



Radcliffe Civic Hub, Radcliffe

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY REPORT



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Radcliffe Civic Hub, Radcliffe

Flood Risk Assessment & Drainage Strategy Report

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Radcliffe Civic Hub, Radcliffe

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VINCI Construction UK - Radcliffe Civic Hub, Radcliffe



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Radcliffe Civic Hub, Radcliffe

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1.0 INTRODUCTION

This Flood Risk Assessment (FRA) and Drainage Strategy Report has been prepared on behalf of Vinci Construction UK in connection with the construction of a new multipurpose Radcliffe Hub building and the internal refurbishment of the existing market hall and market chambers buildings. The site is situated on the existing Radcliffe Market Hall site, which is located to the south of Dale Street, Radcliffe. Even though the total area of the proposed development is less than 1.0ha, a very small area of the site is located in Flood Zone 2 and therefore an FRA is required.

This FRA has been prepared in accordance with the general requirements of the National Planning Policy Framework and the associated Planning Practice Guidance, both published by the Department for Communities and Local Government. This involves the identification of flood risk to new development(s) on the site, the possible effect of this development on flood risk elsewhere and the investigation of the impact on the development as a result of increased sea levels, fluvial flows and larger pluvial events due to increased impermeable areas and climate change.

The purpose of this report is to present a site-specific assessment of flood risk based on available information, to identify relevant flood levels affecting the site with respect to a particular probability of flooding. The flood levels identified are dependent on the correctness of the current conditions, as stated in this report and the prediction of future climatic conditions implicit in the National Planning Policy Framework.

For any size of storm event, the procedure will always yield a probability that the event will occur in any year, albeit the probability is smaller for larger events. The predicted storm event has a probability of occurrence in any year and the derived flood level has an associated probability of exceedance. This means that there is always a risk that property flooding could occur one or more times in any year.

Therefore, this report should not be interpreted or relied upon as providing a guarantee against flooding. There is always a residual risk that flooding will occur and it is not possible to predict a zero risk of flooding.

In accordance with National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance, flood risk must be assessed for all sources including tidal (from the sea), fluvial (from rivers), pluvial (from land), groundwater, sewer and artificial water bodies (e.g., reservoirs, canals, major water supply infrastructure etc.).

More specifically, the development of any site must be carried out in such a way as to mitigate any potential flood risk, both on and off site from all sources of flooding.

The other purpose of this report is to present the surface water and foul water outline drainage strategies for the site which have been developed by the Alan Johnston Partnership. To demonstrate how the specific drainage requirements are to be met, the report should be read in conjunction with the relevant drawings and supporting information, included within the appendices.

The drainage strategies outlined within this report, have been prepared in accordance with BS EN 752:2017 (Drain and sewer systems outside buildings), Sewers for Adoption, Building Regulations Approved Document H (Drainage and waste disposal), the National Planning Policy Framework document (Department for Communities and Local Government, July 2021) and associated Planning Practice Guidance.



2.0 SITE DESCRIPTION

The site is situated on the current Radcliffe Market Hall site, which is located to the south of Dale Street, Radcliffe, at National Grid reference SD 78542 06952. The site location is illustrated in Appendix A and the extent of the area to which the application relates is shown on the enclosed aerial photo, attached in Appendix B.

The existing site covers a total area of 0.701ha with the proposed development area covering 0.508ha. The site currently comprises of the existing Radcliffe Market Hall and Market Chambers buildings, another existing building with retail units, the Bridge Tavern pub and hardstanding public open space. The site is bounded by Dale Street to the north and west, an existing car park to the south and the River Irwell to the east.

The site generally falls from north-east to south, with levels falling from approximately 67.00mAOD in the north-east to approximately 63.58mAOD in the south. An aerial photo is included in Appendix B to illustrate the site at the present day and a topographic survey is attached in Appendix C.

2.1 Geology

An intrusive site investigation was completed in August 2022 by ID GeoEnvironmental Limited and is contained within the GeoEnvironmental appraisal of land at Radcliffe Hub, Radcliffe, Report No. 5238-G-R001.

