BURO HAPPOLD

Manchester Metropolitan University All Saints Library

Flood Risk Assessment

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26 October 2023

Revision P02

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author	**Carys Thomas**
date	**26 October 2023**
approved	**Nilani Venn**
signature	Nilani Venn I am approving this document 2023.10.26 16:41:37+01'00'
date	**26 October 2023**

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Contents

1 Executive Summary 7

2 Introduction 8

2.1 Background 8

2.2 Site Description 8

2.3 Proposed Development 10

3 Planning Context 11

3.1 Overview 11

3.2 National Planning Policy Framework (NPPF) 11

3.2.1 Responsible Authorities 11

3.2.2 Strategic Flood Risk Assessment 11

3.3 Manchester Core Strategy 12

3.4 Flood Risk Assessments 12

3.4.1 Flood Zones 12

3.4.2 Sequential Test 13

3.4.3 Climate Change 13

4 Flood Risk Appraisal 15

4.1 National Planning Policy Framework 15

4.1.1 Flood Zone 15

4.1.2 Flood Risk Vulnerability Classification 15

4.2 Fluvial and Tidal Flooding 16

4.3 Surface Water Flooding 18

4.3.1 Baseline 18

4.3.2 Proposed 19

4.4 Flooding from Combined Sewers 20

4.5 Groundwater flooding 20

4.6 Flooding from Artificial Sources 22

4.7 Historical Flooding 23

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5 Summary and Conclusion 24

Appendix A Proposed development Drawings 25

Appendix B NPPF Planning Practice Guidance Table 1: Flood Zones 26

Appendix C NPPF Planning Practice Guidance Table 2: Flood Risk Vulnerability and Flood Zone 'Incompatibility' 28

Appendix D Planning Practice Guidance Annex 3: Flood Risk Vulnerability Classification 29

Appendix E Environment Agency Flood Data 32

Table of Tables

Table 3—1 Climate Change Allowances for 1% AEP peak rainfall intensity for the Irwell Management Catchment. 14

Table 3—2 Climate change allowances for peak river flow in the Irwell Management Catchment 14

Table 4—1 EA flood data for River Medlock at the nearest location to the site (Eastings, Northings: 384137, 397476). 17

Table 4—2 EA flood data for area south of the Proposed Development (Eastings, Northings: 384400, 396681). 17

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Glossary

Term	Definition
Annual Exceedance Probability (AEP)	The probability that a storm event will be exceeded in any given year.
Attenuation	A method to reduce a flood peak to prevent flooding, often utilising temporary storage, but increasing the duration of the flow.
Flood Risk	The level of risk to personal safety and damage to property resulting from flooding due to the frequency or likelihood of flood events.
Flood Risk Assessment (FRA)	An assessment of the flood risks to the Proposed Development over its expected lifetime and the possible flood risks to the surrounding areas, assessing flood flows, flood storage capacity and runoff.
Fluvial Flooding	Flooding resulting from an exceedance event in a river or watercourse.
Groundwater	Water present within underground strata known as aquifers.
Groundwater Flooding	Water occurring below ground in natural formations (typically rocks, gravels and sands).
Impermeable Surface	A surface that does not permit the infiltration of water and, therefore, generates surface water runoff during periods of rainfall.
Inundation	Flooding of land with water
Mitigation	Positive measures taken to reduce either the probability of flooding or the consequences of flooding or a combination of the two.
Permeability	The measures of ease with which a fluid can flow through a porous medium.
Resilience	The degree to which an asset or development can recover from a flooding event.
Return Period	The average frequency of a specified condition. An 'n' year event is one that occurs on average over the long term, once every 'n' years
Risk	Risk is the probability that an event will occur and the impact (or consequences) associated with that event.
Runoff	Water flow over surfaces to the drainage system. Runoff occurs when rainfall exceeds the rate of permeability of a surface.
Strategic Flood Risk Assessment (SFRA)	An SFRA is the assessment and 'categorisation' of flood risk on an area-wide basis in accordance with the NPPF, usually carried out by the Local Planning Authority.
Surface Water Flooding	Surface water flooding occurs when the volume of water is unable to filtrate through the ground to enter drainage systems, and therefore runs quickly off land and results in localised flooding. This type of flooding is usually associated with intense rainfall.
Sustainable Drainage Systems (SuDS)	SuDS are used as a strategy to manage surface water in a sustainable manner or least damaging solution through management practices and physical structures.

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Abbreviations

Abbreviation	Definition
AOD	Above Ordnance Datum
CC	Climate Change
DFE	Design Flood Event
EA	Environment Agency
FRA	Flood Risk Assessment
GI	Ground Investigation
GMCA	Greater Manchester Combined Authority
LLFA	Lead Local Flood Authority
MCC	Manchester City Council
MMU	Manchester Metropolitan University
MST	Manchester City, Salford City and Trafford Councils
NPPF	National Planning Policy Framework
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems

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1 Executive Summary

Subject		Findings
Site Description		The site is located in Hulme, Manchester. It has an approximate total area of ~0.61ha and is currently home to the Manchester Metropolitan University (MMU) All Saints Library. The nearest watercourses are the River Medlock, approximately 225m to the north of the site. The site is relatively flat, with a high point of +37.9mAOD at the southwest corner of the site.
Proposal Description		The Proposed Development involves two phases; Phase 1 comprises of the demolition of the All Saints Building adjacent to Oxford Road and replacement with a new 12 storey element and Phase 2 is the redevelopment and refurbishment of the adjacent All Saints Library building, which includes adding 2 additional storeys to the building including a level 5 roof terrace.
Vulnerability classifications & Design Life		The Proposed Development will be used for educational purposes and therefore is classified as *More Vulnerable* by the National Planning Policy Framework (NPPF). Based on the use of the site, the design life for the development has been assessed for the impacts of climate change in the epoch between 2061 and 2125..
Sequential & Exception Test		The Sequential Test and Exception Test are not required as the site is in Flood Zone 1.
Site Flood Risk	Fluvial & Tidal	The site is located within Flood Zone 1, defined as being at *Low* risk of fluvial and tidal flooding. The site remains at a *Low* risk from fluvial flooding in the future with the impact of climate change. The Environment Agency (EA) has no record of flooding in the area.
	Groundwater	The local authority's latest Strategic Flood Risk Assessment (SFRA) states that the site is not located within an area at risk of groundwater flooding. Following the proposed groundwater monitoring, and with the proposed mitigation measures in place, the risk to the Proposed Development will remain *Low*.
	Surface Water & Sewers	The site is subject to *Very Low* surface water flood risk. There are areas of Low to Medium risk adjacent to the site, along the site boundary. The site has no recorded instances of sewer flooding. A surface water drainage strategy has been developed to manage surface water at the site to allow for the impacts of climate change.
	Artificial Sources	Part of the site is located within the maximum extent of flooding from reservoirs when river levels are normal and when they are flooded. The Rochdale Canal is a broad canal to the north of the site, which is identified in the Manchester City, Salford City and Trafford Council Level 2 Hybrid Strategic Flood Risk Assessment as not posing a flood risk as it is a controlled and managed water body. The probability of reservoir failure and breach of the Canal is considered to be very low and therefore the risk of flooding from artificial sources is considered to be *Low* on the site.
Mitigation Measures	Drainage Strategy	The Drainage Strategy outlines the complexities associated with the site and drainage components. The Drainage Strategy aims to achieve a 20% betterment in surface water run-off in comparison to the pre-development condition via attenuation and controlled release. The strategy is designed to ensure on-site flood risk is managed up to the 1 in 100 year flood event, with appropriate allowances for climate change made and that the off-site flood risk is not increased due to the development. With the proposed surface water strategy in place, the flood risk to and from the site is considered to be *Low*.
Summary and Conclusion		It is concluded that the risk of flooding from all sources, for the entire design life is considered to be *Low* and that the Proposed Development will not increase the risk of flooding elsewhere.

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2 Introduction

2.1 Background

This site-specific Flood Risk Assessment (FRA) has been prepared by Buro Happold as part of the planning application for the Manchester Metropolitan University (MMU) All Saints Library Transformation. This assessment has been carried out in accordance with the UK National Planning Policy Framework (NPPF) and considers the risk of flooding from fluvial, tidal, surface water (pluvial), combined sewer, artificial (reservoir and canal) and groundwater sources.

2.2 Site Description

The site, shown in Figure 2—1, is located in Greater Manchester within the Hulme Ward and is centred on Ordnance Survey grid reference SJ 84225 97158. The site is located at the existing All Saints Library at MMU, All Saints Park, Manchester, M15 6BH.

The site is bounded by the elevated Mancunian Way A-road (A57) to the north, Oxford Road to the east, All Saints Park to the south and the MMU Business School to the west. The site is currently occupied by the existing MMU All Saints Library. The site boundary and the above-mentioned locations are shown in Figure 2—1.

The site has an area of approximately 0.61 ha and has a relatively flat topographical profile. The highest point on site is at the southwestern corner, with a maximum elevation of 37.9 mAOD. There is a very gradual downward slope from All Saints Park towards the Mancunian Way. Site elevations are shown in Figure 2—2.

The site is situated on the border of the Croal Irwell and Rock Irk Medlock Operational catchments, which sit within the wider River Irwell Catchment. The nearest waterbody to the site is the River Medlock, a designated Main River which is partially culverted through the city and is approximately 225m to the north of the site. The River Medlock is shown in Figure 2—1.

The site is within Flood Zone 1. The nearest areas within Flood Zone 2 and 3, a medium and high risk of flooding respectively, are located approximately 200m to the north of the site from the River Medlock, and 250m to the south from a culverted watercourse.

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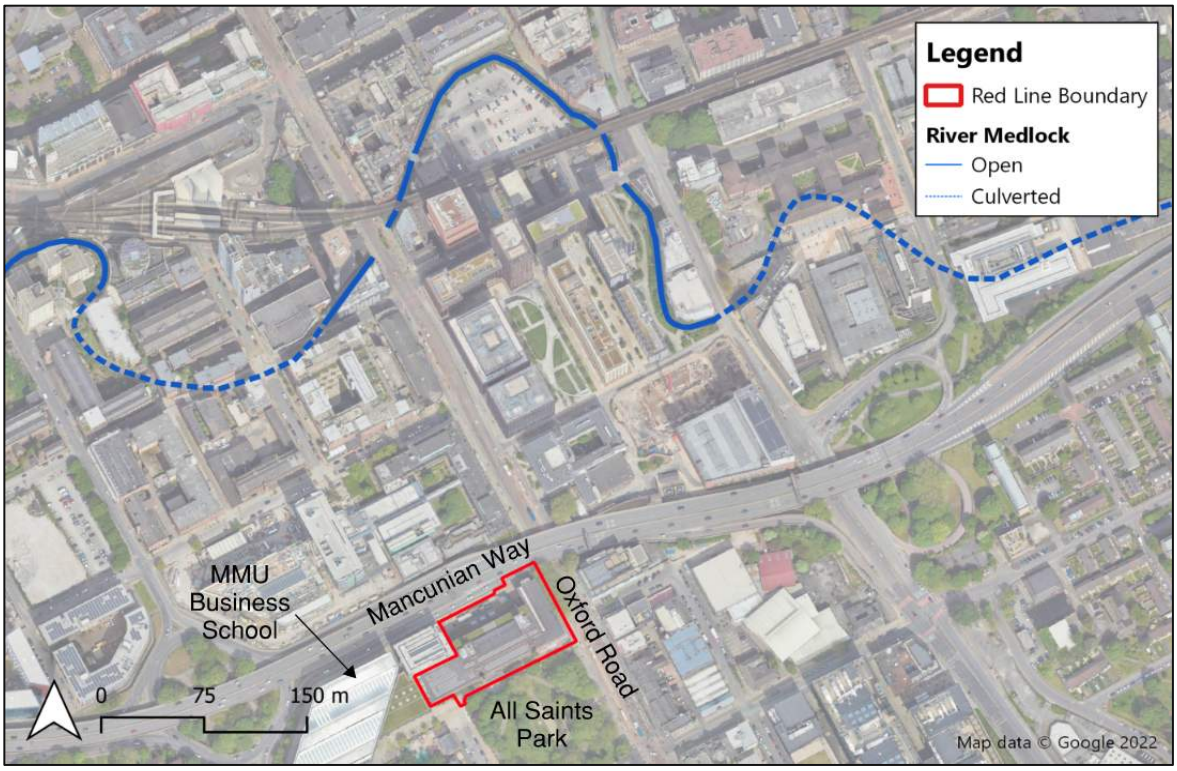

Figure 2—1 Site Boundary showing site extent, adjacent areas, and the River Medlock.

