



FLOOD RISK ASSESSMENT

Martin Harris Music Block, Bridgeford Street, Manchester, M15 6FH

**Report prepared on behalf of University of
Manchester**

01/07/22

Rev. 01

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FLOOD RISK ASSESSMENT & SUDS STRATEGY

Revision List

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1.0 Introduction

1.1 General

- 1.1.1 This report relates to a planning application for the development of a brownfield site off Bridgeford Street, Manchester for the proposed development of a new music teaching block.
- 1.1.2 This report sets out the results of a flood risk assessment required in support of a planning application for this development. The assessment has been carried out in accordance with the general principles set out in National Planning Policy Framework, Technical Guidance to the National Planning Policy Framework and Flood Risk and Coastal Change Planning Practice Guidance.
- 1.1.3 This report is prepared solely for the benefit of The University of Manchester. This report may not be assigned without prior written permission from Clancy Consulting Ltd.

1.2 Background Information

- 1.2.1 In 2001 the Department for Transport, Local Government and the Regions (DTLR) published Planning Policy Guidance Note 25 (PPG25), which explains how flood risk should be taken into consideration during the planning and development process.
- 1.2.2 PPG25 was replaced by Planning Policy Statement 25: Development and Flood Risk published in March 2010. This Policy Statement was introduced to place more emphasis on the increased flood risk from climate change.
- 1.2.3 In March 2012, the Government released the National Planning Policy Framework (NPPF) aiming to make the planning system less complex and more accessible, to protect the environment and promote sustainable growth.
- 1.2.4 NPPF accompanied with the Technical Guidance superseded PPS25 although the principles set out in the new publication remain similar in terms of the flood risk aspect.
- 1.2.5 The flood risk Practice Guide was published online in March 2014 with the latest update in August 2021.
- 1.2.6 In July 2018 the NPPF was updated. This update has highlighted the need for further awareness of flood risk issues for new developments. This has since been revised in February 2021 to include minor clarifications.

2.0 Structure of the Report

- 2.1** The report has been structured to follow the general principles set out in the Technical Guidance published in March 2014 along with subsequent revisions.
- 2.2** The methodology for this FRA has comprised a desktop study making reference to the Environment Agency (EA) Mapping, Manchester City Council Strategic Flood Risk Assessment (SFRA) and Manchester City Council LLFA Guidance with relevant plans including plans showing the location of local sewers.
- 2.3** Sources of information
- Flood maps from the Environment Agency published online
 - Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA
 - United Utilities Asset Data
 - British Geological Survey / Magic Map
 - Existing site records
 - Government Website Flood Risk Assessment Guidance