The site investigation report indicates that the underlying strata consists of made ground to depths of up to 1.8mbgl, which is underlain by glaciofluvial sheet deposits comprising mainly of sandy gravelly clays to depths of up to 5.2mbgl. Pennine Middle Coal Measures Formation bedrock, comprising of mudstone was proven to depths of up to 18.0mbgl with a thin band of coal around 13.2mbgl.

This is supported by the information taken from the British Geological Survey (BGS) 1:50,000 Bedrock geology maps. These show that the site has superficial deposits

comprising of glaciofluvial sheet deposits, with bedrock reported to be of the Pennine Middle Coal Measures Formation comprising of mudstone, sandstone and siltstone.

2.2 Hydrogeology

The Environment Agency groundwater maps show that both the superficial deposits and the bedrock is classified as a Secondary A Aquifer, defined as permeable layers that can support local water supplies, and may form an important source of base flow to rivers.

The Environment Agency groundwater maps also indicate that the development site is not situated within a groundwater Source Protection Zone (SPZ).

The ID GeoEnvironmental Limited, Geoenvironmental Appraisal Report indicates that groundwater strikes were recorded as shallow as 1.33mbgl and these are recorded within the superficial deposits. However, there is also a second groundwater body recorded within the bedrock at depths of around 3.20mbgl. As such, the shallow groundwater body within the superficial deposits may be perched water, with the actual groundwater level found within the bedrock at depths of around 3.20mbgl but this should be confirmed by further investigations.

2.3 Hydrology

Adjacent to the development site runs the River Irwell. Despite this, the majority of the site is located within Flood Zone 1 which is categorized by the Environment Agency as land assessed as having less than a 1 in 1,000 annual probability of river flooding (1% - 0.1%). Therefore, the majority of the site is an area identified by the Environment Agency as at low risk of flooding from rivers and streams.

3.0 PROPOSED DEVELOPMENT

The entire site covers a total area of 0.701ha but some areas of the site will remain as per the existing scenario. These include the Radcliffe Market Hall and Market Chambers buildings, which covers a total area of 0.161ha and the Bridge Tavern Pub which covers a total area of 0.032ha.

As such, the Radcliffe Market Hall and Market Chambers buildings and the Bridge Tavern Pub areas will drain as per the existing scenario and therefore only the remaining 0.508ha area will be considered within the drainage strategy sections of this report.

The proposed development is to demolish the existing retail units building to the north of the site and replace it with the new Radcliffe Hub building and associated public open space areas. The development will also include the refurbishment of the existing Radcliffe Market Hall and Market Chambers buildings.

To enable a viable scheme, the proposed site levels are constrained by the existing developments and highways surrounding the site, therefore the site levels may be amended

but are likely to remain similar to the existing in order to tie into the surrounding developments and highways. A proposed site plan is attached in Appendix D.

4.0 PLANNING POLICY

The National Planning Policy Framework (NPPF) sets out the Government's policy on meeting the challenges of climate change, flooding and coastal change. The NPPF states that:

"Planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impact of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure. This is central to the economic, social and environmental dimensions of sustainable development. Local planning authorities should adopt proactive strategies to mitigate and adapt to climate change taking full account of flood risk, coastal change and water supply and demand consideration."

This Flood Risk Assessment proposes recommendations to facilitate the proposed development so that it takes into account flood risk at all stages of the development.

4.1 Sequential and Exception Test

Based on the sites location which is mainly within Flood Zone 1 and only a very small area to the east located within Flood Zone 2, the development is deemed appropriate according to NPPF therefore the development is appropriately situated and the Sequential Test is not required.

4.2 Exception Test

NPPF classifies the development (leisure/shops) as a 'Less Vulnerable' development and as the site is located within Flood Zones 1 and 2, the development is deemed appropriate according to NPPF and therefore the Exception Test is not required.

5.0 FORMS OF FLOODING

The National Planning Policy Framework requires all forms of flooding to be considered.

5.1 Flooding from Rivers

The Flood Risk map is included as Appendix E.

As can be seen from the Flood Risk map, the majority of the site is located within Flood Zone 1 with a chance of flooding of less than 0.1% (or 1 in 1000) with only a very small area to the east of the site located within Flood Zone 2. Therefore, the Product 4 flood level data has been obtained from the Environment Agency and is also attached in Appendix E.