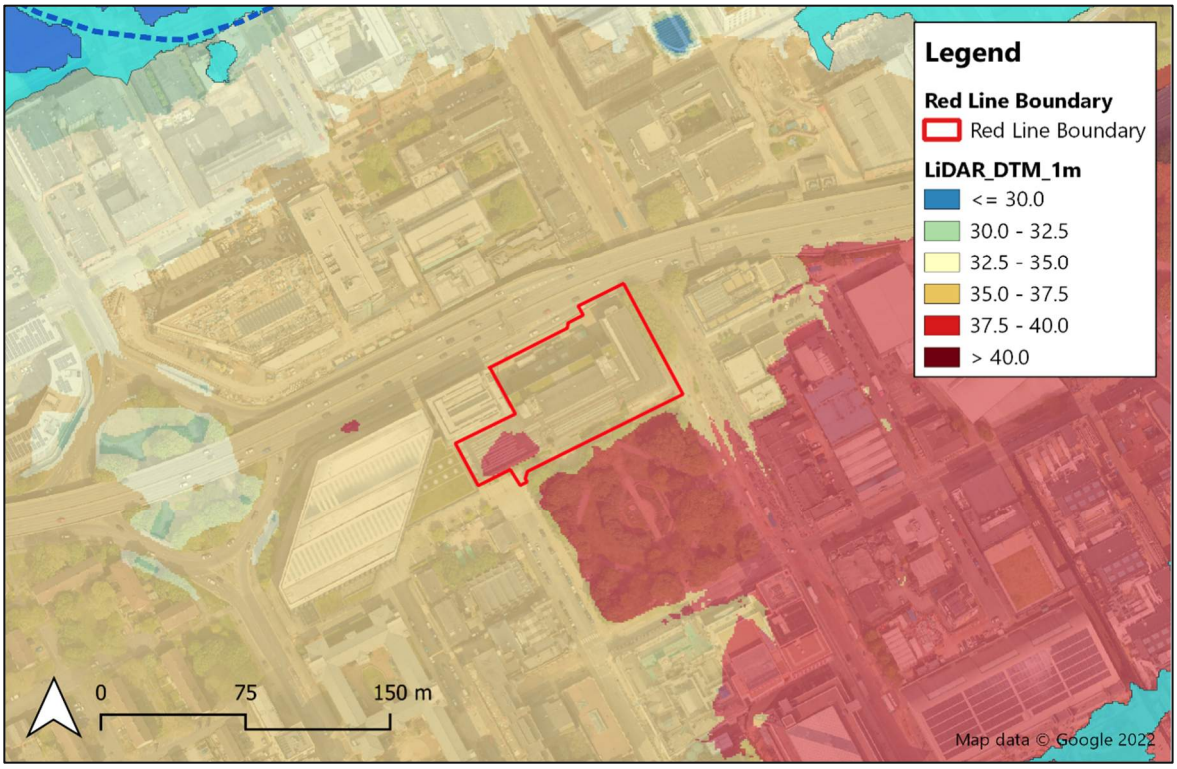

Figure 2—2 Environment Agency LIDAR Composite DTM 2020 1m data (© Environment Agency copyright and/or database right 2022. All rights reserved. © Environment Agency copyright and/or database right 2015. All rights reserved)

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2.3 Proposed Development

The Proposed Development involves two phases, where Phase 1 comprises of the demolition of the All Saints Building adjacent to Oxford Road and replacement with a new 12 storey element. Phase 2 then covers the redevelopment and refurbishment of the adjacent All Saints Library building, which includes adding 2 additional storeys to the building including a level 5 roof terrace. The existing basement within Phase 1 will be infilled. The basement within Phase 2 will be refurbished.

The Proposed Developments are illustrated in Figure 2—3.

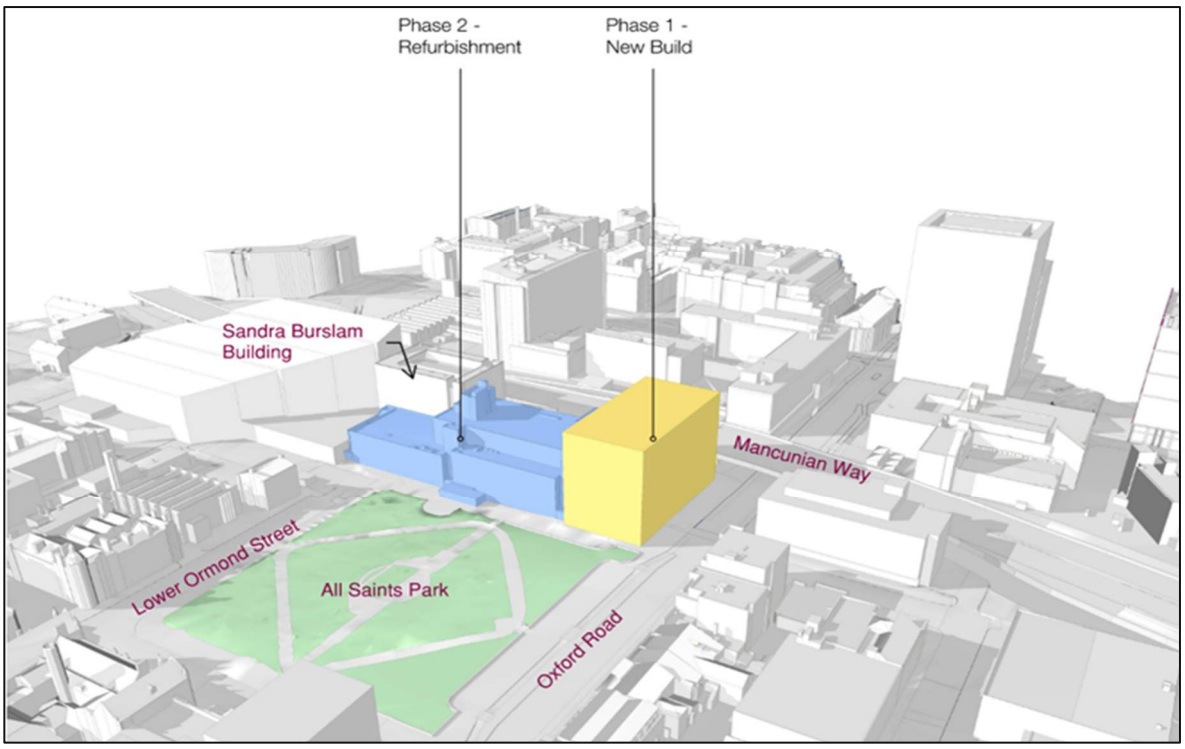

Figure 2—3 Proposed Development Plan (Library Transformation Project. Manchester Metropolitan University, RIBA Stage 1 Report, Hodder + Partners, Draft Issue, June 2022).

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3 Planning Context

3.1 Overview

This FRA has been prepared in accordance with the policies and guidance applicable to the Proposed Development, outlined within the following publications:

- National Planning Policy Framework (March 2012, Updated July 2021);
- National Planning Policy Framework Planning Practice Guidance website (Updated: August 2022);
- Manchester City, Salford City and Trafford Council Level 2 Hybrid Strategic Flood Risk Assessment (SFRA); Level 1 SFRA (March 2010);
- Manchester City, Salford City and Trafford Council Level 2 Hybrid Strategic Flood Risk Assessment (SFRA); Level 2 SFRA (March 2011);
- Greater Manchester Combined Authority (GMCA), 2019-2020 SFRA (October 2020);
- Manchester's Local Development Framework, Core Strategy (July 2012).

3.2 National Planning Policy Framework (NPPF)

Land use planning policy in England is governed by the NPPF, introduced in 2012 and revised in 2018, 2019 and 2021. This FRA has been carried out in accordance with the July 2021 revision of the NPPF. The NPPF is issued by the Government Department for Levelling Up, Housing and Communities (DLUCH), as named since September 2021, formerly known as the Ministry of Housing, Communities and Local Government (MHCLG) at the time of issue.

As part of the wider sustainability objectives of the NPPF, the framework asks Proposed Developments to mitigate and adapt to the impacts of climate change, accounting for the long-term implications for flood risk (Ref. 153).

The framework also requires that inappropriate development in areas of flood risk be avoided (Ref. 159), stating that where development is necessary in areas of flood risk, it should 'be made safe' for its lifetime without increasing flood risk elsewhere.

3.2.1 Responsible Authorities

The Flood and Water Management Act (2010) stipulated the duty imposed on the Environment Agency for supervision of matters relating to flood defence in England with a focus on the risk associated with statutory 'Main Rivers', 'Critical Ordinary Watercourses', coastal and reservoir risk. The act also created the designation of a Lead Local Flood Authority (LLFA) for management of risk including from Ordinary Watercourses, surface water, ground water and sewer flood risk. The LLFA for the site is Manchester City Council (MCC).

Successive Land Drainage Acts from 1930 have also established Internal Drainage Boards (IDBs) for catchment wide management of flood risk in areas of special drainage needs. No IDBs have presently been established within Greater Manchester.

3.2.2 Strategic Flood Risk Assessment

As stipulated in the NPPF, local authorities are required to carry out and keep up to date a strategic assessment of flood risk (SFRA) for the governed area, considering the management of risk from all sources and the cumulative impacts of flooding in local areas susceptible. The risk of flooding to the Proposed Development from each flood source will be assessed in Section 4.

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The most relevant SFRAs to the site are as follows:

- **Manchester City, Salford City and Trafford Council (MST), 2010-2011** - A Level 1 SFRA, Level 2 SFRA and accompanying maps were prepared by JBA in 2010-2011 for Manchester City, Salford City and Trafford Councils covering the site. The risk of groundwater flooding is covered in the Level 1 report only while a more detailed assessment of the risk of fluvial, canal, surface water and sewer flooding were provided in the Level 2 report. The SFRA does not cover the risk of reservoir flooding on the grounds of national security.

- **Greater Manchester Combined Authority (GMCA), 2019-2020** - A Level 1 SFRA has been prepared by JBA for the Greater Manchester Combined Authority (GMCA) in March 2019, of which Manchester City Council (MCC) is a constituent authority. A Level 2 SFRA was also prepared in October 2020. This SFRA had a focus on sites related to the development of the Greater Manchester Spatial Framework.