3.0 Site Description

3.1 Location

3.1.1 The site is located detailed as below.

OS X (Eastings)	384419
OS Y (Northings)	396599
Nearest Post Code	M15 6FH

Table 1 – Site Details

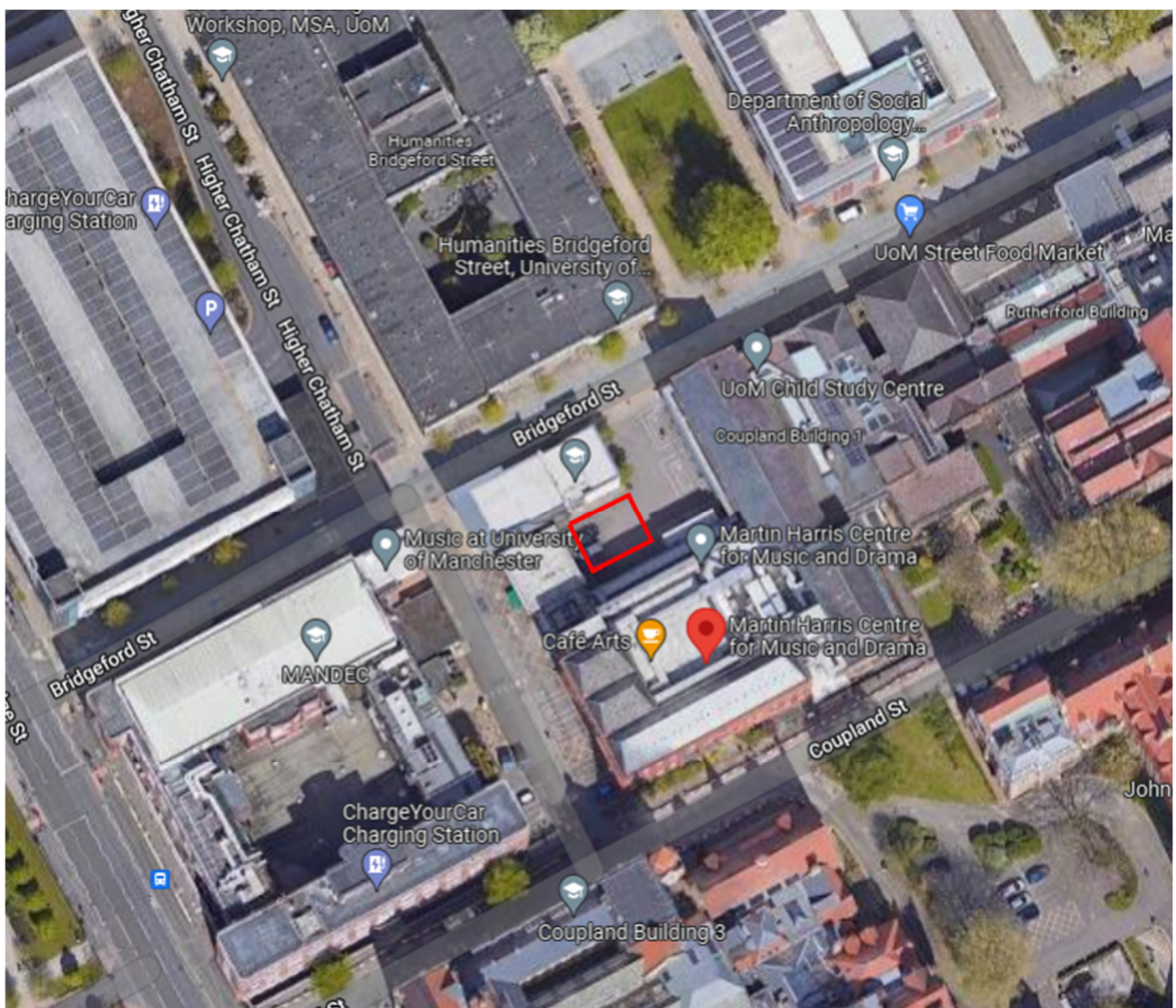


Figure 1- Existing Aerial Plan (Google Mapping)



Figure 2 - Site Location (OS)

3.2 Existing Site Layout and Topography

- 3.2.1** The Existing site comprises a brownfield site of approximately 0.012 hectares which was formerly used as a car parking area.
- 3.2.2** The site is accessible via Bridgeford Street to the North of the development area.
- 3.2.3** A topographic survey has been undertaken and is included in Appendix C. The ground levels are fairly consistent with a slight slope down from the North-East Boundary at approximately 36.52m AOD to 36.42m AO in the North-West Corner.

3.3 Geology

- 3.3.1** The British Geological Survey's (BGS) online geological maps indicates the site has superficial deposits of Glaciofluvial Sheets and Devensian comprising, Sand and Gravel with Chester Formation bedrock comprising of Sandstone.
- 3.3.2** A desk study ground investigation has been carried out by Clancy Consulting in April 2021. The investigations confirmed the presence of sandstone and Diamicton deposits as well as some areas

of made ground. The body of the report (no appendices) has been included in appendix B for reference.

3.4 Hydrology

- 3.4.1** There are no watercourse or surface drainage features within the site. The nearest ordinary watercourse is highlighted on the Google Mapping as shown below. This mapping indicates that the nearest watercourse is the River Medlock, which is approximately 0.79km to the North of the development site.

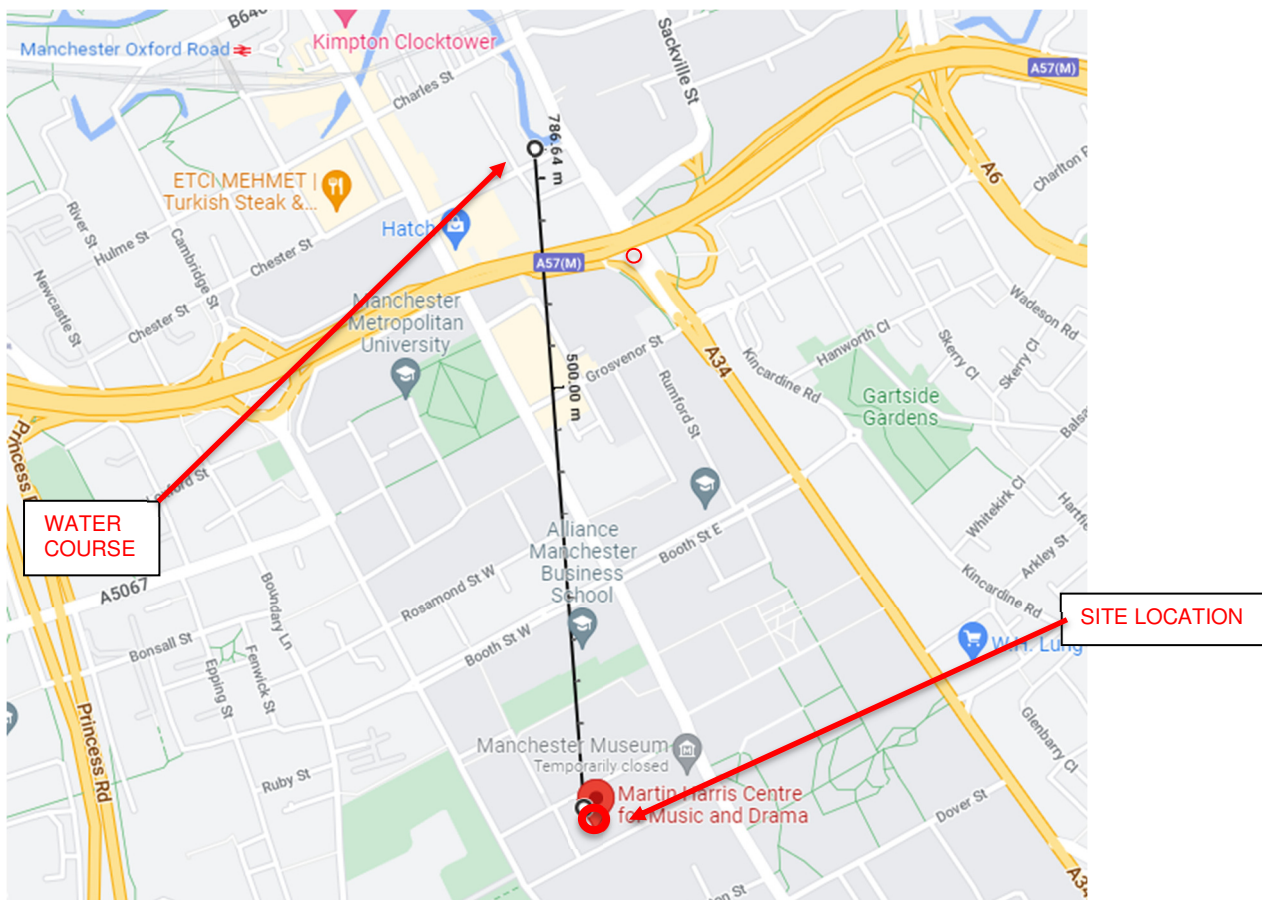


Figure 3 – Ordinary Water Courses (Google Maps)

