

FloodSmart Plus



Flood Risk Assessment

Site Address

Waterfold Business Park
Rochdale Road
Bury
BL9 7BQ

Date

2023-10-31

Report Status

FINAL

Grid Reference

381938, 410431

Site Area

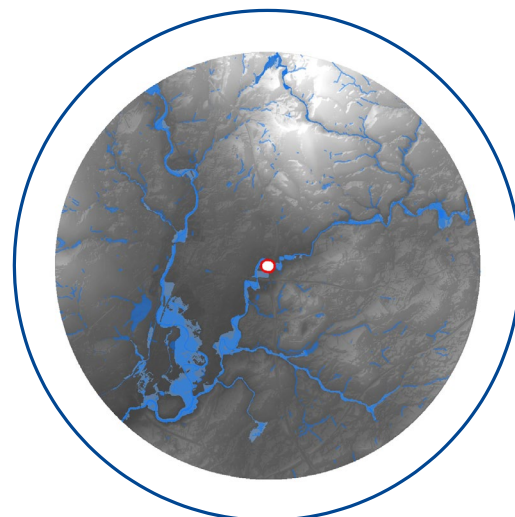
0.14 ha

Report Prepared for

Poise
124 City Road
London
EC1V 2NX

Report Reference

80525R1



RISK – Very Low to Medium

The Site is mapped within the EA's fluvial Flood Zone 2 (Medium Probability). The EA's RoFRS mapping and a site-specific analysis of the EA's modelled flood data and Site topography suggest a Very Low to Low risk of flooding from the River Roch.

Surface water (pluvial) flood risks are Very Low to Medium.

Groundwater flood risks are Moderate and flooding risks from artificial sources (i.e. canals, reservoirs and sewers) are Low. Mitigation measures are recommended in this report to reduce the risks to an acceptable level over the lifetime of the development.

Report Author

Alexander Farr
Consultant

Report Checker

James Robinson
Senior Project Consultant

Report Reviewer

Bob Sargent
Associate

GeoSmart Information Ltd
Suite 9-11, 1st Floor, Old Bank Buildings,
Bellstone, Shrewsbury, SY1 1HU
+44(0)1743 298 100
info@geosmartinfo.co.uk
www.geosmartinfo.co.uk

1. Executive summary



A review has been undertaken of national environmental data sets to assess the flood risk to the Site from all sources of flooding in accordance with the National Planning Policy Framework (NPPF) (2023) and National Planning Practice Guidance (NPPG) (Published in 2014 and updated in August 2022). A site-specific flood risk assessment, to assess the flood risk to and from the development Site, is provided within this concise interpretative report written by an experienced GeoSmart consultant. Baseline flood risk and residual risks that remain after the flood risk management and mitigation measures are implemented are summarised in the table below.

Site analysis

Source of Flood Risk	Baseline ¹	After analysis ²	After Mitigation ³
River (fluvial) flooding	Very Low to Low		Very Low
Sea (coastal/tidal) flooding	Very Low		N/A
Surface water (pluvial) flooding	Very Low to Medium		Very Low
Groundwater flooding	Moderate		Negligible
Other flood risk factors present	Yes (reservoir breach)		N/A
Is any other further work recommended?	Yes (see below)		

1 BASELINE risks assigned for the whole Site, using national risk maps, including the benefit of EA flood defences.

2 AFTER ANALYSIS modification of risk assessment based on detailed site specific analysis including some or all of the following: flood model data, high resolution mapping, building location, access routes, topographic and CCTV surveys. Reasons for the change in classification are provided in the text.

3 AFTER MITIGATION risks include risks to proposed development / asset and occupants if mitigation measures recommended in this report are implemented, including the impacts of climate change.

*N/A indicates where mitigation is not required.

Summary of existing and proposed development

The Site is currently used within a commercial capacity as a car parking area.

Development proposals comprise the installation of electric vehicle infrastructure within the parking area. Site location plans and topographic survey are included within Appendix A.

Summary of flood risks

The flood risks from all sources have been assessed as part of this report and are as follows:

- Historical flooding related to exceedance of the channel capacity of the River Roch is understood to have previously within the vicinity of the Site but did not affect the Site area itself.

River (fluvial) flooding

According to the Environment Agency's (EA) Flood Map for Planning Purposes, the Site is located within fluvial Flood Zone 2 (Medium probability)

According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map, which considers the type, condition and crest height of flood defences, the Site has a variable risk of flooding ranging from Very Low to Low from the nearby watercourse, the River Roch.

Modelled flood data obtained from the EA has been analysed in line with the most up to date guidance on climate change (EA, 2022), to confirm a maximum "design" flood level at the Site:

- During a 1 in 100 year plus 35% climate change allowance event the flood level within the vicinity of the Site would be 75.31 mAOD, compared to Site ground levels of between 74.47 and 75.80 mAOD. However, due to the local topography, the Site would not be anticipated to flood in this event.

Emergency evacuation routes are available to the south east. Due to the nature of the development, on-Site refuge would not be recommended in a flood event.

Surface water (pluvial) flooding

According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping, the Site has a risk of pluvial flooding ranging from Very Low to Medium.

- Flood depths in the area proposed for development could be up to 0.60 m in the 1 in 100 year present day scenario event, restricted to topographic lows upon the eastern portion of the Site.
- Flood depths in the area proposed for development could be up to 0.90 m in the 1 in 100 year plus climate change event, anticipated upon c. 33% of the Site area to the east.

Groundwater flooding

Groundwater Flood Risk screening data indicates there is a Moderate potential risk of groundwater flooding at the surface in the vicinity of the Site during a 1 in 100 year event:

- According to a review of the hydrogeology (Section 3), the Site is likely underlain by permeable superficial deposits above permeable bedrock. Groundwater levels may rise in the bedrock and superficial aquifers in a seasonal response to prolonged rainfall recharge which may cause an unusually high peak in groundwater levels during some years.

Artificial sources of flooding

- The risk of flooding from artificial (man-made) sources such as reservoirs, sewers and canals has been assessed:
 - The EA's Risk of Flooding from Reservoir map confirms the Site is at risk of reservoir flooding. The potential for a breach of a reservoir to occur and flooding affecting the Site is low.
 - Ordnance Survey (OS) data confirms there are no canals near to the Site.
 - The Strategic Flood Risk Assessment (SFRA) (JBA Consulting, 2019) indicates that there have been no recorded instances of sewer flooding at or within the vicinity of the Site.

The risk of flooding from artificial sources is considered to be Low.

Recommendations

Recommendations for flood mitigation are provided below, based upon the proposed development and the flood risk identified at the Site:

- There is a risk of flooding from surface water, where flood depths could be up to 0.90 m in depth in the area which is currently proposed for development.

Where the development layout can be altered, development should be located in areas of the Site which have the lowest flooding risks towards the west of the Site, and ground levels should aim to slope away from the proposed infrastructure where possible.

- Mitigation measures should be implemented to protect the charge stations from instances of flooding. These can be:
 - Electricity meters and electrical sockets located above the modelled flood level.
 - Having switches to turn off the charge points located above the predicted flood level, once flooding occurs.
 - Having covers for the chargers in the event of a flood.
 - The development proposals are for electrical charging units, which are assumed to be limited in size and scale, but it is not clear if there would be any changes to ground levels as part of the proposals. If there are any changes to ground levels or any significant built infrastructure proposed as part of the plans, which could take up volume within the floodplain, a separate assessment of floodplain storage capacity should be undertaken.

- As there is a risk of flooding from groundwater sources at the surface, risk to buried infrastructure should be considered, along with water proofing of the base of the proposed infrastructure.
- The ongoing management and maintenance of existing and any proposed drainage networks, under the riparian ownership of the developer, should be undertaken in perpetuity with the development.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

2. Introduction



Background and purpose

A site-specific flood risk assessment has been undertaken, to assess the flood risk to and from the development Site. This assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area. The information gathered was then used to construct a 'conceptual site model', including an understanding of the appropriateness of the development as defined in the NPPF (2023) and the source(s) of any flood risk present, guided by the NPPG (Published in 2014 and updated in August 2022). Finally, a preliminary assessment of the steps that can be taken to manage flood risk to the development was undertaken.

This report has been prepared with reference to the NPPF (2023) and NPPG (2022).

"The National Planning Policy Framework set out the Government's planning policies for England and how these are expected to be applied" (NPPF, 2023).

The NPPF (2023) and NPPG (2022) promote a sequential, risk based approach to the location of development. This also applies to locating a development within a Site which has a variable risk of flooding.

"The approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding" (Paragraph: 023. NPPG, 2022).

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the Site.

Report scope

In accordance with the requirements set out within NPPG 2022 (Paragraph: 021 Reference ID: 7-021-20220825), a thorough review of publicly and commercially available flood risk data and EA supplied data indicating potential sources of flood risk to the Site from rivers and coastal sources, surface run-off (pluvial), groundwater and reservoirs, including historical flood information and modelled flood extent. Appropriate measures are recommended to manage and mitigate the flood risk to the property.

Information obtained from the EA and a review of the Greater Manchester Strategic Flood Risk Assessment (SFRA) (JBA Consulting, 2019) is used to ascertain local flooding issues and, where appropriate, identify information to support a Sequential and/or Exception test required as part of the NPPF (2023).

The existing and future flood risk to and from the Site from all flood sources is assessed in line with current best practice using the best available data. The risk to the development has been assessed over its expected lifetime, including appropriate allowances for the impacts of climate change. Residual risks that remain after the flood risk management and mitigation

measures are implemented, are considered with an explanation of how these risks can be managed to keep the users of the development safe over its lifetime.

An indication of whether the Site will potentially increase flood risk elsewhere is provided, including where the proposed development increases the building footprint at the Site. A drainage strategy to control runoff can be commissioned separately if identified as a requirement within this report.

Report limitations

It is noted that the findings presented in this report are based on a desk study of information supplied by third parties. Whilst we assume that all information is representative of past and present conditions, we can offer no guarantee as to its validity and a proportionate programme of site investigations would be required to fully verify these findings.

The basemap used is the OS Street View 1:10,000 scale, however the Site boundary has been drawn using BlueSky aerial imagery to ensure the correct extent and proportion of the Site is analysed.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

Datasets

The following table shows the sources of information that have been consulted as part of this report:

Table 1. Datasets consulted to obtain confirmation of sources of flooding and risk

Source of flooding	Datasets consulted			
	Commercial Flood Maps	Local Policy & Guidance Documents*	Environment Agency (Appendix B)	OS Data
Historical	X	X	X	
River (fluvial) / Sea (tidal/coastal)	X	X	X	

Source of flooding	Datasets consulted			
	Commercial Flood Maps	Local Policy & Guidance Documents*	Environment Agency (Appendix B)	OS Data
Surface water (pluvial)	X	X	X	
Groundwater	X	X		
Sewer		X		
Culvert/bridges		X		X
Reservoir		X	X	

*Local guidance and policy, referenced below, has been consulted to determine local flood conditions and requirements for flood mitigation measures.

Local policy and guidance

For this report, several documents have been consulted for local policy and guidance and relevant information is outlined below:

Greater Manchester Strategic Flood Risk Assessment (JBA Consulting, 2019):

Appendix C of this report contains Figures 6-7 (Historic Flood Incidents) and 6-8 (United Utilities historic sewer flooding incidents and Greater Manchester surface water hotspots) of the SFRA.

Policy Recommendation 8:

Planning permission for at risk sites can only be granted by the LPA where a site-specific FRA shows that:

- The NPPF and FRCC-PPG have been referenced together with appropriate consultation with the relevant LPA, LLFA, the EA, and UU, where applicable
- The effects of climate change have been considered using the latest allowances developed by the EA
- There is no loss in floodplain storage resulting from the development
- The development will not increase flood risk elsewhere

- There is no adverse effect on the operational functions of any existing flood defence infrastructure
- Proposed resistance / resilience measures designed to deal with current and future risks are appropriate
- Appropriate SuDS techniques have been considered and are to be incorporated into the design of the site, where applicable
- Whether the development will be safe for its lifetime and has passed the Exception Test, if applicable
- An appropriate Emergency Plan is included that accounts for the possibility of a flood event and shows the availability of safe access and egress points accessible during times of flood.

Guidance

Strategic Flood Risk Assessments are carried out by local authorities, in consultation with the Environment Agency, to assess the flood risk to the area from all sources both now and in the future due to climate change. They are used to inform planning decisions to ensure inappropriate development is avoided (NPPF, 2023).