3.3 Manchester Core Strategy

The Core Strategy 2012-2027 was adopted in July 2012 to guide development within Manchester. It sets the out the long-term strategic policies for Manchester's future development and will form the framework that planning applications will be assessed against. The following policies relate to flood risk:

- Policy EN8 describes the expected measures to be taken to ensure development is adaptable to climate change. These include minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rainwater permeability and provision of linked and diverse green infrastructure.
- Policy EN14 focuses on reduction of flood risk and references PPS25 (now superseded by the NPPF PPG Flood Risk and Coastal Change). In addition, all new development should minimise surface water run-off, including through Sustainable Drainage Systems (SuDS). Where feasible and appropriate, developments should seek to open up culverted sections of river to reduce flood risk and any danger of collapse.
- Policy EN17 is about water quality. Development should minimise surface water run-off from development and associated roads and maximise the use of SuDS.

3.4 Flood Risk Assessments

Applications are required to be supported by a Flood Risk Assessment where the site is located in Flood Zone 2 or 3 (NPPF Ref. 167) or where a site in Flood Zone 1 is:

- Greater in area than 1 hectare;
- Land which has been identified by the Environment Agency (EA) as being Areas with Critical Drainage Problems;
- Land identified in an SFRA as being at increased risk of flooding in the future;
- Land that may be susceptible to other sources of flooding (e.g. pluvial flooding) where the development would introduce a more vulnerable use.

The Proposed Development is located within the Conurbation Core Critical Drainage Area and therefore qualifies for assessment to support planning.

3.4.1 Flood Zones

The NPPF aims to avoid inappropriate development in areas at highest risk of flooding. The risk of flooding from fluvial and coastal sources has been compiled into zoning maps for planning by the EA. The Planning Practice

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Guidance to the NPPF contains a series of tables that help identify the risk of flooding to a development. These tables are presented in Appendix B to Appendix D.

- Table 1 (Appendix B) defines four Flood Zones by flood risk, gives the land use classification appropriate to the flood risk and specifies the requirements of a FRA within each zone;
- Table 2 (Appendix C) presents the flood risk vulnerability and flood zone 'incompatibility' and identifies where development is appropriate for each flood risk vulnerability classification and whether the Exception Test is required.
- Annex 3 of the NPPF (Appendix D) provides information on the flood risk vulnerability classifications given in Table 2.

The Flood Zones defined in the NPPF are as follows:

Flood Zone	Definition
Flood Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b).
Flood Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map).
Flood Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map).
Flood Zone 3b Functional floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map).

3.4.2 Sequential Test

It is stated in the NPPF that all plans should take a sequential approach to locating development (Ref. 161), providing a risk-based assessment of the location of the development. The aim is to steer development to areas with the lowest risk of flooding from all sources (NPPF Ref. 162). A formal Sequential Test is not considered to be required for the site as the Proposed Development is located within Flood Zone 1 according to MST Level 2 Hybrid SFRA; Level 1 SFRA.

3.4.3 Climate Change

The flood zones shown in the EA flood maps for planning do not take into account the possible impacts of climate change or consequent changes in the future probability of flooding.

Allowances for the predicted effects of climate change should be taken into account when preparing site-specific flood risk assessments. The guidance published by the EA to support the NPPF contains sensitivity ranges that are recommended to be applied to peak rainfall intensities, peak river flows, sea level rise, offshore wind speeds and

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extreme wave heights. The general trend is for each parameter to increase in the future, which in turn increases the risk of flooding to any site. The allowances for peak rainfall intensity for the Irwell Management catchment are provided by the Department for Environment, Food and Rural Affairs (Climate change allowances for peak rainfall in England (data.gov.uk)) and are presented in Table 3—1. Climate change allowances for peak river flow are also provided using information generated by the UK Centre for Ecology and Hydrology using UK Climate projections and are summarised for the Irwell Management catchment in Table 3—2.

It is recommended by the EA that both the central and upper end allowances are assessed in order to understand the range of the impact. The guidance further notes that the following considerations be made in order to decide which allowances are used to inform the flood risk management strategy for a development:

- Likely depth, speed and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s);
- Vulnerability of the Proposed Development types or land use allocations to flooding;
- 'Built in' resilience measures used, for example, raised floor levels; and
- Capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

Table 3—1 Climate Change Allowances for 1% AEP peak rainfall intensity for the Irwell Management Catchment.

Epoch	Central Allowance	Upper End Allowance
2050s	25%	40%
2070s*	30%	45%
** Use 2050s for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125*		

Table 3—2 Climate change allowances for peak river flow in the Irwell Management Catchment

Epoch	Central Allowance (based on 50th percentile)	Higher Central Allowance (based on 70th percentile)	Upper End Allowance (based on 95th percentile)
2020s (2015-2039)	12%	15%	24%
2050s (2040-2069)	19%	26%	43%
2080s (2070-2125)	35%	46%	75%

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4 Flood Risk Appraisal

4.1 National Planning Policy Framework

4.1.1 Flood Zone

The Flood Map for Planning (Figure 4—1) produced by the EA shows that the site is located entirely within Flood Zone 1. Flood Zone 1 is defined as an area with an annual probability of flooding from rivers or the sea of less than 0.1%.

The risk of flooding from rivers or the sea in Flood Zone 1 is classified as low, having an annual exceedance probability (AEP) of 0.1% or 1 in 1,000 years. In accordance with EA guidance, the focus of this FRA will therefore be on the management of surface water run-off and the risk of flooding from other sources.

The nearest areas within Flood Zone 2 and 3, a medium and high risk of flooding respectively, are located approximately 175m and 180m to the north, respectively and is associated with the River Medlock (Figure 4—1). It is recommended that since there are areas of medium and high flood risk (Flood Zone 2 and 3) in the vicinity of the site, the central climate change allowance is adopted. The EA recommends a design life for a non-residential development of 75 years. Therefore, the Design Flood Event (DFE) is 1 in 75 year plus 30% allowance for climate change.

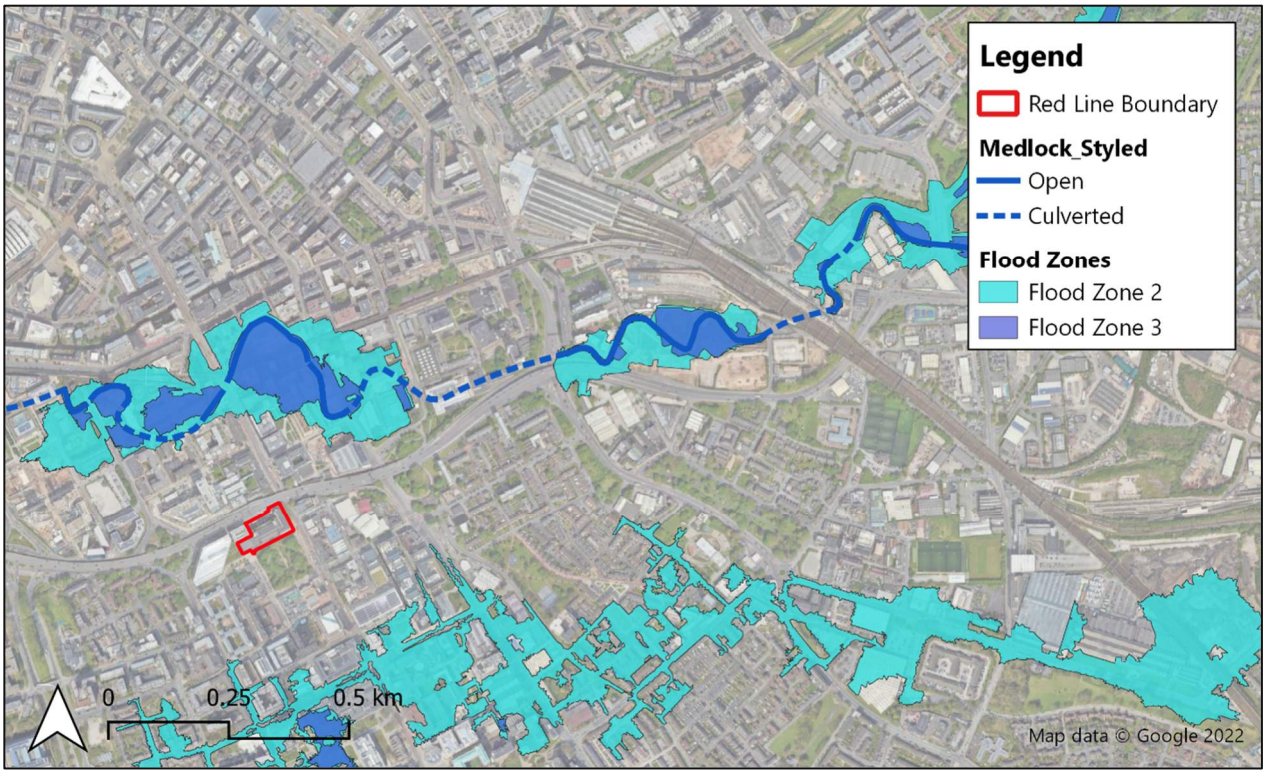

Figure 4—1 Environment Agency Flood Zone map with the site boundary outlined in red (©Environment Agency copyright and/or database right 2015. All rights reserved. Map data ©2021 Google). Flood Risk Vulnerability Classification

The NPPF Planning Practice Guidance contains a series of tables which identify where development should be permitted, based on the Flood Zone in which the development is located and the proposed uses of that development. These tables are included in Appendix B to Appendix D.

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The Proposed Development land use is for educational purposes and therefore is classified as *More Vulnerable* within the NPPF. This land use is considered appropriate for development within Flood Zone 1, in accordance with Annex 3 of the Planning Practice Guidance.

4.2 Fluvial and Tidal Flooding

Fluvial flooding occurs when sustained or intense rainfall events increase the flow in rivers causing the water level to rise above the level of the banks and into the surrounding areas.

Tidal flooding occurs when particularly high tides coincide with storm surges. Storm surges are caused by low atmospheric pressure events resulting in temporary localised raising of sea levels.

The site, shown in Figure 4—2, is located within the Irwell Management Catchment and sits on the boundary of the Roch Irk Medlock and Croal Irwell operational catchments. Most of the site falls within the Roch Irk Medlock operational catchment. The River Medlock travels from east to west and joins the Bridgewater Canal and the River Irwell approximately 1.4km and 1.8km downstream of the site.

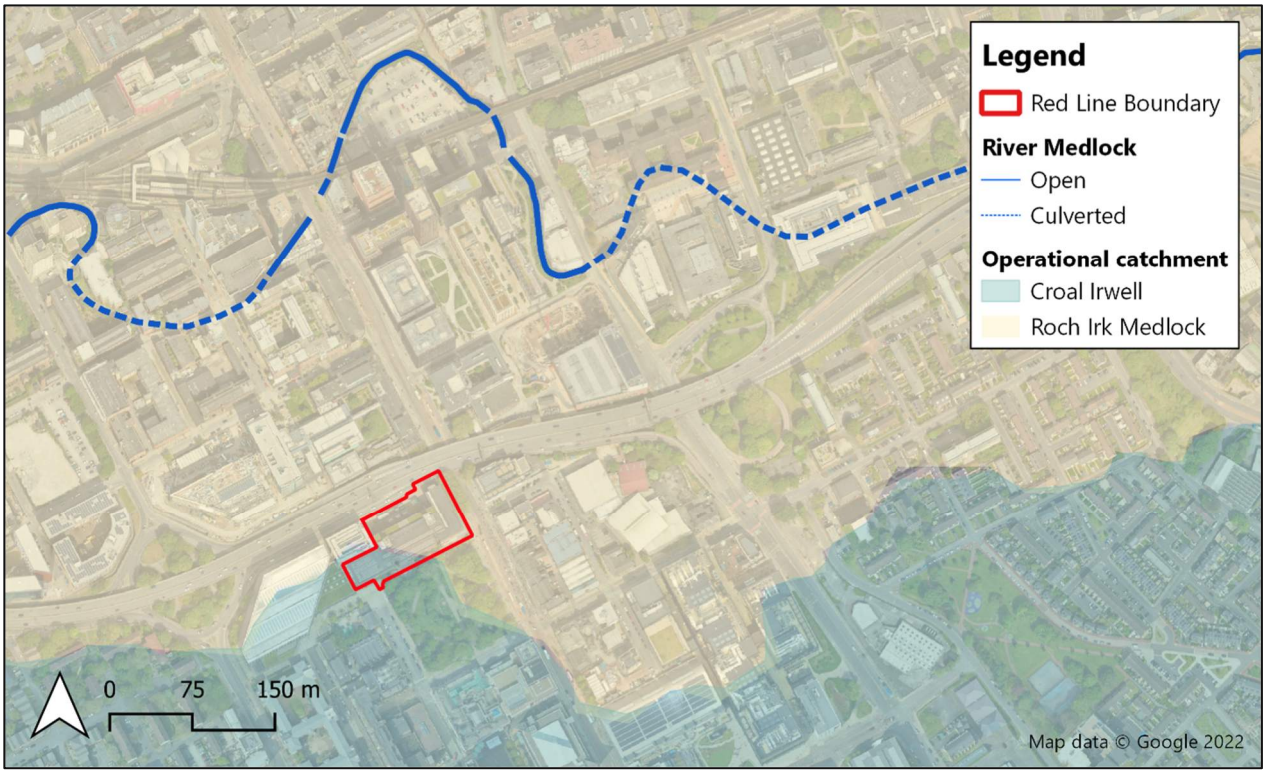

Figure 4—2 Fluvial Catchments and Waterbodies associated with the site.