The Product 4 flood information provided by the Environment Agency indicates that the nearest flood node to the site is Node 3 and the highest flood level at Node 3 is the 1 in 1000 year undefended flood level of 62.70mAOD. Assessing the topographic survey, attached in Appendix C, it can be seen that the lowest level of the site is 63.58mAOD which is located adjacent to the north-west corner of the existing Market Chambers building. As such, the lowest level of the site is 880mm above the highest flood level adjacent to the site. Therefore, it is concluded that the entire site is located above the highest flood level and as such, the risk of flooding from rivers is considered to be low.

This is further strengthened by the fact that the areas indicated as being located within Flood Zone 2 are outside the existing and proposed building areas, with only the existing highway, Blackburn Street and associated pedestrian areas located within Flood Zone 2.

The nearest designated main river is the River Irwell, which is located immediately east of the site boundary. Despite this, the risk of flooding to the new development from rivers is considered to be low.

5.2 Flooding from Sea

The site is not at risk of flooding from the sea. The lowest level of the site is approximately 63.58mAOD, i.e., well above tidal flood levels.

5.3 Flooding from Land

Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. The Surface Water Flooding map is included in Appendix E. It can be seen from the map that most of the site is classified as having a low or very low risk of surface water flooding.

A small section of land between the existing market hall building and retail building is classified as having high flood risk. Assessing the topo survey attached in Appendix C, it can be seen that this area is actually a low point when compared to the surrounding site levels.

However, these areas are to be reworked during the construction of the new Radcliffe Hub building and surrounding hard landscaping and therefore the levels within these areas will likely be amended to suit the new drainage network. These areas will also have sufficient new positive drainage to collect any surface water runoff.

Therefore, due to the likely amended levels and sufficient drainage systems (channel drains and gullies) these areas can be considered to be at low risk from flooding. Therefore, the risk of flooding from overland flows due to surface water flooding is considered to be low and as such the overall site is considered to be at low risk of flooding from surface water/surrounding land.

5.4 Flooding from Groundwater

As outlined in Section 2.2, the GeoEnvironmental appraisal of land at Radcliffe Hub, Radcliffe, Report No. 5238-G-R001 showed a shallow groundwater body present between

depths of 1.33mbgl and 4.15mbgl. However, as previously indicated this may actually be perched water.

From the groundwater vulnerability maps we can see that the site is located within an area with a low risk of groundwater flooding but due to the relatively shallow groundwater encountered during the site investigation it is envisaged that any existing or proposed basements should have suitable forms of waterproofing.

Given the overall low risk over the site area and the mitigation measure of waterproofing any basements, the site is considered to be at low risk of flooding from groundwater.

5.5 Flooding from Sewers

A record of Public Sewers surrounding and serving the development site has been obtained from United Utilities and this is included in Appendix F. As can be seen from the United Utilities sewer map, there are a number of public sewers located within the site boundary.

The site also contains a series of private surface and foul water sewers which discharge into the aforementioned public sewers. These are indicated within the Utility Survey plans, which are attached within Appendix F.

However, as the public sewers are maintained by United Utilities and also the fact that the proposed drainage for the site will be suitably designed, leads to the conclusion that the site itself is considered to have a low risk of flooding from sewers.

5.6 Flooding from Reservoirs, Canals and Other Artificial Sources

The Reservoir Flood Risk map is included in Appendix E and the closest artificial waterbody is the Manchester, Bury and Bolton canal which is located approximately 600m north-west of the site. The nearest reservoir is Elton Reservoir which is located approximately 1.90km north of the site. As such, it can be seen from the map that the site is not at risk of flooding from reservoirs, canals or other artificial sources.



6.0 PROPOSED DEVELOPMENT

6.1 Effect of Proposed Development

As previously outlined in Section 3.0, the existing site covers a total area of 0.701ha but a total area of 0.193ha of the site will remain as per the existing scenario and will therefore drain as per the existing scenario.

Therefore, the 0.193ha areas to remain as per the existing scenario will be excluded from the remainder of this report, with only the 0.508ha development area being used to calculate the existing brownfield runoff rates and proposed surface water discharge rates.

