

Appendix C

Fluvial Flood Risk Note – Response to EA

MECD – Work Stage 3 Flood Levels Review

1. Introduction

This document has been written in response to the EA letter ‘Flood Risk Review – Manchester Engineering Campus Development (MECD), Oxford Road’ (ref: SO/2014/114076/03-L01). The EA letter addresses information provided by Arup which highlighted that the EA model, detailing the flood risk posed to the MECD development, had assumed a significantly lower manhole level at a node adjacent to the site which affected the findings – this was confirmed to be the case by topographical survey undertaken by the MECD team. The letter acknowledged that, in light of the information provided by Arup, ‘*the volumes exiting the Corn Brook system in the vicinity of the site would be significantly different than our (EA) current model results suggest*’ [i.e. less severe] and goes on to recommend that:

- An estimation should be made as to whether the revised volumes of flood water are likely to reach/affect the site location.
- The recommended ground floor and entrances to the basement should be at least 600mm above the 1% AEP climate change flood level.

This document aims to address these points and evaluate the potential flood risk posed to the MECD site to enable the building design to progress towards a planning submission. A drawing (Ref: 5983-ARP-SW-GF-SI-CD-301001) is attached detailing the site location, anticipated overland flow paths of floodwaters and an assessment of the proposed finished floor levels.

2. Context

The MECD development is shown to be located in Flood Zone 2 (‘Medium’ probability of flooding) on the EA’s Flood Zone map. This is due to the potential for surcharging of a culverted watercourse, the Corn Brook, in close proximity to the south of site (approx. 135m).

In late 2014, it became evident that there was a topographical level discrepancy within the hydraulic model upon which the EA’s 2009 classification of flood risk to the development was based. Arup undertook an exercise to correct this discrepancy using the original EA model, as it appeared likely to reduce the volume of the surcharging floodwaters that would emerge from the Corn Brook (via manhole covers and interconnected drainage gullies within the street) and subsequently downgrade the flood risk to the site. This information was discussed with the EA over a period of October 2014 to February 2015.

This note aims to conclude these discussions and summarise any considerations with regards to flood risk and finished floor levels that are needed during the detailed design phase.

3. Assessment of fluvial flood risk to MECD (from Corn Brook)

Extreme Flood Volumes

The revised volumes for the cumulative flow of floodwaters from manholes, in close proximity to the site, are detailed in **Table 1**. The manhole locations are highlighted in drawing ref: 5983-ARP-SW-GF-SI-CD-301001. They were based on the original EA model and agreed by the EA (Liam Gaffney) on 12 November 2014.

Table 1. Modelling results from the updated model and the original EA model

Manhole location	Node ID	1 in 1000 year simulation <i>Cumulative flow from the manhole to 2D zone (m³)</i>		1 in 100 year + climate change simulation <i>Cumulative flow from the manhole to 2D zone (m³)</i>	
		Existing EA Model (Run 1)	Adjusted EA Model (Run 2)	Existing EA Model (Run 1)	Adjusted EA Model (Run 2)
1	SJ84964704	29,284	-	14,430	-
2	SJ84966704	-	-	-	-
2*	SJ84966702	3,077	10,206	112	2,363
3	SJ84966707	-	-	-	-
4	SJ84966705	-	-	-	-
5	SJ84967701	3,891	10,655	255	3,396
6	SJ84967703	-	-	-	-
7	SJ84968703	288	715	-	-
Net flood volume:		30,386	1,164	14,573	1,032
Note: Red volumes indicate out flowing flood volumes, black indicates inflowing flood volumes to manholes					
Run 1:	MH1 assumed a 36.5mAOD ground level				
Run 2:	MH1 adjusted to surveyed ground level 38.5mAOD				

Note, that the term ‘adjusted EA model’ has been used to mean the original EA model where just the cover level of MH1 has been adjusted to the newly surveyed level, which is 1.8m higher than originally modelled.