3.5 Hydrogeology

- 3.5.1** The Devensian Till superficial layer beneath the site is classified by the EA as being an Undifferentiated Secondary Aquifer, while the Chester Formation below this is classified as being a Principal Aquifer. This means that there is potential across this area for a high level of water storage and transmission.
- 3.5.2** There are 15 records of licensed groundwater abstractions within 1km of the site as per the information provided by the EA, with the closest being 543m Northwest and the furthest 877m Southwest. Groundwater quality below the site has not been classified under an EA Local River Basin Management Plan.

- 3.5.3** The site is located within a zone 3 (total catchment) ground water source protection zone. Refer to the extract from Magic Map below. Zone 3 (total catchment) refers to an area in which all the groundwater has the potential to end up at an abstraction point.

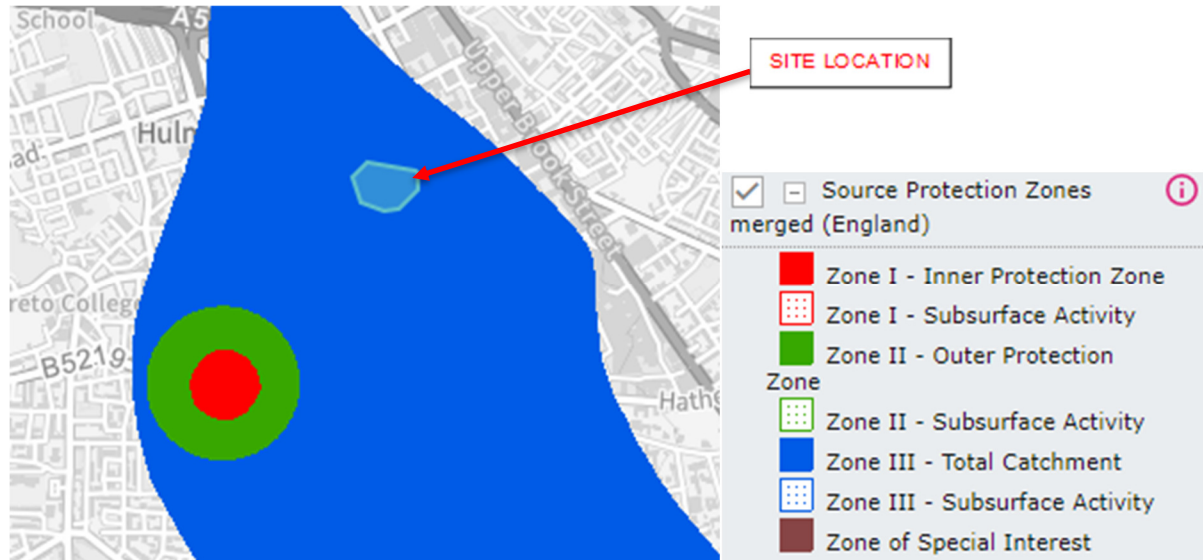


Figure 4 – Ground Water Source Protection. (Magic Maps)

4.0 Proposed Development

4.1 Description

- 4.1.1** The proposed development comprises a single new two storey modular construction music teaching block with approximately 120m² footprint. The Proposed development is serviced by an access road off Bridgeford Street. A proposed plan of the development can be found in Appendix A.

5.0 Flood Potential

5.1 Rivers and Sea.

5.1.1 The following zones define the levels of flood risk from Rivers and the Sea:

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 between 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. SFRA should identify this zone.

5.1.2 As part of its general obligations under the Water Resources Act 1991, The Environment Agency has carried out surveys of its existing defences against flooding and has published a series of nationwide 'Indicative Floodplain Maps' based upon information from historic flood events and basic hydraulic modelling. In general terms, these maps give a good indication of the areas likely to be affected by flooding. More recently, the Environment Agency have published the 'Flood Map' on their website which is based on improved hydraulic modelling and detailed local data.

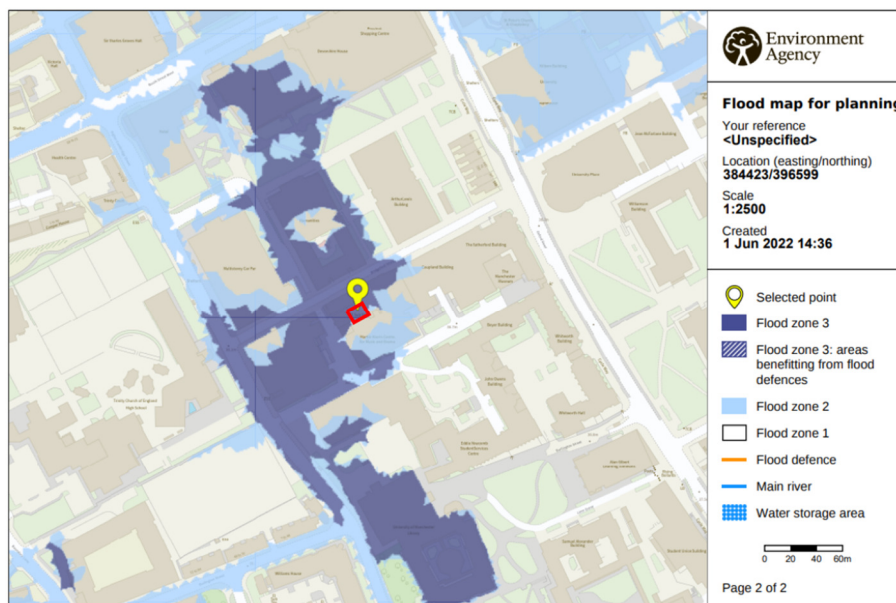


Figure 5 – EA Flood Map for Planning (Gov.uk)

