

Flood Risk Assessment
for a
New Science Block
at
Xaverian College, Rusholme, Manchester
undertaken on behalf of
Xaverian College

Report Title:	Flood Risk Assessment – New Science Block, Xaverian College
Report Reference:	10961-WML-00-XX-RP-C-0001 – Rev 01
Client:	Xaverian College
Issue Date:	March 2023
Drafted By:	Kevin Tyldesley
Authorised By:	Loughlin O’Gorman

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked
01	March 2023	For planning submission.	KPT	LOG

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1.0 INTRODUCTION

- 1.1 WML Consulting Ltd have been commissioned by Xaverian College to provide a Flood Risk Assessment (FRA) to support a planning application for a New Science Block within the existing Xaverian College site at Rusholme, Manchester.
- 1.2 The Flood Risk Assessment (FRA) follows the guidance and requirements of the National Planning Policy Framework (NPPF) – and the supporting Technical Guidance to the NPPF.
- 1.3 The NPPF identifies that it is the responsibility of developers to demonstrate:
- whether the development would be affected by current or future flooding from any source;
 - that the development is safe and where possible reduces flood risk overall;
 - whether flood risk would be increased elsewhere;
 - mitigation measures for any identified flooding risks;
 - that the site can be developed and occupied safely.
- 1.4 The FRA identifies whether there are any flooding or surface water management issues related to the development site that may warrant further consideration.

2.0 NATIONAL PLANNING POLICY

- 2.1 The aim of the Sequential Test, as set out in the NPPF, is as follows:-

‘Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.’

- 2.2 It is intended that new development is steered to areas with the lowest probability of flooding.
- 2.3 The flood zones are shown on the Flood Map for Planning, these zones indicate the probability of sea and river flooding. The extents of Flood Zones 2 and 3 are shown on the flood map, with Flood Zone 1 being the land outside Flood Zones 2 and 3. Flood Zone 1 is the area at the lowest probability of sea or river flooding.

These maps can be viewed on the GOV.UK website via the link below.

<https://flood-warning-information.service.gov.uk/long-term-flood-risk>

- 2.4 The NPPF Technical Guidance defines at Table 1 the Flood Risk Zones as below:

Flood Zone 1 Low Probability	Land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
Flood Zone 2 Medium Probability	Land assessed as having between 1 in 100 and 1 in 1,000 annual probability of river flooding (1% to 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% to 0.1%) in any year.
Flood Zone 3a High Probability	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.
Flood Zone 3b Functional Floodplain	Land where water has to flow or be stored at times of flood.

2.5 The NPPF Technical Guidance defines at Table 2 the Flood Risk Vulnerability Classifications, i.e. five categories of flood risk vulnerability with each category having a list of appropriate development uses. The classifications are:

- Essential Infrastructure
- Highly Vulnerable
- More Vulnerable
- Less Vulnerable
- Water – compatible development

2.6 The NPPF Technical Guidance defines at Table 3 the Flood Risk Vulnerability and flood zone 'compatibility' as shown below. Thereby providing a matrix that confirms whether a proposed development type is appropriate within a particular flood risk zone.

Table 3 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 Zone (Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	X	Exception Test required	✓
	Zone 3b functional flood plain	Exception Test required	✓	X	X	X

Key: ✓ - Development is appropriate.
X - Development should not be permitted.

2.7 The proposed development would be classified as a 'more vulnerable' form of development. From table 3 it can be seen that this form of development is appropriate in Flood Zones 1 and 2, and also in Flood Zone 3a subject to satisfying the requirements of the Exception Test.

3.0 LOCAL POLICY DOCUMENTS

3.1 Strategic Flood Risk Assessments (SFRAs) are prepared by Lead Local Flood Authorities (LLFAs) in consultation with the Environment Agency, sewerage undertakers and where applicable internal drainage boards. Their aim is to assess the risk to the local area from flooding from all sources currently and in the future, taking account of the impact of future climate change.

3.2 The final version of the joint Manchester City, Salford City and Trafford Council Level 2 Hybrid SFRA was published in March 2011. The SFRA, and the information associated with it, can be found via the link below.

https://www.manchester.gov.uk/downloads/download/3871/strategic_flood_risk_assessment_sfra

4.0 EXISTING SITE AND PROPOSED DEVELOPMENT DESCRIPTION

- 4.1 The existing Xaverian College site is located on Lower Park Road, Manchester, M14 5RB. A plan illustrating the existing site layout can be found at appendix 01.
- 4.2 The site contains several existing college buildings together with student play / social areas and car parking / access areas.
- 4.3 It is understood that the development proposals are as follows:-
- The demolition of the existing Sunbury Building (noted as no. 2 on the plan at appendix 01).
 - The construction of the New Science Block in place of the Sunbury Building
 - Minor alterations to the existing external area around the New Science Block.
- 4.4 A plan illustrating the development proposals that can be found at Appendix 02.

5.0 POTENTIAL SOURCES OF FLOODING

- 5.1 The Environment Agency (EA), Manchester City Council (MCC), and United Utilities (UU) have been asked to confirm if they have any information regarding past, present or future flooding issues that may affect the site.
- 5.2 The EA's response can be found at appendix 03, the information provided in it is discussed further below.
- 5.3 The MCC response is yet to be received. However, if it is received during the planning application determination period, and if it contains information that significantly affects the findings of the FRA, the response will be added at appendix 03, the report amended to suit, and re-submitted to the planning authority.
- 5.4 The UU response, which can be found at appendix 04, confirms that they have no records of sewer flooding incidents in the vicinity of the proposed development site.
- 5.5 Potential sources of flooding that require consideration as part of the FRA are as below:-
- Flooding from rivers – fluvial flooding;
 - Flooding from sea – tidal flooding;
 - Flooding from surface water run-off – pluvial flooding;
 - Flooding from sewers;
 - Flooding from ground waters;
 - Flooding from reservoirs;
 - Flooding from other sources.

