



STAR RADCLIFFE ACADEMY

FLOOD RISK ASSESSMENT

Project No: 2303-02
August 2023
FS013-REN-XX-XX-T-C-0160
Rev: P02

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Revision	Description	Issued by	Date	Checked
P02	Planning Issue	H Wilkinson	08.09.2023	P Whitesmith
P01	Preliminary Issue	H Wilkinson	04.08.2023	P Whitesmith

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1.0 INTRODUCTION

1.1 Purpose of this report

This Site-Specific Flood Risk Assessment (FRA) has been prepared for the proposed Star Radcliffe Academy development. The assessment investigates the potential flood risk impacts of the proposed development in accordance with the National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance.

This FRA is considered proportionate to the degree of flood risk and to the scale, nature, and location of the development, and has been prepared in accordance with non-statutory technical standards for sustainable drainage and NPPF climate change allowances.

2.0 THE SITE

2.1 Site Location

The proposed development site is located off Spring Lane, Radcliffe.

The site location is described below:

- Post Code M26 2SZ
- OS X (Easting) 378714
- OS Y (Northing) 407606
- Nat. Grid SD 787076

The site location is illustrated in Figure 2.1 below.



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Figure 2.1: Indicative Site Location

2.1 Site Description

The site is circa 4.56 hectares comprising approximately 43% impermeable hard standing. Based on aerial imagery and the topographical survey information (Appendix A), the site is occupied by a school (Spring Lane School) and leisure centre with swimming pool (Radcliffe Leisure Centre) in the south as well as tarmacadam hardstanding associated with car parking beyond. The north-west of the site is occupied by open grassland.

The topographical survey (Appendix A) indicates that the site lies approximately between 77.000m AOD at the north-western boundary and 69.300m AOD at the south-eastern boundary.

A 2300mm diameter surface water culvert is indicated to cross the southern portion of the site, flowing from west to east.

2.2 Existing Site Drainage

CCTV and utility surveys have been carried out to trace the existing drainage on site.

The foul drainage network associated with the existing buildings is indicated to discharge from the site on the eastern boundary underneath the Metrolink track, however, the survey information does not extend far enough to trace the connection into the public sewer network.

CCTV survey information indicates the surface water from the site discharges into the existing combined drainage and the culvert running beneath the southern portion of the site.

A further CCTV survey has been commissioned to confirm the connectivity of the culvert and existing combined drainage into the downstream sewer network / watercourse.

Refer to Appendix B for the United Utilities sewer records and Appendix C for the CCTV survey information.

2.3 Geology

The lower south-eastern part of the site is largely underlain by granular made ground to about 2m depth overlying glacial till. Further granular made ground exists over the upper north-western part of the site but this is largely restricted to an area of former allotments. The natural ground in this area consists of glacial sand and gravel extending 4m in depth resting on glacial till.

The deeper solid geology is the Pennine Middle Coal Measures formation comprising mudstone, siltstone and sandstone. Boreholes have indicated that the depth to the bedrock varies from 12.6m to 20.5m below the existing ground level.

For further details, reference should be made to the phase 2 geo-environmental report produced by Geotechnics.

2.4 Hydrology and Hydrogeology

The closest surface water feature is the Manchester, Bolton and Bury Canal which lies 4m to the north of the site.

Based on the geology across the site, a summary of the Environment Agency aquifer designations is presented below:

STRATUM	COVERAGE	Aquifer Designation
Till, Devensian	Eastern portion of the site	Secondary Aquifer (Undifferentiated). The classification is assigned where it is not possible to attribute either category A or B to the aquifer
Glaciofluvial Sheet Deposits	Western portion of the site	Secondary A Aquifer. This geology is of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic level
Pennine Middle Coal Measures Formation	Full Site	Secondary A Aquifer. This geology is of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic level

Table 2.1 – EA Aquifer Designations of Site Geology

A summary of the pertinent hydrogeological features identified within the geo-environmental data report are provided below:

STRATUM	Distance (m) & Direction	Aquifer Designation
Nearest Groundwater Abstraction	250m	There are two entries within 250m relating to the same location, a pond/reservoir located 13m to the north-east (immediately north of the former Radcliffe West Fork Embankment). Water has been abstracted from a reservoir fed by surface water drainage for use as process water in the paper and printing industry initially by the East Lancashire Paper Mill Co. and then by St. Regis Paper Company U.K. Ltd.