5.1.3 The site is located within **Flood Zone 3** in terms of flooding from any nearby water course or the sea. This is due to its close proximity to a number of different water courses, with the River Irwell, Bridgewater Canal, Ashton Canal and River Medlock all within 2km of the site.

5.1.4 Flood Risk Vulnerability Classification.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a†	Exception Test Required†	✗	Exception Test Required	✓	✓
Zone 3b*	Exception Test Required*	✗	✗	✗	✓

Table 2 - Flood Risk Vulnerability and Flood Zone 'Compatibility' (Gov.uk)

Key:

✓ Development is appropriate

✗ Development should not be permitted

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

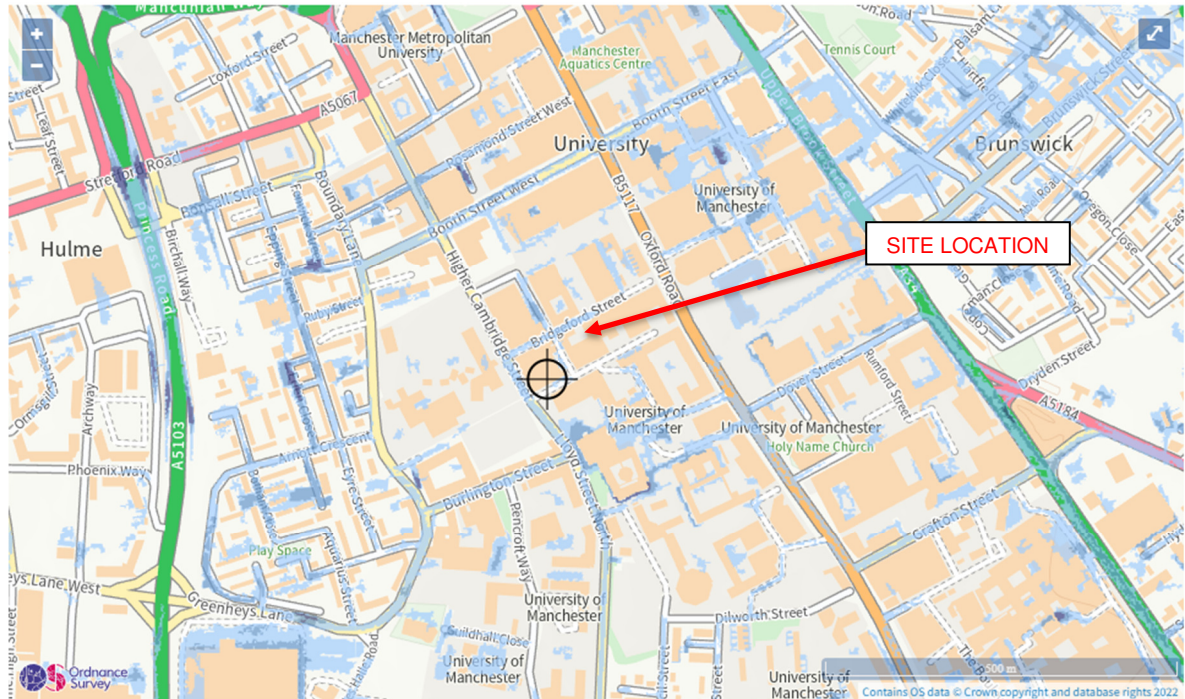
* * * In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

5.1.5 The NPPF (Technical Guidance) Table 3, Flood Risk Vulnerability and Flood Zone Compatibility matrix, indicates that “**More Vulnerable**” development proposals in **Flood Zone 3** are acceptable upon completion of an exception test.

5.2 Surface Water

- 5.2.1** During extreme rainfall events, or due to poor gully drainage maintenance, there will be times when gully capacity is exceeded which will lead to surface flow within the surrounding roads. Mapping for this form of flooding is shown on the Environment Agency website.



Extent of flooding from surface water

● High ● Medium ● Low ○ Very low ⊕ Location you selected

Risk Category	Definition
High	Each year, there is a chance of flooding of greater than 1 in 30 (3.3%)
Medium	Each year, there is a chance of flooding of between 1 in 30 (3.3%) and 1 in 100 (1%)
Low	Each year, there is a chance of flooding of between 1 in 100 (1%) and 1 in 1000 (0.1%)
Very Low	Each year, there is a chance of flooding of less than 1 in 1000 (0.1%)

Figure 6 - Flood Risk from Surface Water (Gov.uk)

- 5.2.2** It can be seen from the flood mapping (Fig 6) that the whole of the site is at very low risk from surface water flooding. There is an area of low risk accumulating within Bridgeford Street just outside the entrance of the site.
- 5.2.3** The extreme event mapping provided by the Environment Agency included data ranging from a 1 in 1 year storm to a 1 in 1000-year storm plus climate change allowances. This data provides the level of the flood water that might accumulate at the low point of the site, from the EA modelling data the following maximum flooding levels are returned for the 1% AEP probability events:

