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Flood Risk Assessment

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1. Introduction

1.1 Scope and Objectives

Civic Engineers Ltd has been appointed by Manchester City Council (MCC) to prepare a Flood Risk Assessment to support a full planning application for the redevelopment of Ancoats Green, Prussia Walkway, Jersey Green and public realm land off Jersey Street, Ancoats, Manchester.

The Flood Risk Assessment presented herein will demonstrate that the proposed development will be safe from flooding and will not pose a flood risk to sites elsewhere.

This Flood Risk Assessment will:

- Investigate all potential risks of flooding to the site.
- Consider the impact the development may have elsewhere with regards to flooding.
- Consider proposals to mitigate any potential risk of flooding determined to be present; and,
- Consider drainage proposals to mitigate flood risk from the site.

This report reviews the following information:

- Environment Agency Online Flood mapping.
- UK Government Long Term Flood Risk Information for surface water flooding and reservoir flooding.
- United Utilities Asset Location Search Sewer Map.
- Phase 1 Desk top study prepared by E3P
- Preliminary results from Phase 2 Ground Investigation undertaken by E3P.

1.2 Development Proposals

The proposed park re-development within the Ancoats Green park area offers a re-developed green space creating a multifunctional green heart to the neighbourhood which fosters a sense of community. The park provides an area with the potential to incorporate rainwater attenuation and SuDS such as rain gardens.

Due to the Jersey Green's current popularity with the community, the intention is to maintain its current layout with minimal yet impactful interventions to the green. The design proposal is to improve footpaths, additional seating opportunities, improve connection across the Rochdale canal and New Islington and Miles Platting and wildflower lawn. There will be no official drainage proposal within this area and cut and fill.

Similarly, Prussia Walkway will contain little cut and fill but to the north of the site it will contain a rain garden which will form part of the drainage system for Ancoats Green.

The Ancoats Green site covers an area of 1.08ha.

Prussia Walkway and Jersey Green sites cover an area of 0.20ha and 0.54ha respectively.

The proposed site plan is included in Appendix A.

2. Existing Site Details

2.1 Location

The proposed development sites Ancoats Green and Prussia Walkway are located in Ancoats, Manchester and lie approximately 0.5km to the northeast of Manchester City Centre. The site is bounded by Portugal Street to the north, Wadeford Close to the east, Jersey Street to the south and industrial buildings to the west.

The proposed development site Jersey Green is located further south of the other two sites with Jersey Street to the northeast and the Rochdale Canal bordering the south of the site.

Ancoats Green site area is approximately 1.08ha. The OS Grid Coordinates at the approximate centre of the site are 385220, 398947 and the nearest postcode is M4 6BZ. The site location and extents are shown in Figure 1 below. Prussia Walkway is approximately 0.20ha and the OS Grid Coordinated at the approximate centre of the site are 385258, 398838. Jersey Green is approximately 0.54ha and the OS Grid Coordinated at the approximate centre of the site are 385368, 398825.



Figure 1: Site location plan

2.2 Current and Historic Use

The Ancoats Green and Jersey Green were and are currently used as a greenspace/park area within Ancoats. Most of the existing site is soft landscaping comprising mainly grassed areas and trees of varying maturity. Hard standing areas in the site are the park public footpaths. The scheme

will include the demolition of a redundant, infilled former canal arm bridge on Jersey Street to create level access to the Prussia Walkway which links Jersey Street to Ancoats Green and to the Rochdale canal.

Prussia Walkway is currently hardstanding car park area with soft landscaping to the north of the site.

2.3 Existing Watercourses and Waterbodies.

The nearest waterbodies to the sites are the Rochdale Canal and the River Medlock. The Rochdale Canal lining the Jersey Green site to the south and the River Medlock being 856m south east of the Ancoats Green.

2.4 Existing Drainage

Plans provided by United Utilities (UU) which show the sewer network in the vicinity of the site are included in Appendix B of this report.

The records indicate the following public sewer infrastructure in the vicinity of the site:

- A 450mm x 675mm combined water sewer is located running below Wadeford Close and down into Jersey Street. The combined sewer also continues down to the south of Wadeford Close and where it sits on the west side of the Jersey Green site.
- A 450mm x 675mm combined water sewer is located running below Wadeford Close and along into Portugal Street to the north of the Ancoats Green site.
- A combined water sewer is located running along Jersey Street and runs west along the length of Jersey Street to the east of the Jersey Green site.
- The existing drainage in the park is absorption through the soft landscaping but there are several existing gullies surrounding the park. There are 3 no. existing gullies on Portugal Street which sits at the north edge of the park. 2no existing gullies are positioned on the south of the site at Wadeford Close. To the south of the Ancoats Green on Jersey Street and Mozart Close there are 3no. existing gullies.