Data obtained from the EA provides flood data for the 1 in 100-year flood event with climate change allowances of 30%, 35% and 70% for the River Medlock and the area within Flood Zone 2 to the south of the site. By comparing the estimated flood levels to the LiDAR data along the site boundary, an assessment of the risk of fluvial flooding, with an allowance for climate change has been undertaken.

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The Finished Floor Levels (FFL) of the Proposed Development are 32.22 mAOD and 37.22 mAOD for the basement and Level 0 respectively. The lowest elevations along the northern and southern site boundary are 36.9mAOD and 37.1mAOD, respectively. The Design Flood Event (DFE) for the site is the 1 in 100 year (1%AEP event) with 35% allowance for climate change (see Table 3—2).

According to the data provided by the EA for Location 1 in Figure 4—3, all flood levels are considerably lower than the identified low elevation point along the northern boundary and the FFL of Level 0 including an allowance for a sufficient freeboard. Flood levels are also less than the basement level without any allowance for a freeboard. Estimated flood levels are tabulated in Table 4—1.

The data obtained from the EA also includes the area of Flood Zone 2 to the south of the site. For all flood events the estimated flood levels near the site are greater than the minimum elevation along the southern site boundary and the basement level and Level 0 of the Proposed Development, as shown in Table 4—2 for location 2 in Figure 4—3. However, according to the map provided by the EA (see Appendix E), the estimated flood extents do not impact the site. This is primarily due to overtopping from the southern watercourse likely to follow a route that does not reach the site due to an overall slope in land levels away from the site.

Table 4—1 EA flood data for River Medlock at the nearest location to the site (Eastings, Northings: 384137, 397476).

Modelled Flood Event AEP and Climate Change Allowance	Modelled Water level (mAOD)
1% AEP +30% Climate Change	31.81
1% AEP +35% Climate Change	31.85
1% AEP +70% Climate Change	32.12

Table 4—2 EA flood data for area south of the Proposed Development (Eastings, Northings: 384400, 396681).

Modelled Flood Event AEP and Climate Change Allowance	Modelled Water level (mAOD)
1% AEP +30% Climate Change	37.38
1% AEP +35% Climate Change	37.39
1% AEP +70% Climate Change	37.47

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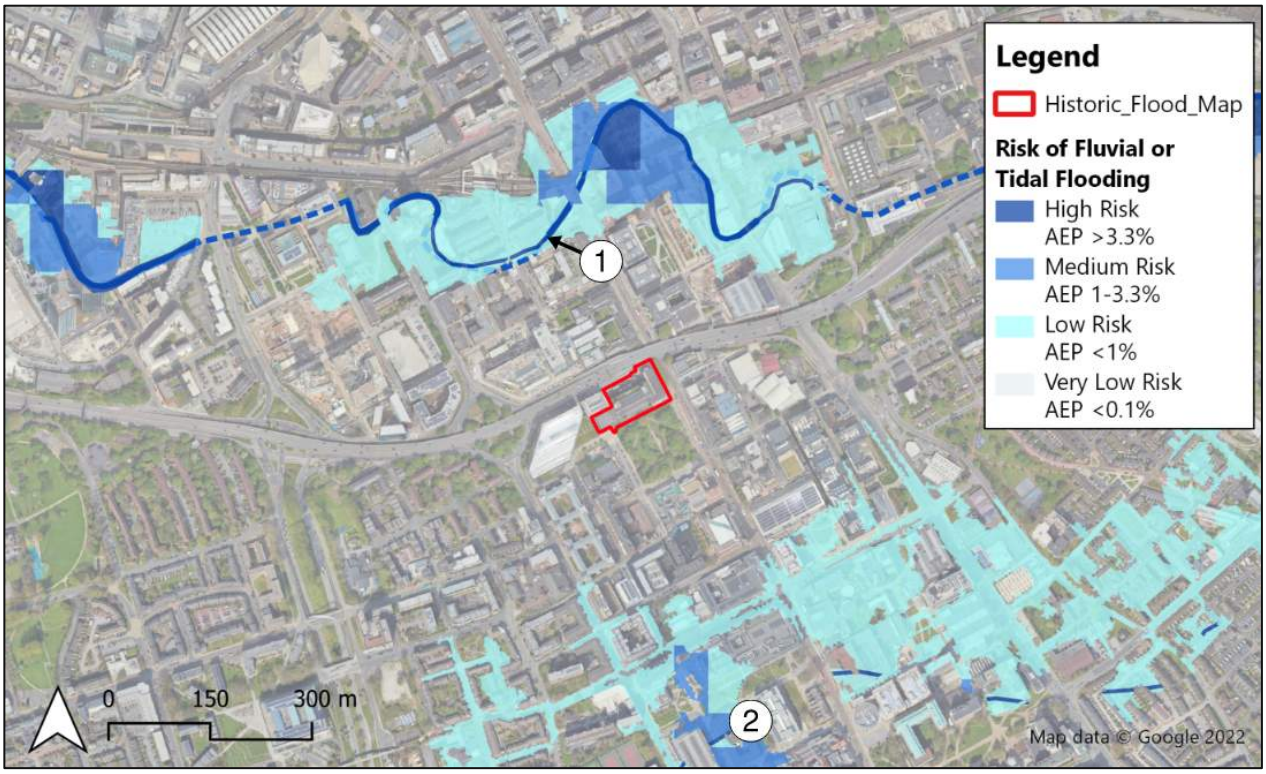

Figure 4—3 Environment Agency Fluvial and Tidal Flood Risk Map. Locations 1 and 2 refer to data collection points for the EA model of the 1% AEP +30% Climate Change allowance event (EA, Product 4, December 2022

4.3 Surface Water Flooding

Surface water flooding occurs when intense rainfall is unable to naturally soak into the ground due to impermeable ground covering such as concrete or tarmac, or low permeability ground conditions preventing infiltration. This excess surface water can flow through built-up areas and open space and pond in lower-lying areas causing localised flooding.

4.3.1 Baseline

The EA provides Surface Water flood risk maps for the extent, depths and velocities however no climate change allowance is accounted for in the mapping. There is a very low risk of surface water flooding across the majority of the site as shown in Figure 4—4. In some locations along the northern site boundary there are areas of low risk whilst adjacent to the site to the south, along the road to the west of the park (Lower Ormond Street) there are areas of medium to high risk of surface water flooding. The existing site consists entirely of impermeable paving. During a rainfall event, there is therefore very little potential for infiltration, and almost all of the rainfall falling on the site would be converted to surface water run-off which, in turn, may overwhelm the drainage network.

Buro Happold is preparing a drainage strategy for the site. The existing site is entirely impermeable and therefore is positively drained hardstanding and buildings. Information obtained from United Utilities (UU), historical topographical and utility surveys indicates that the site is drained by public and private networks. There exists a public surface water sewer on Oxford Road, to the east of the building. Assessment of the private drainage network surveys conclude that many of the foul water drains are being used as surface water drains due to the increased diameter and positioning of the building downpipes, which may or may not also carry foul water from the existing building. These

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have been identified to the north and south of the building. A surface water drain has been identified in the south-east corner of the site flowing from All Saint's Park in the south-west towards Oxford Road in the north-east. This drain is assumed to serve All Saint's Park and discharge to one of the public sewers within Oxford Road.

The existing brownfield surface water runoff from the site to the public sewer is estimated as 91 litres per second (l/s).

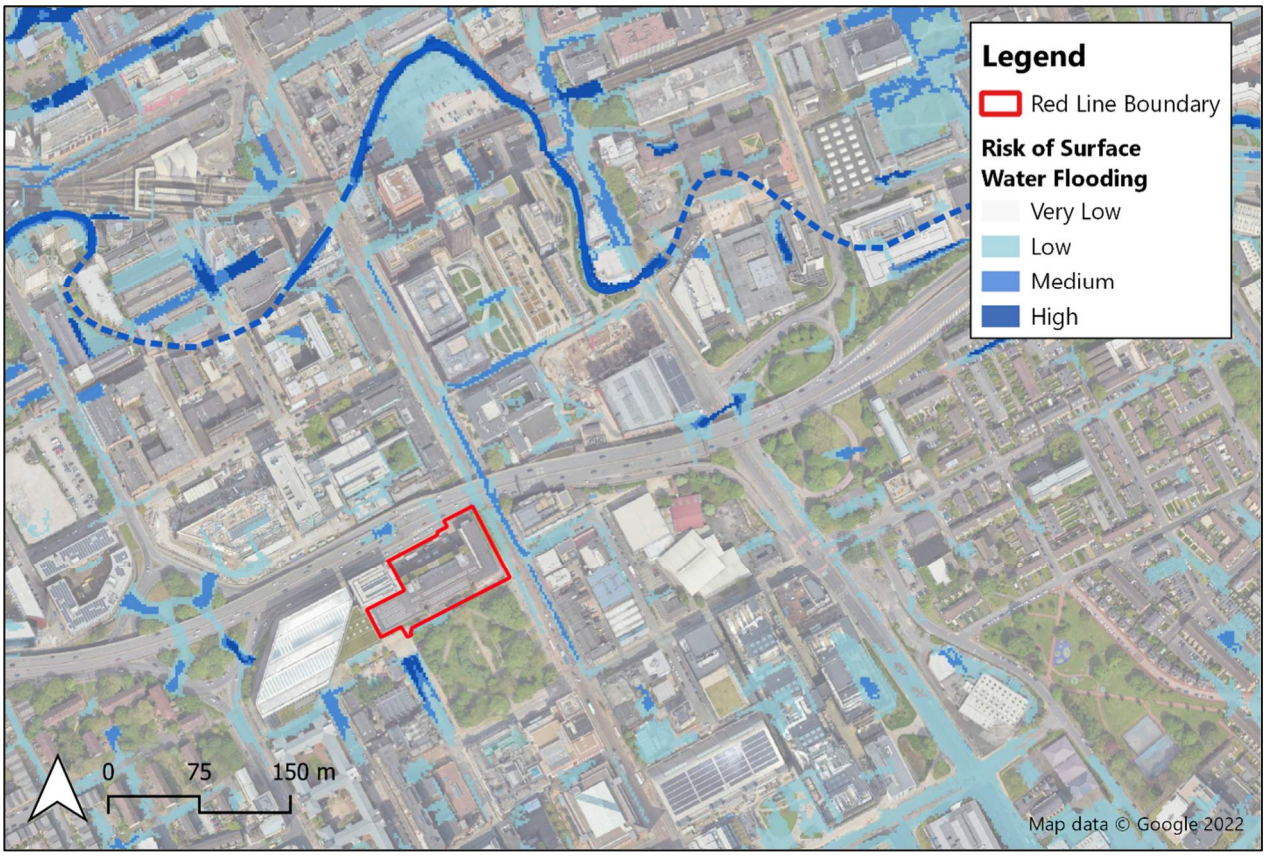

Figure 4—4 Environment Agency Surface water extents and flood risk map © Crown copyright and database rights 2019 Ordnance Survey (OS) 100024198.