1%AEP (+30% climate change) = 36.70mAO
1%AEP (+35% climate change) = 36.70mAO
1%AEP (+70% climate change) = 36.72mAO

- 5.2.4** For the Irwell Management Catchment Area, a 1% AEP event for the 2070's epoch (development life to 2061-2125) the upper band climate change allowance recommended is +45% and as such the maximum flood level assumed for this report is 36.72mAO which approximates to a 2070s epoch design life and exceeds the current climate change allowance recommendations.
- 5.2.5** The guidance from the government website suggests that in area of flood zone 3, for extra flood resistance and resilience measures the FFL must be 300mm above the predicted flood level or alternative flood prevention and protection measures included. Elevating the FFL would minimise the impact on the modular supplier's design requirements. As such it is proposed to have an FFL of 37.02mAO for the new structure.
- 5.2.6** From the mapping, (Fig 8) it can be seen that the water accumulating on Bridgeford Street flows West down towards Higher Cambridge Street away from the site.

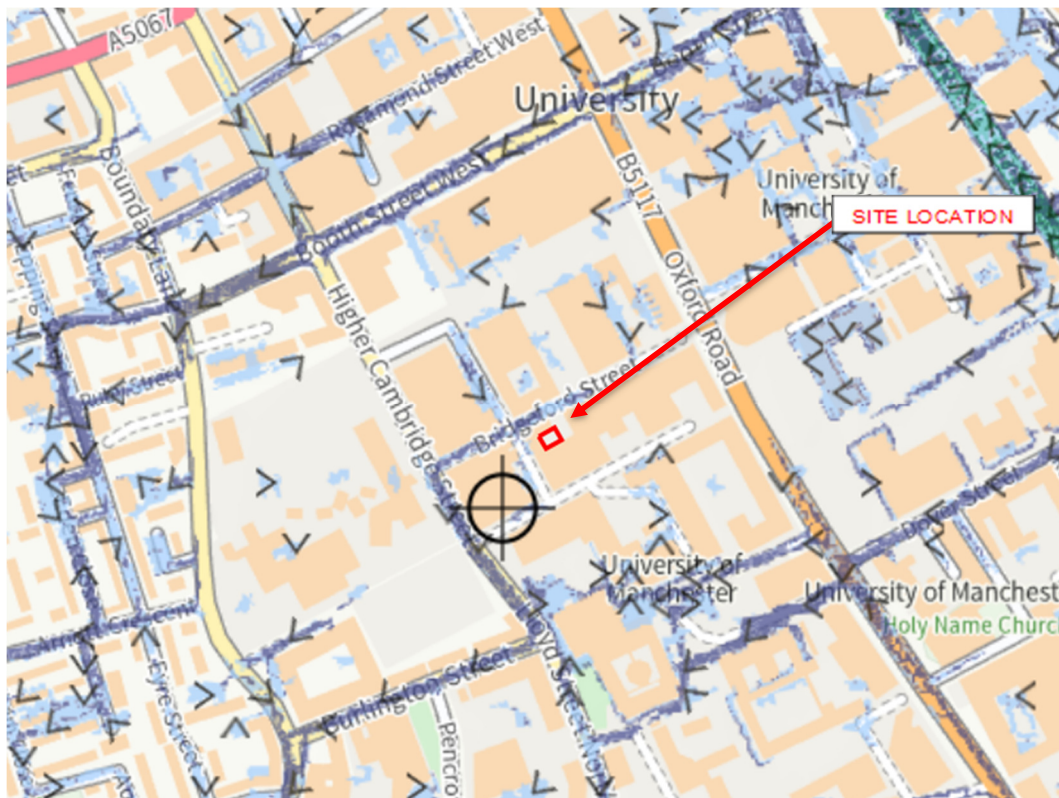


Figure 8 - Flood Risk from Surface Water – velocity / flow direction (Gov.uk) – Low risk.

- 5.2.7** From a review of the Topographical Survey for the site, it is assumed that the surface water is drained to various yard gullies positioned at the low points across the car park area. If there were to be any overland flood flow still finding its way onto the development site on the Western boundary of the car park there is a flow path between two of the existing buildings, which we assume would divert excess surface water away from and around the proposed building footprint into the highway to the West.

5.3 Ground Water

- 5.3.1** Reference has been made to the Magic Mapping tool. Mapping has been altered to include areas of vulnerability to ground water flooding. The development site shown to be at low-medium flood risk.