The pre and post development impermeable areas for the 0.508ha development area have been assessed and are indicated on the attached drawing in Appendix G. The comparison between the pre and post development impermeable areas is also summarised below;

Total Development Site Area (ha)	Existing Impermeable Area (ha)	Proposed Impermeable Area (ha)
0.508	0.508	0.471

Given that there is a slight decrease in the total impermeable area, the proposed development will result in a slight reduction in the volume of impermeable areas and as such, the proposed development will lead to a small decrease in the

- ◆ Volume of surface water ponding on the site
- ◆ Volume of surface water runoff leaving the site or discharging into surrounding areas
- ◆ Peak discharge rate from the site

Accordingly, drainage systems are needed to drain the foul and surface water flows arising from the proposed development. Where possible, any existing drainage networks should be utilised. Appropriate design and construction of these systems as set out in Section 6.3 should ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

6.2 Existing Drainage Systems

As can be seen from the United Utilities sewer maps attached in Appendix F, there are a number of public sewers located within the site boundary.

To the south-west of the proposed development there is a 450mm surface water sewer running underneath the existing car park towards the River Irwell. From the maps it appears to be draining the surrounding buildings including the highways and the existing market hall before being discharged via a headwall to the river Irwell. To the North is another surface water sewer also discharging in the River Irwell and draining the surrounding highways with a diameter of 1800mm running through the pedestrian area.

Running somewhat perpendicular to the surface water sewers are 2 combined water sewers. On the north side is a 750x1150mm concrete sewer travelling east to west picking up smaller combined sewers serving the minor roads off Dale street and Church Street West. To the south of the development is a 375mm vitrified clay sewer passing through the proposed development and Radcliffe Market Hall which from the UU sewer maps appears to take the discharge west of site. A 300mm overflow pipe connects the 2 sewers running next to the 1800mm eventually discharging into the River Irwell during peak conditions.

As the 375mm combined sewer is running underneath the building footprint for the multi-unit building, it is proposed to redirect the public sewer around the new development. Further discussion with united utilities should be conducted to confirm the feasibility of the diversion.

As the area of proposed development is an active brownfield site there is the possibility of additional drainage on site not currently accounted for on an public sewer maps. As such a CCTV survey should be conducted on site prior to any detailed design or beginning of construction works. The exact details of the drainage and the possibility of utilising the existing drainage as an outfall should be explored throughout the detailed drainage design process.

6.3 Proposed Drainage Strategy

As outlined above in section 6.1, site-wide drainage systems are required to drain the foul and surface water flows arising from the proposed development. The proposed drainage systems must ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

6.3.1 Surface Water Drainage

The Building Regulations - Approved Document H (2015) details a hierarchy of potential methods for disposing of surface water as shown below in order of preference:

- ◆ Discharge via infiltration
- ◆ Discharge to watercourse
- ◆ Discharge to sewer

Considering the hierarchy above, the surface water network for the retained area of the existing site should infiltrate where possible. As indicated in Section 2.1, an intrusive site investigation was completed in August 2022 by GRM and is contained within the GeoEnvironmental appraisal of land at Radcliffe Hub, Radcliffe, Report No. 5238-G-R001.

Although no soakaway testing was completed during the site investigation, it did indicate the presence of glaciofluvial sheet deposits. As these deposits are mostly clay, it can be concluded that infiltration is no possible.

As the possibility of infiltration has been ruled out by the site investigation, the intent for the development would be to discharge to a watercourse. As indicated in Section 5.1, the nearest watercourse is the River Irwell located immediately east of the site boundary.

Therefore, it is envisaged that the surface water runoff from the proposed development area will discharge into the watercourse to the east of site. As can be seen from the public sewer maps in Appendix F, a surface water sewer running north-west to south-east through site discharges at a headwall beneath the bridge on Blackburn street. Public manhole UUMH5904 provides an optimal connection point for the proposed surface water network.

As the watercourse is a designated main river it is envisaged that discussions with the Environment Agency and Lead Local Flood Authority will be required to obtain the relevant permits to work near the watercourse and permits to discharge into the watercourse.

While every effort to use the existing systems should be made, the drainage systems should be designed to suit the proposed site layout and topography which aims to provide an efficient design.