It is evident that the adjusted EA model predicts a reduced overall volume of surcharged floodwaters that that would flood from the Corn Brook overland. The 1 in 1000 year simulation is the worst case scenario considered, with overland flow flooding occurring from Manholes 5 and 7. It should be noted that the majority of floodwaters outflowing from Manhole 5, are predicted to flow back into Manhole 2* (highlighted in black in **Table 1**) by the model. Updated predictions therefore conclude that only approximately 1165m³ of water would be overland flow retained at the surface that would have the potential to flood adjacent areas (including the MECD site?).

Overland flow paths of floodwaters

In order to assess the overland flow path of the c.1165m³ of potential floodwaters from Manholes 5 and 7, the following sources of information were used to assess if this water could potentially reach the MECD site:

- Topographical information for the MECD site and surrounding area in the form of LiDAR data – as detailed in the attached drawing (ref: **5983-ARP-SW-GF-SI-CD-301001**)
- Site visits to Manholes 5 and 7 – photographs highlighting the main observed flow paths are detailed in **Images 1-4** below.

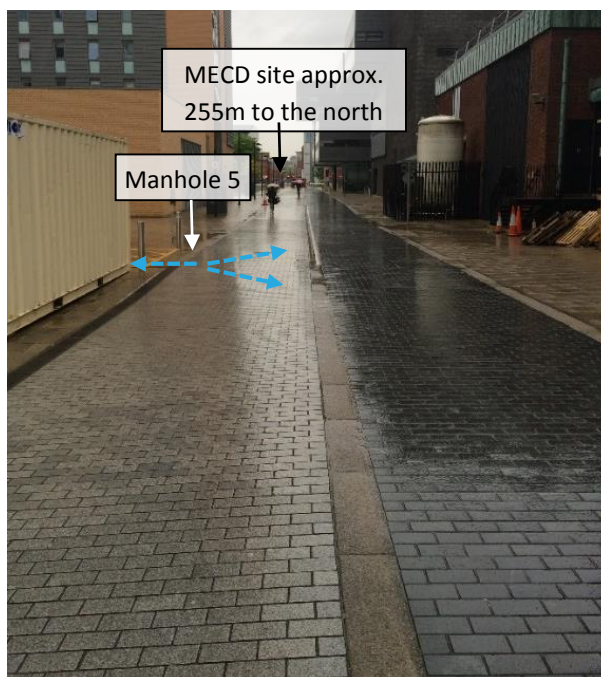


Image 1 - estimated overland flow paths for Manhole 5 (viewed north)



Image 2 - estimated overland flow paths for Manhole 5 (viewed south)



Image 3 - main overland flow paths for Manhole 7
(viewed East towards Upper Brook Street)

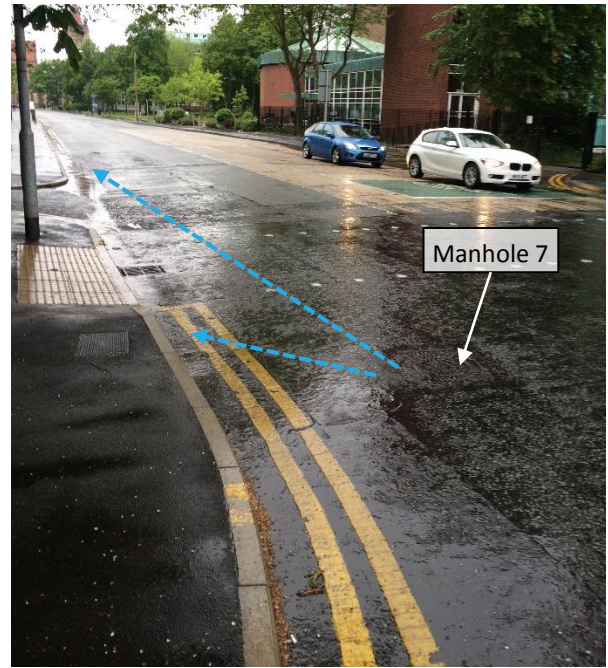


Image 4 - main overland flow paths for Manhole 7
(viewed West towards Oxford Rd)

(Images located approx. 350m south of the MECD site)

Location of all photos are referenced on the drawing discussed below.