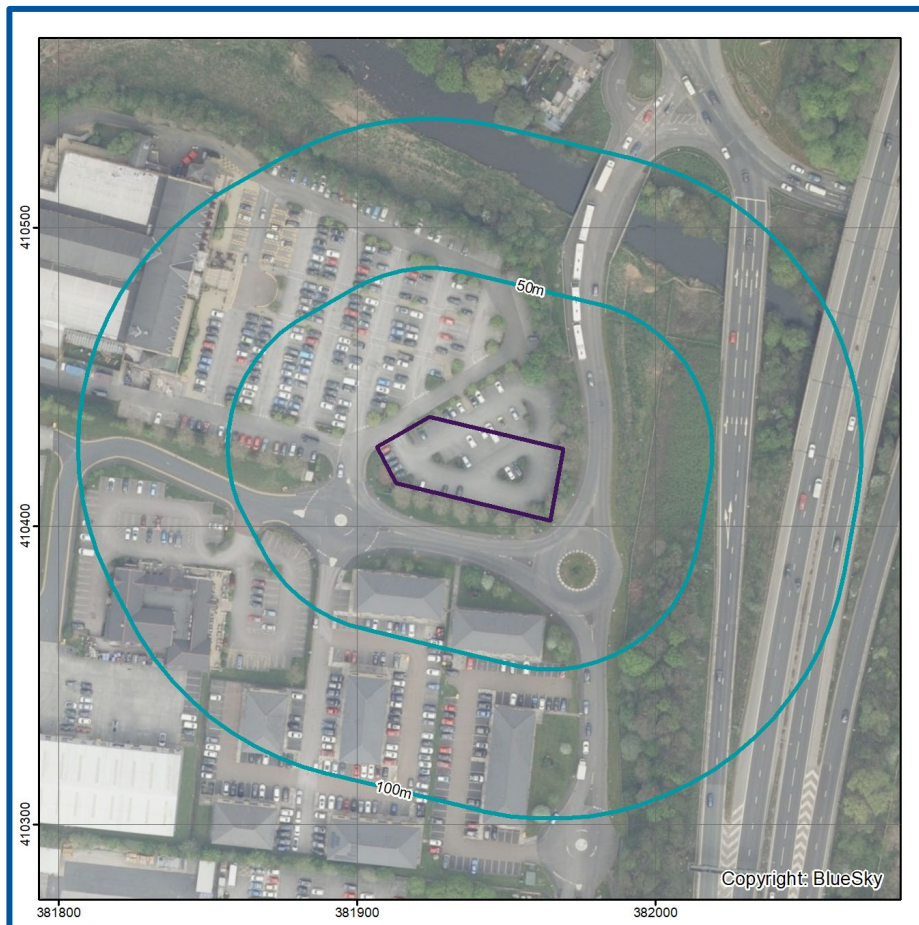
3. Site analysis



Site information

The Site is located within the outskirts of Bury within a setting of commercial land use at National Grid Reference SD 81938 10431.

Figure 1. Aerial imagery of the Site (Bluesky, 2023)

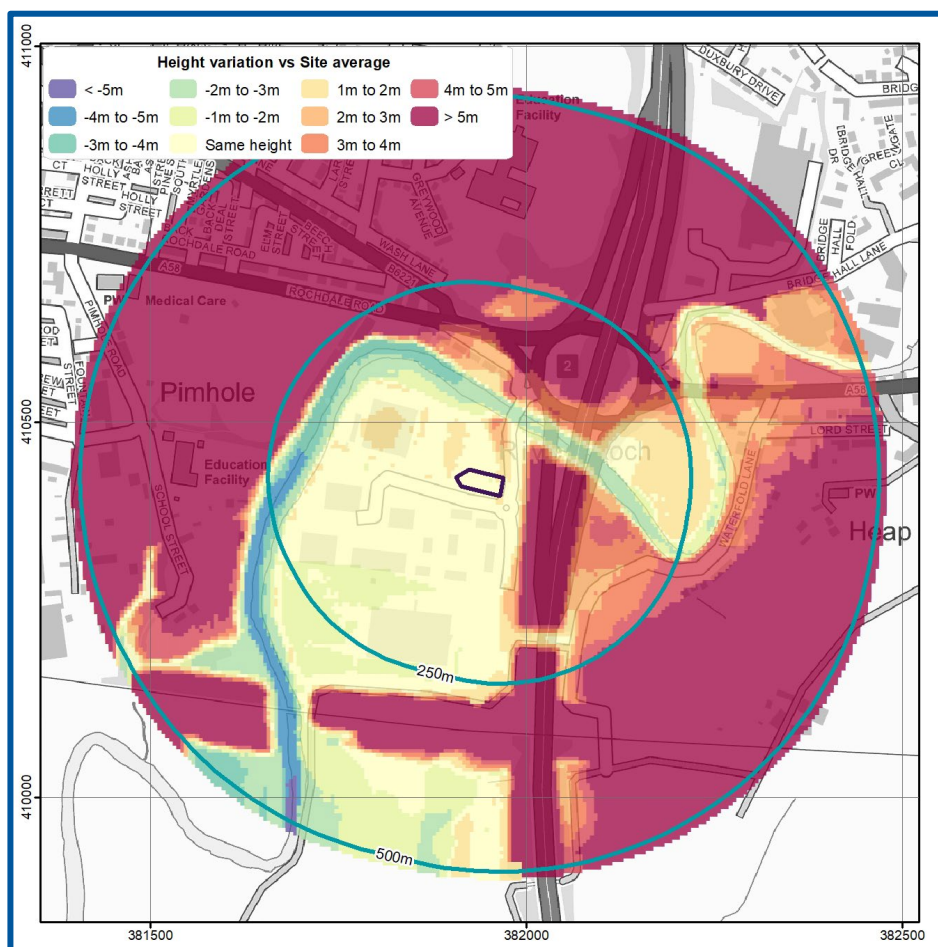


BlueSky copyright and database rights 2023

Figure 2, overleaf, indicates that the Site is located within a relatively low-lying area beside the River Roch. The Site is surrounded by higher-elevation land to the to the east and to the south, and across the river to the north and to the west.

The general ground levels on the Site are between 74.47 and 75.80 mAOD with the Site falling gradually in an easterly direction. This is based upon a Site specific topographic survey undertaken by Murphy Geospatial (Appendix A).

Figure 2. Site Location and Relative Elevations (GeoSmart, 2023)



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

Development

The Site is currently used within a commercial capacity as a car parking area.

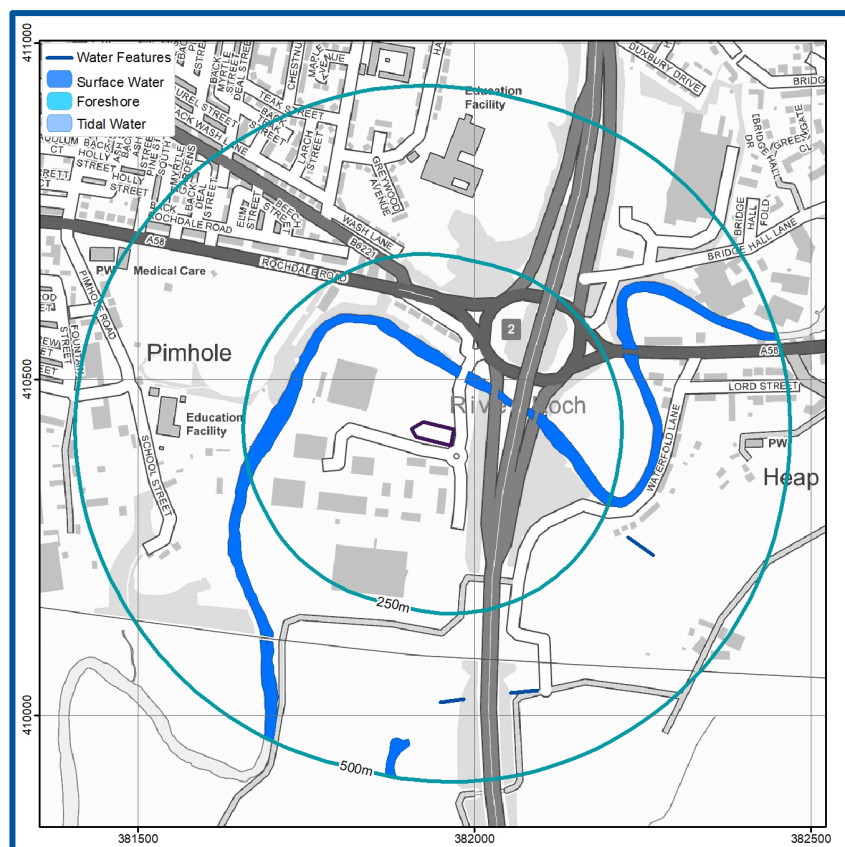
Development proposals comprise the installation of electric vehicle infrastructure within the parking area. Site location plans and topographic survey are included within Appendix A.

The effect of the overall development will not result in an increase in number of occupants and/or users of the Site and will not result in the change of use, nature or times of occupation. According to Annex 3 of the NPPG (2022), the vulnerability classification of the existing development is Less Vulnerable and proposed development is Less Vulnerable. The estimated lifespan of the development is 75 years.

Hydrological features

According to Ordnance Survey (OS) mapping included in Figure 3, there are multiple surface water features within 500 m of the Site.

Figure 3. Surface water features (EA, 2023)



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

The River Roch is located c. 80 m to the north of the Site at its closest point, and flows to the south west.

Multiple drainage ditches are located within 500 m of the Site with the closest located c. 310 m to the south east of the Site.

An unnamed surface water feature is present c. 430 m to the south of the Site.

A reservoir is present c. 690 m to the south west of the Site.

Proximity to relevant infrastructure

Infrastructure has been identified within the vicinity of the Site which could influence the risks of flooding to existing or future occupants. These include:

- Multiple road and foot bridges, as well as the Roch Viaduct railway bridge, span the River Roch up and downstream of the Site. The closest bridge is located c. 60 m to the north east of the Site boundary.

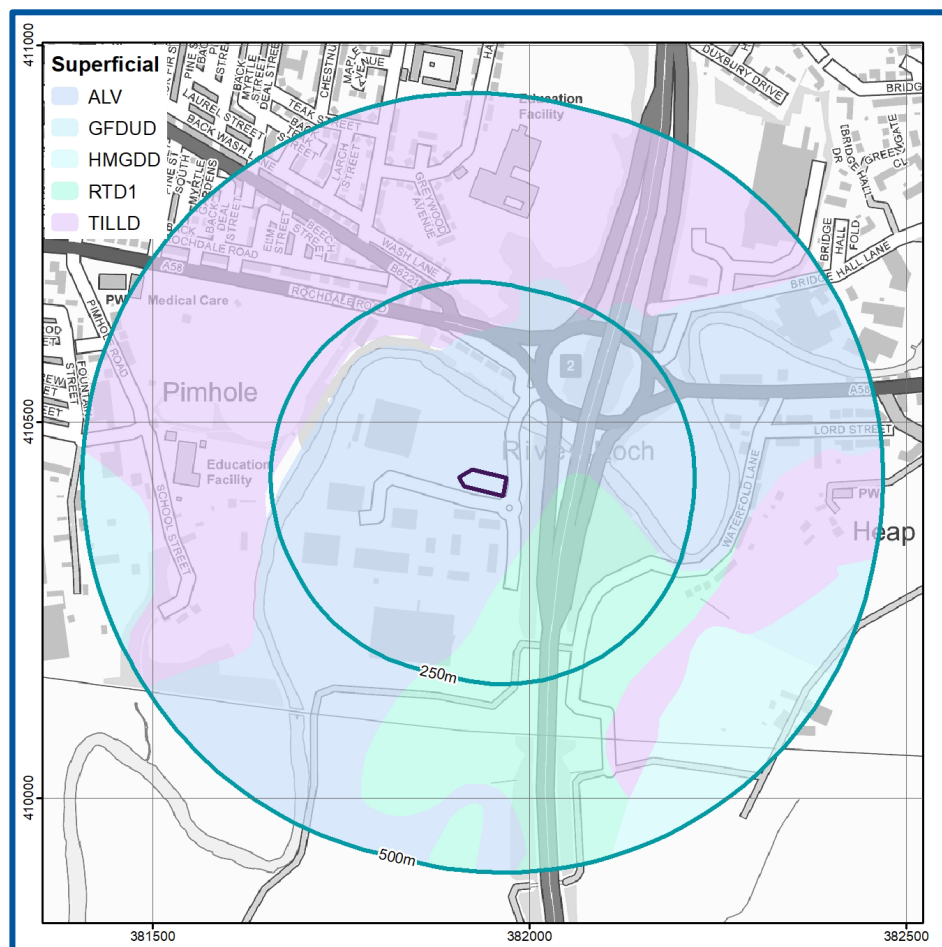
- A series of sluice gates and weirs is present upon the River Roch, with the closest being upstream c. 610 m to the north east of the Site.

Hydrogeological features

British Geological Survey (BGS) mapping indicates that the underlying superficial geology (Figure 4) consists of Alluvium (ALV) (BGS, 2023), classified as a Secondary (A) Aquifer (EA, 2023). Multiple boundaries with other superficial formations are present within 500 m of the Site:

- River Terrace Deposits, 1 (RTD1), classified as a Secondary (A) Aquifer (EA, 2023).
 - Approximately 60 m to the south east of the Site at its closest point.
- Till, Devensian (TILLD), classified as a Secondary (undifferentiated) Aquifer (EA, 2023).
 - Approximately 170 m to the north of the Site at its closest point.
- Hummocky (Moundy) Glacial Deposits, Devensian (HMGDD), classified as a Secondary (A) Aquifer (EA, 2023).
 - Approximately 320 m to the south east of the Site at its closest point.

