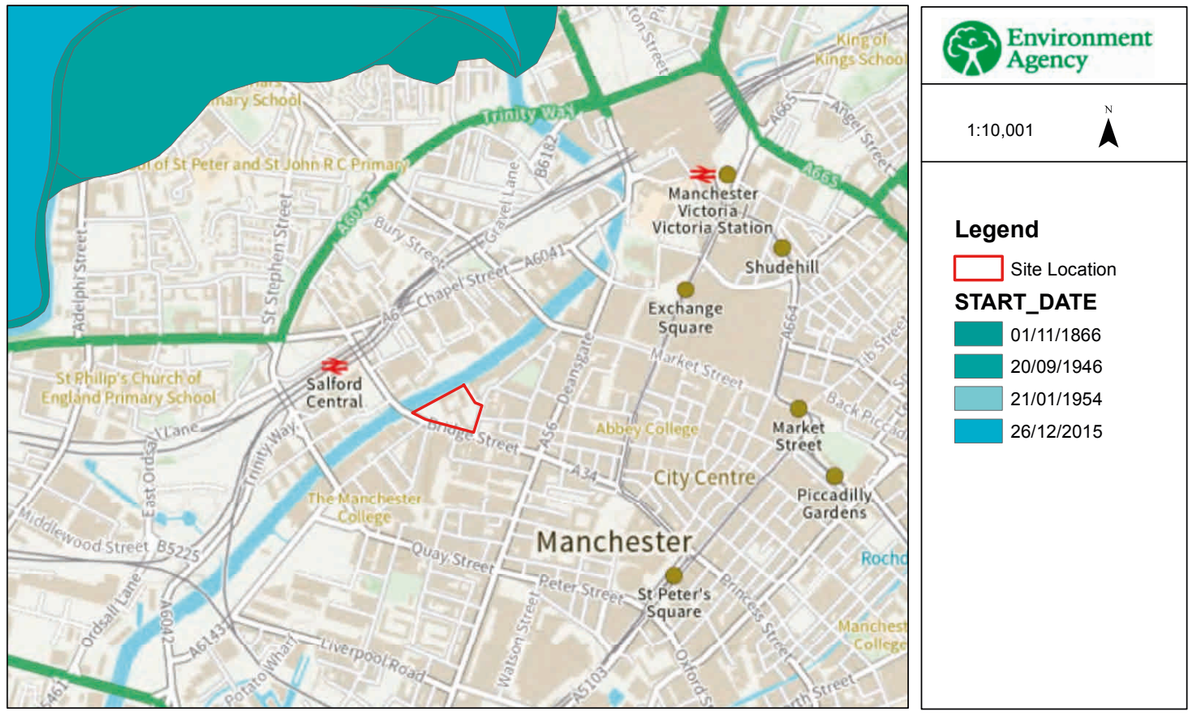
This data is updated on a quarterly basis as better data becomes available.

Detailed flood map - centred on Albert bridge house, Bridge Street, Manchester.
Created on 13/06/2022 [GMMC266479AB]



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Recorded Flood outline map - centred on Albert bridge house, Bridge Street, Manchester.
Created on 13/06/2022 [GMMC266479AB]



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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Modelled data

This section provides details of different scenarios we have modelled and includes the following (where available):

- outline maps showing the area at risk from flooding in different modelled scenarios
- modelled node point map(s) showing the points used to get the data to model the scenarios and table(s) providing details of the flood risk for different return periods
- map(s) showing the approximate water levels for the return period with the largest flood extent for a scenario and table(s) of sample points providing details of the flood risk for different return periods

Climate change

The climate change data included in the models may not include the latest flood risk assessment climate change allowances. Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