In line with Sewers for Adoption (7th Edition), the requirements for the design of a new surface water drainage systems are as follows:

- ◆ Below ground piped drainage to be sized to accommodate the 1 in 2 year (50% AEP) design storm without surcharge.
- ◆ System to be designed not to flood any part of the site in a 1 in 30 year (3% AEP) design storm.
- ◆ For events in exceedance of the 1 in 30 year design storm and up to and including the 1 in 100 year event, site drainage and topography should be designed where practicable to route surface water run-off away from buildings to safe above-ground storage areas on site, thereby preventing this run-off from leaving the site and increasing flood risk elsewhere.

For each design case described above, the design storm is the critical storm duration for the site conditions. In the case of the 1 in 100 year design storm, a 40% increase in the peak rainfall intensity is applied to allow for the estimated worst case impacts of climate change. This is in accordance with advice, issued by the Environment Agency, which updates previous climate change allowances outlined in the National Planning Policy Framework.

Suitable systems of below ground drainage will be required to contain as a minimum requirement, the 1 in 30 year event. Additionally, any surface water run-off from events that exceed the design capacity of the new drainage system, up to and including the 1 in 100 year (+40%) event, will be retained on-site in safe storage areas.

In line with common practice, it is proposed the surface water discharge from the proposed development should mimic that from the existing site.

As the existing site is a brownfield site, Bury Metropolitan Borough Council will require the proposed water runoff to be restricted to at least a 50% betterment over the existing rates.

Using a pre development area of 6141m² as shown in Appendix G, an assessment of the existing surface water run-off from the greenfield site has been completed using the ICP SuDS method within Micro Drainage. For the existing 0.614ha site, the existing brownfield run-off rates were calculated. The brownfield runoff assessment is attached in Appendix H and the results are summarized within the table below.

Rainfall Return Period (years)	Existing Brownfield Runoff Rate (L/s)
2 Year	74.9
30 year	135.6
100 year	169.0

As such, applying a 50% reduction to comply with Bury Metropolitan Borough Council, the maximum surface water discharged rate for the entire site is 32.4 L/s.

As seen in from the Outline Drainage Strategy Drawing attached in Appendix J, it is anticipated that the attenuation storage will be provided in the form of a tubosider and the surface water drainage network itself with a vortex flow control device used to restrict the discharge rate to the required greenfield runoff rates indicated above. A tubosider has been chosen over an attenuation tank given the layout of the building and the frequency of pile caps amongst the foundations.

The surface water drainage calculations have also been included within Appendix J and as can be seen the proposed surface water drainage and attenuation storage prevent any flooding for all rainfall events up to and including the 1 in 100 year + 40% climate change event and also meet the greenfield discharge restrictions above. This is summarised in the table below.

Rainfall Return Period (years)	Existing Greenfield Runoff Rate (L/s)	Proposed Discharge Rate (L/s)	Percentage Betterment (%)
Qbar (2 Year)	74.9	32.1	50.5
30 year	135.6	42.3	70.2
100 year	169.0	52.6	69.5

As can be seen from the Outline Drainage Strategy Drawing attached in Appendix J, the surface water drainage collects the runoff from the site via rainwater downpipes, linear drainage channels and gullies to and conveys the surface water runoff to the public surface water manhole within the site boundary.

The runoff discharges into the public manhole then subsequently the River Irwell via a flow control chamber which restricts the runoff to the watercourse to the required brownfield 50% betterment discharge rates, for all rainfall events up to and including the 1 in 100 year +40% climate change event.

As well as drainage for the proposed building, the existing pub within the site boundary will still need to be drained. Proposed manhole SW14 has been located on the south side of the existing building as is to connect to the existing network. CCTV surveys will be required to determine exact outfall positions and SW14 is subject to relocation. The 100 year storage and hydrobrake have both been upsized to accommodate the increase in impermeable areas for the network to drain.

The surface water drainage strategy and discharge rate should be confirmed via more detailed discussions with Bury Metropolitan Borough Council and Environment Agency prior to the commencement of any works.