2.5 Topography

A topographical survey was undertaken by Malcolm Hughes Chartered Surveyors in February 2022 and is contained in Appendix C of this report. The survey shows the Ancoats Green site is relatively level, varying from 50.2m in the southwest to 52.5m in the northwest of the site. The survey shows the Jersey Green site is also relatively level, varying from 51.3m in the northwest to 49.6m in the southwest of the site. Prussia Walkway levels range within 50.0m – 51.0m.

2.6 Geology

Intrusive site investigations were carried out by E3P on the week commencing 12th December 2022. The results report is found in Appendix D.

During the investigation made Ground was encountered within all exploratory hole locations from ground level to a maximum depth of 3.80 m bgl. The Made Ground was shallowest on the eastern boundary and became deeper to the west.

Made Ground encountered along the western boundary in association with the former infilled canal comprised of reworked topsoil overlying interlayered gravelly sands and reworked gravelly clay. Made Ground comprised a grey gravel was encountered overlying gravels and reworked gravelly clay. Gravels of sandstone, mudstone, slate, brick, and concrete were encountered as well as fragments of glass, ceramic, tar, ash, and clinker were also encountered throughout the Made Ground. Hydrocarbon odours and sheens were encountered between 0.50 – 3.70 m bgl in WS101 to WS104. The rest of the site (central and eastern section) encountered shallower Made Ground and generally comprised a reworked topsoil overlying a sandy gravel followed by a reworked gravelly clay. Gravels of sandstone, mudstone, limestone, brick and concrete were encountered as well as fragments of glass, ceramic, metal, timber, and plastic throughout this layer. A slight sheen was encountered within perched water in TP104. No other odours were encountered.

3. Relevant Policy and Guidance

3.1 National Planning Policy Framework

In July 2021, the Ministry of Housing, Communities and Local Government revised the National Planning Policy Framework document (NPPF) and the Planning Practice Guidance which provides guidance on how flood risk should be assessed during the planning and development process.

The NPPF refers to the Flood Zones which are shown on the Environment Agency Flood Map, and establishes the range of uses which are appropriate, or compatible, land uses for each Flood Zone.

The Flood Zones can be summarised as follows:

Zone 1: Low Probability. This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any one year. (<0.1%)

Zone 2: Medium Probability. This zone comprises land assessed as having between 1 in 100 and 1 in 1000 annual probability of river flooding (1%-0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

Zone 3a: High Probability. This zone comprises land assessed as having 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Zone 3b: Functional Flood Plain. This zone comprises land where water must flow or be stored in times of flood. Strategic Flood Risk Assessments should identify this zone.

Annex 3 of the National Planning Policy Framework (NPPF) 2021 defines the type and nature of different development classifications in the context of their flood risk vulnerability. The following extract below outlines the NPPF Flood Risk Vulnerability Classifications.

HIGHLY VULNERABLE

- Police and ambulance stations; fire stations and command centres; 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, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; 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.
- Car parks.

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 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.

The flood risk vulnerability and flood zone 'compatibility' has been summarised in Table 1 below. The EA presents a set of recommendations based on the level of vulnerability of a proposed structure and its Flood Zone.

Table 1: Flood Risk vulnerability and Flood Zone compatibility from NPPF Technical Guide

Flood Risk Vulnerability Classification		Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
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	×	×	×	✓
		✓ Development is appropriate × Development should not be permitted.				

3.2 Site Specific NPPF Flood Risk Categorisation

To assess the NPPF flood risk classification for the site, the Government web based 'Flood Map for Planning' is reviewed, the flood map identifies the probability of flooding from rivers or sea (not taking into account the presence of flood defences). The Government web based 'Long Term Flood Risk Assessment for Locations in England' was also used to identify the flood risks from rivers and seas, surface water and reservoirs. The Flood Map for Planning and surrounding areas is shown as figure 3 in section 4.4.

3.3 Site Specific Flood Zone Compatibility

The proposal for the development is park area which is classed as water compatible in the Flood Risk Vulnerability Classification (Table 1). From the River and Sea Flooding Map (Figure 2), it is clear to see the site sits within flood zone 1 which is compatible with the proposed development.