Flooding from Rivers – Fluvial Flooding

- 5.6 The online Flood Map for Planning and the information supplied by the EA confirms that the area where the development is proposed is located in Flood Zone 1 (very low risk), which means that this area has a chance of flooding of less than 0.1% (1 in 1,000) each year.
- 5.7 Hence it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Sea – Tidal Flooding

- 5.8 The site is not located in an area that is at risk of tidal flooding.

- 5.9 Hence it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Surface Water Runoff – Pluvial Flooding

- 5.10 The online surface water flood mapping appears to indicate that the site is generally at “very low” risk from this form of flooding. Very low risk means that each year this area has a chance of flooding of less than 0.1% (1 in 1,000) each year.
- 5.11 However, it can be seen that the potential for surface water flood risk appears to increase to “low” (0.1% to 1%) within the public highway to the south and west of where the New Science Block is to be constructed.
- 5.12 Though it should be noted that flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features, such as surface water drainage systems that were not taken into account when the modelling behind the surface water flood maps was carried out, can greatly affect the chance and severity of flooding.
- 5.13 It is considered that the locations where the surface water flood risk increases above “very low” actually represent localised low spots, which would be served by the existing highway drainage system.
- 5.14 Given the above, it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Sewers

- 5.15 United Utilities have confirmed that they do not have any records of sewer flooding in the vicinity of the site.
- 5.16 On this basis it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Groundwater

- 5.17 Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below ground infrastructure and buildings (tunnels, basements, etc.) where these are underlain by permeable strata (aquifers).
- 5.18 From the online British Geological Survey data, it appears that the ground conditions in the vicinity of the site are Devensian Glacial Till, indicated to mainly comprise clay locally interbedded with sands and gravels. In general, clayey ground conditions such as this are likely to limit the potential for ground water flooding.
- 5.19 From the topographic survey of the area, it can be seen that the site levels are slightly above those of the public highways to the south and west of where the New Science Block will be constructed. Hence it is considered that groundwater would be unlikely to gather at significant depths within the site.
- 5.20 In addition, it is understood that whilst the New Science Block will not have any basement areas, the existing Sunbury Building, which does have a basement area, has not been affected by groundwater flooding in the past.
- 5.21 Given the above, it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Reservoirs

- 5.22 The online reservoir flood mapping does indicate that the site is potentially at risk from this form of flooding.

- 5.23 In England the legal framework for reservoir safety is set out in the Reservoirs Act 1975, with amendments from the Flood and Water Management Act 2010. The implementation of the rules set out by these acts is overseen by the Environment Agency. They have resulted in a strict and comprehensive programme of inspection, renovation and management having been in place for many decades, thereby ensuring that reservoirs that pose risks are regularly inspected and that their owners address any problems identified.
- 5.24 On this basis it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Other Sources

- 5.25 From a review of the Ordnance Survey mapping, there does not appear to be any other significant bodies of water in the vicinity of the site.
- 5.26 On this basis, it is considered that the risk to the development from this form of flooding is low.

6.0 DRAINAGE STRATEGY

6.1 The proposed development is to be drained by separate foul and surface water drainage systems.

Surface water drainage proposals

6.2 The surface water drainage proposals for the development will incorporate the principles of the NPPF and the SUDS manual.

6.3 The proposed drainage system will be designed in accordance with BS EN 752-4 and the Building Regulations Approved Document H (2010), which indicates the following hierarchy for the disposal of surface water drainage from new development sites:

1. discharge via infiltration
2. discharge to watercourse
3. discharge to sewer

6.4 These options are discussed further below.

6.5 **Surface water discharge via infiltration** – the near surface ground conditions in the vicinity of the site are described as Devensian Glacial Till, mainly comprising clay locally interbedded with sands and gravels.

6.6 Clayey ground conditions such as this tend to be relatively impermeable, hence it is considered that the use of soakaways or other infiltration techniques are unlikely to be appropriate for discharging all the runoff generated by the development.

6.7 However, it is considered that the proposed hard landscaped areas could still utilise porous surfacing, so that some infiltration will be achieved, with any surplus runoff collected by a below ground piped system.

6.8 The ground conditions will be confirmed by intrusive site investigations prior to detailed design stage, and if, during these investigations, it appears that the ground conditions may support the use of infiltration, then this should be confirmed by BRE365 compliant infiltration testing to inform the design of infiltration devices.

6.9 **Surface water discharge via watercourse** – from the Ordnance Survey mapping covering the area around the site, it can be seen that there are no existing watercourses within, or in the vicinity of the proposed development.

6.10 Hence it will not be feasible to discharge the surface water runoff via this route.

6.11 **Surface water discharge via the public sewerage system** – given the above it is considered that it will be necessary to discharge the surface water runoff from the proposed development to the public drainage system, as the area does currently.

Design of the proposed surface water drainage system

6.12 The existing site is a brown field site. Therefore, in line with current guidance, the surface water runoff rates from the re-developed site should achieve a 50% betterment when compared against the existing situation for all storm events up to and including the critical 1 in 100 year event plus a 40% climate change allowance.

6.13 To this end, it is proposed that the allowable discharge rate from the development be restricted to 3 l / sec for all storm events up to and including the critical 1 in 100 year event plus a 40% climate change allowance.