Table 2.2 – Summary of Hydrogeological Features

2.5 Proposed Development

The proposed redevelopment consists of the demolition of the existing Spring Lane School and Radcliffe Leisure Centre (also known as Coney Green Leisure Centre). Following these demolition works it is proposed to construct a new 3-storey secondary school building along with a new artificial grass pitch, a multi-use games area (MUGA), a grass pitch, new car parking areas and access roads.

The proposed access road to the south of the site is to be adopted by Bury Council and so does not form part of our assessment of the onsite drainage as it will be covered under a separate design.

Refer to proposed development plans in Appendix D for details.

3.0 SUITABILITY OF DEVELOPMENT PROPOSALS

3.1 National Planning Policy

The National Planning Policy Framework (NPPF) and the accompanying Planning Practice Guidance (PPG) aim to ensure that flood risk is taken into consideration at all stages of the planning process and advocates the use of a risk-based 'Sequential Test' to preferentially locate development in areas with a low risk of flooding. Where development is necessary in high-risk areas, the NPPF aims to ensure that the development is safe without increasing flood risk through the application of the Exception Test.

The PPG, defines the levels of flood risk within England as follows:

- Flood Zone 1 - Low Probability - Land having less than a 1 in 1,000 annual probability of river or sea flooding.
- Flood Zone 2 - Medium Probability - Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
- Flood Zone 3a - High Probability - Land having a 1 in 100 or greater annual probability of river flooding; or having a 1 in 200 or greater annual probability of sea flooding.
- Flood Zone 3b - Functional Floodplain - Land where water must flow or be stored in times of flood.

The PPG states that a site-specific FRA is required for all new development proposals located in Flood Zones 2 and 3, and for any proposal of 1 hectare or greater regardless of its flood zone classification. The flood zones as described above are shown on the Environment Agency's Flood Map for Planning, available online.

Table 2 of the PPG classifies development types based on their vulnerability to flooding, ranging from 'Essential Infrastructure' which has to be operational in times of flood, through 'Highly Vulnerable' (e.g. emergency service stations), 'More Vulnerable' (e.g. residential dwellings and establishments), 'Less Vulnerable' (e.g. offices/retail), to 'Water Compatible' development (e.g. open space, docks, marinas and wharves).

Table 3 of the PPG indicates which 'vulnerability classes' are acceptable in each of the Flood Zones, and when the Exception Test should be applied. This is reproduced as Table 3.1 below.

3.2 Flood Risk Vulnerability

The Flood Risk Vulnerability Classification has been determined in accordance with Planning Practice Guidance, Flood Risk and Coastal Change. For multi-occupancy sites, the Flood Risk Vulnerability should be based upon the most vulnerable part of the site. The Flood Risk Vulnerability Classification is 'More Vulnerable', which includes 'Non-residential uses for health services, nurseries and educational establishments'.

3.3 Flood Zone Compatibility

The Flood Zone Compatibility has been reviewed in accordance with Planning Practice Guidance, Flood Risk and Coastal Change, paragraph 067.

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 3.1: Flood Risk Vulnerability and Flood Zone Compatibility Key

Key:

✓ Development is appropriate

✗ Development should not be permitted

The site is shown on the Environment Agency's Flood Map for Planning to be located within Flood Zone 1 (refer to Figure 3.1 for map). Therefore, the proposal is considered appropriate in accordance with Planning Practice Guidance.



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Figure 3.1: Environment Agency Flood Map for planning

3.4 Application of Sequential and Exception Test

The above Table 3.1 indicates which 'vulnerability classes' are acceptable in each of the Flood Zones, and when the Exception Test should be applied.