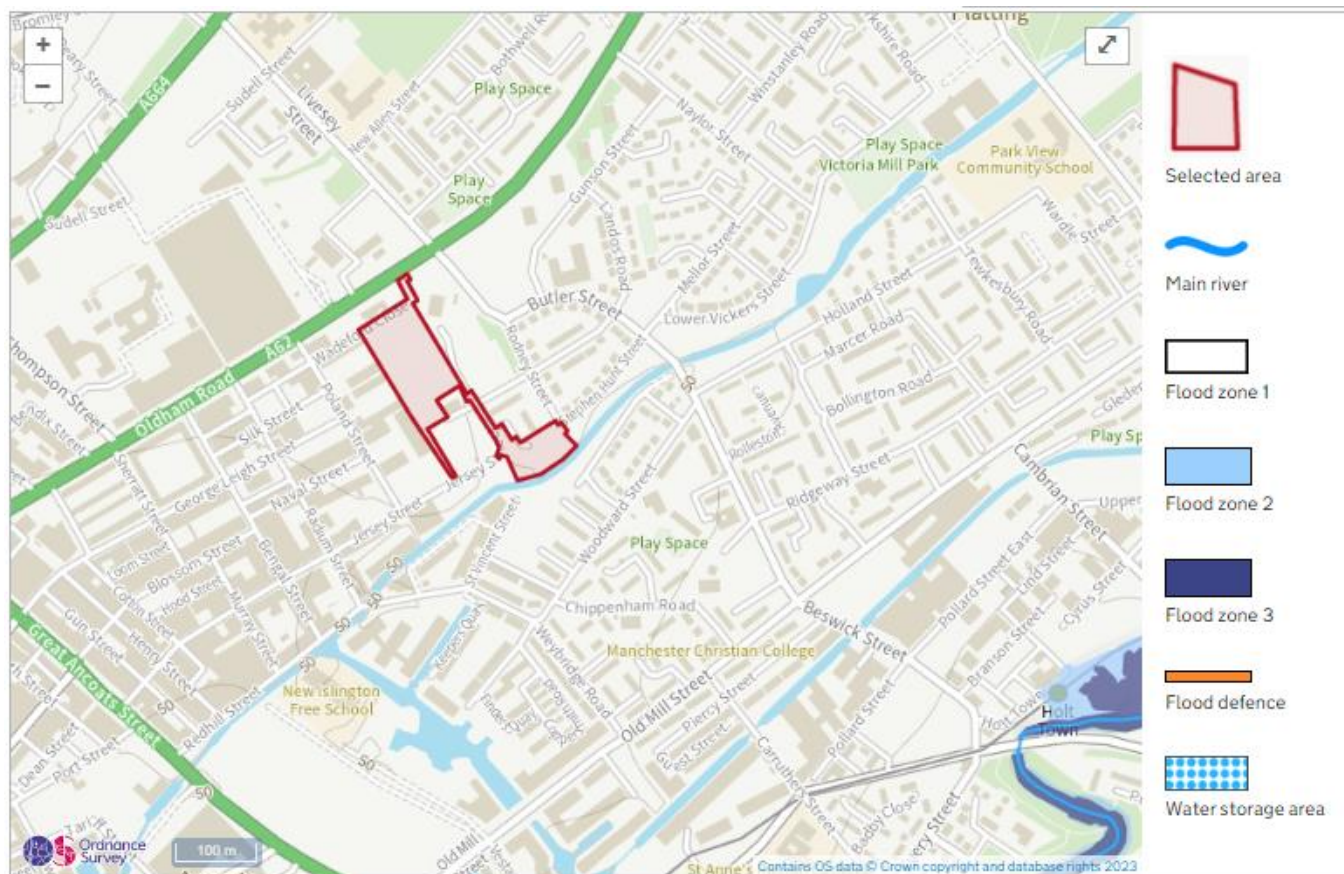


Figure 2 – Rivers and Seas Flood Map

3.4 Manchester City Council Strategic Flood Risk Assessment (SFRA) and Manchester Core Strategy 2012

Manchester City Council SFRA states:

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

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

Policy EN 14 (Flood Risk) of the Manchester Core Strategy requires that:

- In line with the risk-based sequential approach contained within PPS25, development should be directed away from sites at the greatest risk of flooding, and towards sites with little or no risk of flooding; this should take account all sources of flooding identified in the Manchester-Salford-Trafford Strategic Flood Risk Assessment (SFRA).
- In addition to the requirements for site-specific Flood Risk Assessments (FRAs) set out in PPS25, an appropriate FRA will also be required for all development proposals, including changes of use, on sites greater than 0.5ha within Critical Drainage Areas (CDAs) and Canal Hazard Zones identified in the SFRA.
- All new development 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 CDAs, evidence to justify the surface water run-off approach / rates will be required.
 - The City of Manchester contains many sections of rivers which are culverted or 'hidden'. Where these are indicated in the SFRA beneath the proposed development site, further investigation will be required and the development proposal should take this into account; where feasible and appropriate development should seek to open up culverted/hidden rivers to reduce the associated flood risk and danger of collapse, taking advantage of opportunities to enhance biodiversity and Green Infrastructure.