Referring to the drawing (ref: **5983-ARP-SW-GF-SI-CD-301001**) and photographs highlighted in **Images 1-4**, it is evident that:

- Manhole 5 (predicted 450m³ flood volume for 1:1000 yr event)

Based on the observed gradients overland flow from this MH, if surcharged, would flow west and north-east of the manhole. There is a relatively flat area located north-east of the manhole, which would encourage localised ponding of the water within this location; any flow passing this would flow towards Manhole 2*. Ground levels are very flat in this location and there is a large proportion of open amenity space to the north of MH5¹ of c. 28,500m². As a worst case estimate, this 450m³ of volume would equate to an average ponded depth c. 15mm and is therefore unlikely to reach the MECD site as it would first have to pass over kerbs and pavement areas within Booth Street East.

- Manhole 7 (predicted 715m³ flood volume for 1:1000 yr event)

¹ Approximate area of green and paved open space north of NH5, bound between Oxford Road, Booth Street East and Upper Brook Street

At this location, gradients and topography, show that potential surcharged Corn Brook water would flow directly west down Brunswick Street and ultimately, following the observed gradient, southwards down Oxford Road and away from the MECD development.

From this assessment, it is considered that the predicted surcharged volumes of floodwaters are unlikely to reach/affect the MECD site location for the 1:1000 year event.

4. Recommended finished floors levels (FFL)

Manhole 1 is located closest to the MECD site boundary and hence, has been used to determine the recommended finished floor level (FFL) for the development. Having simulated both the 1 in 1000 year and 1 in 100 year (plus 20% climate change) events within the adjusted EA model, the water heights detailed in **Table 2** were outputted for Manhole 1. These were used to determine a minimum FFL of **37.80 mAOD**, based on EA guidance.

Table 2. Water heights and proposed finished floor levels

Condition	Adjusted model outputs for Manhole 1
1 in 1000 year (Flood Zone 2) flood level	37.424 mAOD
1 in 100 year (Flood Zone 3) flood level + climate change	37.200 mAOD
Freeboard allowance	600 mm
1 in 100 year (Flood Zone 3) + freeboard + climate change	37.80 mAOD
Proposed finished floor level for MECD	38.35 mAOD

The FFL for the MECD development is proposed such that it will tie in to the existing floor levels of the on-site buildings at **38.35 mAOD**. This is above the minimum recommended FFL and as such, is in accordance with the guidance provided by the EA.

5. Summary

In summary, addressing the two main points highlighted by the EA:

- It is considered that any surcharged Corn Brook flood water, from Manholes 5 and 7, are unlikely to reach/affect the MECD site.
- The minimum FFL (based on EA guidance) for the development is determined as 37.80 mAOD. This is below the proposed FFL for MECD of 38.35 mAOD.

Hence, it is concluded that the site is at a low risk of fluvial flooding and there are no specific flood mitigation measures required for design consideration beyond those required under NPPF for a site located in Flood Zone 1.

DESIGN NOTE

Reference:
Subject:

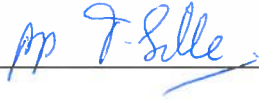
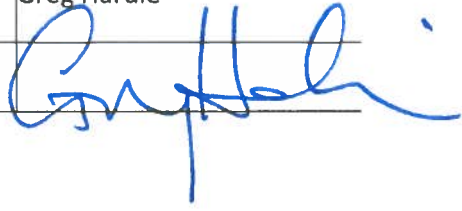
5983-ARP-00-XX-DN-C-000008
MECD Flood Levels