The Sequential Test, as set out in the NPPF, aims to steer developments to areas with the lowest risk of flooding (i.e. to steer developments to Flood Zone 1 areas where possible). Since the proposed development area is located wholly within Flood Zone 1, based on the guidance presented in Table 3.1 above, the Sequential Test is deemed to have been passed.

The Exception Test, as detailed in paragraph 159 of the NPPF, is applied after the Sequential Test has been undertaken and, in circumstances when 'More Vulnerable' development and 'Essential Infrastructure' cannot be located within Flood Zones 1 or 2, or 'Highly Vulnerable' development cannot be located within Flood Zone 1. The proposed land use at Star Radcliffe Academy is

classified as a 'More Vulnerable' development in accordance with Table 2 of the NPPF. Table 3.1, shows that a 'More Vulnerable' development is appropriate within Flood Zone 1, and it is not necessary to apply the Exception Test.

4.0 SOURCES OF FLOODING

4.1 Flood Map for Planning (Rivers and Seas)

Fluvial flooding occurs when high flows exceed the capacity of the river channel and spill out onto the floodplain, usually after a period of prolonged or heavy rainfall.

The EA Flood Map for planning (rivers and sea) has been reviewed (Figure 4.1). The site falls wholly within Flood Zone 1. The risk of flooding from Rivers and Sea across the site is very low. It means that each year the land is assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

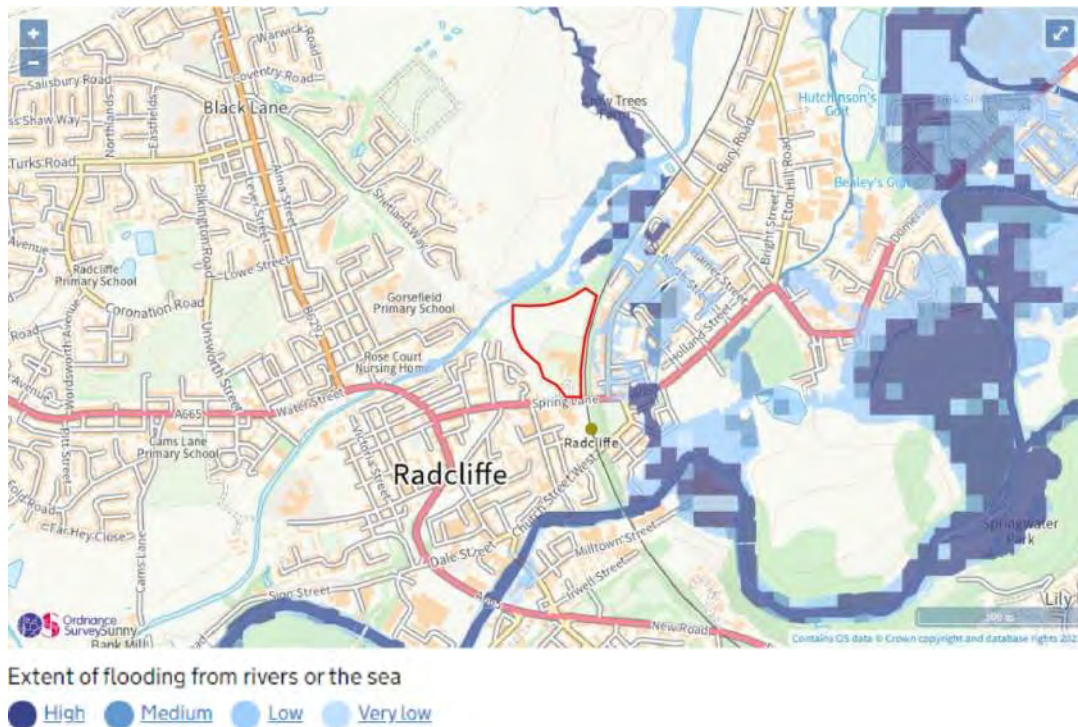


Figure 4.1: Risk of flooding from Rivers and Seas

4.2 Flooding from Land (Pluvial Flooding)

The Environment Agency Map showing risk of flooding from surface water is presented in Figure 4.2. This type of flooding can be difficult to predict, much more so than river or sea flooding as it is hard to forecast exactly where or how much rain will fall in any storm.