4. Flood Risk Assessment

The potential sources of flooding to the development have been assessed and are discussed below.

4.1 Tidal/ Fluvial Flooding (Rivers and Sea)

From the Government flood map for planning:

- Where a site is located in a dark blue shaded zone, this indicates that the site is within Flood Zone 3 where there is a chance of flooding of 1 in 100 (1%) or greater.
- Where a site is located in a light blue shaded zone; this indicates that the site is within Flood Zone 2 where there is a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%).
- Where a site is located in a white (unshaded) area, it is generally deemed to be classified as Flood Zone 1 where there is a chance of flooding of less than 1 in 1000 (0.1%).

From the 'Flood Map for Planning', shown below in Figure 2, it can be seen that the proposed sites and the surrounding area are entirely located within an area classified as Flood Zone 1 (low risk of flooding from rivers or sea). For Flood Zone 1 all development is deemed to be appropriate and neither the sequential nor the exception test is required (refer to Table 1 in section 3.1, taken from Annex 3 of the NPPF).

4.2 Reservoir Flooding

Reservoir flooding is extremely unlikely to happen and there has been no recorded loss of life in the UK from reservoir flooding since 1925. The Environment Agency is the enforcement authority and ensures that reservoirs are inspected regularly, and essential safety work is carried out.

4.3 Public Sewers, Highway Drainage Flooding and Infrastructure Failure

There are no known cases of the site flooding as a result of surcharged public sewers or highway drainage.

Providing United Utilities and Manchester City Council maintain their drainage assets in the surrounding area of the site, the risk of flooding to the proposed development site from public sewer or highway drainage is low.

4.4 Surface Water Flooding to the Site

Surface water flooding can be caused when rainwater, during extreme rainfall events, does not drain away through the normal drainage system or soak into the ground. Surcharging sewers can result in overland flows which if originating at a higher elevation than a development site can potentially pose a flood risk.

Surface water flooding is dependant primarily on topography which dictates either the flow path of overland flow which is not contained within public sewers, or areas in which ponding may occur. Surface water flooding is more difficult to predict than the risk of flooding from Rivers or Sea as it is dependent on the amount of rain which will fall in a very localised area, the specific topography of that region and the capacity and functionality of the drainage network within that section.

From the UK Government's Flood Risk from Surface Water (extent of flooding) map.

- Where a site is in a dark blue shaded zone, this indicates that the site is at high risk of flooding where there is a chance of flooding of greater than 1 in 30 (3.3%).
- Where a site is in a mid-blue shaded zone, this indicates that the site is at medium risk of flooding where there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
- Where a site is in a light blue shaded zone; this indicates that the site is at low risk of flooding where there is a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%).
- Where a site is in a white (unshaded) area; this indicates that the site is at very low risk of flooding where there is a chance of flooding of less than 1 in 1000 (0.1%).

The extent of flooding to the site from surface water is indicated in Figure 3. It shows that small portions of the site to be at risk of surface water flooding. These areas are located within the proposed Prussia Walkway section of the Ancoats Green area.