Figure 4. Superficial Geology (BGS, 2023)

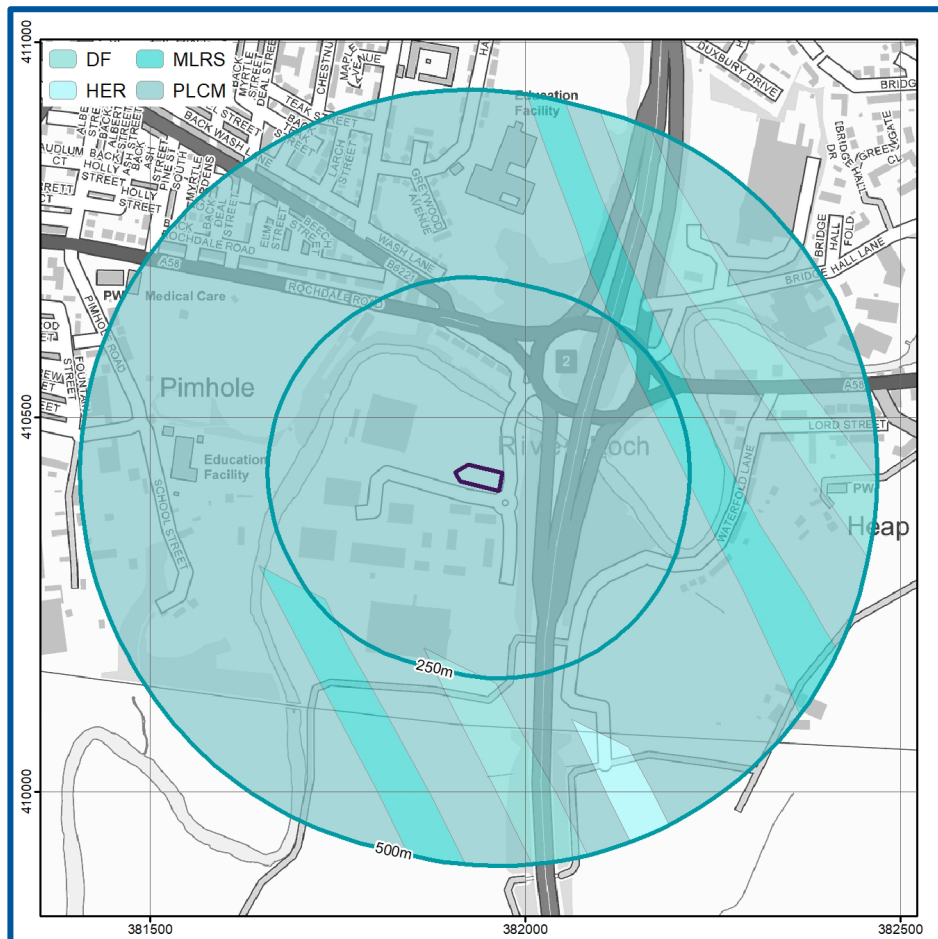


Contains Ordnance Survey data © Crown copyright and database right 2023
Contains British Geological Survey materials © NERC 2023

BGS mapping indicates that the underlying bedrock geology (Figure 5) consists of the Pennine Lower Coal Measures Formation (PLCM) (BGS, 2023) and is classified as a Secondary (A) Aquifer (EA, 2023). Multiple boundaries with other bedrock formations are present within the vicinity of the Site:

- Milnrow Sandstone (MLRS), classified as a Secondary (A) Aquifer (EA, 2023).
 - Approximately 220 m to the north east and south west of the Site at its closest points, being separated by an assumed transverse fault.
- Darwen Flags (sandstone) (DF), classified as a Secondary (A) Aquifer (EA, 2023).
 - Approximately 240 m to the south of the Site at its closest point.
- Helpet Edge Rock (sandstone) (HER), classified as a Secondary (undifferentiated) Aquifer (EA, 2023).
 - Approximately 320 m to the south east of the Site at its closest point.

Figure 5. Bedrock Geology (BGS, 2023)



Contains Ordnance Survey data © Crown copyright and database right 2023
Contains British Geological Survey materials © NERC 2023

Geological conditions

A review of the BGS borehole database (BGS, 2023) indicates the nearest borehole to the Site (ref: SD81SW16) is located c. 100 m to the east of the Site boundary at an elevation of c. 74.68 mAOD. It should be noted that this borehole is mapped within the RTD1 extent and as such may not be fully representative of the underlying geology at the Site, especially regarding the superficial deposits.

The corresponding borehole log indicates the underlying geology to consist of Made Ground (surface) to a depth of 1.82 m below ground level (bgl), overlying shaly mudstone to a depth 10.05 m bgl, overlying interbedded sands and sandstones, shales, and mudstones to a depth of 60.96 m bgl, overlying interbedded shales and 'grey rock' to a depth of 186.84 m bgl.

Groundwater

Groundwater was reportedly encountered within SD81SW16 between May and August 1917, but the depth at which it was encountered is not recorded within the borehole log. As such, the depth to groundwater at the Site cannot be inferred.

4. Flood risk to the development



Historic flood events

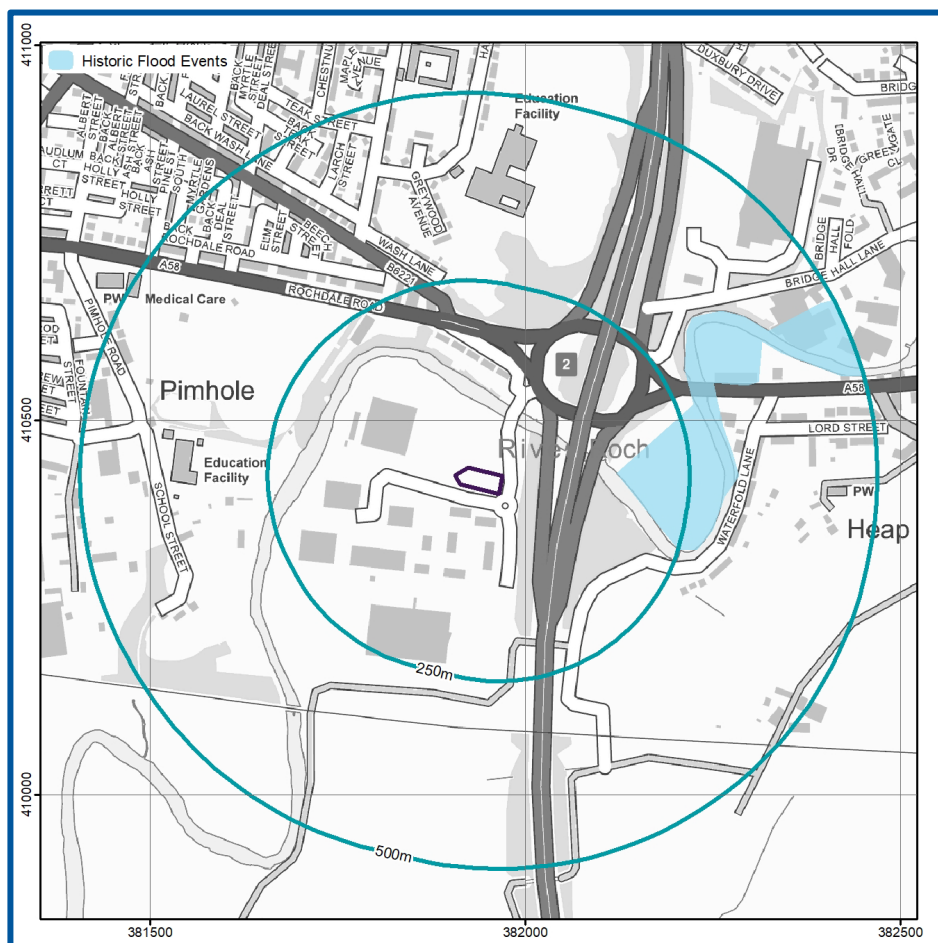
According to the EA's Historic Flood Map (Figure 6) and a review of the SFRA (JBA Consulting, 2019), there have been no reported flooding events affecting the Site. However, a flood event has been reported c. 150 m to the east of the Site:

- 26/12/2015: The Boxing Day flood occurred due to a period of prolonged intense rainfall, leading to the channel capacity of the River Roch being exceeded.

The Lead Local Flood Authority have compiled a Section 19 flood event report which confirms that the nearby area was flooded, with over 808 properties across Bury experiencing some degree of internal flooding (GMCA, 2016).

The purpose of historical flood data is to provide information on where and why flooding may have occurred in the past. The absence of any recorded events does not mean flooding has never occurred on-Site or that flooding will never occur at the Site.

Figure 6. EA Historic Flood Map (EA, 2023)



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

Rivers (fluvial) / Sea (coastal) / Estuarine (tidal) flooding

The predominant risk at the Site is from flooding from rivers, termed as fluvial flooding. The Site is located in an inland location and the risk of flooding from coastal and tidal processes are therefore considered to be Very Low.

River (fluvial) flooding occurs during times of heavy rainfall or snow melt when watercourses' capacity can be exceeded, over topping the banks and flood defences.

According to the EA's Flood Map for Planning Purposes (Figure 7), the Site is located within fluvial Flood Zone 2 and is therefore classified as having a Medium probability of fluvial flooding from the River Roch.

Figure 7. EA Flood Map for Planning Purposes (EA, 2023)



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

Flood defences

Guidance

Sites that are located close to flood defences are likely to be zones where rapid inundation will occur in the event of the flood defences being overtopped or breached. A Site located close to flood defences (within 250 m) may require a more detailed FRA subject to local topography.

Existing flood defences

- The Site is in an area which benefits from flood defences but is not within the EA's ABD.¹
- There are no formal flood defences within 500 m of the Site.
- There are informal flood defences within the vicinity of the Site:
 - Natural high grounds and embankments along the banks of the River Roch, c. 75 m to the north of the Site at their closest point.
 - According to the EA (2023), these informal defences defend up to a 1 in 5 year flood event. The current condition and minimum crest level of the defences are not provided.

Model data

As the Site is located within the EA's fluvial floodplain, modelled flood elevation data was obtained from the EA and has been used to assess flood risk and to provide recommendations for mitigation for the proposed development.

Undefended modelled data from the Lower Roch Flood Mapping Report (JBA Consulting, 2018) has been extracted from the 2D floodplain data provided at the Site.² The data is provided in the table below and is included within Appendix B.

¹ The EA maps Areas which Benefit from the presence of Defences (ABD) in a 1 in 100 (1%) chance of flooding each year from rivers; or 1 in 200 (0.5 %) chance of flooding each year from the sea. If the defences were not there, these areas would flood in a 1 in 100 (1%)/ 1 in 200 (0.5 %) or larger flooding incident. The EA do not show all areas that benefit from all flood defences, some defences are designed to protect against a smaller flood with a higher chance of occurring in any year, for example a flood defence which protects against a 1 in 30 chance of flooding in any year. Such a defence may be overtopped in a flood with a 1 in 100 (1%)/ 1 in 200 (0.5%) chance of occurring in any year, but the defence may still reduce the affected area or delay (rather than prevent) a flood, giving people more time to act and therefore reduce the consequences of flooding.

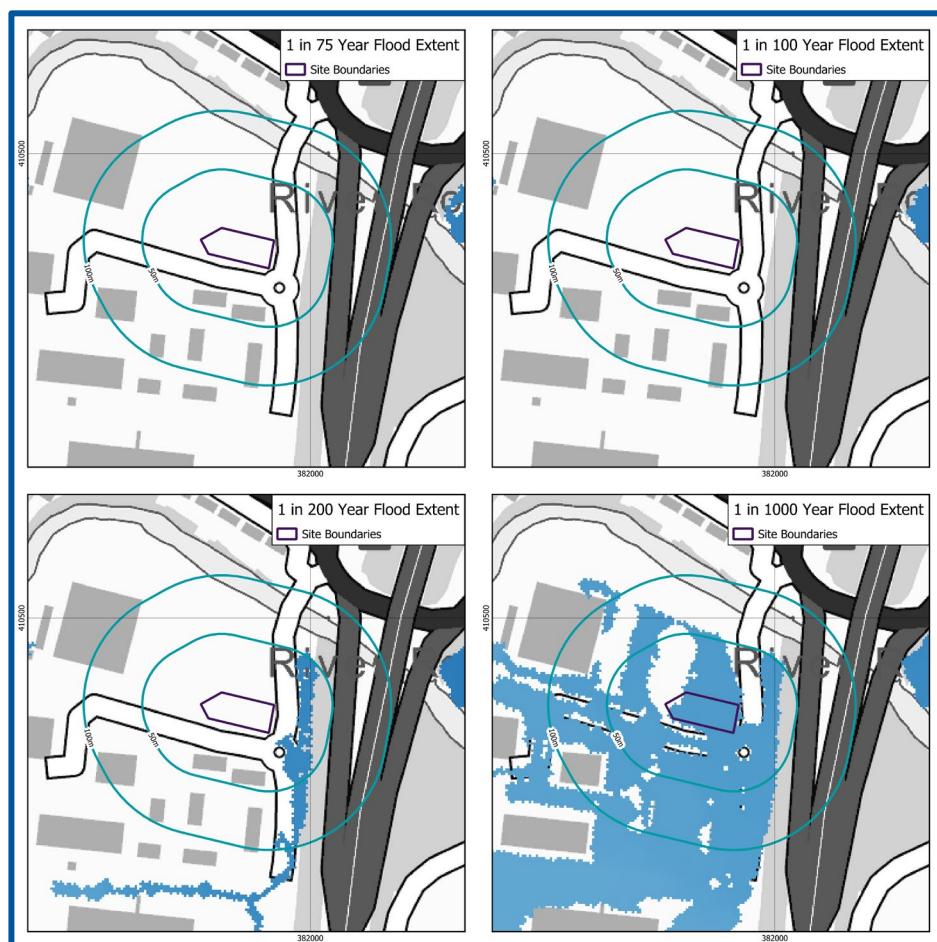
² The accuracy of the modelled flood levels are not known. These are dependent on the accuracy of input datasets such as LiDAR data, used to model the impacts of flooding within the 2D domain. Confirmation of the accuracy of the modelled flood data can be obtained separately from the Environment Agency.