As illustrated in figure 4.2, the site is typically at very low (<0.1%) risk of surface water flooding with only small areas of medium- to high-risk towards the southern end of the site in existing car park areas.

This map is not definitive and is based on the best information available to the Environment Agency, such as ground levels and drainage.

To mitigate any risk associated with surface water flooding, the building is to be positioned towards the northern end of the site with appropriate falls to mitigate any issues. In the proposed development, the ground is to be reprofiled with gullies, channel drains and permeable surfaces used to ensure that surface water can flow freely into the drainage network.



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Figure 4.2: Risk of Flooding from Surface Water

4.3 Flooding from Groundwater

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 surface infrastructure and buildings (for example, tunnels, basements, and car parks) underlain by permeable rocks (aquifers).

A review of the record searches carried out as part of the phase I geo-environmental survey for the site shows that the site is within a low vulnerability area for groundwater flooding. However, investigations have shown that there is a relatively high water table in parts of the site. To mitigate against this, the external levels are to be developed to ensure that these are not reduced from the existing situation in areas of high groundwater.

Based on the above, the site is not considered to be at risk from groundwater flooding.

4.4 Flooding from Sewers

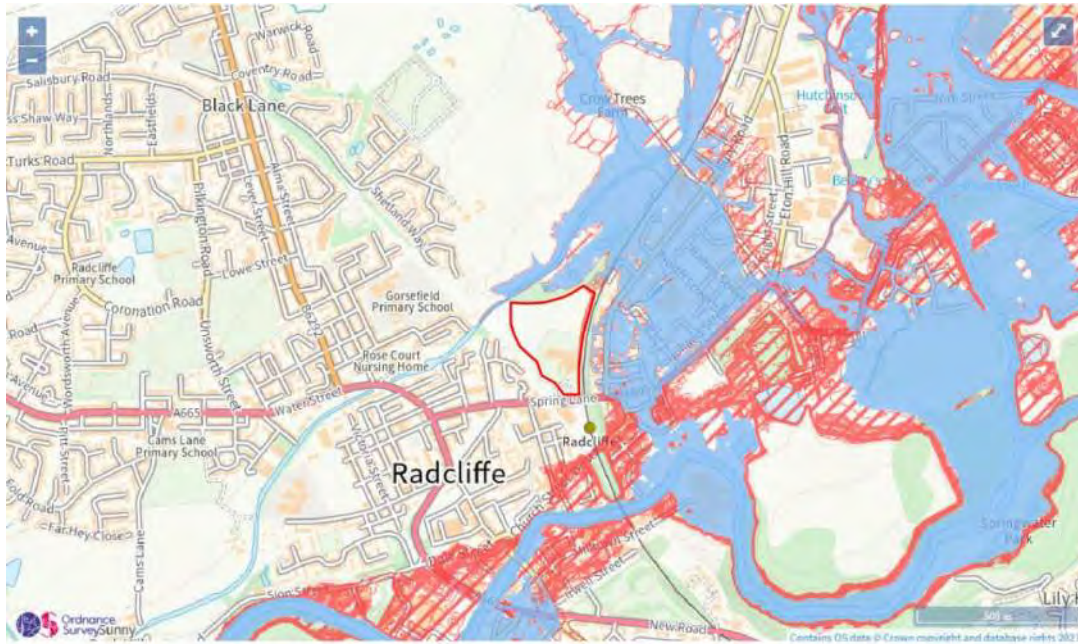
Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system is too great to be handled. This type of flooding tends to occur sporadically in both location and time. The majority of sewers are built to the guidelines within Sewers for Adoption. These sewers have a design standard to the 1 in 30-year flood event and therefore it is likely that most sewer systems will surcharge during rainstorm events with a return period greater than 30 years.