- 6.14 As the development does not involve a significant reduction in impermeable area, it is clear that attenuation storage and flow control will be required to ensure the reduced allowable runoff rate is not exceeded.
- 6.15 It is assumed that this attenuation will be provided within geo-cellular storage tanks, oversized pipework or similar located beneath the external area that surrounds the proposed building.
- 6.16 A plan illustrating the drainage strategy for the proposed development can be found at appendix 06, and supporting surface water drainage calculations can be found at appendix 07.

Foul water drainage proposals

- 6.17 The foul drainage flows generated by the proposed development will be directed to the existing on-site private foul drainage system, which in turn discharges into the public foul drainage system locally.

7.0 SUMMARY

- 7.1** WML Consulting Ltd have been commissioned by Xaverian College to provide a Flood Risk Assessment (FRA) to support a planning application for a New Science Block within the existing Xaverian College site at Rusholme, Manchester.
- 7.2** It is understood that the development proposals are as follows:-
- The demolition of the existing Sunbury Building (noted as no. 2 on the plan at appendix 01).
 - The construction of the New Science Block in place of the Sunbury Building
 - Minor alterations to the existing external area around the New Science Block.
- 7.3** The online Flood Map for Planning confirms that the area where the development is proposed is located in Flood Zone 1 (very low risk), which means that this area has a chance of flooding of less than 0.1% (1 in 1,000) each year.
- 7.4** The proposed development type would be classified as a 'more vulnerable' form of development, and from Table 3 of the NPPF guidance notes it can be seen that this type of development is appropriate in Flood Zone 1.
- 7.5** It is considered that the development is not at significant risk of flooding from tidal waters, surface water, reservoirs, sewers, groundwater or from other sources.
- 7.6** The surface water drainage proposals for the development will incorporate the principles of the NPPF and the SUDS manual. For further details of the surface water drainage proposals refer to chapter 6.
- 7.7** The foul drainage flows generated by the proposed development will be directed to the existing on-site private foul drainage system, which in turn discharges into the public foul drainage system locally.
- 7.8** Given the above it is considered that the proposed development should not be at risk from flooding during its life time, and that it will not increase flood risk to elsewhere.
- 7.9** Given the above it is considered that the development is appropriate in this instance.

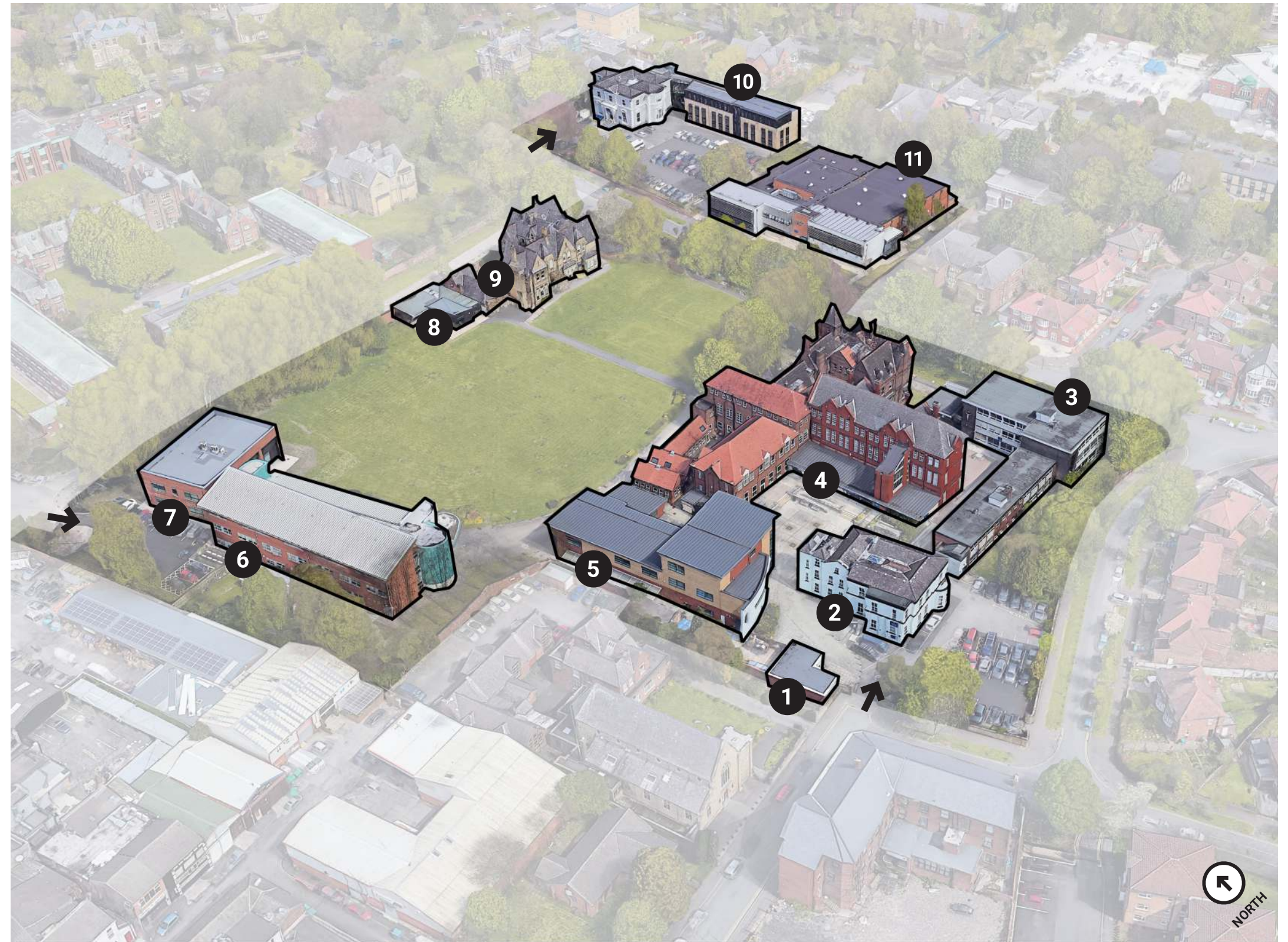
Appendix 01

Site Location Plan

Existing Site.