Table 2. EA present day modelled flood data

Ground levels on-Site (mAOD)	Modelled Flood Levels (mAOD)			
	1 in 75 year	1 in 100 year	1 in 200 year	1 in 1000 year
74.47 to 75.80	N/A	N/A	N/A	75.48
Flood depths (m)	No flooding anticipated	No flooding anticipated	No flooding anticipated	0 - 1.01

The following figure confirms the flood extent associated with overtopping of the flood defences in the present day flooding scenarios.

Figure 8. Modelled present day flooding scenarios (JBA Consulting, 2019)



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

Climate change factors

The EA's *Flood risk assessments: climate change allowances* guidance (Published 19 February 2016 and updated May, 2022) has been used to inform a suitable increase in peak river flows for the proposed development. The updated guidance confirms 'Less Vulnerable' developments are required to undertake a Basic assessment approach.

As the Site is located within the Irwell Management Catchment, within the North West River Basin, and the proposed development is classed as Less Vulnerable, where the proposed lifespan is approximately 75 years, the Central (35%) allowance has been used to determine a suitable climate change factor to apply to river data.

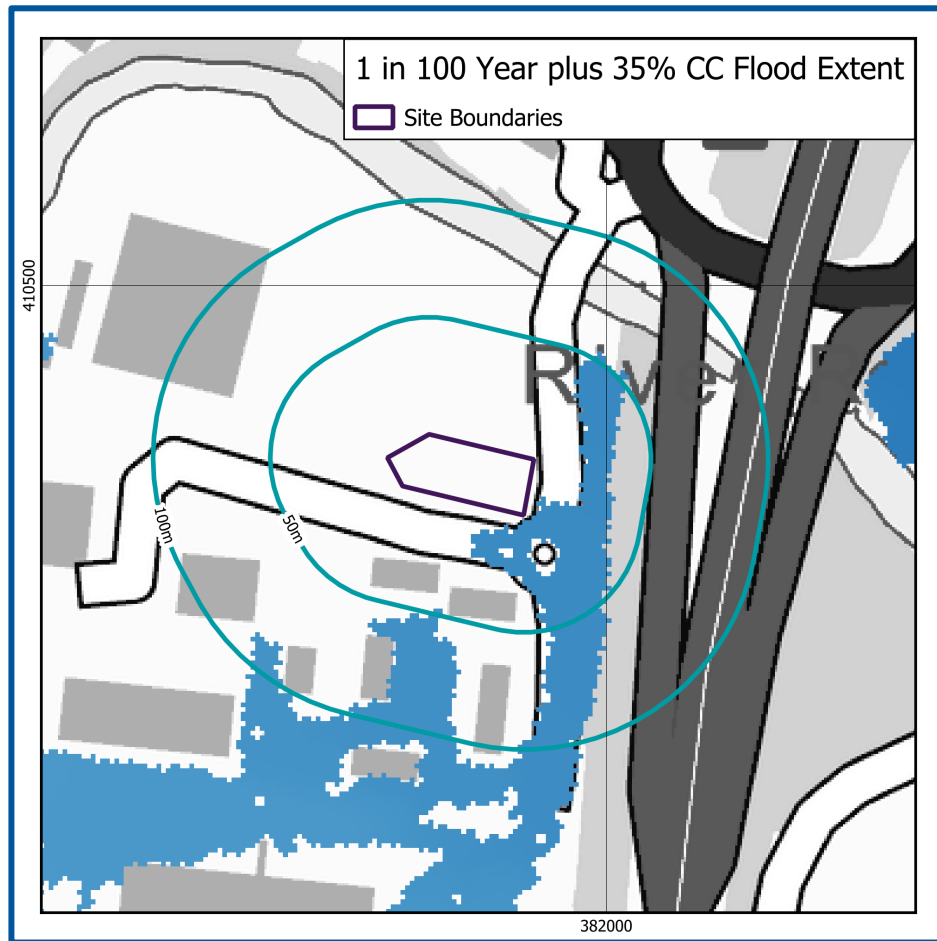
Table 3. Flood levels plus climate change allowances

Ground levels on-Site (mAOD)	Modelled Flood Levels (mAOD)
	1 in 100 year plus 35% 2080s central allowance for climate change flood level
74.47 to 75.80	75.31
Flood depths (m)	No flooding anticipated*

*Whilst the nearest flood extent exceeds the minimum ground level on-Site, the flooding is anticipated to be contained within the highway of Waterfold Road, as illustrated within Figure 9, overleaf.

The relevant climate change allowance has already been provided as part of the modelling study, and the associated flood level at the Site is indicated in Table 3. Figure 9 overleaf confirms the extent of flooding associated with the 1 in 100 year plus 35% climate change event.

Figure 9. Modelled 1 in 100 year plus 35% climate change flood extent (JBA Consulting, 2019)



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

Flood risk including the benefit of defences

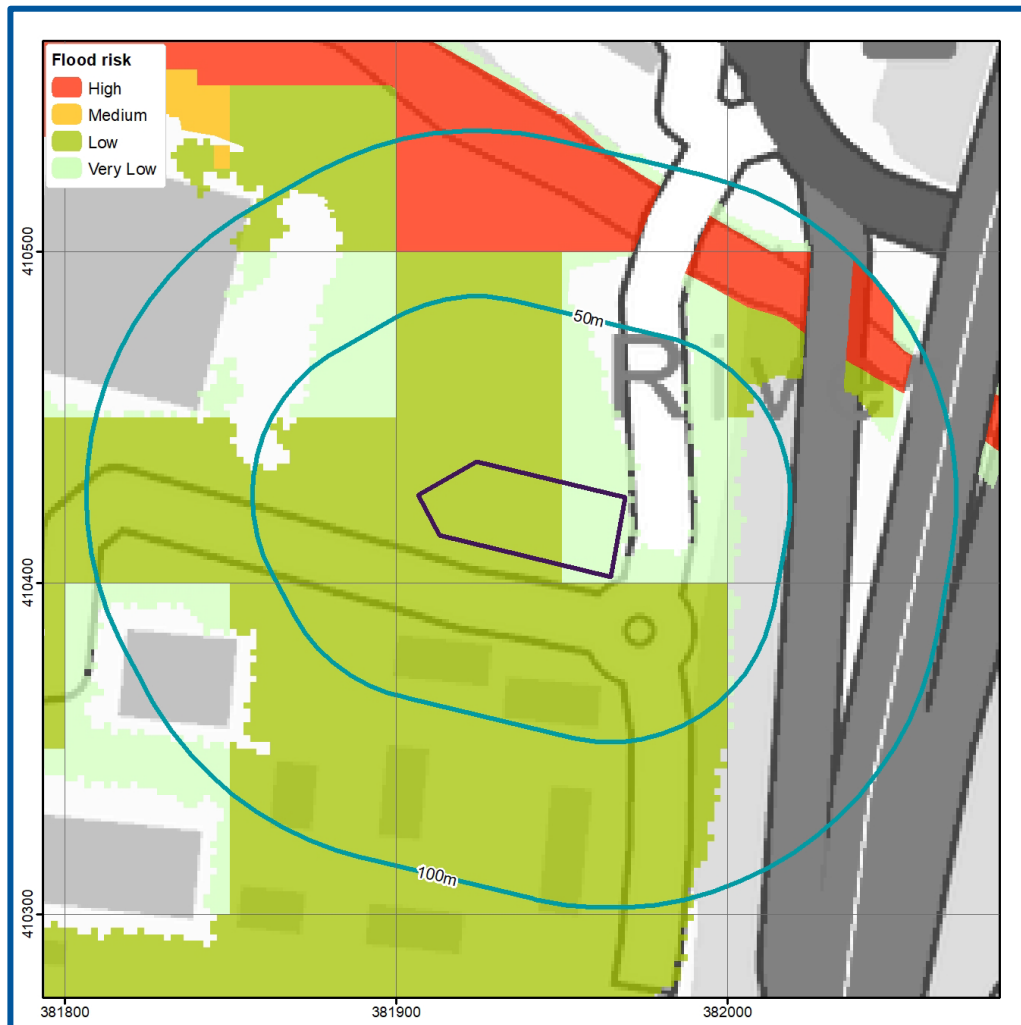
The type and condition of existing flood defences influence the 'actual' risk of fluvial flooding to the Site, albeit the long-term residual risk of flooding (ignoring the defences) should be considered when proposing new development.

According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map (Figure 10, overleaf), which considers the type, condition and crest height of flood defences, the Site has a risk of flooding ranging from Very Low to Low from the nearby watercourse, the River Roch. The area mapped at Very Low risk is indicated to be upon the eastern portion of the Site.

Further analysis of Site ground levels and modelled flood data indicate the Site would only be impacted in the 1 in 1000 year overtopping scenario. Whilst the overall Site risk rating would remain Very Low to Low, the east of the Site would be anticipated to experience flooding in this event, with only the north western perimeter of the Site anticipated to remain flood-free.

This discrepancy is likely due to the EA's RoFRaS mapping being based on a coarse 50 m x 50 m resolution grid.

Figure 10. Risk of Flooding from Rivers and Sea map (EA, 2023)



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

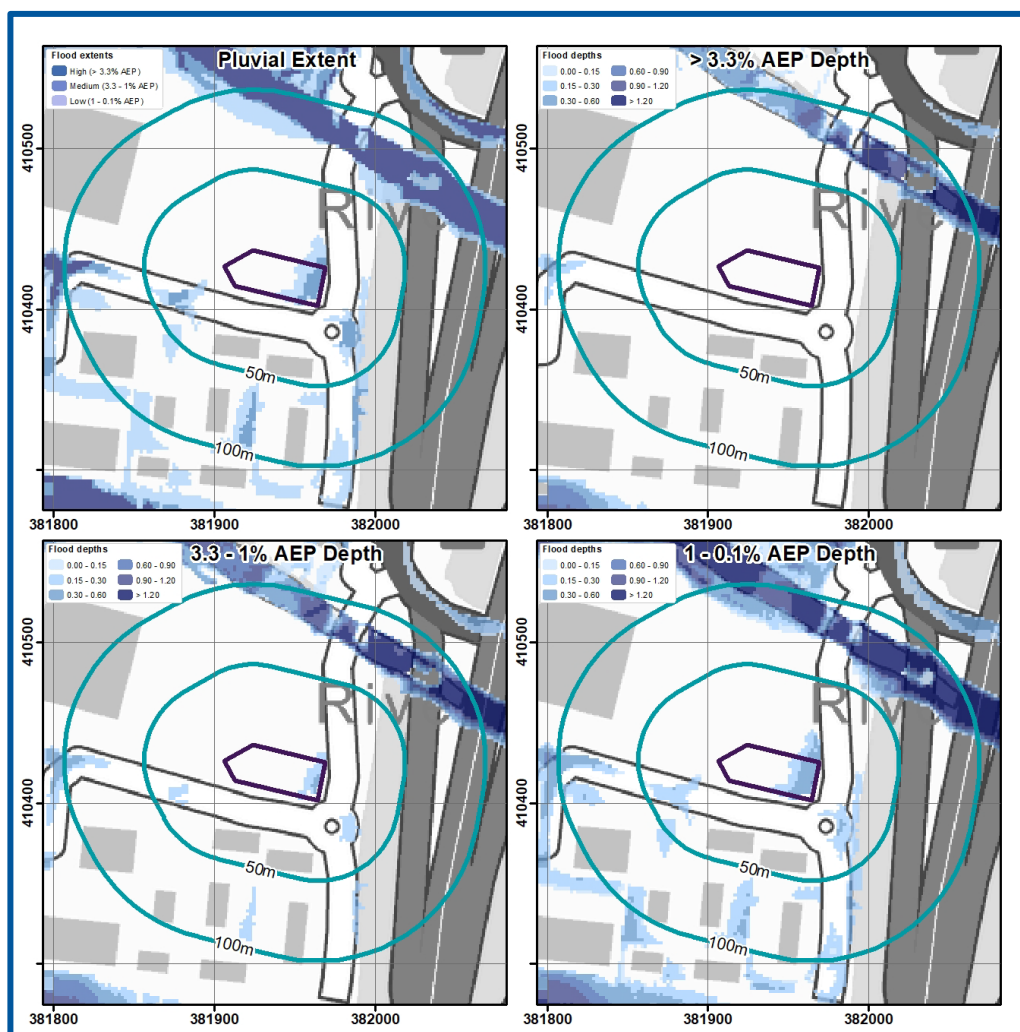
Surface water (pluvial) flooding

Surface water flooding occurs when intense rainfall exceeds the infiltration capacity of the ground and overwhelms the drainage systems. It can occur in most locations even at higher elevations and at significant distances from river and coastal floodplains.