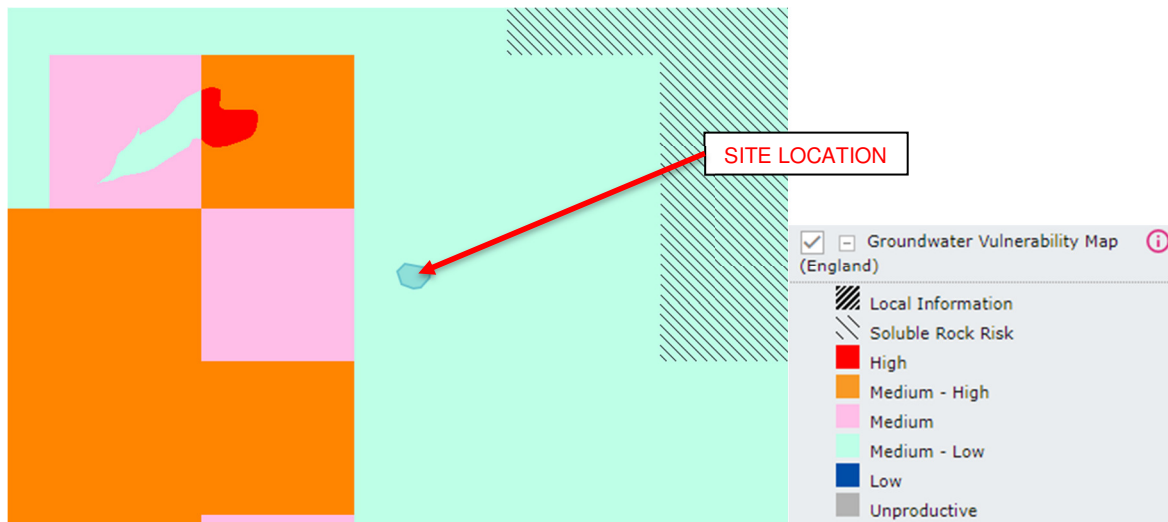


Figure 9 – Magic mapping for vulnerability to ground water flooding.

- 5.3.2** A ground investigation was carried out at a site roughly 250m from the Martin Harris Music Block in November 2011 (L&AD2002 Ltd – Exploratory Soil Survey Report Boundary Lodge, Manchester). This investigation found that there were permeable soils of sand and gravel present on site, with groundwater being recorded in one of the boreholes also at a depth of 7.57m. Groundwater flooding risk is therefore considered **low**.

5.4 Artificial Sources

- 5.4.1** Artificial sources of flooding are potentially from man-made structures and infrastructure. The Environment Agency have modelled the potential effect of flooding from failures in retaining structures containing reservoirs. The blue area on the map below indicates potential flooding (figure 10).
- 5.4.2** It should be noted that reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. As reservoirs are significant items of infrastructure, regular inspections are carried out and maintenance tasks undertaken by reservoir panel engineers as a priority. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensure that reservoirs are inspected regularly, and essential safety work is carried out.
- 5.4.3** The risk of flooding from reservoirs at this site is **low**.

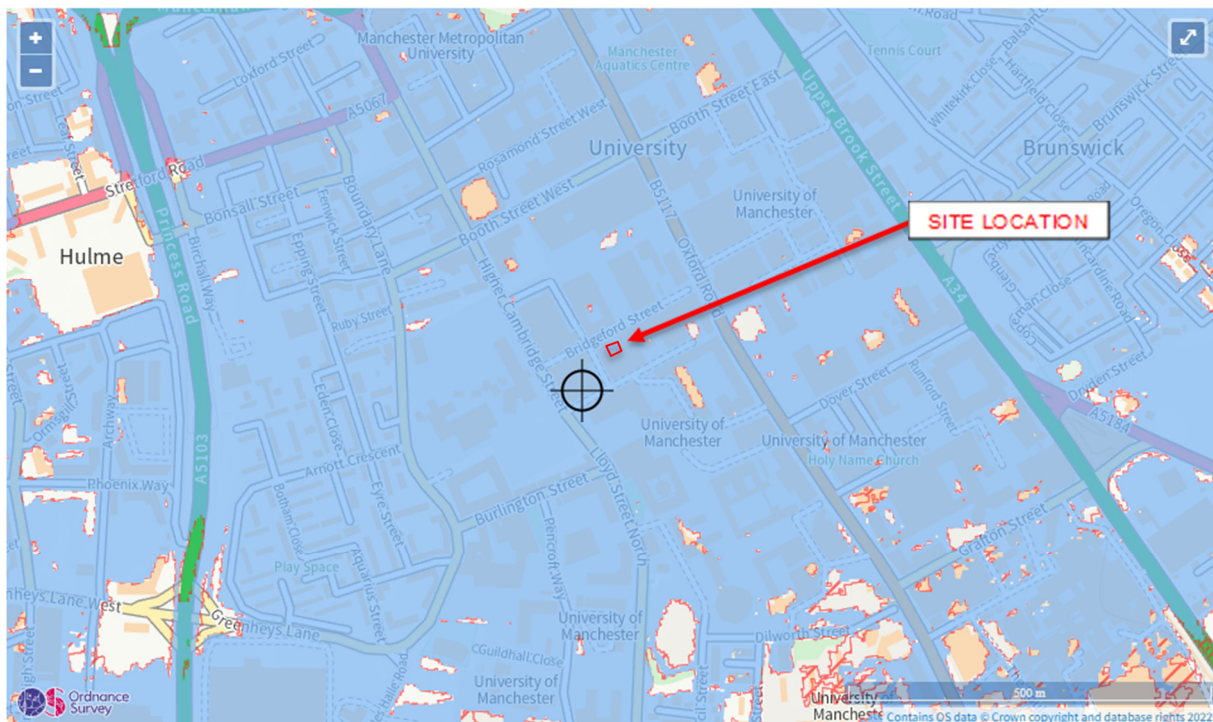


Figure 10 – Extent of Flooding from Reservoirs (Gov.uk)

5.5 Existing Historical Flood Information

- 5.5.1** Reference has been made to the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA. There are no specific recorded events of flooding at the development site. However, it does note various flooding events in conjunction with the River Irwell, Bridgewater Canal and the Manchester Ship Canal, which are all within around 2.5km Northwest of the site.
- 5.5.2** For surface water flooding, it is recognised that this is an issue in some areas around the site in the Manchester SFRA but there are no details of specific incidents and locations.