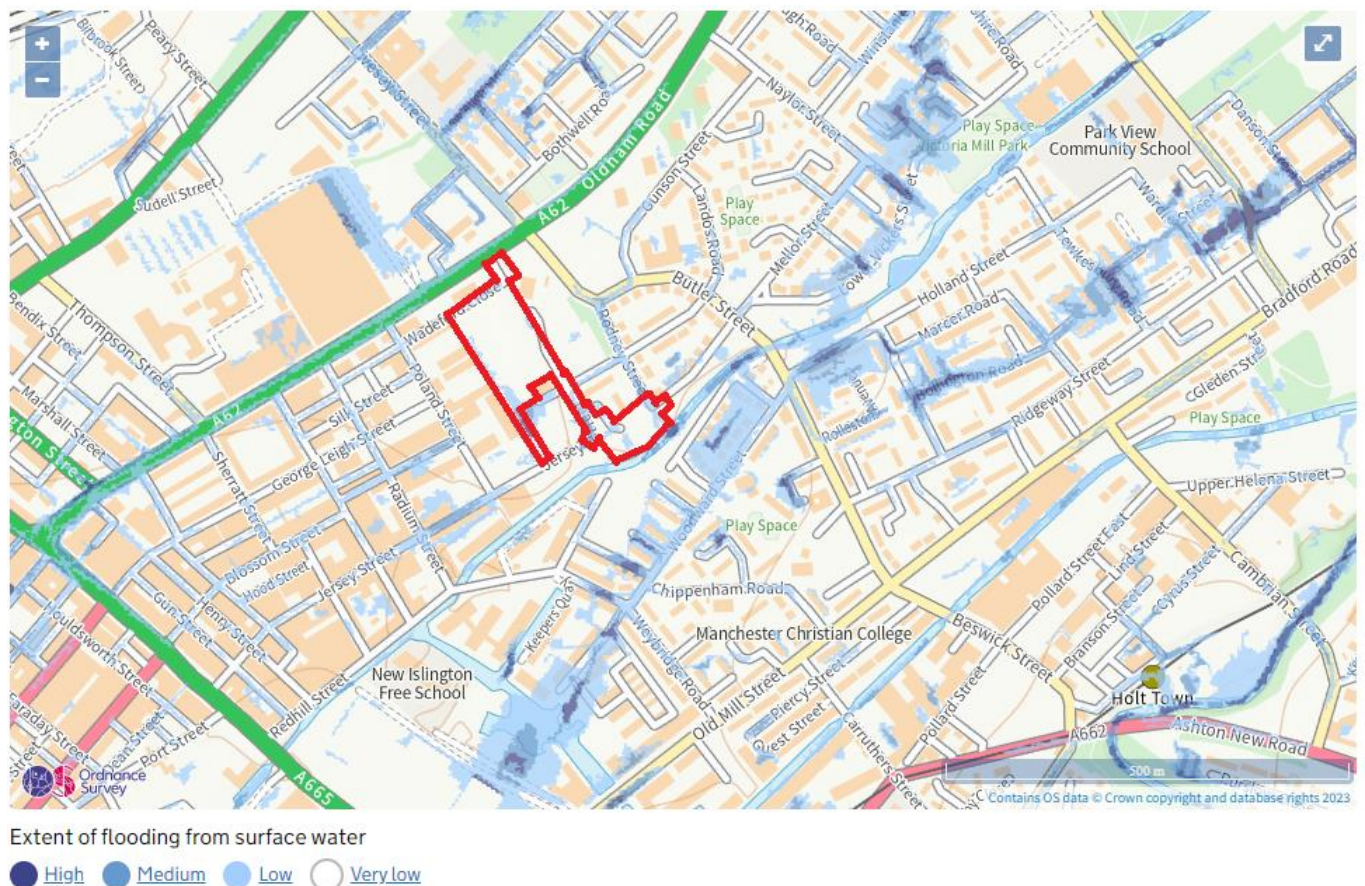


Figure 3: Surface Water Flood Risk Map

4.5 Surface Water Flooding from the Site

Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. The proposed surface water drainage network shall be designed to not flood for the critical 1 in 30-year storm event and flood water generated up to the critical 1 in 100-year plus climate change storm event shall be constrained within areas on site so as not to cause damage to buildings, essential services or adjoining developments and services.

The redevelopment of the park slightly increases the amount of impermeable area within the Ancoats Green site, however, SuDS are incorporated in the design which will ensure the potential to increase flood risk to the surrounding area is low. A detailed assessment of the proposed surface flows is carried out within the drainage strategy within Section 5 of this report.

4.6 Summary of Flood Risk

From the evidence collated and subsequent negotiations, the flood risk proposed to the development can be summarised as follows:

- Rivers and Sea – Very low risk
- Reservoir – Very low Risk
- Groundwater – Medium/Low risk
- Public Sewers – Low risk
- Surface Water – High / Medium

5. Surface Water Management Strategy

5.1 Existing Site/Pre-development Runoff

The Ancoats Green site is currently a cordoned off space consisting of both hard and soft landscaping. Approximately 0.14Ha of the Ancoats Green site is covered in man-made impermeable surface, 0.94Ha is grassy areas.

The site currently drains via road gullies and infiltration through the existing grassy soft landscaping.

Pre-development run off rates have been calculated Causeway Flow software are included in Appendix E. Based on the existing site's impermeable area 0.14 hectares, the existing/predevelopment runoff rate is 16.3 L/s for the 1:1 year return period rainfall event.

5.2 Drainage Hierarchy Points of Discharge

The NPPF Planning Practice Guidance Paragraph 080 states that:

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

1. into the ground (infiltration).
2. to a surface water body.
3. to a surface water sewer, highway drain, or another drainage system.
4. to a combined sewer."

Infiltration Potential Sustainable Drainage Systems (SuDS) Features to be Considered

Intrusive site investigations were carried out by E3P on the week commencing 12th December 2022. Due to the cohesive deposits on site the soak away tests did not drain away, and an infiltration rate

could not be calculated. This confirms that the ground conditions are not favorable for the use of soak aways. The site investigation results report can be found in Appendix D.

Water Body

The nearest surface water body is the Rochdale Canal located approximately 105m to the south of the proposed Ancoats Green site. The proposed strategy would be to discharge into this canal, however, following discussions with the Canal & Rivers trust, we are unable to discharge into this area of canal.