According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping (Figure 11), the Site is at a variable risk of pluvial flooding ranging from Very Low to Medium.

The majority of the Site is at Very Low risk, with the lower-lying areas (c. 33% of Site area) to the east experiencing ponding in the Low and Medium risk events.

Figure 11. EA surface water flood extent and depth map (EA, 2023)



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

Guidance

According to EA's surface water flood risk map the Site is at:

- Very Low risk - chance of flooding of less than 1 in 1000 (0.1%).
- Low risk - chance of flooding of between a 1 in 1000 & 1 in 100 (0.1% and 1%).
- Medium risk - chance of flooding of between a 1 in 100 and 1 in 30 (1% and 3.3%).

The SFRA does not indicate any reported incidents of historical surface water flooding within 100 m of the Site and does not confirm whether the Site is located within a Critical Drainage Area (CDA)³ (JBA Consulting, 2019).

Figure 11 confirms the extent and depth of flooding in multiple modelled flood scenarios:

- No flooding would be anticipated upon the Site in the >3.3% (High) risk event, nor would access to the Site be impeded.
- Flooding depths of up to 0.60 m would be anticipated to impact the eastern boundary of the Site in the 3.3 - 1% AEP (Medium) risk event, associated with ponding in topographic lows. Access to the Site would be anticipated to be unaffected in this event.
- Flooding depths of up to 0.90 m would be anticipated upon the east (c. 33%) of the Site in the 1 - 0.1% AEP (Low) risk event, associated with ponding in topographic lows. Access to the Site is anticipated to be largely unaffected in this event.

Guidance

According to EA's surface water flood risk map the following advisory guidance applies to the Site:

Flood Depth

- 0.15 to 0.3 m - Flooding would: typically exceed kerb height, likely exceed the level of a damp-proof course, cause property flooding in some areas
- 0.3 to 0.9 m - Flooding is likely to exceed average property threshold levels and cause internal flooding. Resilience measures are typically effective up to a water depth of 0.6 m above floor level.

³ A Critical Drainage Area (CDA) is an area that has critical drainage problems and which has been notified to the local planning authority as such by the Environment Agency in line with the National Planning Policy Framework (NPPF, 2021). CDA's are specific to Flood Zone 1, defined as areas where runoff can and may have historically contributed to flooding downstream, although they are not necessarily areas where flooding problems may occur. Where a Site is located in Flood Zone 1 and within a CDA, a Flood Risk Assessment (FRA) is required and the Council may also request Sustainable Drainage Scheme (SuDS) features to be included within the proposed development.

Climate change factors

Paragraph 002 of the National Planning Practice Guidance (August, 2022) requires consideration of the 1% AP (1 in 100 year) event, including an appropriate allowance for climate change.

As the Site is located within the Irwell Management Catchment and the proposed development is classed as Less Vulnerable, where the proposed lifespan is approximately 75 years, the Upper End (45%) allowance is required to determine a suitable climate change factor to apply to rainfall data.

The 0.1% AP (1 in 1000 year) surface water flooding event has been used as a proxy in this instance for the 1% AP (1 in 100 year) plus climate change event.

Surface water flooding flow routes

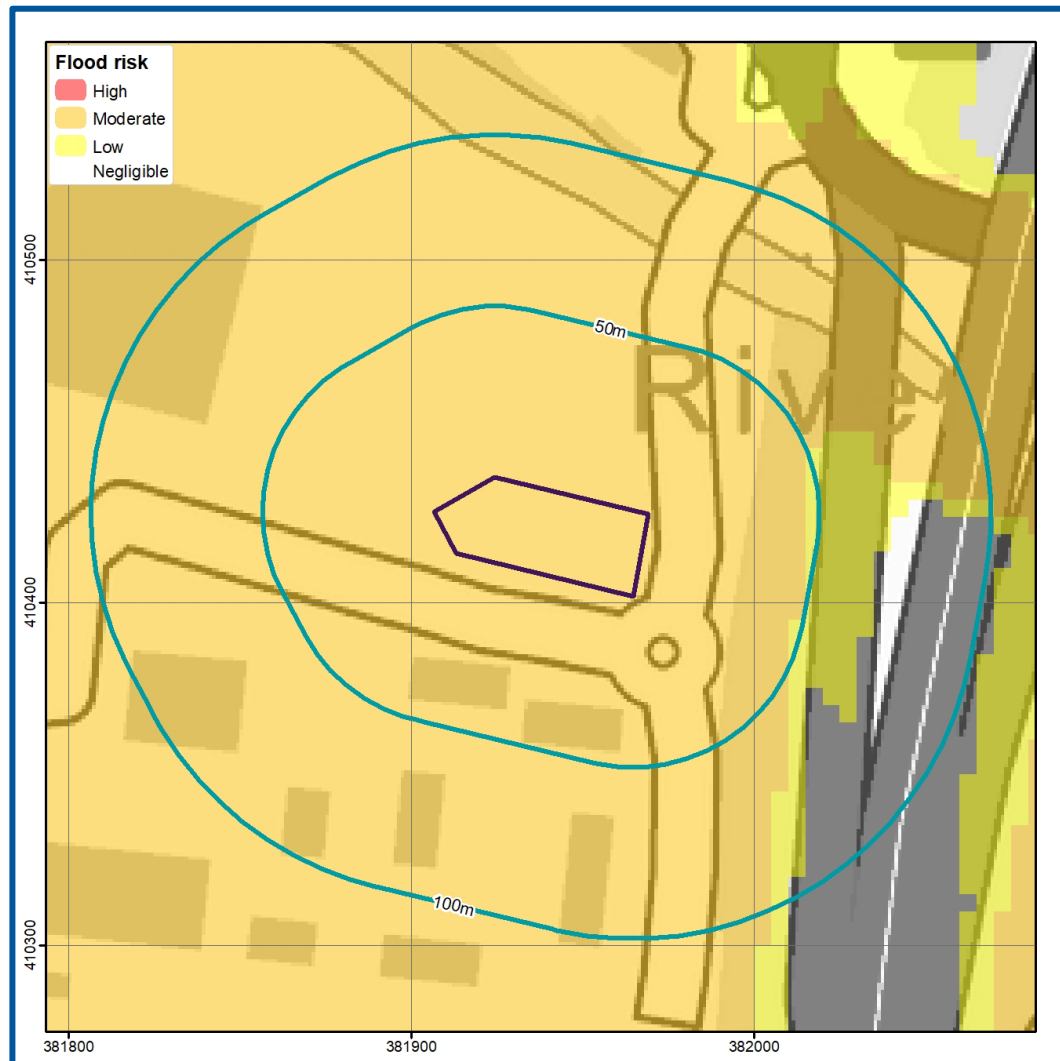
Analysis of OS mapping, ground elevation data and the EA's pluvial flow route mapping in the 1 in 1000 year (Low probability) event confirms the Site is not located on a potential overland flow route.

Groundwater flooding

Groundwater flooding occurs when sub-surface water emerges from the ground at the surface or into Made Ground and structures. This may be as a result of persistent rainfall that recharges aquifers until they are full; or may be as a result of high river levels, or tides, driving water through near-surface deposits. Flooding may last a long time compared to surface water flooding, from weeks to months. Hence the amount of damage that is caused to property may be substantially higher.

Groundwater Flood Risk screening data (Figure 12, overleaf) indicates there is a Moderate risk of groundwater flooding at surface in the vicinity from permeable superficial deposits during a 1 in 100 year event.

Figure 12. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2023)



Contains Ordnance Survey data © Crown copyright and database right 2023
Contains British Geological Survey materials © NERC 2023

Mapped classes within the screening map combine likelihood, possible severity and the uncertainty associated with predicting the subsurface system. The map is a national scale screening tool to prompt site-specific assessment where the impact of groundwater flooding would have significant adverse consequences. Mapping limitations and a number of local factors may reduce groundwater flood risk to land and property even where it lies within mapped groundwater flood risk zones, which do not mean that groundwater floods will occur across the whole of the risk area.

A site-specific assessment has been undertaken to refine the groundwater risk screening information on the basis of site-specific datasets (see Section 3) including BGS borehole data, and the EA's fluvial and tidal floodplain data (where available) to develop a conceptual groundwater model. The risk rating is refined further using the vulnerability of receptors including occupants and the existing and proposed Site layout, including the presence of basements and buried infrastructure. The presence of any nearby or on-Site surface water features such as drainage ditches, which could intercept groundwater have also been considered.

- According to a review of the hydrogeology (Section 3), the Site is underlain by permeable superficial deposits above permeable bedrock. Groundwater levels may rise in the bedrock and superficial aquifers in a seasonal response to prolonged rainfall recharge which may cause an unusually high peak in groundwater levels during some years.
- Despite the presence of an aquifer the Site would only be at risk of groundwater flooding if the water table reaches the base of the Site development or the ground surface when groundwater seepage could lead to overland flow and ponding.
- Spring lines have not been identified in close proximity to the Site.
- The local topography and drainage is such that the development threshold is likely to be lower than the area where groundwater emerges in adjacent high points.
- The design of the development should consider the groundwater pathway through permeable formations.
- According to a review of the hydrogeology (Section 3), there are no nearby relevant boreholes from which the underlying groundwater depth can be inferred, as the corresponding log for borehole SD81SW16 does not indicate the depth at which it encountered groundwater, only that it was present.

The hydrogeological characteristics suggest there is potential for a groundwater table beneath the Site.

Guidance

Moderate Risk - There will be a significant possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.

Climate change predictions suggest an increase in the frequency and intensity of extremes in groundwater levels. Rainfall recharge patterns will vary regionally resulting in changes to average groundwater levels. A rise in peak river levels will lead to a response of increased groundwater levels in adjacent aquifers subject to the predicted climate change increases in peak river level for the local catchment.

The impact of climate change on groundwater levels beneath the Site is linked to the predicted risk in both peak river levels and the variation in rainfall recharge, which is uncertain.

Flooding from artificial sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.)

Sewer flooding

Figure 6-8 of the SFRA does not identify any incidences or modelled incidences of flooding as a result of surcharging sewers within a 100 m² square area around the Site. (JBA Consulting, 2019).

Guidance

Properties classified as “at risk” are those that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system either once or twice in the ten year reference period. Records held by the sewage utility company provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

Canal failure

According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier; United Utilities.

Culverts and bridges

The blockage of watercourses or structures by debris (that is, any material moved by a flowing stream including vegetation, sediment and man-made materials or refuse) reduces flow capacity and raises water levels, potentially increasing the risk of flooding. High water levels can cause saturation, seepage and percolation leading to failure of earth embankments or other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure.

No culverts have been identified within 250 m of the Site, and as such no risk has been identified regarding potential blockage of culverts.

Multiple bridges have been identified within close proximity to the Site. These structures may pose a flood risk to the Site should they become blocked or damaged. However, due to the scale of the nearby bridges, this would be considered unlikely to occur.

The River Roch modelling study includes several 1 in 100 year blockage scenarios provided with 25%/50%/75% blockage. In these scenarios, no flooding would occur within 150 m of the Site, with the closest extent remaining similar to the design run 1 in 100 year present day scenario.

The SFRA does not contain any information regarding historic drainage issues within the Site area (JBA Consulting, 2019).