Xaverian Campus Buildings

1. Estate Workshop / Gatehouse
Staff spaces
2. Sunbury
RE (Pastoral)
3. Xavier
Science
Lecture Theatre
4. Firwood (*Grade II Listed*)
General Teaching (main block)
Admin Spaces
Social / Dining & associated kitchens.
Chapel
5. Ryken
General Teaching
Main Reception
LRC (Library)
6. Mayfield
General Teaching
7. Theresa Quinn
General Teaching
8. The Pavilion
Social / Dining
9. Marylands (*Grade II Listed*)
General Teaching
10. Ward Hall (*Grade II Listed*)
Art / DT / Graphics
11. Birtles
Main Hall / Exams
Performing Arts
Sport



Google Earth View of Xaverian Campus

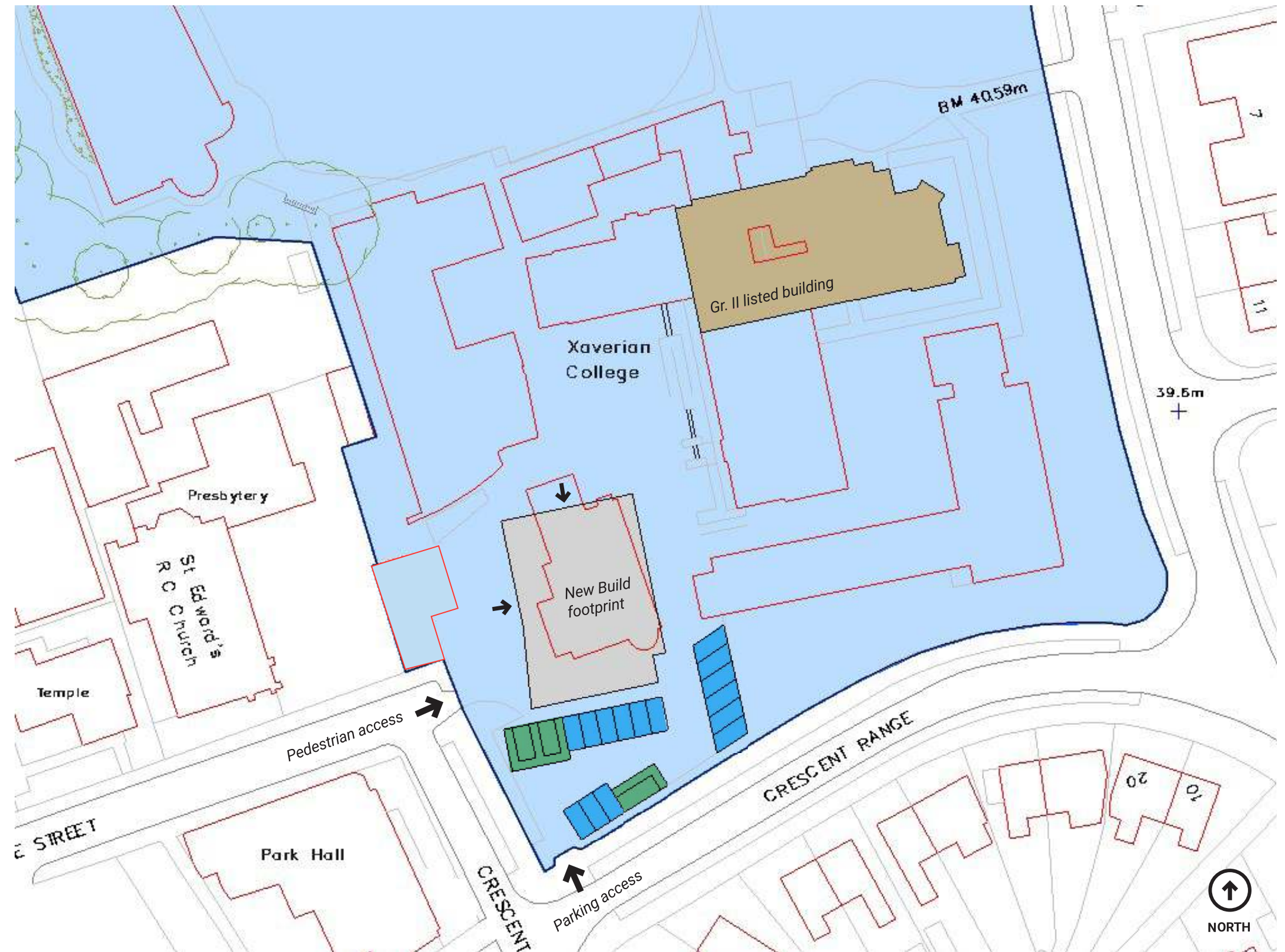
Appendix 02

Proposed Site Plan

Proposed Site Context.