4.3.2 Proposed

The Drainage Strategy (Buro Happold, 2023) has been developed in accordance with Manchester's Local Flood Risk Management Strategy, discussions with the United Utilities and the LLFA.

The Drainage Strategy recommends separate systems for surface and foul water. Although the Strategy aimed to adhere to the drainage hierarchy, infiltration, discharge to a watercourse and to an existing surface water sewer, the site's complexities prohibited these actions. It is therefore proposed that the surface water from the development is discharged to the existing combined sewer network that serves the existing site.

Surface water run-off is proposed to be attenuated and released at a controlled rate to better the run-off rate in comparison to the pre-development rate. Dur to the extensive site constraints, a 20% betterment is targeted rather than the 50% recommended by the Local Flood Risk Management Strategy. This would reduce the total run off rate from 91l/s to 73l/s with a required attenuation volume of approximately 150m^3. Sustainable Drainage Systems such as permeable paving and Attenuation Storage Systems are considered feasible.

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The Drainage Strategy is designed to ensure flood risk associated with events up to the 1 in 100 year storm event including a 30% allowance for climate change is managed effectively on site and that the development does not increase the off-site flood risk. With the proposed surface water strategy in place, the flood risk to and from the site is considered to be *Low*.

Please refer to the Drainage Strategy for further information (Buro Happold, 2023).

4.4 Flooding from Combined Sewers

Flooding from combined sewers may occur during periods of intense rainfall when high volumes of surface water run-off exceed the capacity of the sewer pipes and cause manholes to become surcharged, causing localised foul water flooding. The GMCA SFRA indicates that there is a risk of localised flooding associated with the drainage infrastructure of the urban areas across Greater Manchester due, in part, to undersized existing drainage capacity and sewer systems and possible blockages of the network.

Based upon existing drainage surveys it is understood that the site currently drains via public and private sewers. The public sewers are located on Lower Ormond Street and Oxford Road, adjacent to the site.

For both the Phase 1 (new build) and Phase 2 (refurbishment) elements of the scheme all new sanitary downpipes will be collected at slab level and routed, below the new slab, to external yard areas to the south of the building. From here, foul water flows will be routed to the existing public combined sewer located at the western end of the site, utilising the existing private foul water network, subject to capacity and condition checks, where possible.

The intention is to reuse existing connections to the public sewer network wherever possible to avoid physical works to UU assets. Where this cannot be avoided, any physical connection works to the public sewer network will be constructed under a Section 106 Agreement with UU.

A Wastewater Development Enquiry has been issued to United Utilities (UU) with regard to discharging foul water to the public combined sewer network to the west of the site, which would follow the existing drainage regime of the site. UU has accepted this strategy.

Based on no known historic flood issues from combined sewers in the vicinity of the site and the proposed foul water strategy agreed with UU, it is considered that the risk of sewer flooding to or from the site is *Low*.

4.5 Groundwater flooding

Groundwater flooding generally occurs in low-lying areas above permeable rock aquifers where the water table meets, and rises above, the ground surface. Groundwater flooding can lead to:

- Flooding of basements of buildings below ground level;
- Flooding of buried services or other assets below ground level;
- Inundation of roads, commercial, residential and amenity areas;
- Flooding of ground floors of buildings above ground levels; and/or
- Overflowing of sewers and drains.

The Risk of Ground Water flooding was assessed in the MST SFRA. The Groundwater Flooding Map (Figure 4—5) shows that the Proposed Development is not at risk of groundwater flooding. However, there is an area identified as at risk approximately 200m west of the site.

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A recent Ground Investigation (GI), commissioned by MMU, was completed by Geotechnical Engineering Limited in April 2023 for the All Saints Library surrounding site. Groundwater levels between 1.20m below ground level (bgl) (BH03 adjacent to Oxford Road) and 2.90 m bgl (WS01 adjacent to the Mancunian Way and WS04 adjacent to All Saints Park) ground water levels were recorded around the site. A previous GI recorded groundwater levels of 2.66-2.78m bgl along Oxford Road (Curtins, 2019). In another survey, close to the Faculty of Science & Engineering Building (Howlet Energy & Water Ltd 2019), groundwater was recorded 7.00-10.00m below ground level.

Based on existing data, groundwater may pose a risk to underground structures, such as the existing basement. However, the GI data indicates that high groundwater levels may be due to locally perched levels and therefore may not pose a risk. Periodic inspections of the existing basement may be required to identify any water ingress. Appropriate pollution control and flood risk measures will need to be put in place if groundwater is encountered during construction.

The risk of groundwater flooding above ground level in the current condition is considered to be *Low*. Following the proposed groundwater monitoring, and with the proposed mitigation measures in place, the risk to the Proposed Development will remain low.

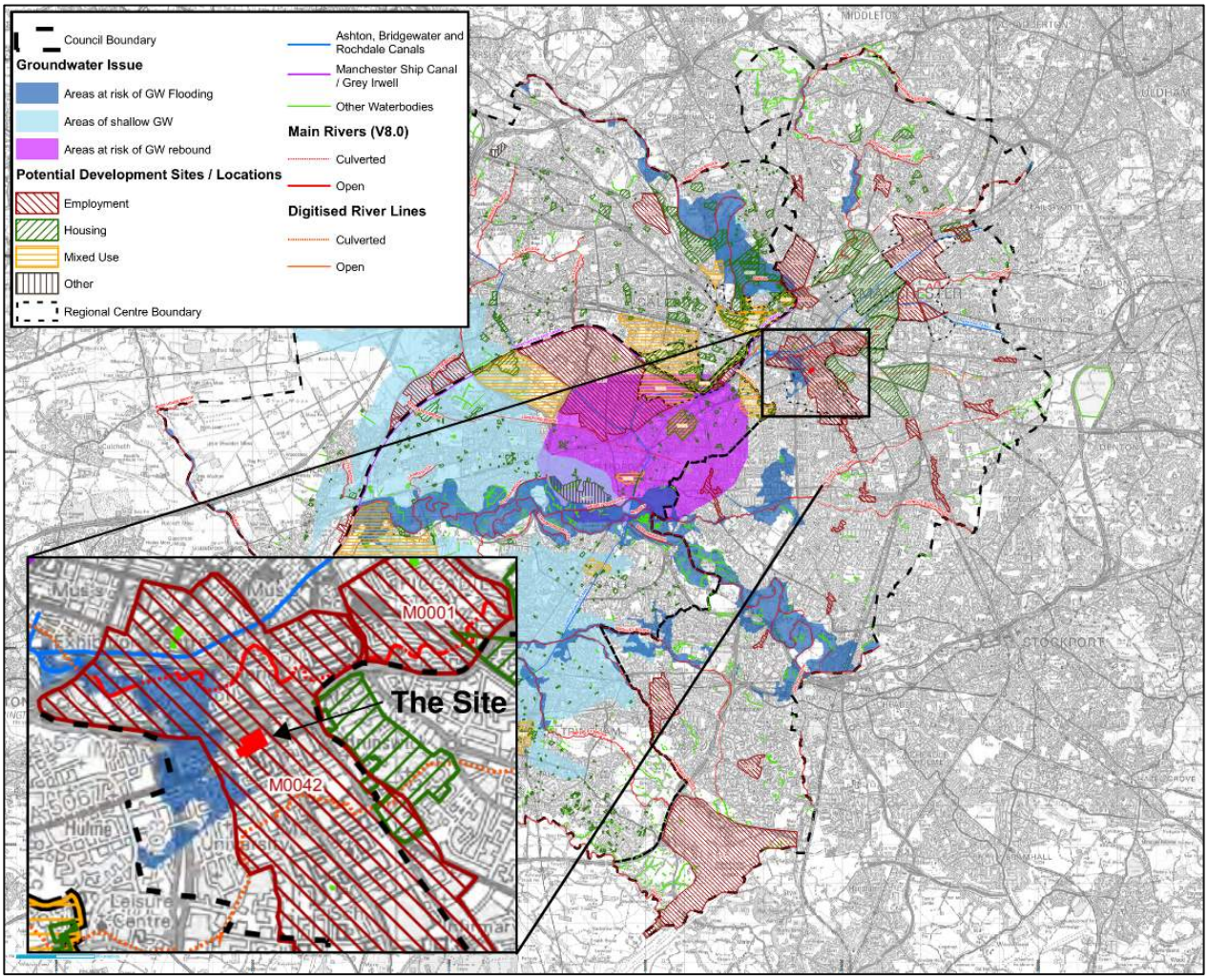

Figure 4—5 Areas at Risk of Groundwater Flooding. Adapted from Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA. Dark blue areas indicate areas identified at risk of groundwater flooding.

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4.6 Flooding from Artificial Sources

Flooding from artificial sources includes flooding from reservoirs, canals and lakes instances where water is retained above the natural ground level. The failure of an artificial source of water has the potential to cause catastrophic damage to its surroundings due to the sudden release of large volumes of water. However, the likelihood of such a failure occurring is extremely low.

The EA reservoir flood map (as shown in Figure 4—6), indicates that the site would be impacted by flooding resulting from a reservoir failure of two nearby reservoirs, namely Gorton and Audenshaw reservoirs, which are approximately 6km and 7km to the east of the site. The risk from Gorton Reservoir poses as a risk to the eastern site boundary when river levels are flooded. The Audenshaw Reservoir is more threatening and puts the site at risk of flooding from failure when river levels are normal and when they are flooded. The flood extents impact the entire site as shown in Figure 4—6. During flooding, flood water can reach high velocities and depths in a short period of time and pose a great hazard to users in its flood path. However, the EA does indicate that flooding from reservoirs is very unlikely in this area[1] and therefore the risk is extremely low due to the regular safety work undertaken at reservoirs to meet the Reservoirs Act 1975[2].

The Rochdale Canal is located approximately 450m to the north of the site. The Rochdale Canal is a broad canal, which is identified in the SFRA as not posing a flood risk as it is a controlled and managed water body. The residual risk of canal flooding is therefore only associated with lower probability events such as overtopping or the breach of embankments. This risk is mitigated by ongoing maintenance.

The site is not located within the canal overtopping hazard zones or canal breach zones which are identified in the SFRA. Overall, the risk of flooding from canals is considered to be very low and mitigation is not required.

[1] Environment Agency. 2021. *Reservoir flood maps: when and how to use them*. Available at: Reservoir flood maps: when and how to use them - GOV.UK (www.gov.uk). Accessed on: 09/08/23.
[2] Environment Agency. 2019. *Managing reservoir safety in England*. Available at: Managing reservoir safety in England - Creating a better place (blog.gov.uk). Accessed on: 09/08/23.