Greater Manchester Combined Authority records for Bury Council show no incidents of flooding on the site because of surcharging of public sewers.

The development proposals also intend to reduce the rate of surface water discharge from the site and accommodate the balance of flows up to and including the 1 in 100-year critical event plus climate change allowance. This restriction will have a positive impact on the surrounding existing drainage and hence work to mitigate the long-term risk of flooding from sewers.

4.5 Flooding from Reservoirs

The Environment Agency Reservoir flood risk map indicates the site to be outside of the maximum flood extent of a breach to any local reservoir.



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Figure 4.3: Risk of Flooding from Reservoirs

4.6 Summary of Flooding Risks

Based on the above review the site is in Flood Zone 1.

The risk of flooding from pluvial, surface water, groundwater, sewers, and reservoirs are all considered to be low.

5.0 DRAINAGE STRATEGY

For the detailed drainage strategy refer to renaissance document FS1013-REN-XX-XX-T-CC-0161. A summary of the principles to be adopted is included below.

5.1 Drainage Hierarchy

In accordance with NPPF, the following hierarchy of surface water drainage options has been considered:

- Discharge into the ground (infiltration);
- Discharge to a surface water body;
- Discharge to a surface water sewer, highway drain, or another drainage system;
- Discharge to a combined sewer.

Infiltration has been considered. Due to the potential contamination risk posed given the presence of made ground on site, the limited infiltration rates, and elevated ground water levels in some locations, infiltration has been discounted as the primary method of discharging surface water from the site. Localised areas of infiltration are being proposed at this stage, however further site investigation will be required to confirm the feasibility.

Opportunities for discharge to a watercourse have been considered. The closest named watercourse is the Manchester, Bolton & Bury Canal which lies immediately to the northwest of the site. The topography of the site is such that the drainage network would be too deep at the point of connection for this to be a suitable discharge point. Bury Council have confirmed that a culverted watercourse flows beneath the southern portion of the site from west to east. Pre-planning advice has been sought from Bury Council LLFA to understand any of their requirements for the surface water drainage network to be connected into the culvert.

Surface water discharge rates from the site are to be restricted to QBAR for the 100-year storm event. Refer to the Outline Drainage Strategy for the Micro-Drainage outputs and initial storage estimate calculations.

Foul water flows will be collected by a dedicated gravity network designed in accordance with BS EN 752 before discharging to the existing combined drainage on site. The connectivity of the existing combined drainage network on site into the public sewer network will need to be confirmed with a CCTV survey. The foul connection will also be subject to agreement under Section 106 of the Water Industry Act.

5.2 Climate Change

The drainage strategy will include for increases in storm intensities of 40% and 45% for the 1 in 30-year and 1 in 100-year events respectively, which is consistent with the effects of climate change for a development with a design life of 100 years, as outlined in NPPF.

6.0 CONCLUSION

The site is within flood zone 1 and is considered to have a very low risk of flooding from surface water.

The site is considered appropriate under Planning Practice Guidance.

Surface water is proposed to be discharged into the culverted watercourse on the site at an agreed discharge rate, subject to agreement with Bury Council LLFA.

It is proposed that Surface water discharge rate from the site is restricted to QBAR.

Foul flows from the development will be discharged to the existing combined drainage network which currently serves the school and leisure centre to the south of the site, subject to Section 106 agreement and confirmation of the connectivity into the public sewer network.

The site is considered to have a low risk of flooding from surface water.

The site is not considered to be at risk from groundwater flooding.

The site is not considered to be at risk from sewer flooding.

The site is not considered to be at risk of flooding from reservoirs.