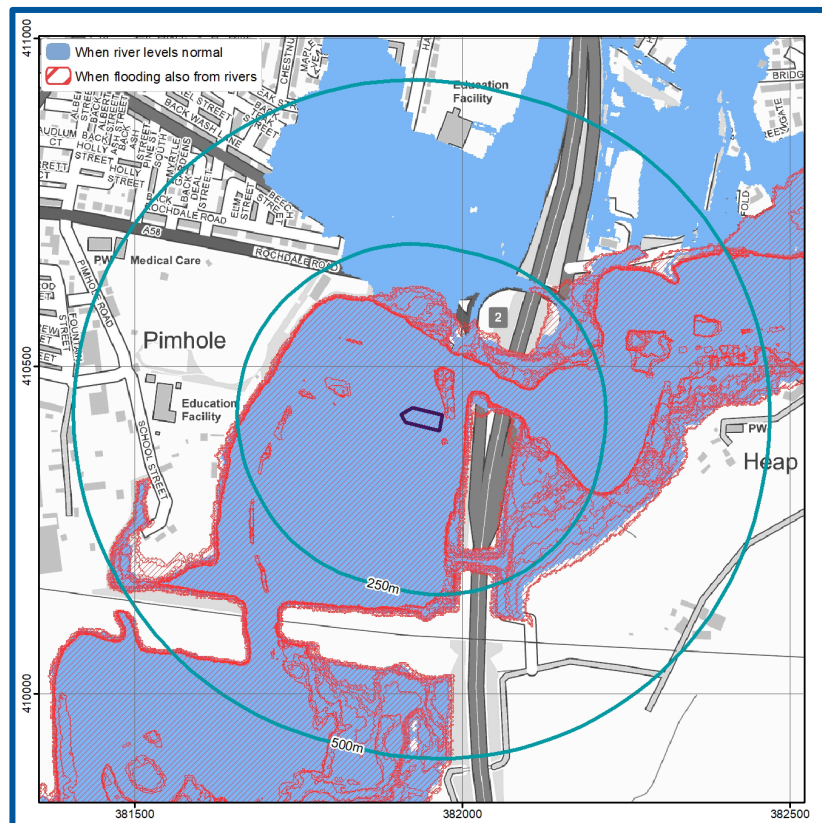
Reservoir flooding

According to the EA's Risk of Flooding from Reservoir mapping the Site is at risk of flooding from reservoirs (Figure 12) (EA, 2023).

The Site is considered to be at potential risk of flooding from 17 different reservoirs:

- Hollingworth Lake, Naden Higher, Naden Middle, Ashworth Moor, Greenbooth, Rooden, Watergrove, Blackstone Edge, Cowm, Kitcliffe, Piethorne, Spring Mill, Chelburn Upper, Hanging Lees, Norman Hill, Ogden (Milnrow), and Birtle Upper.

Figure 13. EA Risk of Reservoir Flooding (EA, 2023)



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

Guidance

The risk of reservoir flooding is related to the failure of a large reservoir (holding over 25,000 m³ of water) and is based on the worst-case scenario. Reservoir flooding is extremely unlikely to occur (EA, 2023).

5. Flood risk from the development



Floodplain storage

Where flood storage from any source of flooding is to be lost as a result of development, on-site level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development, should be provided. Where it is not possible to provide compensatory storage on site, it may be acceptable to provide it off-site if it is hydraulically and hydrologically linked.

The loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal.

The development is located within fluvial Flood Zone 2, but does not involve an increase in building footprint. Therefore, there would be no displacement of flood water and compensatory flood storage is not required.

Drainage and run-off

Based on the topography and nature of the surface water flood risk in the vicinity, interference or interaction with overland flow paths and inflows from off-Site is considered unlikely.

The development proposals do not involve an alteration in impermeable surface area at the Site. Therefore, an estimation of run-off is not considered to be required.

6. Suitability of the proposed development



The information below outlines the suitability of proposed development in relation to national and local planning policy.

National policy and guidance

The aims of the national planning policies are achieved through application of the Sequential Test and in some cases the Exception Test.

Guidance

Sequential test: The aim of this test is to steer new development towards areas with the lowest risk of flooding (NPPF, 2023). Reasonably available sites located in Flood Zone 1 should be considered before those in Flood Zone 2 and only when there are no reasonably available sites in Flood Zones 1 and 2 should development in Flood Zone 3 be considered.

Exception test: In some cases, this may need to be applied once the Sequential Test has been considered. For the exception test to be passed it must be demonstrated that the development would provide wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Suitability of the proposed development, and whether the Sequential and Exception Tests are required, is based on the Flood Zone the Site is located within and the flood risk vulnerability classification of the existing and proposed development. Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

This report has been produced to assess all development types, prior to any development. The vulnerability classification and Flood Zones are compared within the table overleaf (Table 2 of the NPPG (2022)).

As the Site is located within Flood Zone 2 and the proposed development is defined as Less Vulnerable; the proposals would be acceptable, but may be subject to the Sequential Test.

Where the Sequential Test is required it must be demonstrated that there are no alternative reasonably available Sites at lower risk of flooding within an area agreed with the council e.g. Bury Council (NPPF (2023)).

Table 4. Flood risk vulnerability and flood zone 'incompatibility' (taken from NPPG, 2022)

Flood risk vulnerability classification		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood Zone	Zone 1 – low probability	✓	✓	✓	✓	✓
	Zone 2 – medium probability	✓	✓	Exception test required	✓	✓
	Zone 3a – high probability	Exception test required	✓	X	Exception test required	✓
	Zone 3b – functional flood plain	Exception test required	✓	X	X	X

EA Flood Risk Standing Advice for vulnerable developments located in Flood Zones 2 or 3 (February, 2022)

For all relevant vulnerable developments (i.e. more vulnerable, less vulnerable and water compatible), advice on the points should be followed:

- Surface water management;
- Access and evacuation; and
- Floor levels.

Surface water management

Plans for the management of surface water need to meet the requirements set out in either the local authority's:

- Surface water management plan where available; OR
- Strategic flood risk assessment.

They also need to meet the requirements of the approved building regulations Part H: drainage and water disposal. Read section H3 rainwater drainage.

Planning permission is required to use a material that can't absorb water (e.g. impermeable concrete) in a front garden larger than 5m².

Access and evacuation

Details of emergency escape plans should be provided for any parts of a building that are below the estimated flood level.

Plans should show:

- Single storey buildings or ground floors that don't have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;
- Basement rooms have clear internal access to an upper level, e.g. a staircase;
- Occupants can leave the building if there's a flood and there's enough time for them to leave after flood warnings.

Floor levels

The following should be provided:

- average ground level of your site
- ground level of the access road(s) next to your building
- finished floor level of the lowest room in your building

Finished floor levels should be a minimum of whichever is higher of 300mm above the:

- average ground level of the site
- adjacent road level to the building
- estimated river or sea flood level

You should also use construction materials that have low permeability up to at least the same height as finished floor levels.

If you cannot raise floor levels to meet the minimum requirement, you will need to:

- raise them as much as possible
- consider moving vulnerable uses to upper floors
- include extra flood resistance and resilience measures

When considering the height of floor levels, you should also consider any additional requirements set out in the SFRA. Flood water can put pressure on buildings causing structural issues. If your design aims to keep out a depth of more than 600mm of water, you should get advice from a structural engineer. They will need to check the design is safe.

Extra flood resistance and resilience measures

Follow the guidance in this section for developments in flood risk areas where you cannot raise the finished floor levels to the required height. You should design buildings to exclude flood water where possible and to speed recovery in case water gets in.

Make sure your flood resilience plans for the development follow the guidance in the CIRIA Property Flood Resilience Code of Practice. Please note that the code of practice uses the term 'recovery measures'. In this guide we use 'resilience measures'.

Flooding can affect the structural stability of buildings. If your building design would exclude more than 600mm of flood water, you should get advice from a structural engineer. They will need to check the design is safe. Only use resistance measures that will not cause structural stability issues during flooding. If it is not possible to safely exclude the estimated flood level, exclude it to the structural limit then allow additional water to flow through the property.

The design should be appropriately flood resistant and resilient by:

- using flood resistant materials that have low permeability to at least 600mm above the estimated flood level
- making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level
- using flood resilient materials (for example lime plaster) to at least 600mm above the estimated flood level
- by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level
- making it easy for water to drain away after flooding such as installing a sump and a pump
- making sure there is access to all spaces to enable drying and cleaning
- ensuring that soil pipes are protected from back-flow such as by using non-return valves

Temporary or demountable flood barriers are not appropriate for new buildings. Only consider them for existing buildings when:

- there is clear evidence that it would be inappropriate to raise floor levels and include passive resistance measures
- an appropriate flood warning or other appropriate trigger is available

If proposals involve the development of buildings constructed before 1919, refer to Flooding and Historic Buildings guidance produced by Historic England.

7. Resilience and mitigation



Based on the flood risk identified at the Site, the national and local policies and guidance and proposed development, the mitigation measures outlined within this section of the report are likely to help protect the development from flooding.

Sea (coastal/tidal) flood mitigation measures

As the Site is not identified as being at risk of flooding from the sea, mitigation measures are not required.

Rivers (fluvial) flood mitigation measures

The Site is located within an area which is affected by flooding from rivers, the following table confirms the flood depths associated with the area proposed for development.

Table 5. Flood levels compared to ground levels on-Site

Ground levels on-Site (mAOD)	Modelled Flood Levels (mAOD)		
	1 in 100 year (mAOD)	1 in 100 year plus 35% CC (mAOD)	1 in 1000 year (mAOD)
74.47 to 75.80	N/A	N/A	75.48
Flood depths (m)	No flooding anticipated	No flooding anticipated	0 – 1.01

The vulnerability classification of the Site and the Flood Zone means proposals for the Site fall under the EA's Flood Risk Standing Advice (FRSA) for less vulnerable developments.

Development proposals are for electric vehicle chargers and the development design has not been finalised.

It is not likely to be feasible to raise the chargers above the maximum modelled flood level and therefore alternative mitigation measures should be assessed.

Considering the nature of the proposed development it is not considered feasible to raise minimum finished floor levels to the recommended elevation. A water exclusion strategy, using avoidance and resistance measures, is appropriate where floods are expected to last for short durations. Potential water exclusion strategies include:

- Temporary flood barriers or covers for the charge points
- Landscaping to divert water away from the property;

- Sustainable Drainage Systems (SuDS) to store/intercept flood water;
- Boundary walls/fencing;

Avoidance and resistance measures are unlikely to completely prevent floodwater entering a site, particularly during longer duration flood events. Therefore, it is recommended that the following flood resilience measures are also considered.

- Flood resilient materials and designs:
 - Electrical sockets should be located above the predicted flood level;
 - Communications wiring: wiring for telephone, TV, Internet and other services should be protected by suitable insulation in the distribution ducts to prevent damage.

If these mitigation measures are implemented this could reduce the flood risk to the development from Low to Very Low.

Surface water (pluvial) flood mitigation measures

A Low to Medium surface water (pluvial) flooding risk has been identified at the Site. In order to ensure the development includes sufficient flood mitigation measures to reduce the risk of pluvial flooding over its lifetime, the flood depths, levels and appropriate mitigation measures have been assessed.

Where practicable, the proposed infrastructure should be located towards the west of the Site, as the surface water risk at the Site is associated with a low-lying area to the east of the Site.

In addition, the regular maintenance of any drains and culverts surrounding/on the Site under the riparian ownership of the developer should be undertaken to reduce the flood risk.

If these mitigation measures are implemented this would reduce the flood risk to the development from Very Low/Medium to Very Low.

Groundwater flood mitigation measures

It is likely the flood mitigation measures recommended for surface water (pluvial) risk will reduce the groundwater flood risk at the development. However specific additional groundwater measures that may also be considered for the Moderate risk identified include:

- Waterproof tanking of base of the electrical infrastructure;
- Interceptor drains; and
- Automatic sump to extract flood water.

If these mitigation measures are implemented this could reduce the flood risk to the development from Moderate to Negligible.

Reservoir flood mitigation measures

According to EA data, the Site is considered to be at risk of flooding from 17 different reservoirs.

There would be a relatively high rate and onset of flooding associated with a reservoir breach, it is therefore unlikely that safe access could be achieved unless a long warning period was provided. Therefore, usage of the Site in such an event should be prohibited.

Other flood risk mitigation measures

As the Site is not identified as at risk from other sources, mitigation measures are not required.

Residual flood risk mitigation measures

The risk to the Site has been assessed from all sources of flooding and appropriate mitigation and management measures proposed to keep the users of the development safe over its lifetime. There is however a residual risk of flooding associated with the potential for failure of mitigation measures if regular maintenance and upkeep isn't undertaken. If mitigation measures are not implemented or maintained, the risk to the development will remain as the baseline risk.

Further flood mitigation information

More information on flood resistance, resilience and water entry can be found here: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

www.knowyourfloodrisk.co.uk

Emergency evacuation - safe access / egress and safe refuge

Due to the nature of the proposals, emergency evacuation to land outside of the floodplain would be the only feasible strategy in the case of an emergency.