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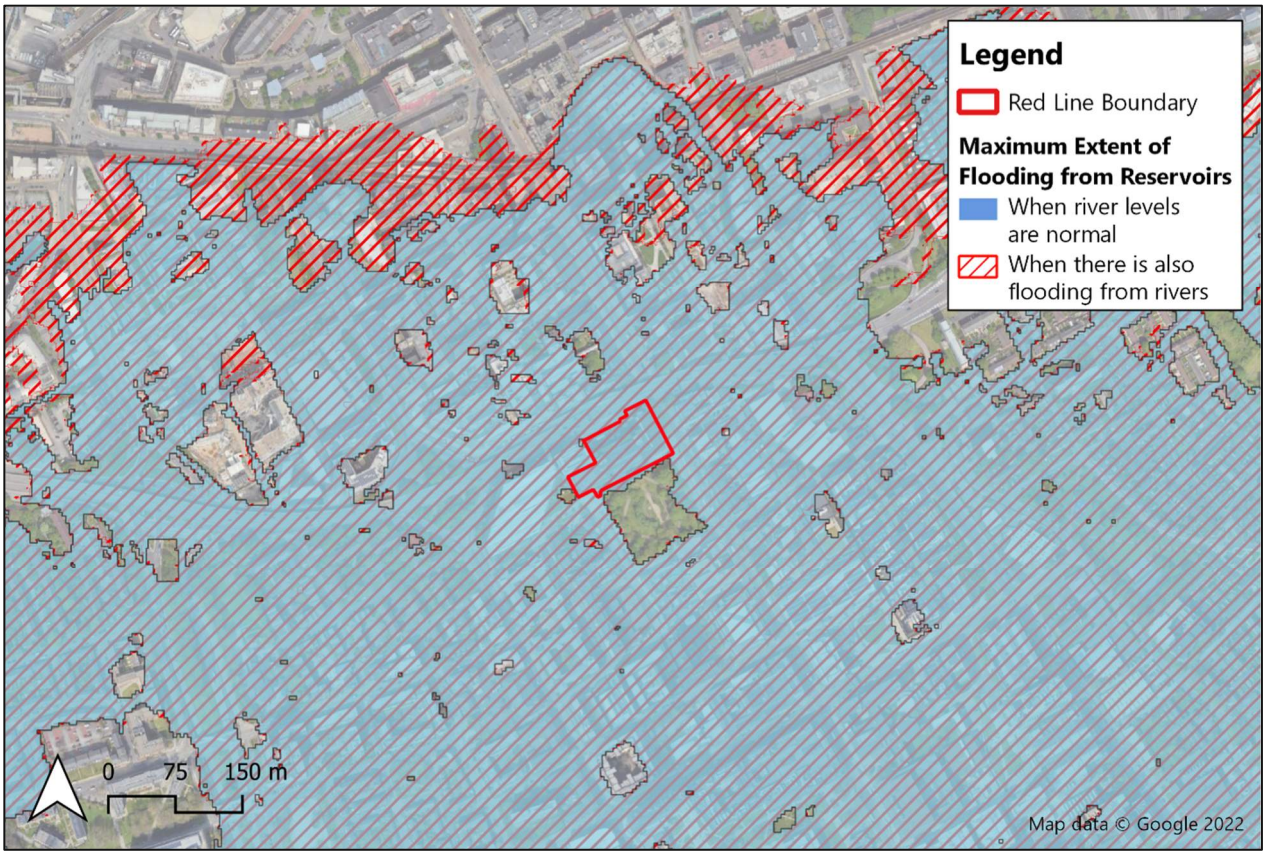

Figure 4—6 Environment Agency Reservoir Flood Map extents with site boundary outlined in red.

4.7 Historical Flooding

According to the EA historical flood mapping, MTC SFRA and the GMCA SFRA, there is no historical flooding of the site itself nor in the immediate surrounding areas.

The GMCA SFRA states that according to UU there are historic sewer flooding hotspots around the site, however no incidents of sewer flooding have been recorded.

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5 Summary and Conclusion

This FRA has been prepared to support the outline planning application for the proposed transformation of the Manchester Metropolitan University (MMU) All Saints Library, Manchester.

The Proposed Development involves two phases; Phase 1 comprises of the demolition of the All Saints Building adjacent to Oxford Road and replacement with a new 12 storey element and Phase 2 is the redevelopment and refurbishment of the adjacent All Saints Library building, which includes adding 2 additional storeys to the building including a level 5 roof terrace.

According to the national flood map produced by the EA, the entirety of the site is located within Flood Zone 1, which is defined as having a low risk of flooding, less than 1 in 1,000 years (0.1%) in any given year, from rivers and the sea. Tidal and fluvial flood risk is therefore considered to be low and additional measures to reduce this risk will not be required.

In accordance with the NPPF, all of the land uses for the Proposed Development are appropriate for Flood Zone 1. The proposed land uses in the Proposed Development are classified as More Vulnerable within the NPPF.

The overall surface water drainage strategy has been developed to provide the opportunity to reduce the surface water run-off rate by 20% across the Proposed Development via attenuation and controlled release. . The strategy is designed to ensure on-site flood risk is managed up to the 1 in 100 year flood event, with appropriate allowances for climate change made and that the off-site flood risk is not increased due to the development.

With the surface water drainage strategy in place, the risk of surface water flooding is considered to be *Low*.

The surface water flood map produced by the EA indicates that the site is classified as having a Very low probability of surface water flooding.

The site is not located within an area at risk of groundwater flooding according to the Groundwater Flooding Map in the MST SFRA. GI surveys indicate that locally perched groundwater may be present at the site although not pose a flood risk above ground. Appropriate pollution control and flood risk measures will need to be put in place if groundwater is encountered during construction. The risk to the Proposed Development is considered to be *Low*.

The map showing the risk of flooding from reservoirs produced by the EA indicates that the site is located within the maximum extent of flooding that would occur if an upstream reservoir were to fail when river levels are normal and when they are flooded. However, the EA advise that flood risk from reservoir flooding is extremely low due to the regular safety work undertaken at reservoirs to meet the Reservoirs Act 1975. As such, the Proposed Development is considered to be at *Low* risk of flooding from artificial sources.

It is concluded that the risk of flooding from all sources, for the entire development design life is considered to be low and that the Proposed Development will not increase the risk of flooding elsewhere.

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Appendix A Proposed development Drawings

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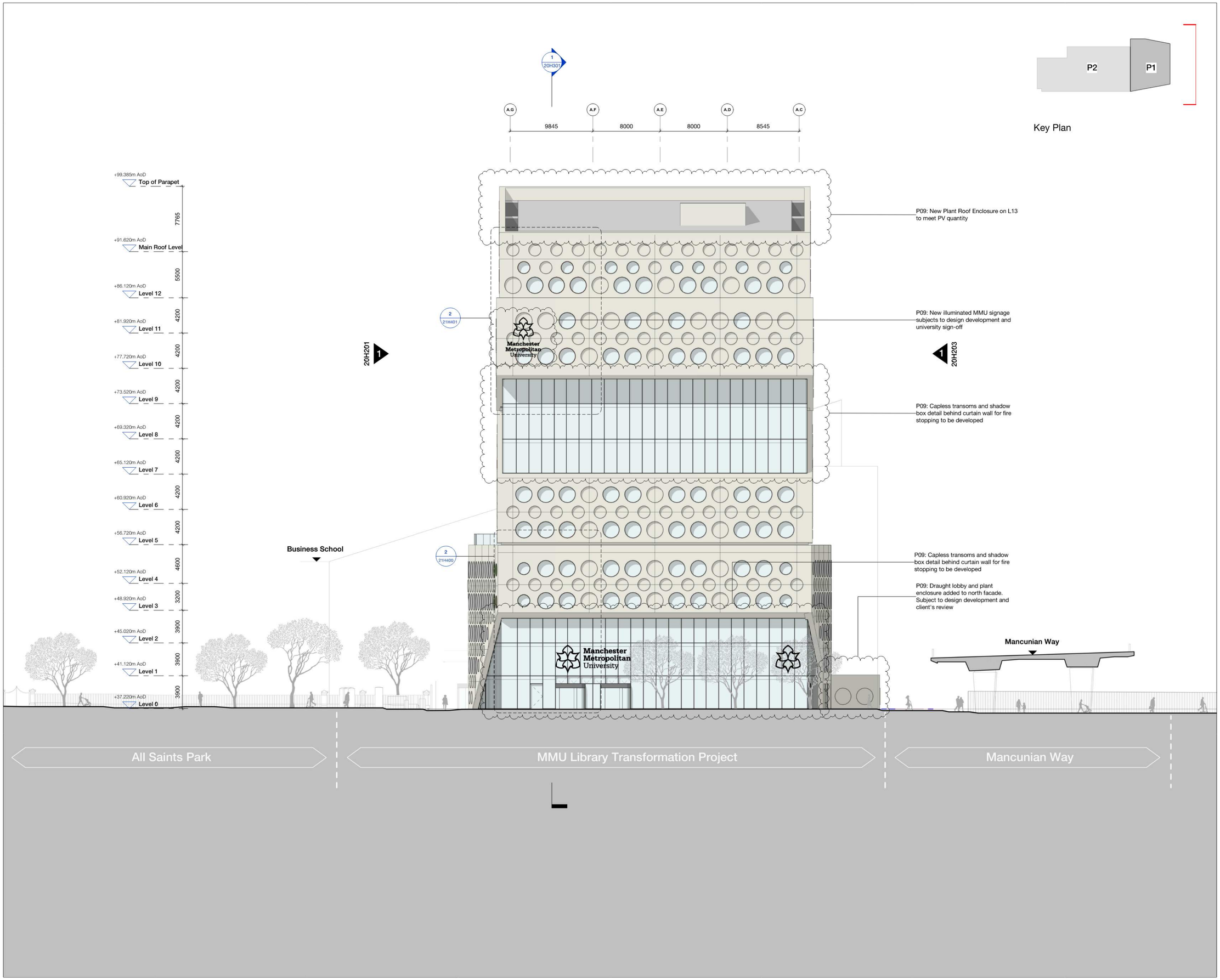

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Architectural Spacifications
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21_Series Facade Drawings
Buro Happold MEP Drawings and Specification
Buro Happold S.E. Drawings and Specification

MINIMUM U-VALUE PROJECT REQUIREMENTS
(Refer to MEP/Sustainability Report)

Air Tightness	2.5 (m3/h.m2 @50Pa)
External Wall	0.14 W/m2K
External Floor	0.14 W/m2K
Roof	0.12 W/m2K
External Doors	1.2 W/m2K
External Windows	1.3 W/m2K (Double glazing)
Curtain Walling	1.3 W/m2K
G-Value	0.3

NOTE:

- Refer to landscape report for concept design & external canopies on roof terrace.
- South and North GA elevations are not orthogonal at points (Refer to Drg no. 20H211 and 20H213 for orthogonal elevations)
- Movement joints to be developed.
- Panelisation of curtain walling and precast panels shown indicatively.
- Coloured indents subject to design development. Please refer to bay studies (Drg no. 21H400, 21H401, 21H405, 21H406, 21H410, 21H415) for colouring strategy.
- Make allowance for Automatic Roller Blinds to Large Glazed areas and Ceramic Frit to all Glazed Surfaces - refer to BH Facade Report + BH MEP for performance requirements and Architectural Outline Specification
- N91/120 bespoke signage systems to be back lit