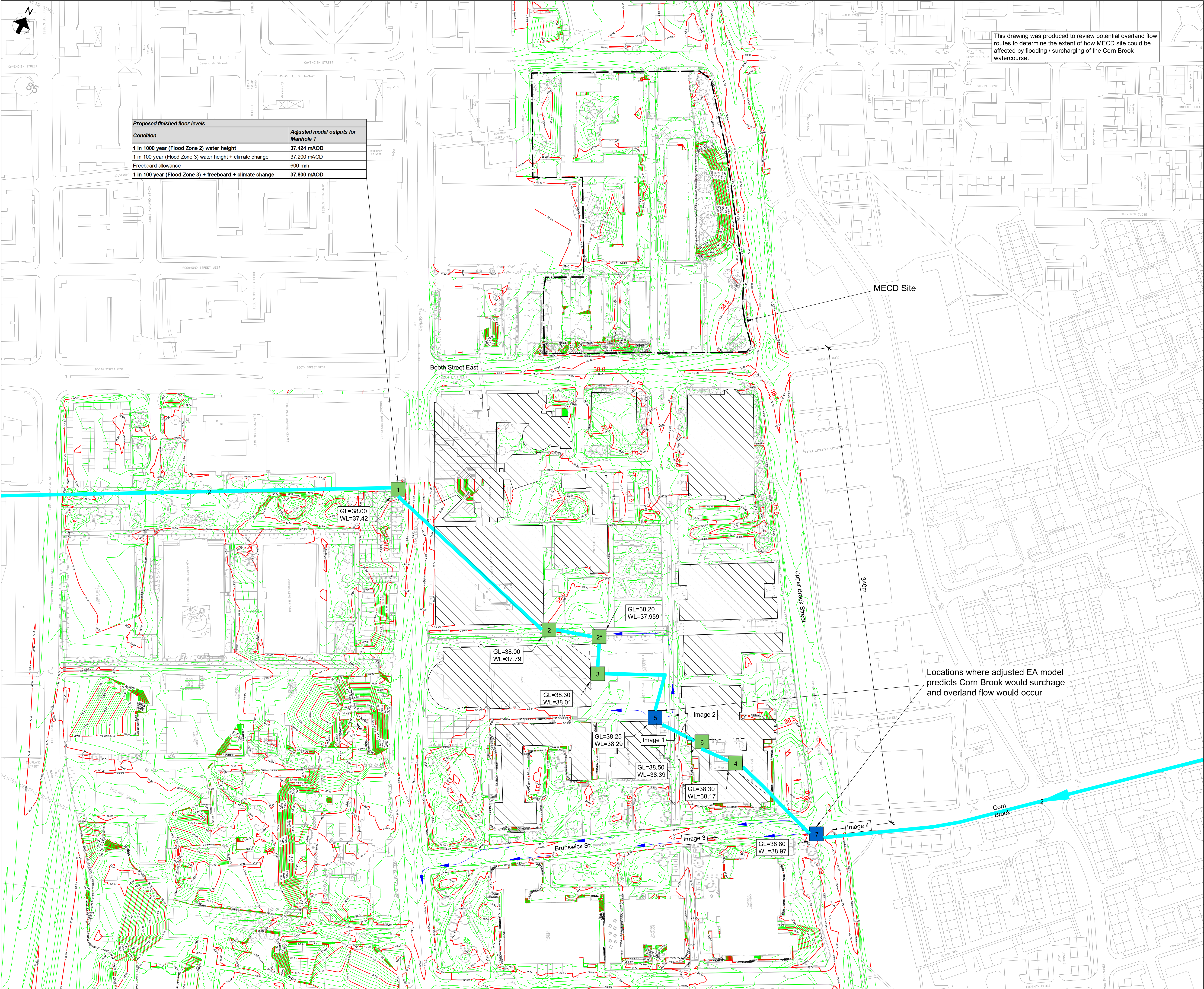
MECD

Date:

29 June 2015

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Rosemary Jenkinson	Tom Saville	Greg Hardie
Signature			



Proposed finished floor levels	
Condition	Adjusted model outputs for Manhole 1
1 in 1000 year (Flood Zone 2) water height	37.424 mAOD
1 in 100 year (Flood Zone 3) water height + climate change	37.200 mAOD
Freeboard allowance	600 mm
1 in 100 year (Flood Zone 3) + freeboard + climate change	37.800 mAOD

- Notes
- All dimensions are in mm, all levels in mOD unless specified otherwise.
 - This map is reproduced from Ordnance Survey Material with the permission of the Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown Copyright. License Number 0100031673 (2013).
 - Water level information obtained from the Environment Agency Corn Brook and River Medlock SFRM study dated 2009.