Surface Water Sewer

Existing gullies are available on Portugal road, however, these are positioned at the higher level areas of site. proves to be unfeasible.

Combined Sewer

A 450mm x 675mm combined water sewer is located running below Wadeford Close and down into Jersey Street to the east of the site. Correspondence with United Utilities (UU) to discharge into this combined sewer has been submitted and UU have agreed a discharge rate into this sewer at a rate not exceeding 5l/s.

Summary

The surface water discharge options are summarised below in Table 4.

Table 2: Summary of Surface Water Disposal

Surface Water Disposal Method	Potential	Description
Infiltration	x	Due to the cohesive deposits on site the soakway tests did not drain away and an infiltration rate could not be calculated. This confirms that the ground conditions are not favourable for the use of soakaways.
Water Body	x	The Canals and Rivers Trust have ruled out the possibility of discharging surface water to the Rochdale Canal.
Surface Water Sewer	x	No sufficient surface water sewers within reasonable proximity to the site.
Combined Water Sewer	✓	Agreed with UU a discharge at a rate no larger than 5 l/s into existing combined sewer on Wadeford Close.

5.3 Proposed Surface Water Drainage Design

As the Ancoats Green was previously developed, surface water drainage from the main development site will be restricted such that it does not exceed the pre-development run off rates, with the aim of achieving at least a 50% reduction in accordance with the recommendations as set out in the Manchester, Salford & Trafford SFRA. However, in addition to this requirement, guidance within the northwest SuDS proforma, introduces a requirement to achieve greenfield run-off rates where a site is to be developed entirely, even if classified as brownfield. The area of Prussia Walkway in the north of the site is included within the Ancoats Green drainage design.

As part of the proposals the area of soft landscaping (permeable area) will decrease, and man-made impermeable areas will increase as illustrated in Table 2 below.

Table 3: Pre-development and Post- development Impermeable Area Comparison

Phase	Description	Pre-development areas (Ha)	Post-development areas (Ha)	Increase/ Decrease (Ha)
Ancoats Green	Impermeable	0.140	0.268	+0.128
	Permeable	0.94	0.812	-0.128

In February 2016, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Table 3 demonstrates the climate change allowances with central and upper end allowances being considered.

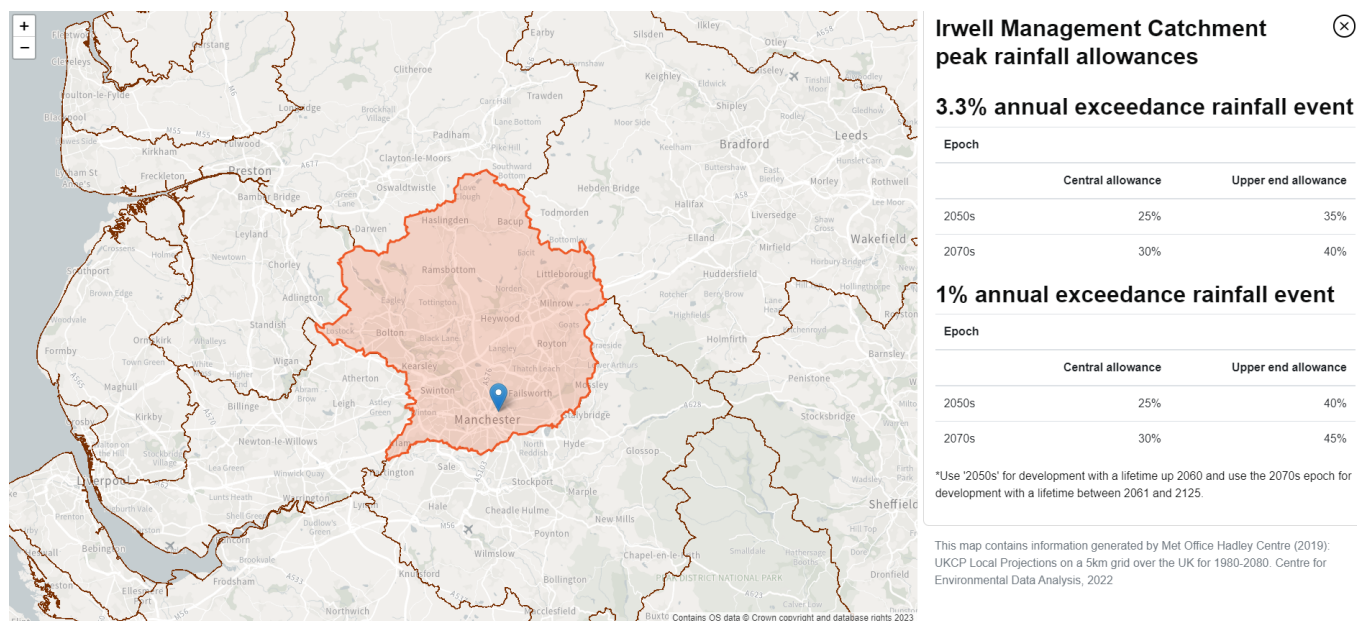


Figure 4: Climate Change Allowances for Peak Rainfall Intensities for the Site Area

Based on the nature of the development, a lifespan up to 25 years is anticipated. The potential climate change allowance for the 2050s advises:

- 25% to 35% for a 3.3% annual exceedance rainfall event;
- 25% to 40% for a 1% annual exceedance rainfall event.