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Drawing
East Elevation

Scale @ A1		Date
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LW		PD
Job Number	Status	Purpose of Issue
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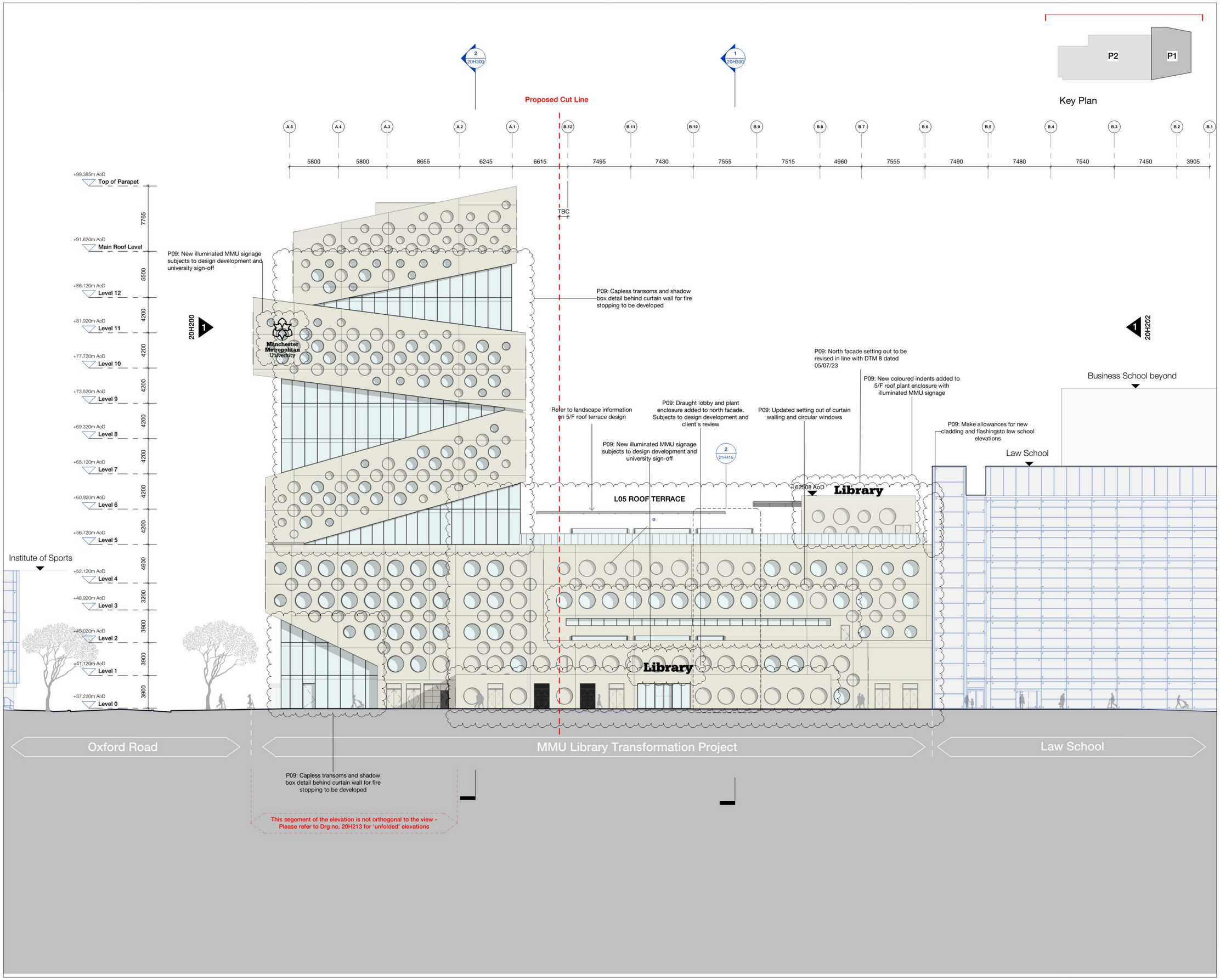

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North Elevation

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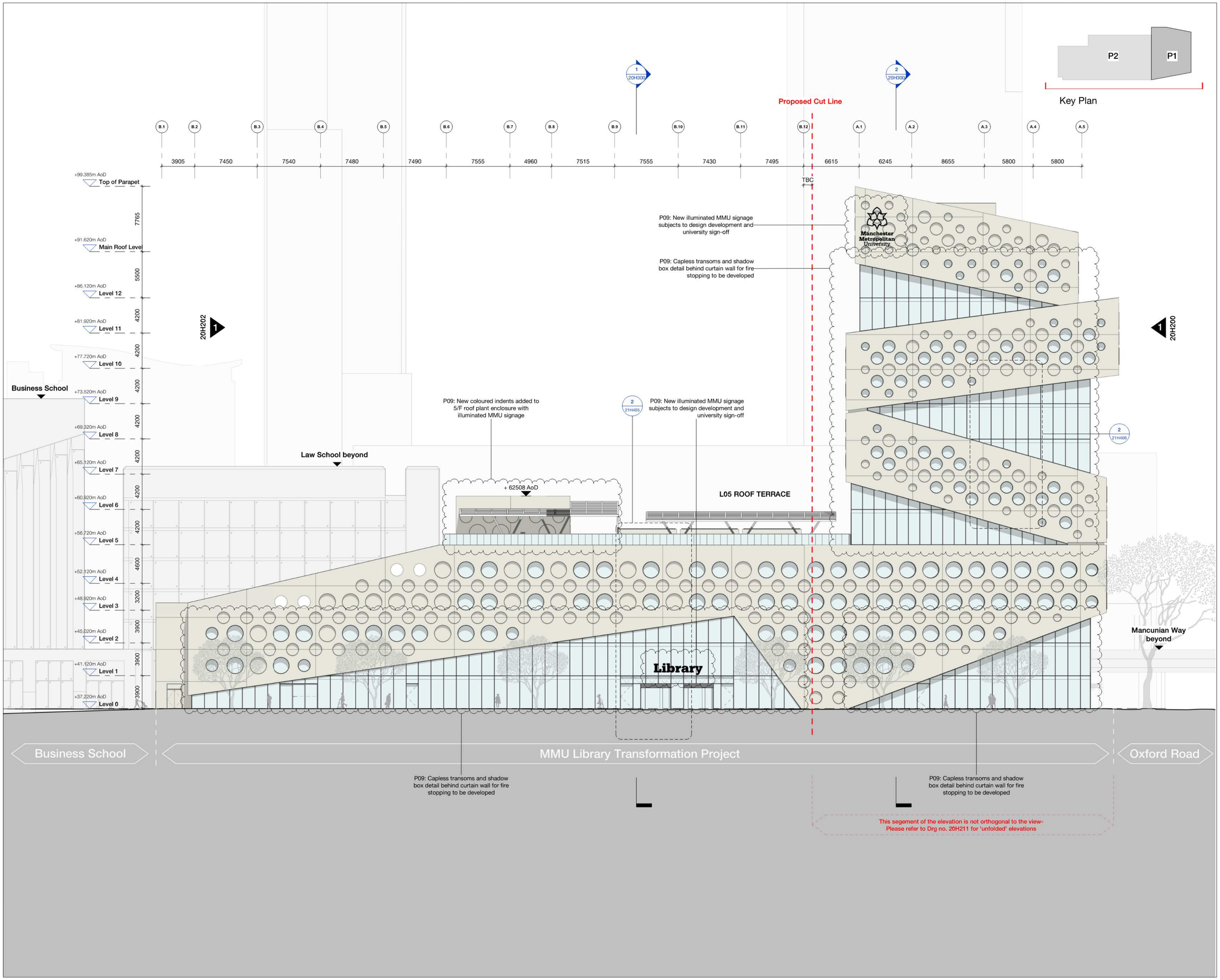

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Curtain Walling	1.3 W/m2K
G-Value	0.3

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South Elevation

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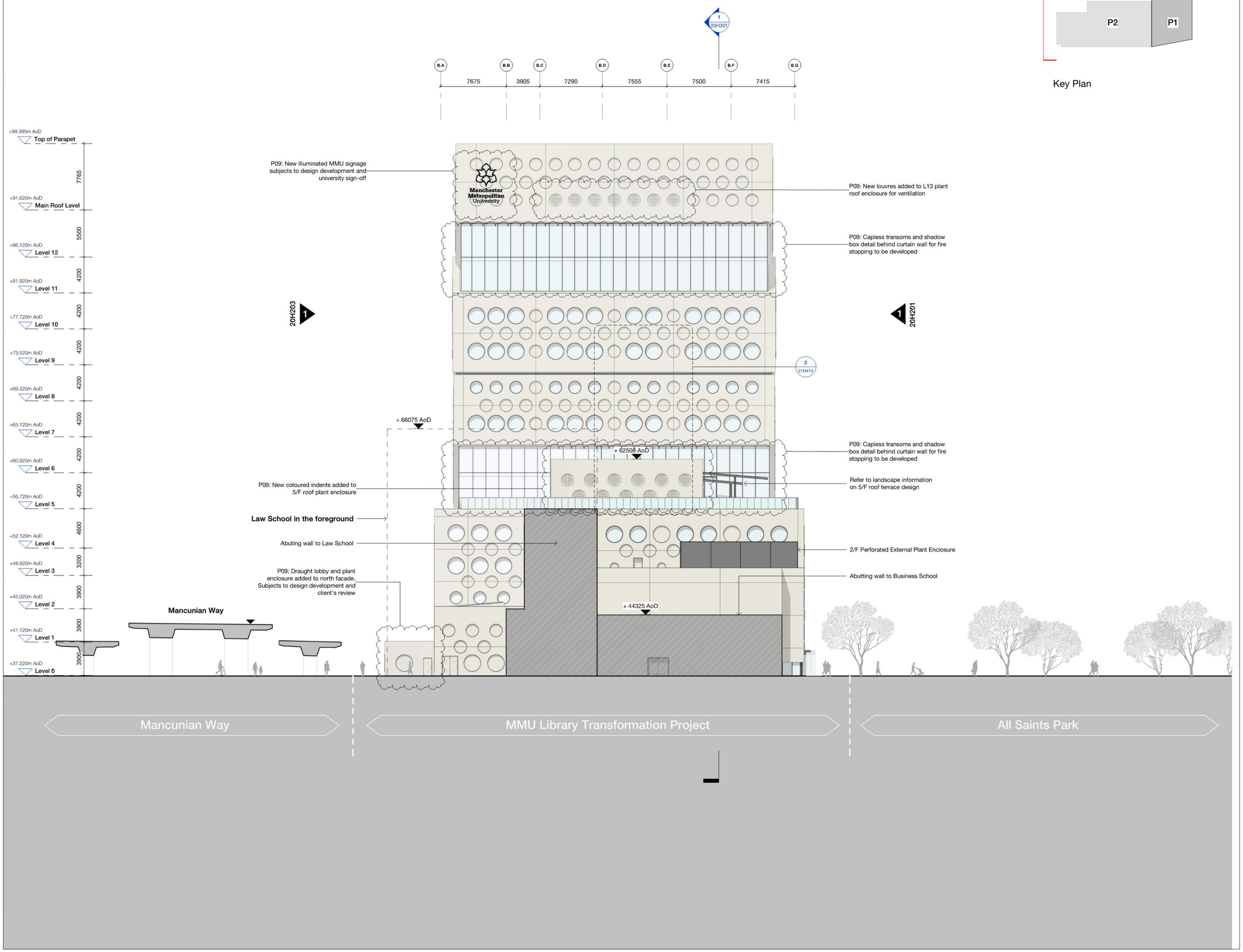

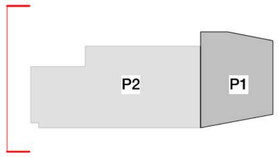

Key Plan

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Appendix B NPPF Planning Practice Guidance Table 1: Flood Zones

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Table 1: Flood zones
(Note: These flood zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 - low probability **Definition** This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). **Appropriate uses** All uses of land are appropriate in this zone. **Flood risk assessment requirements** For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and 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 flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention. **Policy aims** In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems[1].
Zone 2 - medium probability **Definition** This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year. **Appropriate uses** Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table 2, are appropriate in this zone. The highly vulnerable uses are only appropriate in this zone if the Exception Test is passed. **Flood risk assessment requirements** All development proposals in this zone should be accompanied by a flood risk assessment. **Policy aims** In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage systems.
Zone 3a - high probability **Definition** This zone comprises land assessed as having a 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. **Appropriate uses** The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

[1] Sustainable drainage systems cover the whole range of sustainable approaches to surface drainage management. They are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible.