7.0 REFERENCES

National Planning Policy Framework, Ministry of Housing Communities & Local Government, <https://www.gov.uk/government/publications/national-planning-policy-framework--2>, (20 July 2021)

Planning practice guidance – Ministry of Housing Communities & Local Government, <https://www.gov.uk/government/collections/planning-practice-guidance>, (20 July 2021)

Ministry of Housing, Communities and Local Government, <https://www.gov.uk/guidance/flood-risk-and-coastal-change>, (20 August 2021)

Flood risk assessments: climate change allowances – Environment Agency
<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>, (06 October 2021)

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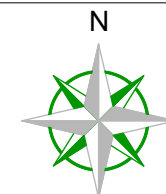
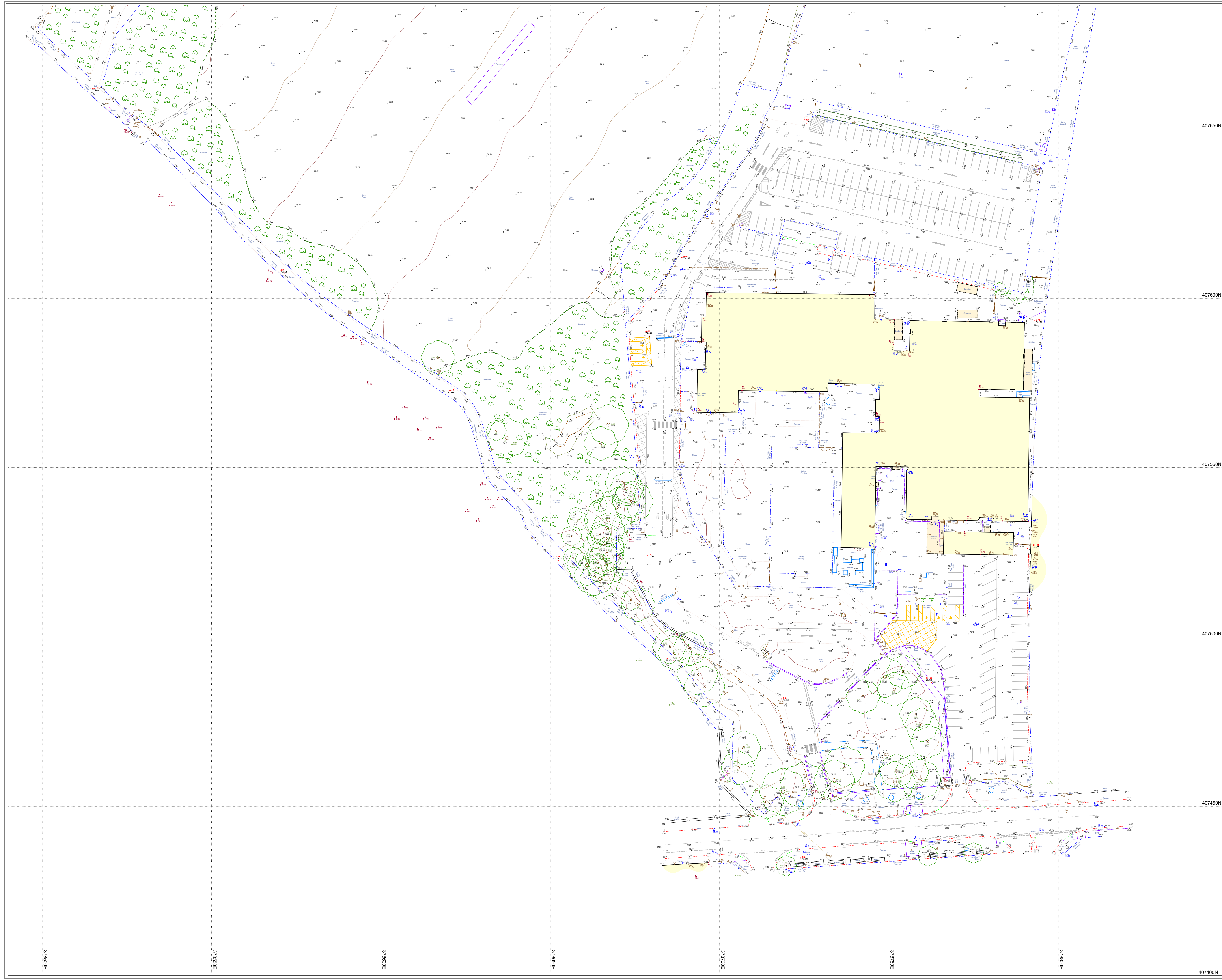
Long term flood risk information, <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>