6.3.2 SuDS Summary

As outlined within the summary table below, all SuDS techniques have been considered for this development;

SuDS Technique	Suitable for This Development?	Reasoning
Green Roof	✗	Not suitable due to minimal roof area.
Rainwater Harvesting	✗	Impractical due to lack of demand for greywater.
Basins & Ponds	✗	Not suitable due to the location of the proposed development.
Filter Strips & Swales	✗	Not suitable due to the location of the proposed development.
Bio-retention Areas	✗	Unsuitable due to lack of available areas.
Infiltration Techniques	✗	Unsuitable due to impermeable strata.
Permeable Surfaces	✗	Unsuitable due to impermeable and limited space to put them.
Tanked/Piped Systems	✓	Suitable and incorporated.

Green roof areas have been considered but due to numerous reasons, such as; areas of plant, maintenance access and increased materials cost associated with heavier roof loads, the use of green roofs has been discounted.

Rainwater harvesting was also considered but due to a lack of greywater demand and the cost associated with tanks and pumping of the separate system, it has been deemed as impractical to include a rainwater harvesting system.

Due to the limited space available outside the footprint of the proposed building as well layout of the site and the presence of the existing pub on site, basins and ponds have been deemed unsuitable. For similar reasons filter strips and swales have been ruled out as a impractical.

Bio-retention areas have been discounted across the site, due to a lack of available areas to construct tree pits or rain gardens.

As previously discussed in Section 6.3.1 infiltration is not feasible across the site and therefore the use of infiltration SuDS techniques is not possible. The use of non-infiltration permeable surfaces such as permeable paving was considered within the car park areas but as these areas are to be drained via filter drains the use of permeable paving has been discounted.

Finally the use of oversized pipe and a below ground tubosider have been incorporated to store runoff during the 100 year +40% climate change storm event.

6.3.3 Water Quality Assessment

Managing the water quality of the surface water runoff from the proposed development is important to ensure that the receiving surface waters or groundwater are well protected. Generally, this can be achieved through the use of well-designed SuDS systems which provide treatment and pollution removal to the surface water runoff.

Standard S3 of the Statutory National Standards for Sustainable Drainage Systems (2018) details the water quality management and addresses the drainage design requirements to minimise the potential pollution risk.

As the proposed development does not consist of any areas of land classified as being a pollution hazard, mitigation indices are not required and as such complies with the water quality requirements of Standard S3 of the Statutory National Standards for Sustainable Drainage Systems (2018).

6.3.4 Foul Water Drainage

Foul water drainage disposal is set out in Part H of the Building Regulations in order of priority the preferred methods are;

1. Public sewer
2. Septic tank
3. Cesspool

The foul water system shall be designed in accordance with;

- ◆ BS EN 752:2017 (Drain and sewer systems outside buildings)
- ◆ Sewers for Adoption (7th Edition)
- ◆ Planning Practice Guidance and the National Planning Policy Framework document (Department for Communities and Local Government, July 2021).
- ◆ BS EN 12056-2:2000 (Drainage systems inside buildings)
- ◆ Building Regulations Approved Document H, Drainage and waste disposal. (Office of the Deputy Prime Minister, December 2015).

As can be seen from the Outline Drainage Strategy Drawing attached in Appendix J, the foul water drainage collects the runoff from the building and discharges at multiple points.

Foul drainage sourcing from changing rooms and toilets around the centre of the development discharge into public combined manhole UUMH5921 so the south of site. Here the foul water discharges into the proposed combined water drainage diversion as further discussed in Section 6.3.5.

Foul drainage sourcing from the east side of the proposed building is to discharge into proposed combined manhole CW01. This manhole is to be located on the existing combined sewer running southwards between the proposed building and Radcliffe Market Building. Similarly to the surface water drainage, foul water from existing pub will need to be taken into the proposed network. CCTV surveys will be required to determine exact outfall positions and proposed foul manhole FW15 is subject to relocation.

As the swimming pool undercroft is 4m lower than the FFL of the building, the foul drainage servicing that area is lower than the inlet levels of the combined sewer it is discharging into. As a result a pump chamber is required. Foul drainage is pumped up from a inlet level of 59.800mAOD in FW01 to 61.100mAOD FW02 before it discharges via gravity into the proposed combined water diversion.

The foul water drainage strategy and unrestricted discharge rate should be confirmed via more detailed discussions with Bury Metropolitan Borough Council and United Utilities prior to the commencement of any works.