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Appendix C NPPF Planning Practice Guidance Table 2: Flood Risk Vulnerability and Flood Zone 'Incompatibility'

Table 2: Flood risk vulnerability and flood zone 'compatibility'

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

Key:

✓ Development is appropriate.
× Development should not be permitted.

Notes to table 2:

This table does not show:

a. the application of the Sequential Test which guides development to Flood Zone 1 first, then Zone 2, and then Zone 3;
b. flood risk assessment requirements; or
c. the policy aims for each flood zone.

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Appendix D Planning Practice Guidance Annex 3: Flood Risk Vulnerability Classification

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Annex 3: Flood risk vulnerability classification

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[2]. • Installations requiring hazardous substances consent[3]. (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")[4].
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[5]. • Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan.*[6]
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).

[2] For any proposal involving a change of use of land to a caravan, camping or chalet site, or to a mobile home site or park home site, the Sequential and Exception Tests should be applied.

[3] See Circular 04/00: *Planning controls for hazardous substances* (paragraph 18) at: www.communities.gov.uk/publications/planningandbuilding/circularplanningcontrols

[4] In considering any development proposal for such an installation, local planning authorities should have regard to planning policy on pollution in the National Planning Policy Framework

[5] For definition, see *Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10* at www.communities.gov.uk/publications/planningandbuilding/planningsustainable

[6] See footnote 3

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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.

Notes to Annex 3

a. This classification is based partly on Department for Environment, Food and Rural Affairs and Environment Agency research on *Flood Risks to People* (*FD2321/TR2*)[7] and also on the need of some uses to keep functioning during flooding.

b. Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.

c. The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

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Appendix E Environment Agency Flood Data

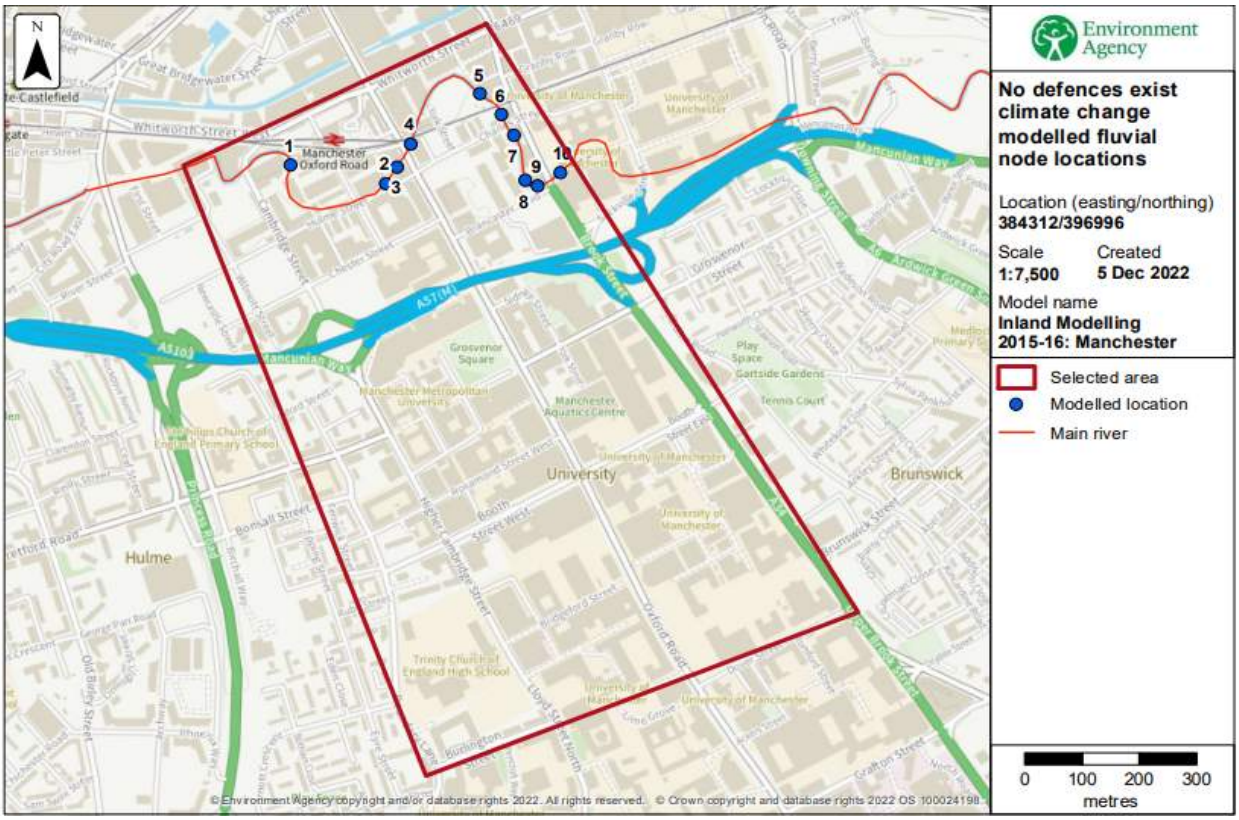

Figure E-1 Locations modelled by the EA along the River Medlock for the no defences Climate Change scenario

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Modelled node locations data

No defences exist climate change

Label	Modelled location ID	Easting	Northing	1.0% AEP (+30%)		1.0% AEP (+35%)		1.0% AEP (+70%)	
				Level	Flow	Level	Flow	Level	Flow
1	1177701	383951	397438	30.58	76.05	30.66	78.75	31.24	99.10
2	1178043	384117	397404	31.80	76.05	31.84	78.75	32.10	99.10
3	1177390	384137	397434	31.81	75.69	31.85	78.37	32.12	98.47
4	1177738	384161	397476	33.27	75.57	33.32	78.25	33.56	98.26
5	1177434	384283	397566	33.32	73.59	33.37	76.20	33.62	94.39
6	1177737	384320	397528	33.35	72.97	33.40	75.56	33.66	93.15
7	1177756	384343	397490	33.35	72.97	33.41	75.56	33.66	93.15
8	1177553	384361	397409	33.38	72.04	33.44	74.59	33.70	91.53
9	1177719	384384	397399	33.42	71.69	33.48	74.22	33.76	91.53
10	1177896	384423	397424	33.43	71.50	33.49	74.03	33.77	95.36

Data in this table comes from the Inland Modelling 2015-16: Manchester Ship Canal model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Figure E-2 Tabulated flood level and flow results associated with the Locations modelled by the EA along the River Medlock for the no defences Climate Change scenario

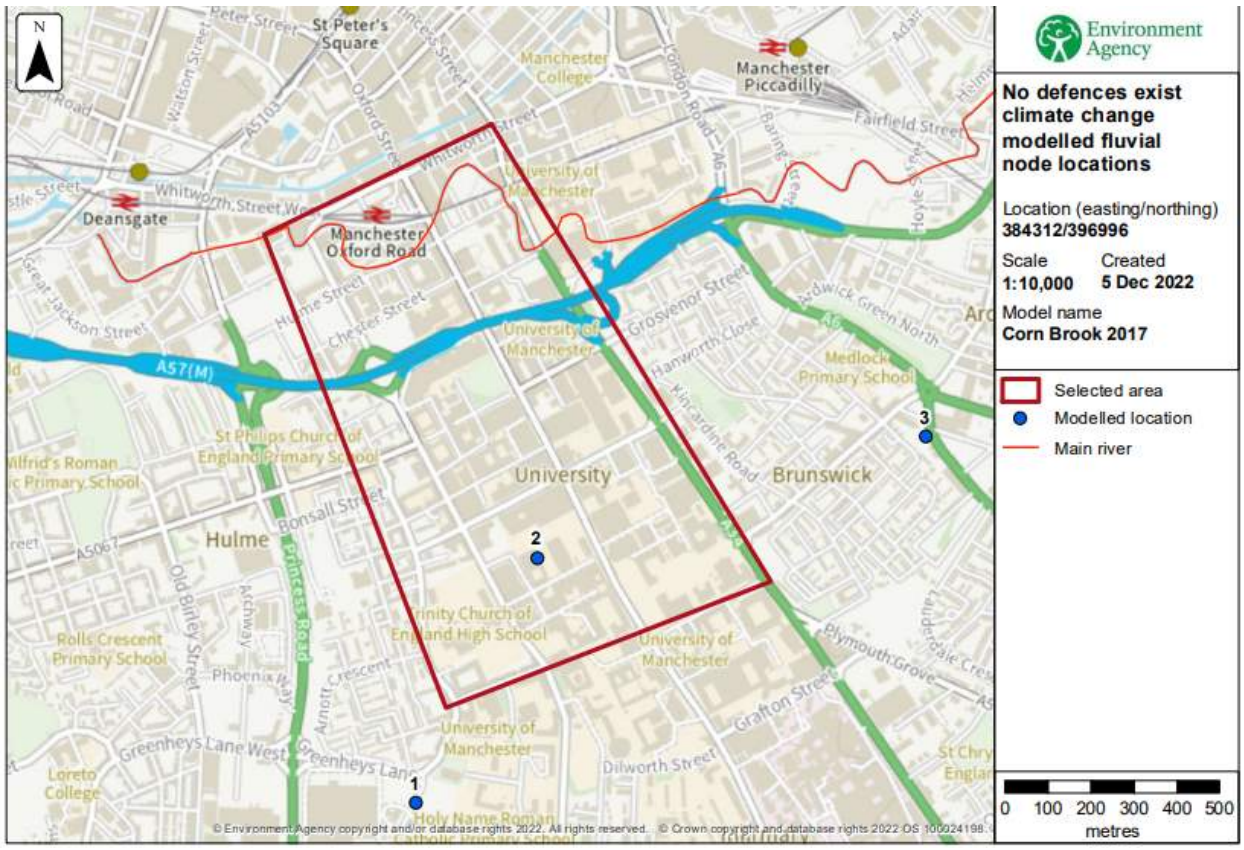

Figure E-3 Locations modelled by the EA to the south of the site for the no defences Climate Change scenario

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Modelled node locations data

No defences exist climate change

Label	Modelled location ID	Easting	Northing	1.0% AEP (+30%)		1.0% AEP (+35%)		1.0% AEP (+70%)		0.1% AEP (+30%)	
				Level	Flow	Level	Flow	Level	Flow	Level	Flow
1	952465	384116	396112	33.75	1.57	33.79	1.63	34.02	2.05	34.46	4.51
2	952467	384400	396681	37.38	2.40	37.39	2.49	37.47	3.13	37.77	7.13
3	952453	385305	396966	40.73	3.46	40.76	3.59	40.94	4.52	41.65	10.10

Data in this table comes from the Corn Brook 2017 model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Figure E-4Tabulated flood level and flow results associated with the Locations modelled by the EA to the south of the site for the no defences Climate Change scenario

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Carys Thomas
Buro Happold Limited
Camden Mill
Lower Bristol Road
Bath
BA2 3DQ
UK

T: +44 (0)1225 320 600
F: +44 (0)870 787 4148
Email: carys.thomas@burohappold.com