As such, the design will consider an allowance of 35% climate change on peak rainfall intensity for 1:30 year return period storm and 40% for 1:100 year period storms during the calculations.

In restricting the flows from the development site to the QBar rate there will be a requirement to provide attenuation to accommodate flows up to the critical 1 in 100-year event with a climate change allowance of 40%. The purpose of the attenuation being to maintain operation of the system during the 1 in 1yr, 1 in 30yr and the 1 in 100yr (plus climate change) storm events.

The required volume of attenuation has been calculated using Causeway Flow based on the proposed Ancoats Green development. Surface Water Calculations are included in Appendix E and propose a restricted rate of 5 L/s and an estimated required storage volume of 119.5m³. The storage volume required is achieved with a combination of pipes, chambers and permeable sub-bases.

The proposed drainage strategy has been developed to include SuDS features as a primary method of surface water management. Permeable paving and raingardens underlain with a sub-base material

with a 30% voids ratio has been proposed widely across the site for its at source runoff treatment and storage capability. Runoff from private highways, accesses and footpaths will be attenuated within the subbase and flows will be restricted at the end of each catchment via a flow control device.

A pre-development enquiry has been submitted to United Utilities and they have advised that evidence should be provided to discount other options for surface water discharge prior to disposal to the public sewer. Provided UU accept the evidence, surface water can be discharged into the 450mm x 675mm combined water sewer running below Wadeford Close and to the east of the site. The discharge rate should be restricted to 5L/s. This will be subject to the sewer having a suitable line and level and condition. The discharge rate will also be subject to the approval of the LLFA. A drainage strategy drawing has been produced and is included in Appendix E of this report showing the proposed drainage connection point, an indicative piped drainage network and areas of attenuation.

In order to provide a functional landscape and to provide the necessary water treatment plus amenity and biodiversity benefits it is proposed that the planters in the proposed scheme are designed as bioretention planters or raingardens which will intercept initial rainfall and will attenuate and filter runoff from more extreme events prior to discharging to the existing public sewer. Sustainable urban Drainage Systems (SuDS)

Where possible the site drainage will look to utilise SuDS features. Section 1.1 of the SuDS Manual (Ciria C753) states the following:

"Sustainable drainage systems (SuDS) can deliver multiple benefits.

Surface water is a valuable resource, and this should be reflected in the way it is managed and used in the built environment. It can add to and enhance biodiversity, beauty, tranquillity and the natural aesthetic of buildings, places and landscapes and it can help make them more resilient to the changing climate.

The philosophy of sustainable drainage systems is about maximising the benefits and minimising the negative impacts of surface water run-off from developed areas.

The SuDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area to manage downstream flood risk and reducing the risk of that runoff causing pollution. This is achieved by harvesting, infiltrating, slowing, storing, conveying and treating runoff on site and, where possible, on the surface rather than underground. Water then becomes a much more visible and tangible part of the built environment, which can be enjoyed by everyone."

The SuDS Manual describes the four pillars of SuDS design as Water Quality, Water Quantity, Amenity and Biodiversity as illustrated in Figure 11.

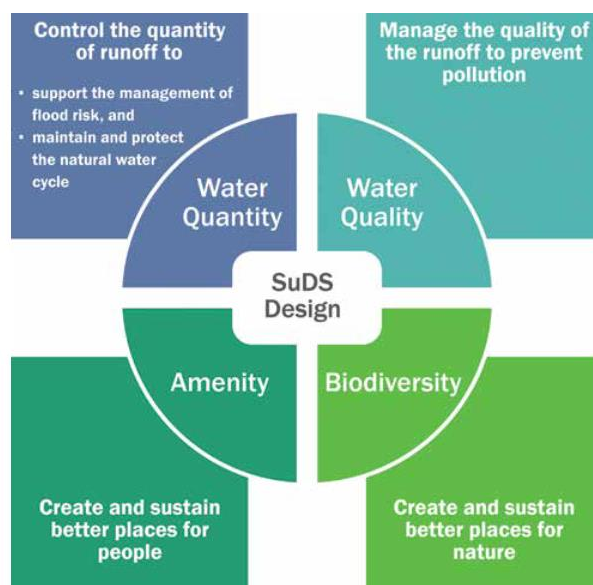


Figure 11: Sustainable Development Objectives (Representation of Figure 2.1 of the SuDS Manual)

Minimising the Impact of the Development on the Quantity of Surface Water Run-off

In order to minimise the impact of the development on existing infrastructure and to reduce the risk of downstream flooding it is important to manage the rate and volume of surface water discharge such that it does not exceed the pre-developed condition and where practicable achieves a betterment.