6.3.5 Public Combined Water Drainage Diversion

As can be seen on the public sewer maps and the proposed drainage strategy, a combined sewer runs in between the site and the existing Radcliffe market building. Given the new layout of the proposed development, public combined manhole UUMH5909 and the pipes connected to it will be displaced by the new foundations. Complications may also arise at the FFL of the swimming pool undercroft is around 0.5m higher than the existing combined drainage.

Therefore, it is envisioned that the existing pipes and manhole underneath the new building are to be abandoned and a diversion running around the building be constructed. The new sewer will follow the outline of the proposed development; starting at public combined manhole UUMH5921 and finishing at proposed combined manhole CW05 before continuing the existing path. The location of the diversion can be seen on the outline drainage strategy in Appendix J.

In order for this diversion to be approved, a section 185 agreement as well as the necessary drawings will need to be filed. Further discussions with united utilities will need to be carried out prior to any works.

7.0 FUTURE MANAGEMENT & MAINTENANCE

The proposed drainage solution uses SUDS techniques in accordance with the CIRIA SUDS Manual C753. The surface water run-off from the proposed development is restricted using a vortex flow control device and the attenuated run-off is stored using a below ground cellular attenuation tank.

It is envisaged that the following components have been or will be included within the drainage strategy for the proposed development:

- ◆ Inspection chambers, manholes and catchpits.
- ◆ Pipes.
- ◆ Drainage channels and gullies.
- ◆ Vortex flow control device.
- ◆ Tubosider attenuation tank

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented. It is assumed that the proposed drainage will remain private and therefore maintenance of the surface and foul water drainage systems will be the responsibility of Vinci Construction/ Bury Metropolitan Borough Council or an on-site facilities management team and therefore a copy of the final construction drainage layout should be provided in the final Operations and Maintenance Manual.

As such, the maintenance of the specified SuDS should be included within the developments Operation and Maintenance Manual and should be detailed in accordance with the CIRIA SuDS Manual C753, as per the operation and maintenance guidance outlined below.

7.1 General Maintenance & Inspection Requirements

- ◆ No work shall be carried out on the drainage system without permission from a nominated person, who has access to information/a working knowledge of the system.
- ◆ Maintenance/inspection work shall be carried out in a safe/planned manner.
- ◆ All work is to be carried out by competent persons suitably trained and equipped in accordance with current statutory safe working policies.
- ◆ Entry into confined spaces shall be kept to a minimum and be restricted to suitably qualified/equipped persons working in accordance with current statutory safe working policies.
- ◆ Drainage systems shall be inspected on a regular basis or should any problems be suspected. Any debris/defects discovered shall be recorded and a programme of cleaning/ repair initiated. Urgent repairs/cleaning shall be actioned as soon as practicable.
- ◆ It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.
- ◆ Clearing of the drainage system can be achieved by a number of methods depending on the nature of the work;
 - Rodding - Manual/Mechanical with flexible rods.
 - Jetting - High pressure water jetting.

- o Plunging.

7.2 Inspection Chambers, Manholes and Catchpits

The appropriate health and safety equipment must be used when accessing manholes/catchpits. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access. The following operations should be carried out annually.

- ◆ Covers of inspection chambers and manholes shall be removed and the sides, benchings and channels cleared.
- ◆ Accumulated deposits of silt in inspection chambers, catchpits and manholes shall be removed. Any traps shall then be plunged and thoroughly flushed out with clean water. This should be completed in Autumn, after leaf fall.
- ◆ Main and branch drains shall be cleared as required and afterwards be flushed with clean water. Any obstructions found shall be removed and not flushed down the system.
- ◆ Covers of inspection chambers, manholes and catchpits shall be replaced, bedded in suitable grease or other sealing material as required and bolted/locked down as appropriate. Missing bolts and broken items shall be replaced in accordance with the manufacturer's details.

7.3 Pipes

Regular inspection and maintenance are important to identify areas which may have become obstructed/clogged and may not be draining correctly, as failure to do so would expose the development to a greater level of flood risk.