Key

--- Site Boundary

Manhole

- Ground level > Peak water level - No Flood Risk
- Ground level < Peak water level - Flood Risk

Building

- Building
- Building Under Construction
- 4 Predicted flood level from Corn-Brook study (1:1000 year)

GL = Ground Level

WL = Water Level in a 1 in 1000 year storm

Potential overland flow route with direction of flow

Approximate Corn Brook alignment

Image Location and direction of image referred to in Arup note: 'MECD EA Flood Levels'

keyplan: north:

revisions:	rev. date	drawn	checked
01	10-10-14	AS	TWS
02	22-10-14	AS	TWS
03	11-05-15	TW	RJ

mecanoo architecten bv

oudes Delft 263, 2611 HD Delft, the Netherlands
P.O. Box 3277, 2601 DG Delft, the Netherlands

Manchester Office: CU&E, 113-115 Portland St, Manchester M1 6DW, UK

T +31 (0)15 279 81 00, F +31 (0)15 279 81 11
www.mecanoo.nl, info@mecanoo.nl

ARUP

The University of Manchester

6th Floor, 3 Piccadilly Place, Manchester, M1 3BN
T +44 161 228 2331, F +44 161 236 105
www.arup.com

project name:
Manchester Engineering Campus Development MECD

sheet name:
Assessment of Overland Flood Risk

date:	project phase:	status:
11-05-2015	Stage 2 Concept Design	Draft
scale:	paper size:	project number:
1:1250	A1	235779-00
sheet number:	revision number:	
5983-ARP-SW-GF-SI-CD-301001	03	

Arup
3 Piccadilly Place
MANCHESTER
M1 3BN

Our ref: SO/2014/114076/03-L01
Your ref: 235779-00

Date: 18 February 2015

FAO: Tom Saville

Dear Sir

**FLOOD RISK REVIEW
MANCHESTER ENGINEERING CAMPUS, OXFORD ROAD**

Further to recent discussions, we would like to provide you with the following comments.

On review of the information you have provided, we accept that the volumes exiting the Corn Brook system in the vicinity of the site would be significantly different than our current model results suggest. Accordingly, flood outlines are likely to reduce correspondingly although we have no current plans to re-run the full model to update these on the published Flood Map for Planning.

We would suggest that the flood risk assessment (FRA) supporting any proposed development should include the revised estimates of flood volumes that you have submitted to us.

The FRA should make some estimation as to whether the revised volumes of flood water are likely to reach/affect the site location. There may still be potential for some limited amounts of flood water to reach the development. If so, it would be advisable to design the building such that any openings to the basement are elevated above surrounding ground. This would mitigate against any residual extreme fluvial event or surface water risks. In any event, we would recommend that the ground floor and entrances to the basement should be at least 600mm above the 1%AEP climate change flood level.

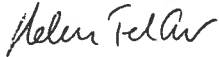
In your e.mail of 12th November 2014 you refer to storage of chemicals. If these are classed as hazardous substances under the National Planning Policy Framework, you should show compliance with the exception test (table 3).

Unless the basement use is classed as "highly vulnerable" in terms of NPPF (table 2), we are unlikely to provide bespoke comments to the LPA on the application as it is in

flood zone 2.

Should you wish to discuss anything in further detail please do not hesitate to get in touch.

Yours sincerely



Helen Telfer
Planning Liaison Officer

Direct dial 01925 542525

Direct fax 01925 415961

Direct e-mail helen.telfer@environment-agency.gov.uk

End

2