5.6 Exception Test

- 5.6.1** As per UK government guidance, an exception test requires the development to demonstrate the following two characteristics: that the sustainability benefits of the development to the community outweigh the flood risk, the development will be safe for its lifetime taking into account the vulnerability of its users and that it won't increase flood risk elsewhere. This development will provide an increase to capacity and quality of the musical teaching facilities at Manchester University, in turn helping to improve the standard of education received by the local community. This will also help to draw in more students to the university as a whole.
- 5.6.2** The development is an area that is vulnerable to fluvial flooding, however this factor has been mitigated by the design through raising the finished floor level by 300mm. As a result of this, the floor level is now above the proposed flood level that is detailed by the EA to occur during extreme storms events, with the specific event chosen (1 in 100 +70% CC) adhering to the 2070s epoch upper band climate change allowance figure (1 in 100 + 45%). Therefore, showing the structure will be able to withstand flooding for the entirety of its predicted 100-year design life.

6.0 Drainage

6.1 Existing Drainage

6.1.1 United Utilities Sewers.

- 6.1.1.1 There are no public sewers running through the site.
- 6.1.1.2 Flooding could occur if the on-site drainage system becomes blocked or a rainfall event exceeds the design capacity.
- 6.1.1.3 For the existing drainage on site, it is known that a 600mm diameter public combined system runs through Bridgeford Street, the road adjacent to the site. (See figure 11 below). There are 3 manholes on the site in the car park area and it is possible that these chambers could surcharge and result in flooding at the surface. As discussed above, this potential risk will be mitigated with the use of careful levels design within the landscaping to divert and potential flood water flows away from buildings. The floor level of the building has also been set at an appropriate level with the required freeboard to reduce the risk of flooding.

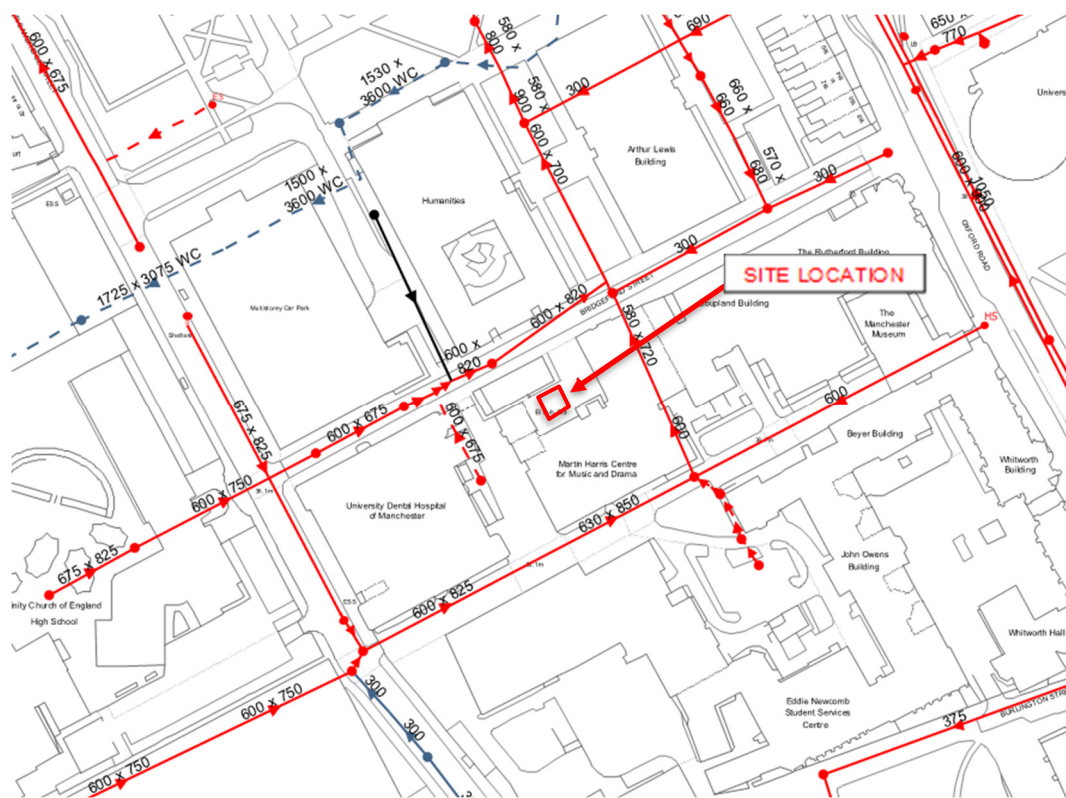


Fig 11 – United Utilities Asset Plan.

- 6.1.1.4 The ground levels in the car park slope towards a yard gully located towards the North of where the building footprint will be, so it is possible this area is currently being drained into this gully and being connected into a surrounding private network.

7.0 Flood Mitigation Measures

7.1 The site is at a low risk of flooding except for the following;

7.1.1 Rivers and Sea

7.1.1.1 Generally, the building has been designed and located on the site to be at the lowest possible risk of flooding and the building levels set such to provide the lowest risk to users of the building.

7.1.1.2 Floor levels have been elevated to satisfy the recommendations from the government website for vulnerable developments, in tandem with this we have also recommend the use of either steps or a ramp for access into the building (to be designed by architect once agreed).

7.1.1.3 There may be times when the development is not easily accessible by vehicles. In the unlikely event that this was to occur, users of the building will be advised to remain in the building until flood water subsides.

7.1.1.4 Should emergency services be required on site the potential maximum depth of water at the building entrance could be approximately 130mm (based on current mapping). Due to the ponding in this location, it is likely that the velocity of flows will be low and could be accessible to emergency services.