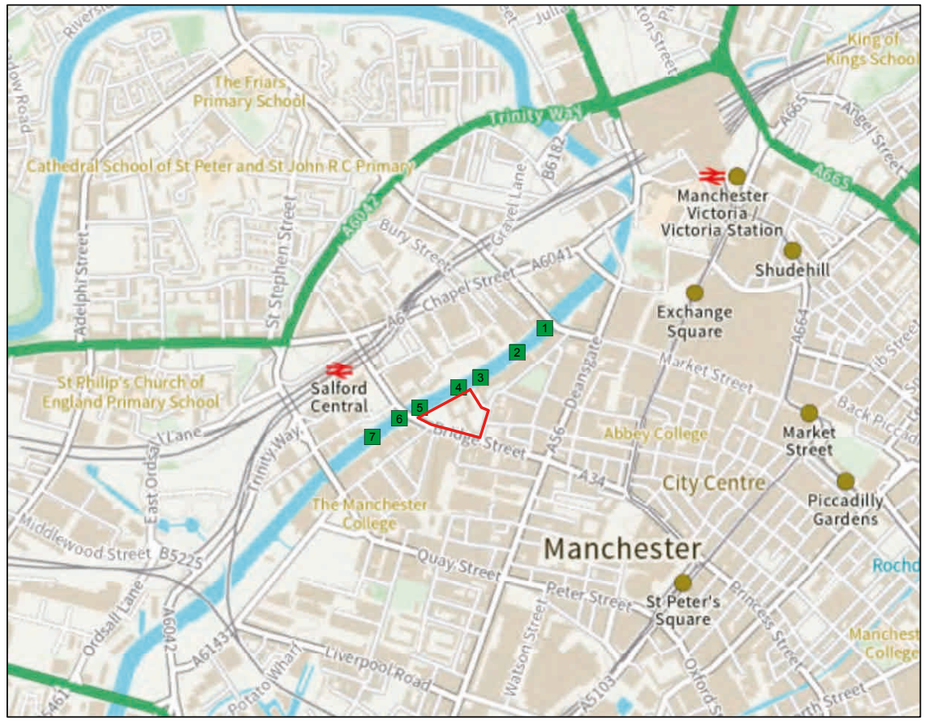
The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

Modelled scenarios

The following scenarios are included:

- No defences exist modelled fluvial: risk of flooding from rivers where there are no flood defences
- No defences exist climate change modelled fluvial: risk of flooding from rivers where there are no flood defences, including estimated impact of climate change

Model measurement map - centred on Albert bridge house, Bridge Street, Manchester.
Created on 13/06/2022 [GMMC266479AB]