Proposed New Build

- 3 storey science block = provides much needed space to meet pupil capacity demand, and the science function enables a potential redevelopment of the Xavier building in future.
- Angled Glazed corner gives new presence for College down Thurloe Street.
- Historic vehicle access gate reinstated to separate vehicle movement from pedestrians, which is much safer for pupils.
- 18 total parking spaces, including 3no accessible bays. (Note: loss of 5no. car parking spaces. Transport assessment required at future date, and possible re-provision of car parking elsewhere on site)
- Exact positioning of the new build on site could be further developed ahead of a formal planning submission, subject a successful funding application. This could prioritise either car parking spaces, or a pupil entrance plaza.



Proposed new build footprint

Appendix 03

Environment Agency correspondence

Kevin Tyldesley

To: GMMC Info Requests
Subject: RE: GMMC301298JP - Response attached from the Environment Agency - Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

From: GMMC Info Requests <InfoRequests.GMMC@environment-agency.gov.uk>

Sent: 17 March 2023 13:18

To: Kevin Tyldesley <Kevin.Tyldesley@wmlconsulting.com>

Subject: GMMC301298JP - Response attached from the Environment Agency - Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

Importance: High

Dear Kevin Tyldesley,

Thank you for your enquiry which was received on 21/02/2023 and then subsequently clarified on 16/03/2023.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Please find attached:

- Detailed Flood Map
- Table

Please be aware there is an update to this modelling planned.

There are no 2D levels available for this site.

We have no records of flooding affecting the site. However, this does not mean flooding has not occurred in the past or that it will not flood in future. We recommend that you also contact United Utilities and Manchester District Council who may hold additional information (the former especially in relation to sewer flooding).

Please be aware you can check your risk of flooding on our external website <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

Here are some useful links below:

<https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

For surface water information please use link: <https://check-long-term-flood-risk.service.gov.uk/map?easting=362125.07&northing=388310.97&map=SurfaceWater>

Please refer to the [Open Government Licence](#) which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind regards,

Julia Poole
Customer and Engagement Officer

Greater Manchester, Merseyside and Cheshire

Email: Inforequests.gmmc@environment-agency.gov.uk

From: Kevin Tyldesley <Kevin.Tyldesley@wmlconsulting.com>

Sent: 21 February 2023 10:17

To: Enquiries, Unit <enquiries@environment-agency.gov.uk>

Subject: Ref 230303/JC11 Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

Hi.

We have been asked to provide a Flood Risk Assessment for a proposed development at the above site, as indicated on the screenshot below.



Can you confirm if you are aware of any flood risk issues that may affect the site please ?

Kind regards.