HR	Depth of flooding - d (m)												
	DF = 0.5				DF = 1								
Velocity v (m/s)	0.05	0.10	0.20	0.25	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.0	0.03+0.5 0.53	0.05+0.5 = 0.55	0.10+0.5 = 0.60	0.13+0.5 = 0.63	0.15+1.0 = 1.15	0.20+1.0 = 1.20	0.25+1.0 = 1.25	0.30+1.0 = 1.30	0.40+1.0 = 1.40	0.50+1.0 = 1.50	0.75+1.0 = 1.75	1.00+1.0 = 2.00	1.25+1.0 = 2.25
0.1	0.03+0.5 0.53	0.06+0.5 = 0.56	0.12+0.5 = 0.62	0.15+0.5 = 0.65	0.18+1.0 = 1.18	0.24+1.0 = 1.24	0.30+1.0 = 1.30	0.36+1.0 = 1.36	0.48+1.0 = 1.48	0.60+1.0 = 1.60	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.55
0.3	0.04+0.5 0.54	0.08+0.5 = 0.58	0.15+0.5 = 0.65	0.19+0.5 = 0.69	0.23+1.0 = 1.23	0.30+1.0 = 1.30	0.38+1.0 = 1.38	0.45+1.0 = 1.45	0.60+1.0 = 1.60	0.75+1.0 = 1.75	1.13+1.0 = 2.13	1.50+1.0 = 2.50	1.88+1.0 = 2.88
0.5	0.05+0.5 0.55	0.10+0.5 = 0.60	0.20+0.5 = 0.70	0.25+0.5 = 0.75	0.30+1.0 = 1.30	0.40+1.0 = 1.40	0.50+1.0 = 1.50	0.60+1.0 = 1.60	0.80+1.0 = 1.80	1.00+1.0 = 2.00	1.50+1.0 = 2.50	2.00+1.0 = 3.00	2.50+1.0 = 3.50
1.0	0.08+0.5 0.58	0.15+0.5 = 0.65	0.30+0.5 = 0.80	0.38+0.5 = 0.88	0.45+1.0 = 1.45	0.60+1.0 = 1.60	0.75+1.0 = 1.75	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50	2.25+1.0 = 3.25	3.00+1.0 = 4.00	3.75+1.0 = 4.75
1.5	0.10+0.5 0.60	0.20+0.5 = 0.70	0.40+0.5 = 0.90	0.50+0.5 = 1.00	0.60+1.0 = 1.60	0.80+1.0 = 1.80	1.00+1.0 = 2.00	1.20+1.0 = 2.20	1.60+1.0 = 2.60	2.00+1.0 = 3.00	3.00+1.0 = 4.00	4.00+1.0 = 5.00	5.00+1.0 = 6.00
2.0	0.13+0.5 0.63	0.25+0.5 = 0.75	0.50+0.5 = 1.00	0.63+0.5 = 1.13	0.75+1.0 = 1.75	1.00+1.0 = 2.00	1.25+1.0 = 2.25	1.50+1.0 = 2.50	2.00+1.0 = 3.00	3.50	4.75	6.00	7.25
2.5	0.15+0.5 0.65	0.30+0.5 = 0.80	0.60+0.5 = 1.10	0.75+0.5 = 1.25	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50	1.80+1.0 = 2.80	3.40	4.00	5.50	7.00	8.50
3.0	0.18+0.5 0.68	0.35+0.5 = 0.85	0.70+0.5 = 1.20	0.88+0.5 = 1.38	1.05+1.0 = 2.05	1.40+1.0 = 2.40	1.75+1.0 = 2.75	3.10	3.80	4.50	6.25	8.00	9.75
3.5	0.20+0.5 0.70	0.40+0.5 = 0.90	0.80+0.5 = 1.30	1.00+0.5 = 1.50	1.20+1.0 = 2.20	1.60+1.0 = 2.60	3.00	3.40	4.20	5.00	7.00	9.00	11.00
4.0	0.23+0.5 0.73	0.45+0.5 = 0.95	0.90+0.5 = 1.40	1.13+0.5 = 1.63	1.35+1.0 = 2.35	1.80+1.0 = 2.80	3.25	3.70	4.60	5.50	7.75	10.00	12.25
4.5	0.25+0.5 0.75	0.50+0.5 = 1.00	1.00+0.5 = 1.50	1.25+0.5 = 1.75	1.50+1.0 = 2.50	2.00+1.0 = 3.00	3.50	4.00	5.00	6.00	8.50	11.00	13.50
5.0	0.28+0.5 0.78	0.60+0.5 = 1.10	1.10+0.5 = 1.60	1.38+0.5 = 1.88	1.65+1.0 = 2.65	3.20	3.75	4.30	5.40	6.50	9.25	12.00	14.75
Flood Hazard Rating (HR)		Colour Code		Hazard to People Classification									
Less than 0.75				Very low hazard - Caution									
0.75 to 1.25				Danger for some – includes children, the elderly and the infirm									
1.25 to 2.0				Danger for most – includes the general public									
More than 2.0				Danger for all – includes the emergency services									

8.0 Conclusions and Recommendations

- 8.1** This report gives details of the flood risk assessment and drainage design, which has been carried out in relation to the proposed educational development of the Martin Harris Music Block on land to the South of Bridgeford Street, Manchester.
- 8.2** The site can be considered at low-medium risk from all forms of flooding except for fluvial flooding which is a much higher risk in this area of Manchester. However, the layout of the development has been designed to locate the building in the lowest risk area of the site. The floor level of the building has also been designed to accommodate potential overland flow routes during extreme rainfall events.
- 8.3** Allowances have been made for climate increases in rainfall events and systems have been designed for extreme rainfall events.
- 8.4** The Proposed development meets NPPF and Local Policy requirements.

Appendix A – Development Proposals