Surface water drainage from the built development site will be restricted such that it does not exceed the pre-development run off rates, with the aim of achieving a 50% reduction in accordance with the recommendations as set out in the Manchester, Salford & Trafford SFRA.

Where possible SuDS are to be incorporated into the post development design to provide attenuation and ensure that runoff from the site does not exceed predevelopment runoff rates.

Varied SuDS methods have been summarised in the table below to assess and establish which are most feasible for the proposed post development site.

Table 4: SuDS Suitability Assessment – Ancoats Green

SuDS Method	Feasibility, Given Site and Project
Green & Blue Roofs	There are no buildings located on site and therefore this method is not available to this project.
Basins and Ponds – Above Ground storage	Basins and ponds increase biodiversity and amenity of the area; provide attenuation; and improve water quality. This method does occupy large areas of developable land and needs to be constructed at the lower levels of the site. Due to the proposed layout, dry basins and ponds have been excluded from the proposals.

Filter Strips, Swales and Raingardens	Filter strips, swales and raingardens can be used within private or public areas to reduce and treat runoff. Raingardens are recommended where possible for runoff treatment and storage volume. Rain gardens are included within the drainage strategy for the project.
Permeable Paving	Permeable paving provides at source runoff treatment and surface water storage when combined with a voided aggregate. Permeable paving with a 30% voids aggregate is proposed within the site within public and private footpaths.
Infiltration Devices	Infiltration isn't possible within this site.
Tanked/Geocellular Attenuation systems	Tanked/geocellular attenuation systems provide high storage capacity and can be incorporated within road pavements and under landscaping. Geocellular storage structures aren't proposed on this site as storage is provided by the permeable paving and raingardens.

Minimising the Impact of the Development on the Quality of Surface Water Run-off

To protect the water quality of receiving surface waters and groundwaters effectively, run off discharged from the site should be of an acceptable water quality.

The surface water run-off from the site will predominantly be from areas which will be subject to occasional vehicular and pedestrian traffic and would be classified as having a low "pollution hazard level" in Table 4.3 of the SuDS Manual and as such a "simple index approach" to treatment should be adopted. The raingardens incorporated into the proposed drainage strategy should sufficiently treat the pollutants from the surrounding area. Table 26.2 of the SuDS Manual describes the "pollution hazard indices" for different land use classes and Figure 12 below is an excerpt from that table that relates to the proposed scheme.

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4

Figure 12 :Excerpt of SuDS Manual Table 26.2 Pollution hazard indices for different use classes

Table 26.3 (represented in Figure 13 below) illustrates the "indicative SuDS mitigation indices for discharge to surface waters" and can be used to inform the SuDS strategy at the site.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 13: Representation of SuDS Manual Table 26.3 SuDS mitigation indices (for notes refer to source material)

Maximise Amenity and Biodiversity Opportunities

Improvements to the area and new areas of soft landscape and planting, including SuDS, will provide significant opportunities for improved amenity and enhanced biodiversity.

6. Proposed Foul Water Drainage

There is no foul water discharge proposed for the site.

7. Conclusion

The proposed development is located within Flood Zone 1 and is considered "water compatible" as such is appropriate for development in the Flood Zone.

Flood risk from all sources has been considered and it shows that various small portions of the site to be at low risk of surface water flooding.

Surface Water discharge for the Ancoats Green development will be limited to greenfield run-off rates for the equivalent site area at 5 l/s. Attenuation will be provided for a 1 in 100-year storm event including a 40% climate change allowance. Where possible SuDS will be incorporated to further improve the water quality and encourage infiltration.

As per the pre-development enquiry response from United Utilities, surface water will likely be discharged into an existing combined sewer located on Wadeford Close.

With incorporation of the proposed mitigation measures, as described above, the proposed development will comply with National and Local Planning Policy. The surface water connection and discharge rate will also be subject to agreement with the LLFA.

There will be no official drainage proposal and cut and fill within the Jersey Green area. Similarly, Prussia Walkway will contain little cut and fill but to the north of the site it will contain a rain garden which will form part of the drainage system for Ancoats Green.

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