Kevin Tyldesley

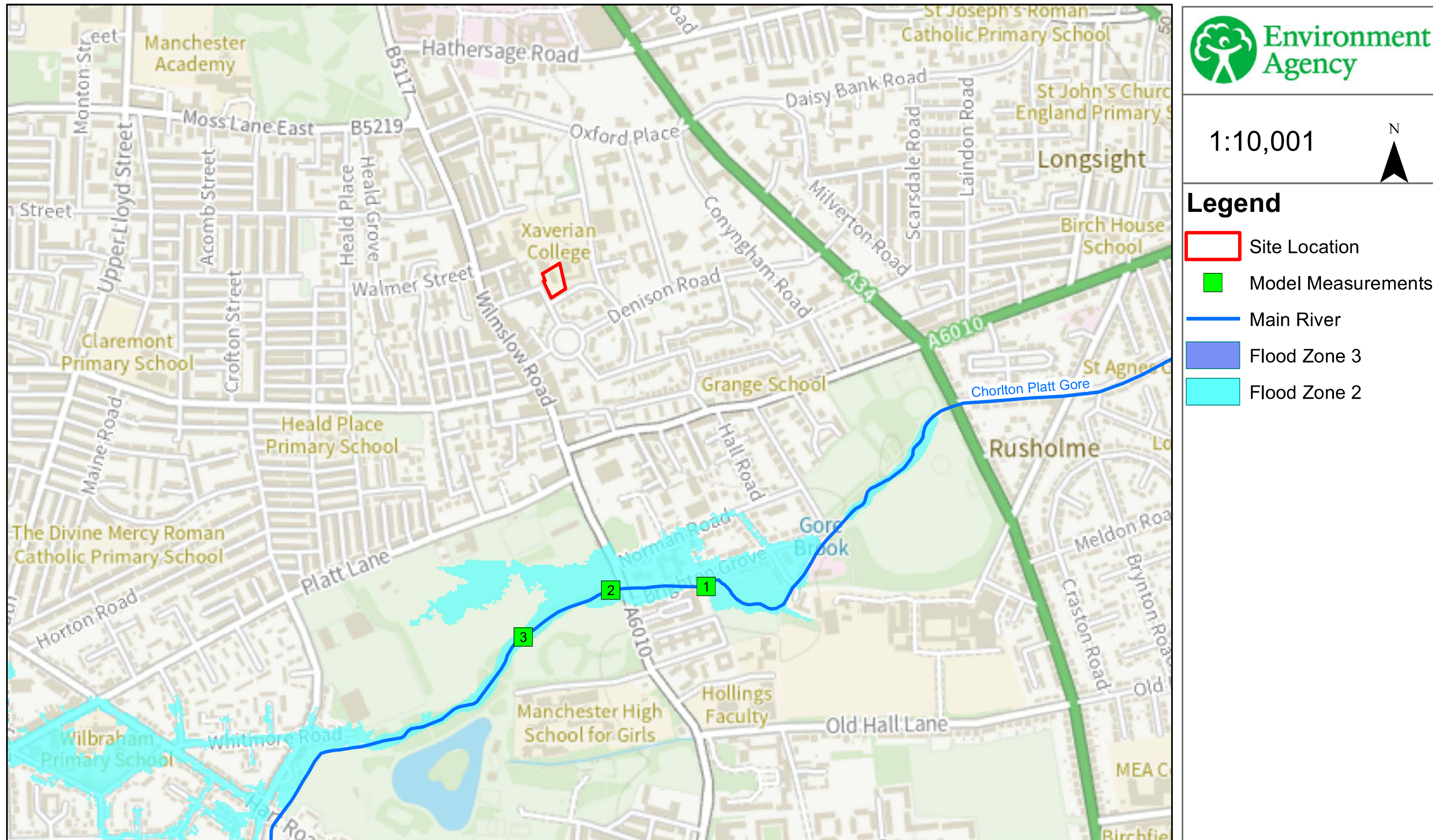
WML Consulting Ltd

Civil, Structural & Geotechnical Engineers

No. 8 Oak Green | Earl Road | Stanley Green Business Park | Cheadle Hulme | Cheshire | SK8 6QL

Tel: 0161 482 0600 | email: kevin.tyldesley@wmlconsulting.com

Detailed Flood Map Centred on Lower Park Road, Manchester, M14 5RB. Created 16/03/2023 [GMMC301298JP]



Map Reference	Model Node Reference	Easting	Northing	Data	Undertended								Defended								
					10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% increase in flow	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.1 % AEP (1 in 1000 year)	50 % AEP (1 in 2 year)	10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% increase in flow	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.1 % AEP (1 in 1000 year)
1	ea013_Model_CHOPO2_0823u	385616	394760	Modelled Water Level (m aodN)	36.88	37.23	37.60	37.68	38.38	38.52	38.86	38.89	36.47	36.88	37.23	37.60	37.68	38.38	38.52	38.86	38.89
2	ea013_Model_CHOPO2_0635d	385423	394753	Modelled Flow (cumecs)	5.86	8.13	10.66	11.21	13.91	14.15	14.51	14.46	5.86	8.13	10.66	11.21	13.91	14.15	14.51	14.46	
				Modelled Water Level (m aodN)	35.37	35.55	35.74	35.78	35.94	35.96	36.45	36.66	35.11	35.37	35.55	35.74	35.78	35.94	35.96	36.37	36.76
				Modelled Flow (cumecs)	5.86	8.13	10.66	11.21	13.91	14.15	14.51	14.46		5.86	8.13	10.66	11.21	13.91	14.15	14.51	14.46
				Modelled Water Level (m aodN)	34.45	34.65	34.87	34.92	35.17	35.23	36.28	36.51	34.18	34.45	34.65	34.87	34.92	35.17	35.24	36.30	36.67
3	ea013_Model_CHOPO2_0423i	385245	394657	Modelled Flow (cumecs)	5.86	8.12	10.66	11.21	13.90	14.13	17.47	18.62		5.86	8.12	10.66	11.21	13.90	14.13	17.31	18.75

Model data taken from Choriton PFIall Gore 2012
AEP - Annual Exceedance Probability
m aodN - metres above ordnance datum Newlyn
cumecs - cubic metres per second

Notes: *Climate Change Scenario - 30%, 35% and 70% increases in flow calculated for the 2080's (2070 - 2115). Please see <https://www.gov.uk/guidance/food-risk-assessments-climate-change-allowances> for more information regarding the new climate change guidance. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any food risk assessment.

Appendix 04

Manchester City Council correspondence

Appendix 05

United Utilities correspondence

Kevin Tyldesley

To: wastewaterdeveloperservices@uuplc.co.uk
Subject: RE: Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>
Sent: 22 February 2023 14:47
To: Kevin Tyldesley <Kevin.Tyldesley@wmlconsulting.com>
Subject: Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

Good Afternoon Kevin,

Thank you for contacting United Utilities.

I can confirm that we have no current record of sewer flooding within the vicinity of the proposed development.

Please note that United Utilities Water Limited (Uuw) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events to place on the register.

Our response does not include:

- any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which Uuw has no control and not a facet of sewer capacity; or
- any historical sewer flooding events that have been removed from the register as a result of investment in our infrastructure.

As with all development sites, we recommend you liaise with our water and wastewater engineers by contacting our Developer Services team so the details of your development proposal can be considered further. Details can be found at the following link.

<https://www.unitedutilities.com/services/builders-developers/>

Should you require any further information please do not hesitate to contact me.'

Kind regards



Louise Dack
Customer Advisor Advanced
Developer Services & Metering
Customer Services
T: 01925 233063 (33063 internal)
unitedutilities.com

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry <https://www.unitedutilities.com/builders-developers/> or you can email us at WastewaterDeveloperServices@uuplc.co.uk

----- Original Message -----

From: Kevin Tyldesley [kevin.tyldesley@wmlconsulting.com]

Sent: 21/02/2023 10:17

To: wastewaterdeveloperservices@uuplc.co.uk

Subject: Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

Hi.

We have been asked to provide a Flood Risk Assessment for a proposed development at the above site, as indicated on the screenshot below.



Can you confirm if you are aware of any flood risk issues that may affect the site please ?

Kind regards.