Environment Agency

1:10,001

N

Legend

- Site Location
- Model Measurements

13th June 2022

Model measurmnets from Manchester Ship Canal 2018

GMMC266479AB /JUF627FX6AUK

Map reference	Model Node Reference	Easting	Northing	Data	Normal Operation (All gates open)											All Latchford Gates closed		Latchford Gate 3 closed
					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 flow	1 % AEP (1 in 100 year) + 35% Increase flow	1 % AEP (1 in 100 year) + 70% Increase flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	1 % AEP (1 in 100 year)	0.1 % AEP (1 in 1000 year)	1 % AEP (1 in 100 year)
1	ea013_0251_IRWI251_1706	700014	1177876	Modelled Water Level (m aodN)	25.89	24.19	24.61	24.85	24.99	25.19	25.70	25.87	26.08	25.58	27.27	25.19	27.52	25.19
				Modelled Flow (cumecs)	445.09	445.09	445.04	444.99	466.27	495.41	573.03	588.76	742.02	552.66	760.91	573.24	758.58	573.18
2	ea013_0251_IRWI251_1653	699576	1177437	Modelled Water Level (m aodN)	24.47	24.47	24.48	24.71	24.85	25.05	25.55	25.66	26.80	25.43	27.11	25.05	27.16	25.05
				Modelled Flow (cumecs)	445.09	445.09	445.04	445.04	466.32	495.47	573.09	588.83	742.87	552.66	762.89	573.29	760.35	573.24
3	ea013_0251_IRWI251_1515	699661	1177523	Modelled Water Level (m aodN)	24.47	24.47	24.47	24.72	24.87	25.08	25.62	25.73	26.95	25.49	27.25	25.08	27.30	25.08
				Modelled Flow (cumecs)	445.09	445.09	445.04	445.09	466.39	495.53	573.16	588.91	736.51	552.74	758.14	573.29	754.44	573.24
4	ea013_0251_IRWI251_1511	699822	1177784	Modelled Water Level (m aodN)	24.47	24.47	24.47	24.72	24.87	25.08	25.62	25.73	26.94	25.49	27.24	25.08	27.29	25.08
				Modelled Flow (cumecs)	445.09	445.09	445.04	445.09	466.39	495.53	573.16	588.91	736.51	552.74	758.14	573.29	754.44	573.24
5	ea013_0251_IRWI251_1361	699890	1177555	Modelled Water Level (m aodN)	24.47	24.47	24.45	24.69	24.84	25.03	25.55	25.65	26.81	25.42	27.10	25.03	27.14	25.03
				Modelled Flow (cumecs)	445.09	445.09	445.04	445.16	466.46	495.60	573.24	588.99	744.53	552.84	773.13	573.29	770.10	573.24
6	ea013_0251_IRWI251_1342	699734	1177651	Modelled Water Level (m aodN)	24.47	24.47	24.37	24.59	24.72	24.90	25.35	25.44	26.42	25.42	26.85	24.90	26.89	24.90
				Modelled Flow (cumecs)	445.09	445.09	445.04	445.16	466.46	495.60	573.24	588.99	744.53	552.84	773.13	573.29	770.10	573.24
7	ea013_0251_IRWI251_1254	699739	1177791	Modelled Water Level (m aodN)	24.47	24.47	24.17	24.39	24.52	24.69	25.13	25.22	26.20	25.03	26.46	24.69	26.49	24.69
				Modelled Flow (cumecs)	445.09	445.09	445.04	445.21	466.51	495.65	573.29	589.05	744.54	552.91	773.25	573.29	770.19	573.24

Model data taken from Manchester Ship Canal 2016

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Notes:

*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.

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

1. Model run is representative of present conditions and all gates are operational as per the agreed automated protocol. Maximum gate opening height is set to 2.4m. This run is the same as used in the flood map products.
2. Model run is representative of all three Latchford Gates closed - removal of operational rules at all three sluice gates at Latchford Locks
3. Model run is representative of a single Latchford Gate closed - failure of single operational sluice gate at Latchford Locks fixed closed

Recorded Flood Outlines

Flood Event Code	Name	Start Date	End Date	Source of Flooding	Cause of Flooding
01313FEG01111	IRWE	01/11/1866	02/11/1866	main river	channel capacity exceeded (no raised defences
01313FEG01110	IRWE	20/09/1946	21/09/1946	main river	channel capacity exceeded (no raised defences
01313FEG01109	IRWE	21/01/1954	21/01/1954	main river	channel capacity exceeded (no raised defences
	Lower Broughton	26/12/2015	26/12/2015	main river	overtopping of defences

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Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment
(SFRA) as part of your work to prepare a site specific flood risk assessment.
This should give you information about:
the potential impacts of climate change in this catchment
areas defined as functional floodplain
flooding from other sources, such as surface water, ground water and reservoirs

About this data

This data has been generated by strategic scale flood models and is not intended for use at
the individual property scale. If you're intending to use this data as part of a flood risk
assessment, please include an appropriate modelling tolerance as part of your assessment.
The Environment Agency regularly updates its modelling. We recommend that you check the
data provided is the most recent, before submitting your flood risk assessment.

Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some
developments may require an environmental permit for flood risk activities from the
Environment Agency. This includes any permanent or temporary works that are in, over,
under, or nearby a designated main river or flood defence structure.
Find out more about flood risk activity permits

Help and advice

Contact the Greater Manchester Merseyside and Cheshire Environment Agency team at
inforequests.gmmc@environment-agency.gov.uk for:
more information about getting a product 5, 6, 7 or 8
general help and advice about the site you're requesting data for