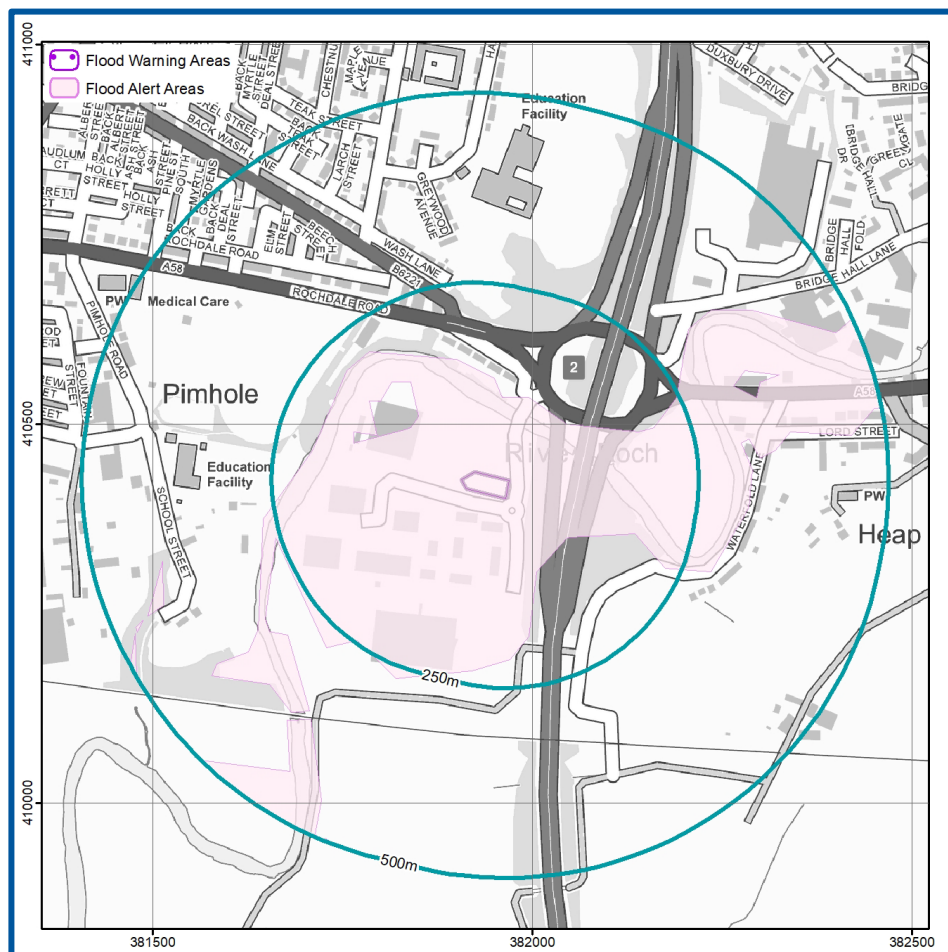
Emergency evacuation from the development and the Site should only be undertaken in strict accordance with any evacuation plans produced for the Site, with an understanding of the flood risks at the Site including available mitigation, the vulnerability of occupants and preferred evacuation routes.

Flood warnings

The EA operates a flood warning service in all areas at risk of flooding; this is available on their website: <https://www.gov.uk/check-flood-risk>. The Site is located within an EA Flood Alerts coverage area (ref: 013WAFUI) so is able to receive alerts (Figure 14, overleaf). All warnings are also available through the EA's 24 hour Floodline Service 0345 988 1188, or quick dial 143002.

The EA aims to issue Flood Warnings 2 hours in advance of a flood event. Flood Warnings can provide adequate time to enable protection of property and evacuation from a Site, reducing risk to life and property.

Figure 14. EA Flood Warning Coverage for the local area (EA, 2023).



Contains Ordnance Survey data © Crown copyright and database right 2023
Environment Agency copyright and database rights 2023

Emergency evacuation

Where possible, a safe access and egress route with a 'very low' hazard rating from areas within the floodplain to an area wholly outside the 1 in 100 year flood event including an allowance for climate change should be demonstrated.

Based on the EA's Flood Zone Map the closest dry evacuation area within Flood Zone 1 is along Waterfold Road (c. 126 m south east – direct measurement). It is advised that evacuation from the premises would be the preferred option in a flood event if safe to do so. It is recommended that residents prepare to evacuate as soon as an EA Flood Warning is issued in order to completely avoid flood waters.

8. Conclusions and recommendations



Table 6. Risk ratings following Site analysis

Source of Flood Risk	Baseline ¹	After analysis ²	After Mitigation ³
River (fluvial) flooding	Very Low to Low		Very Low
Sea (coastal/tidal) flooding	Very Low		N/A
Surface water (pluvial) flooding	Very Low to Medium		Very Low
Groundwater flooding	Moderate		Negligible
Other flood risk factors present	Yes (reservoir breach)		N/A
Is any other further work recommended?	Yes (see below)		

1 BASELINE risks assigned for the whole Site, using national risk maps, including the benefit of EA flood defences.

2 AFTER ANALYSIS modification of risk assessment based on detailed site specific analysis including some or all of the following: flood model data, high resolution mapping, building location, access routes, topographic and CCTV surveys. Reasons for the change in classification are provided in the text.

3 AFTER MITIGATION risks include risks to proposed development / asset and occupants if mitigation measures recommended in this report are implemented, including the impacts of climate change.

*N/A indicates where mitigation is not required.

The table below provides a summary of where the responses to key questions are discussed in this report. Providing the recommended mitigation measures are put in place it is likely that flood risk to this Site will be reduced to an acceptable level.

Less vulnerable developments within Flood Zone 2 are acceptable according to the NPPF and providing the recommended mitigation measures are put in place (see previous sections) it is likely that flood risk to this Site will be reduced to an acceptable level.

Table 7. Summary of responses to key questions in the report

Key sources of flood risks identified	Rivers, surface water, groundwater (see Section 4).
---------------------------------------	---

Are standard mitigation measures likely to provide protection from flooding to/from the Site?	Yes (see Section 7).
Is any further work recommended?	Yes (see exec summary and Section 7)

9. Further information



The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
	Additional assessment: SuDSmart Report		The SuDSmart Report range assesses which drainage options are available for a Site. They build on technical detail starting from simple infiltration screening and work up to more complex SuDS Assessments detailing alternative options and designs. Please contact info@geosmartinfo.co.uk for further information.
	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.

10. References and glossary



References

- British Geological Survey (BGS) (2023).** Geology of Britain Viewer. Accessed from: <https://mapapps2.bgs.ac.uk/geoindex/home.html> on 31/10/23.
- Defra/Environment Agency (2005).** Flood Risk Assessment Guidance for New Development. *Phase 2 Framework and Guidance for Assessing and Managing Flood Risk for New Development – Fill Documentation and Tools*. R & D Technical Report FD232-/TR2.
- Environment Agency [EA] (2022).** Flood risk assessments: climate change allowances. Accessed from: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> on 31/10/23.
- Environment Agency [EA] (2023).** MagicMap. Accessed from: <http://magic.defra.gov.uk/MagicMap.aspx> on 31/10/23.
- Environment Agency [EA] (2023).** Flood map for planning. Accessed from <https://flood-map-for-planning.service.gov.uk/> on 31/10/23.
- Environment Agency [EA] (2023).** Long term flood risk assessment for locations in England. Accessed from <https://flood-warning-information.service.gov.uk/long-term-flood-risk> on 31/10/23.
- GeoSmart (2023).** GeoSmart groundwater flood risk (GW5) map (version 2.4).
- Greater Manchester Combined Authority (2016).** Section 19 Flood Investigation Report Boxing Day 2015. Access from <https://www.greatermanchester-ca.gov.uk/media/1261/boxing-day-flood-report.pdf> on 31/10/23
- JBA Consulting (2019).** Greater Manchester Strategic Flood Risk Assessment. Accessed from: <https://www.greatermanchester-ca.gov.uk/GMCAFiles/PFE/Supporting%20documents/04%20Sustainable%20and%20Resilient%20Places/04.02.01%20GM%20Strategic%20Flood%20Risk%20Assessment%20Level%201%20Report.pdf> on 31/10/23.
- LiDAR Survey Open Data (2023).** Accessed from: <https://environment.data.gov.uk/DefraDataDownload/?Mode=survey> on 31/10/23.
- Ministry of Housing, Communities & Local Government (2023).** National Planning Policy Framework (NPPF). Accessed from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1182995/NPPF_Sept_23.pdf on 31/10/23.
- Ministry of Housing, Communities & Local Government (2022).** Planning Practice Guidance (NPPG). Flood Risk and Coastal Change. Accessed from <https://www.gov.uk/guidance/flood-risk-and-coastal-change> on 31/10/23.
- Ordnance Survey Mapping (2023).** © Crown copyright. All rights reserved. Licence number AL 100054687. For full terms and conditions visit: www.ordnancesurvey.co.uk

Glossary

General terms

BGS	British Geological Survey
EA	Environment Agency
GeoSmart groundwater flood risk model	GeoSmart's national groundwater flood risk model takes advantage of all the available data and provides a preliminary indication of groundwater flood risk on a 50m grid covering England and Wales. The model indicates the risk of the water table coming within 1 m of the ground surface for an indicative 1 in 100 year return period scenario.
Dry-Island	An area considered at low risk of flooding (e.g. In a Flood Zone 1) that is entirely surrounded by areas at higher risk of flooding (e.g. Flood Zone 2 and 3)
Flood resilience	Flood resilience or wet-proofing accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly. Mitigation measures that reduce the damage to a property caused by flooding can include water entry strategies, raising electrical sockets off the floor, hard flooring.
Flood resistance	Flood resistance, or dry-proofing, stops water entering a building. Mitigation measures that prevent or reduce the likelihood of water entering a property can include raising flood levels or installation of sandbags.
Flood Zone 1	This zone has less than a 0.1% annual probability of river flooding
Flood Zone 2	This zone has between 0.1 and 1% annual probability of river flooding and between 0.1% and 0.5 % annual probability sea flooding
Flood Zone 3	This zone has more than a 1% annual probability of river flooding and 0.5% annual probability of sea flooding
Functional Flood Plain	An area of land where water has to flow or be stored in times of flood.
Hydrologic model	A computer model that simulates surface run-off or fluvial flow. The typical accuracy of hydrologic models such as this is $\pm 0.25\text{m}$ for estimating flood levels at particular locations.
OS	Ordnance Survey
Residual Flood Risk	The flood risk remaining after taking mitigating actions.

SFRA	Strategic Flood Risk Assessment. This is a brief flood risk assessment provided by the local council
SuDS	A Sustainable drainage system (SuDS) is designed to replicate, as closely as possible, the natural drainage from the Site (before development) to ensure that the flood risk downstream of the Site does not increase as a result of the land being developed. SuDS also significantly improve the quality of water leaving the Site and can also improve the amenity and biodiversity that a Site has to offer. There are a range of SuDS options available to provide effective surface water management that intercept and store excess run-off. Sites over 1 Ha will usually require a sustainable drainage assessment if planning permission is required. The current proposal is that from April 2014 for more than a single dwelling the drainage system will require approval from the SuDS Approval Board (SABs).

Aquifer Types

Principal aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
Secondary A aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Secondary B aquifer	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
Secondary undifferentiated	Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.

NPPF (2021) terms

Exception test	Applied once the sequential test has been passed. For the exception test to be passed it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
Sequential test	Aims to steer new development to areas with the lowest probability of flooding.

Essential infrastructure	Essential infrastructure includes essential transport infrastructure, essential utility infrastructure and wind turbines.
Water compatible	Water compatible land uses include flood control infrastructure, water-based recreation and lifeguard/coastal stations.
Less vulnerable	Less vulnerable land uses include police/ambulance/fire stations which are not required to be operational during flooding and buildings used for shops/financial/professional/other services.
More vulnerable	More vulnerable land uses include hospitals, residential institutions, buildings used for dwelling houses/student halls/drinking establishments/hotels and sites used for holiday or short-let caravans and camping.
Highly vulnerable	Highly vulnerable land uses include police/ambulance/fire stations which are required to be operational during flooding, basement dwellings and caravans/mobile homes/park homes intended for permanent residential use.