Pipes are proprietary products and therefore the materials used can vary across the site. As such, where used the manufacturer's recommendations should be followed. Access for maintenance of the pipes is provided through inspection chambers and manholes. The below table sets out the maintenance schedule for the pipe components of the proposed drainage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect for evidence of poor operation via water levels. If required take remedial action.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection should be provided as post construction CCTV survey.	N/A

	Inspect/check all inlets, outlets and overflows to ensure they are in good condition and operating as designed.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
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7.4 Drainage Channels and Gullies

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating. The below table sets out the maintenance schedule for the drainage channel and gullies components of the proposed drainage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Litter and debris removal.	Monthly or as required.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
Remedial Actions	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial remediation.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection including channel outlet boxes and gully sumps.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.

7.5 Vortex Flow Control Device

Regular inspection and maintenance is important to identify if the vortex flow control device has become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk.

Vortex flow control devices are proprietary products and therefore can vary from manufacturer to manufacturer. As such, where used the manufacturer's recommendations should be followed.

- ◆ Normally, little maintenance is required as there are generally a vortex flow control device has no moving parts.
- ◆ If blockages occur, they tend to do so at the intake of the vortex flow control device.

- ◆ Vortex flow control devices are generally fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.
- ◆ The smaller type conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.
- ◆ Following installation of the vortex flow control device it is vitally important that any extraneous material i.e., Building materials are removed from the unit and the chamber.
- ◆ After the system is made live, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. Units should also be inspected within 48 hours after large storms.

7.6 Tubosider Attenuation Tank

Although tubosiders are designed to require no maintenance, it's key to identify if the inlets/outlets have become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required take remedial action	Monthly for 3 months, then annually.
Remedial Actions	Repair/rehabilitate inlet, outlet, access chamber and vent	As required.
Monitoring	Inspect inlet, outlet, access chamber and vent to ensure that they are in good condition and operating as designed.	Annually

8.0 CONCLUSIONS

- ◆ The site is located within Flood Zone 1 with a low probability of flooding from all sources.
- ◆ GeoEnvironmental appraisal of land at Radcliffe Hub, Radcliffe, Report No. 5238-G-R001 indicated that the ground composition contained predominantly clay and as such has been concluded that infiltration is not suitable.
- ◆ Therefore, it is envisaged that the surface water runoff from the proposed development area will discharge into the watercourse, River Irwell, immediately east of site.
- ◆ The surface water discharge is to be restricted to 50% betterment over the existing brownfield runoff rates, for all rainfall events up to and including the 100 year plus 40% climate change design storm, to comply with LLFA requirements. The proposed surface water drainage design meets this criteria and also ensures there is no flooding for all rainfall events up to and including the 100 year plus 40% climate change design storm.
- ◆ The foul water drainage is to discharge into the existing United Utilities public combined water sewers to the south of site via gravity. It is anticipated that the foul water can discharge into the public sewer at unrestricted rates.
- ◆ The surcharged runoff is to be restricted using a vortex flow control device and the surcharged runoff attenuated using the proposed surface water drainage network itself and also a tubosider located beneath the proposed building.
- ◆ The existing combined water sewer towards the south of site is to be diverted around the new proposed building. This will require a Section 185 agreement as well as further correspondence with United Utilities.
- ◆ The existing pub and beer garden is to drain as per the existing scenario with stub connections so that it can discharge into the new private proposed drainage network.
- ◆ The external ground levels around proposed buildings shall fall away from the proposed building with any new levels being designed to ensure any overland flood routes, for events in excess of the 100 Year + 40% CC, exit towards the surrounding highways, for use in exceptional circumstances.



9.0 RECOMMENDATIONS

- ◆ Further discussions with United Utilities should be conducted in regards to the diversion of the combined water sewer due south of site. A section 185 agreement as well as the accompanying drawings should be submitted and agreed prior to the commencement of any works.
- ◆ The surface water drainage strategy and discharge rate should be confirmed via more detailed discussions with Bury Metropolitan Borough Council and Environment Agency prior to the commencement of any works.
- ◆ The foul water drainage strategy and unrestricted discharge rate should be confirmed via more detailed discussions with Bury Metropolitan Borough Council and United Utilities prior to the commencement of any works.
- ◆ Flow rates for both foul and surface water sewers should be obtained from the existing pub to confirm capacity requirements. A CCTV survey should also be conducted to confirm the size and location of the outfalls.