Improving the Flood Performance of New Buildings, Flood Resilient Construction, Department for Communities and Local Government, <https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/improving-the-flood-performance-of-new-buildings-in-flood-risk-areas>, (May 2007)

Greater Manchester Combined Authority, *Level 2 Hybrid Strategic Flood Risk Assessment*, <https://www.greatermanchester-ca.gov.uk/what-we-do/planning-and-housing/places-for-everyone/supporting-documents/?folder=%5C04%20Sustainable%20and%20Resilient%20Places#fList>, (October 2020)

Bury Council Flood Risk Management Strategy, <https://www.bury.gov.uk/asset-library/local-flood-risk-mangement-strategy-2018.pdf>, (April 2018)

APPENDIX A
Existing Topographical Survey



Station Information:

Station	Easting (m)	Northing (m)	Level (m)
GH1	378768.7125	407439.5951	69.4040
GH2	378723.9184	407434.5625	70.2157
GH3	378686.4828	407493.0440	72.1509
GH4	378652.4071	407522.5137	74.1746
GH5	378621.4679	407572.9205	73.7960
GH6	378591.6364	407607.9300	75.2537
GH7	378516.4417	407662.0965	77.2056
GH20	378718.3002	407481.7274	70.0546
GH21	378678.6761	407542.0673	70.3359
GH22	378679.3056	407588.8192	70.3092
GH23	378688.9806	407612.1280	70.4496
GH24	378725.6336	407651.6431	71.1628
GH100	378762.6144	407486.4439	70.2300
GH101	378790.9402	407525.9993	70.2470
GH102	378792.9497	407593.3598	70.5357

OS Note:
Some services may have been omitted due to parked vehicles.
The Ordnance Survey tile is to be used as a guide only.

OS Buildings Surveyed Buildings

----- This survey has been orientated to the Ordnance Survey (O.S.) National Grid OSGB36(15) via Global Navigational Satellite Systems (GNSS) and the O.S. Active Network (OS Net).

A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGM15GB transformation models.

The survey has been correlated to this point and a further one or more OSGB36 (15) points established to create a true O.S. bearing for angle orientation.

Please refer to Survey Station Table to enable establishment of the on-site grid and datum.

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Rev	Date	Description	Drawn	Q. Re
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- Topographical Surveys
- Site Engineering
- Utility / CCTV Surveys
- Measured Building Survey
- 3D Laser Scanning
- Revit & BIM Models

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CLIENT

Mott
MacDonald

PROJEC

**Land off Spring Lane
Radcliffe, Bury
M26 2SZ**

Topographical Survey

SCALE A1@ 1: 500	DATE 21.01.22
DRAWN MT	QUALITY REF GH12664

Level datum	See notes
Grid orientation	See notes
Job number	42645

Drawing No.	Rev.
42645_T	0

Comments

This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

37885 Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

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1. *Drainage information provided has been determined without man-entry into the chambers. Whilst every effort has been made to correctly identify the subgroups (numbered 1-4) it is recommended that this provision should be checked in areas that are critical to the future proposal/development.*
2. *At several rows are presumed to be straight line connections between chambers unless proven otherwise by the use of a sonde or CCTV survey.*
3. *Further clarity on the drainage will be confirmed on the CCTV report to follow.*
4. *Elements of gas and water have been added from statutory records.*
5. *Elements of CCTV have been added from statutory records.*
6. *Elements of electricity (open items) added from substation records.*

UTILITY LINETYPE

[illegible]