Kevin Tyldesley

WML Consulting Ltd

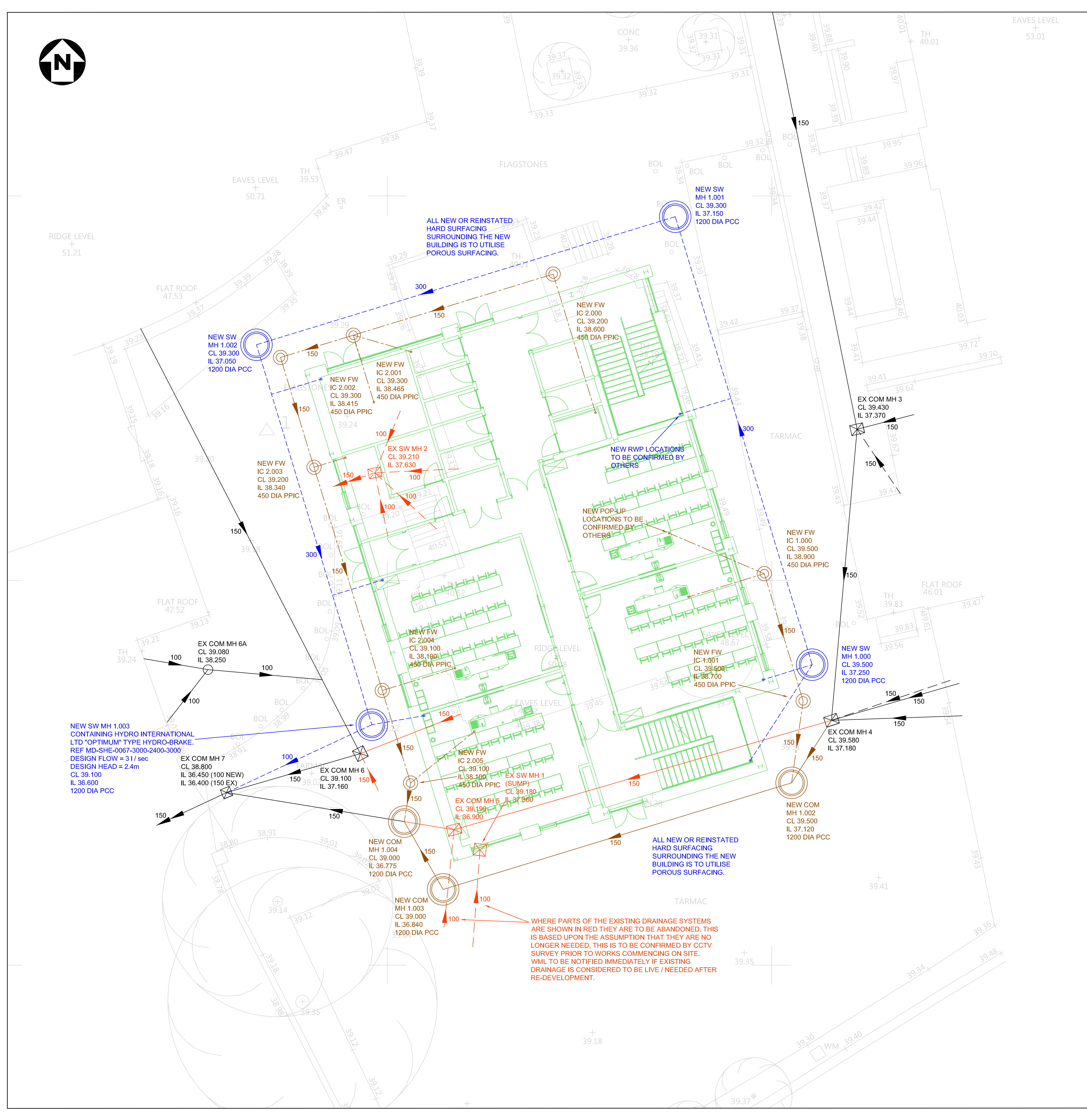
Civil, Structural & Geotechnical Engineers

No. 8 Oak Green | Earl Road | Stanley Green Business Park | Cheadle Hulme | Cheshire | SK8 6QL

Tel: 0161 482 0600 | email: kevin.tyldesley@wmlconsulting.com

Appendix 06

Drainage Strategy Plan



THE PROPOSED DEVELOPMENT IS TO BE DRAINED VIA SEPARATE FOUL AND SURFACE WATER DRAINAGE SYSTEMS.

THE SURFACE WATER DRAINAGE PROPOSALS FOR THE DEVELOPMENT WILL INCORPORATE THE PRINCIPLES OF THE NPPF AND THE SUDS MANUAL.

1. DISCHARGE VIA INFILTRATION
2. DISCHARGE TO WATERCOURSE
3. DISCHARGE TO SEWER

AS THE DEVELOPMENT DOES NOT INVOLVE A SIGNIFICANT REDUCTION IN IMPERMEABLE AREA, ATTENUATION STORAGE AND FLOW CONTROL WILL BE REQUIRED TO ENSURE THE REDUCED ALLOWABLE RUNOFF RATE IS NOT EXCEEDED.

THE FOUL DRAINAGE FLOWS GENERATED BY THE PROPOSED DEVELOPMENT WILL BE DIRECTED TO THE EXISTING ON-SITE PRIVATE FOUL DRAINAGE SYSTEM, WHICH IN TURN DISCHARGES INTO THE PUBLIC FOUL DRAINAGE SYSTEM LOCALLY.