UTILITY SURVEY II
Extracted Survey Area

Playrate (top playback pin)	0.002	Send to Patch	U7T7
End of Patch	4.000	Reset/End Patch	AR
Start of Patch	4.000	Reset/End Patch	ACP
Play Rate Signal	MS	No Sound Control	S/C
	TYPE	No Patch Insertion	NPV
Off-Busway Audio	CSM	No Patch Insertion	NPV
Bus Drop	SO	Not Distributed	NEX
Left Level	BL	Base Level	NEX
Right Level	R/L	High Level	NEX
Send to L/R	U7L	Send of Patch to Top Level	T.P. to T. or V
Send to L/R	U7R	SEND TO TOP LEVEL	
		SPR Accuracy	
Channel Elements		Multiple Elements, Patch	

LEGEND

			Interconnection chamber		Bolted
			Power Invert		Bolometer Inductor
			Power Invert		Bolometer Inductor
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			Power Invert		Bolometer Inductor
			Power Invert		Bolometer Inductor
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			Power Invert		Bolometer Inductor
			Power Invert		Bolometer Inductor
			Power Invert		Bolometer Inductor

P48.128 - 2014 LEVEL B SURVEY

QUALITY LEVEL	DEFINITION OF THE DETERMINATION OF QUALITY LEVEL	ACCURACY
Q-1	A QUALITY INSPECTION IS SUPPORTED TO ASSESS THE QUALITY OF THE DETECTION OF DEFECTS (AND DETECTION POSSIBLE).	UNDEFINED
Q-2 (GOOD)	EVIDENCE OF THE QUALITY DETECTED BY ONE OF PAIR OR ONE DETECTION ANALYSED CONSIDERED AS SUFFICIENT.	± 10% (ARITHMETICAL MEAN OF SEVERAL REPEATED MEASUREMENTS)
Q-3 (GOOD)	POSITION OF THE QUALITY DETECTED BY ONE OF PAIR OR ONE DETECTION ANALYSED CONSIDERED AS SUFFICIENT.	± 20% (IN CASE OF DETECTION OF DEFECTS, MEASUREMENT OF DEFECTS - ARITHMETICAL ± 40% OF DETECTION OF DEFECTS)
Q-4 (GOOD)	EVIDENCE OF THE QUALITY DETECTED BY MULTIPLE DETECTION TECHNIQUES (PAIR OR ONE DETECTION).	± 20% (IN CASE OF DETECTION OF DEFECTS, MEASUREMENT OF DEFECTS - ARITHMETICAL ± 40% OF DETECTION OF DEFECTS)

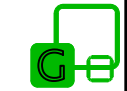
DISCLAIMER

Whilst every effort has been taken in the preparation of this drawing, the original land marks/apparatus configuration may have been altered since the survey/drawing was produced. The owner/contractor shall ensure that the surveyor is made aware of himself as to the accuracy of this drawing and position of the apparatus. The existence of the apparatus shall be further verified by the use of suitable detection devices and safe digging practices in accordance with HSG47, further advice on this location is available from the owner/contractor or the owner. No representation is made by Greenhatch Group, its agents or contractors as to the accuracy or sufficiency of the sufficiency or otherwise of this drawing and the position of the apparatus.

All apparatus shall be treated as live unless proved otherwise by the owner. It is the users responsibility to ensure that the information on the location of apparatus is provided to all personnel who may be directly (or indirectly) working in its proximity to the apparatus.

Rev	Date	Description	Drawn	Q Ref

Ref	Date	Description	Drawn	Q. No.



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CLIENT

**Mott
MacDonald**

PROJ

**Land off Spring Lane
Radcliffe, Bury
M26 2SZ**

TITLE

Utility Survey

SCALE A1@ 1: 500	DATE 26/01/2022
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DRAWN MAB/MA/STM	QUALITY REF GH12865
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Level datum	See notes
Grid orientation	See notes

Job number	42645	
Drawing No.		Rev.

42645_T_UG	0
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This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

APPENDIX B
United Utilities Sewer Records