PRELIMINARY

Project	NEW SCIENCE BLOCK
Client	XAVERIAN COLLEGE
Title	PROPOSED DRAINAGE STRATEGY

WML Job No. 10961	Drawn KPT	Checked LOG	Date MARCH 2023	Scale 1:100 At A1
			No 8 Oak Green Earl Road Stanley Green Business Park Cheside Hulme Cheshire SK9 6GL Tel 0161 482 0600 Fax 0161 486 9210 e-mail info@wmlconsulting.com www.wmlconsulting.com	

Drawing No.								
Project	Originator	Volume	Level	Type	Role	Number	Rev	
10961 - WML -	00 -	XX -	DR -	C -	1001	P01		

Appendix 07

Surface Water Drainage Calculations

WML Consulting Ltd		Page 1
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL	10961 - XAVERIAN COLLEGE SURFACE WATER DRAINAGE DESIGN REV 01	
Date 24/03/2023 10:56 File 10961 - SW - 01.MDX	Designed by KPT Checked by LOG	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.359	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.037	4-8	0.013

Total Area Contributing (ha) = 0.050

Total Pipe Volume (m³) = 2.767

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	24.000	0.250	96.0	0.025	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	23.000	0.240	95.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	21.000	0.135	155.6	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	8.000	0.150	53.3	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	134.59	5.30	37.225	0.025	0.0	0.0	0.0	1.33	53.1	9.1
S1.001	131.99	5.59	36.975	0.025	0.0	0.0	0.0	1.34	53.1	9.1
S1.002	129.11	5.92	36.735	0.050	0.0	0.0	0.0	1.05	41.6	17.5
S1.003	128.06	6.05	36.600	0.050	0.0	0.0	0.0	1.06	8.3«	17.5

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	39.500	2.275	Open Manhole	1200	S1.000	37.225	225				
S2	39.300	2.325	Open Manhole	1200	S1.001	36.975	225	S1.000	36.975	225	
S3	39.300	2.565	Open Manhole	1200	S1.002	36.735	225	S1.001	36.735	225	
S4	39.100	2.500	Open Manhole	1200	S1.003	36.600	100	S1.002	36.600	225	
S	38.800	2.350	Open Manhole	0		OUTFALL		S1.003	36.450	100	

No coordinates have been specified, layout information cannot be produced.

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.003, Volume (m³): 3.6

Unit Reference	MD-SHE-0067-3000-2400-3000
Design Head (m)	2.400
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	36.600
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.400	3.0
Flush-Flo™	0.293	2.0
Kick-Flo®	0.602	1.6
Mean Flow over Head Range	-	2.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.7	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.6	7.500	5.1
0.300	2.0	1.600	2.5	4.000	3.8	8.000	5.3
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.8	5.000	4.2	9.000	5.6
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.8		

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<u>Simulation Criteria</u> Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000 Foul Sewage per hectare (l/s) 0.000 Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0																																																											
<u>Synthetic Rainfall Details</u> Rainfall Model FSR Ratio R 0.359 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 18.000 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status ON																																																											
Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 40																																																											
<table border="1"> <thead> <tr> <th>PN</th> <th>US/MH Name</th> <th>Storm</th> <th>Return Period</th> <th>Climate Change</th> <th>First (X) Surcharge</th> <th>First (Y) Flood</th> <th>First (Z) Overflow</th> <th>Overflow Act.</th> <th>Water Level (m)</th> </tr> </thead> <tbody> <tr> <td>S1.000</td> <td>S1</td> <td>60 Winter</td> <td>30</td> <td>+0%</td> <td>30/15 Winter</td> <td></td> <td></td> <td></td> <td>37.623</td> </tr> <tr> <td>S1.001</td> <td>S2</td> <td>60 Winter</td> <td>30</td> <td>+0%</td> <td>30/15 Summer</td> <td></td> <td></td> <td></td> <td>37.621</td> </tr> <tr> <td>S1.002</td> <td>S3</td> <td>60 Winter</td> <td>30</td> <td>+0%</td> <td>30/15 Summer</td> <td></td> <td></td> <td></td> <td>37.618</td> </tr> <tr> <td>S1.003</td> <td>S4</td> <td>60 Winter</td> <td>30</td> <td>+0%</td> <td>1/15 Summer</td> <td></td> <td></td> <td></td> <td>37.614</td> </tr> </tbody> </table>										PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	S1.000	S1	60 Winter	30	+0%	30/15 Winter				37.623	S1.001	S2	60 Winter	30	+0%	30/15 Summer				37.621	S1.002	S3	60 Winter	30	+0%	30/15 Summer				37.618	S1.003	S4	60 Winter	30	+0%	1/15 Summer				37.614
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No. 8 Oak Green
Stanley Green Business Park
Earl Rd, Cheadle Hulme, SK8 6QL

10961 - XAVERIAN COLLEGE
SURFACE WATER DRAINAGE DESIGN
REV 01

Date 24/03/2023 10:56
File 10961 - SW - 01.MDX

Designed by KPT
Checked by LOG

Innovyze

Network 2020.1.3

Micro Drainage

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 0

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.359

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.000

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

DVD Status OFF

Analysis Timestep Fine

Inertia Status OFF

DTS Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

Water Level

PNUS/MH NameStormReturn PeriodClimate ChangeFirst (X) SurgeFirst (Y) FloodFirst (Z) OverflowOverflow Act.

S1.000S1 60 Winter100+40%30/15 Winter39.105

S1.001S2 60 Winter100+40%30/15 Summer39.101

S1.002S3 60 Winter100+40%30/15 Summer39.097

S1.003S4 60 Winter100+40%1/15 Summer39.091

Surcharged FloodedHalf Drain PipeLevel Exceeded

PNUS/MH NameDepth (m)Volume (m³)Flow / Cap.Overflow (l/s)Time (mins)Flow (l/s)Status

S1.000S11.6550.0000.104.9SURCHARGED

S1.001S21.9010.0000.063.0FLOOD RISK

S1.002S32.1370.0000.135.0FLOOD RISK

S1.003S42.3910.0000.403.0FLOOD RISK

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