Data Sources

Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2023 BlueSky copyright and database rights 2023
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2023 Ordnance Survey data © Crown copyright and database right 2023
Flood Risk (Flood Zone/RoFRS/Historic Flooding/Pluvial/Surface Water Features/Reservoir/ Flood Alert & Warning)	Environment Agency copyright and database rights 2023 Ordnance Survey data © Crown copyright and database right 2023
Flood Risk (Groundwater)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2023) Contains British Geological Survey materials © NERC 2023 Ordnance Survey data © Crown copyright and database right 2023
Location Plan	Contains Ordnance Survey data © Crown copyright and database right 2023
Topographic Data	OS LiDAR/EA

	Contains Ordnance Survey data © Crown copyright and database right 2023 Environment Agency copyright and database rights 2023
--	--

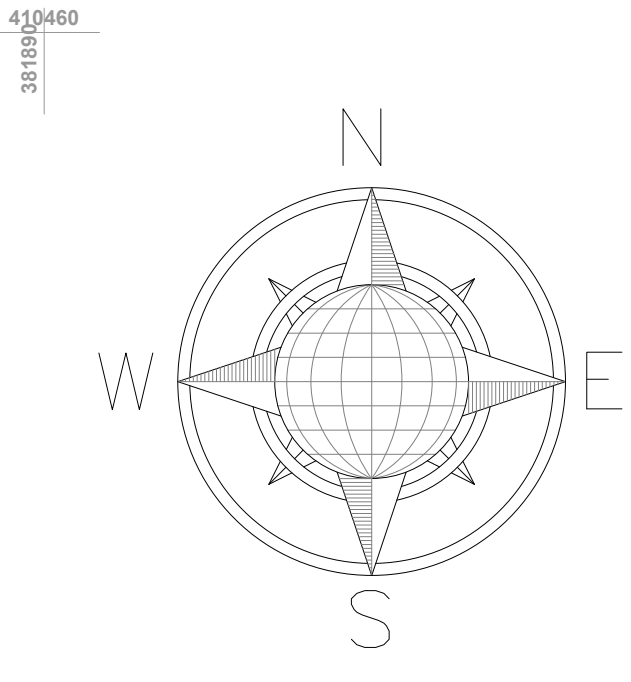
11. Appendices



Appendix A



Site plans



410450

410440

410430

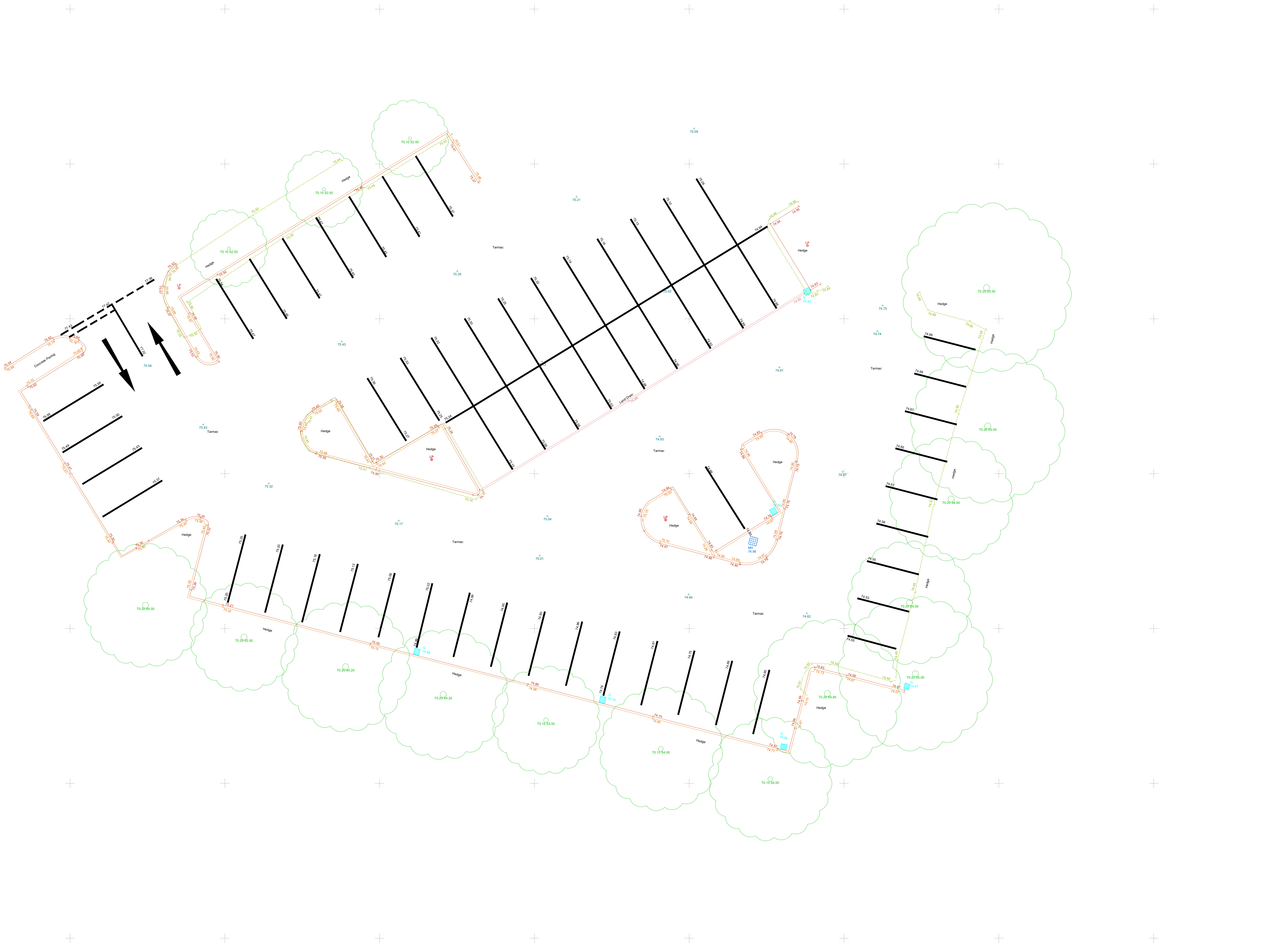
410420

410410

410400

410390

410380



LEGEND		
Topographic Linework Features		
Air-Con Unit (ACU)	Hand Rail	Service
Barrier	Hedge	Sky Light
Beam Line	Hoarding	Slope Bottom
Bench	Kerb Bottom	Slope Top
Bin	Kerb Drop	Slot Drain
Bollard Illuminated	Kerb Top	Speed Bump
Bollard	Lake	Steel Cladding
Bridges	Land Drain	Steel Structure
Building Facade	Lift	Step Line
Building	Obstruction	Surface Change
Bus Stop Shelter	Opening - Slab	Tank
Cable Trough	Pipe Line	Telephone Box (TB)
Canopy	Overhead Cables	Ticket Machine(TVM)
Canopy	Overhead Cables	Traffic
Centre Line	Partition	Top of Fence Line
Column	Parking Meter (PM)	Top of Wall Line
Column Bottom Line	Track	Track
Column Top Line	Platform Train/Tram	Traffic Crib Box(TCB)
Concrete Base/Slab	Tree Drop Line	Tree Drop Line
Contour Major	Tree Line	Tree Line
Contour Minor	Post-box	Trial Pit
Cycle Lane	Rail	Vegetation Line
Ditch	Ramp	Vent
Door	Red Line Dashed	Verge Line
Duct	Red Line Solid	Wall Line
Electric Box (EBOX)	Red Line Double	Window
Fence	River Edge	Window Glazing
Fixture	Road Edge	White Line Dashed
Flowerbed	Road Scar Line	White Line Double
Footpath	Road Text	White Line Solid
Grating	Roof	Yellow Line Dashed
Grid Line	Sanitary	Yellow Line Double
		Yellow Line Solid

Topographic Point Features		
AV Air Valve	IC Inspection Cover	RS Road Sign
AFEX Apex Building	IC - CATV	RE Rodding Eye
BL Bed Level	IC - Comms	SA Sector Antenna
BS Bellshale Beacon	IC - Electric	SIGN Sign (General)
B Bollard	IC - Round	SOF Soffit Level
BOLT Bolt	IC - Telecom	SH Spot Height
BH Borehole	IC - Traffic	SC Stop Cock
B Bush	Invert Level	TP Telegraph Pole
CP CCTV Camera Pole	Lamp Post	T Top of Fence Level
CE Ceiling Elevation	Manhole	T Top of Tree Level
D Dipole	MH - Foul	T Top of Wall Level
ER Earth Rod	MH - Round	TL Traffic Light
EAVE Eave	MH - Surface Water	T Tree (TX XX SX XX)
EL Electrical Pole	Marker Post	T Trunk Radius(m)
FL Fire Hydrant	Microwave Dish	S-Spread Radius(m)
FL Floor Level	Pipe - Down	Tree Coniferous
GM Gas Meter	Pole	Tree Deciduous
GV Gas Valve	Post	TT Tree Trunk
W Valve General		V Valve
W Water Level		W Water Meter
W Water Valve		W Water Valve

Special Features		
E=XXXX XXX	E=XXXX XXX	Scan Target
ID A N=YYYY YYY	ID A N=YYYY YYY	
H=ZZZ ZZZ	H=ZZZ ZZZ	

Fence Types		
B/W Barbed Wire	C/L Chain Link	O/B Open Boarded
C/B Close Boarded	H Heras	P/W Post and Wire
C/I Corrugated Iron	I/R Iron Railings	P/R Post and Rail

Murphy Geospatial Disclaimer

All reasonable endeavours have been used to capture the required data in the survey to the agreed standards of accuracy. Where features have been distorted due to a lack of access, the areas will be annotated as 'UTS' (Unable To Survey). The Company shall not be liable for any damages or consequential losses arising from the reliance on survey information beyond its specified scale and accuracy, or survey information used for purposes other than that stated in the Contract of Works.

Any concerns with the survey should be raised with Murphy Geospatial, who will endeavour to promptly provide a remedy. The Client shall not seek recourse through any third party until such time as Murphy Geospatial have had the opportunity to redress any concerns raised.

For full terms and conditions visit [Terms and Conditions](#) [www.murphygs.com](#)

Revisions				
Rev	Description	Surveyed by	Drawn by	Checked by
A	First Issue	MF - 10/08/23	DH - 17/08/23	SH - 24/08/23



Geospatial certainty you can trust [murphygs.com](#)

UK Head Office

39-41 North Road
London
N7 9DP
Phone: (+44) (0)20 599 3775
Email: info@murphygs.com

London Manchester Birmingham Glasgow Belfast Cork Kilclare

UKCS

RICS

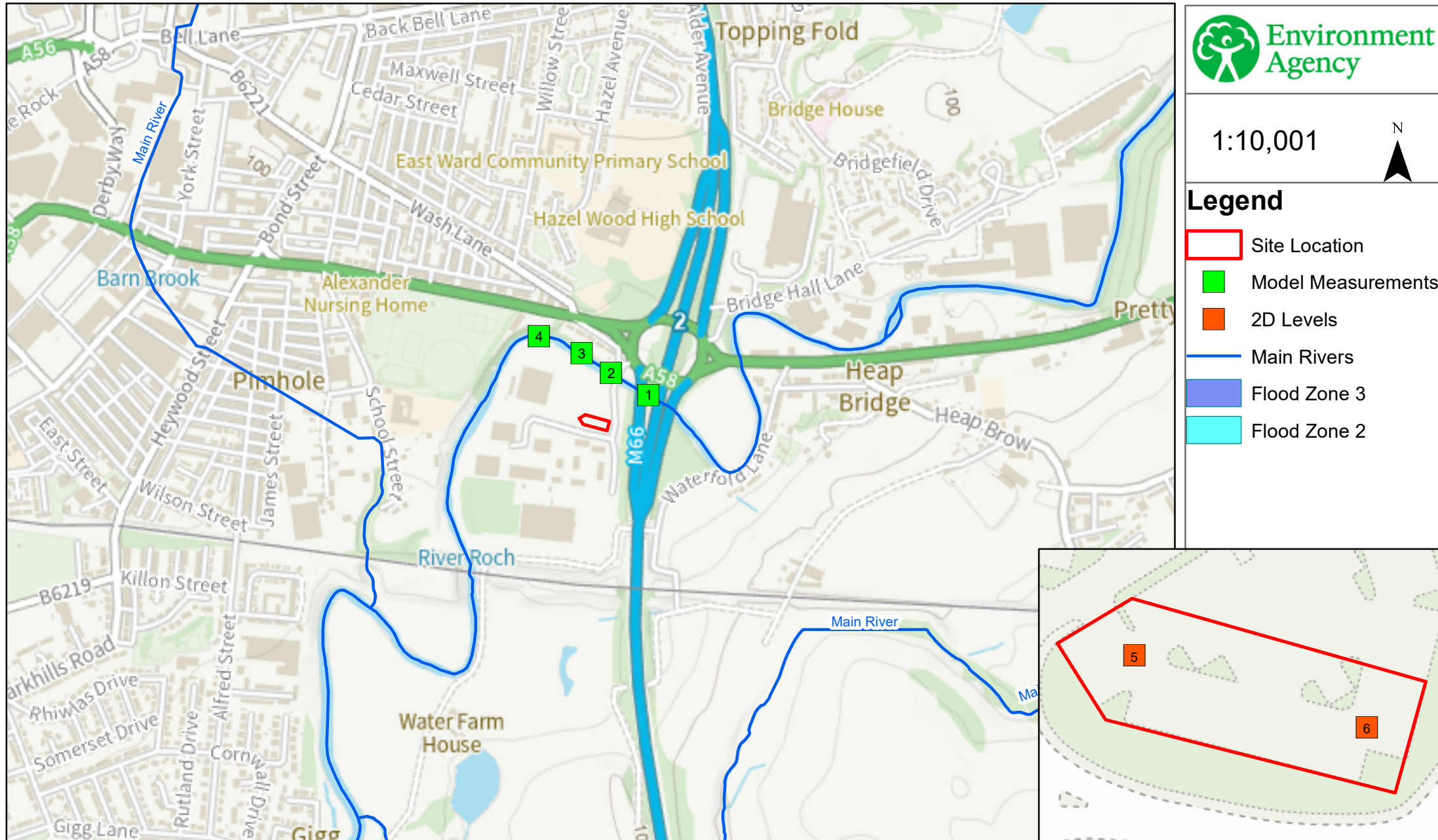
Client	Poise
Project	WP1 - Village Hotels
Site Address	Multiple Topo/GPR Surveys
Description	Waterford Business Park
Survey Grid	Bury
Survey Datum	BL9 7BQ
RICS Band	Topographical Survey
Drawing Scale	Localised OSGB36(15) - Scale Factor 1.0
Drawing Number	GNSS - Ordnance Datum Newlyn (ODN)
	Band E
	1:100 @A0
	MGS53607-UT-Nottingham-Topo-01

Appendix B

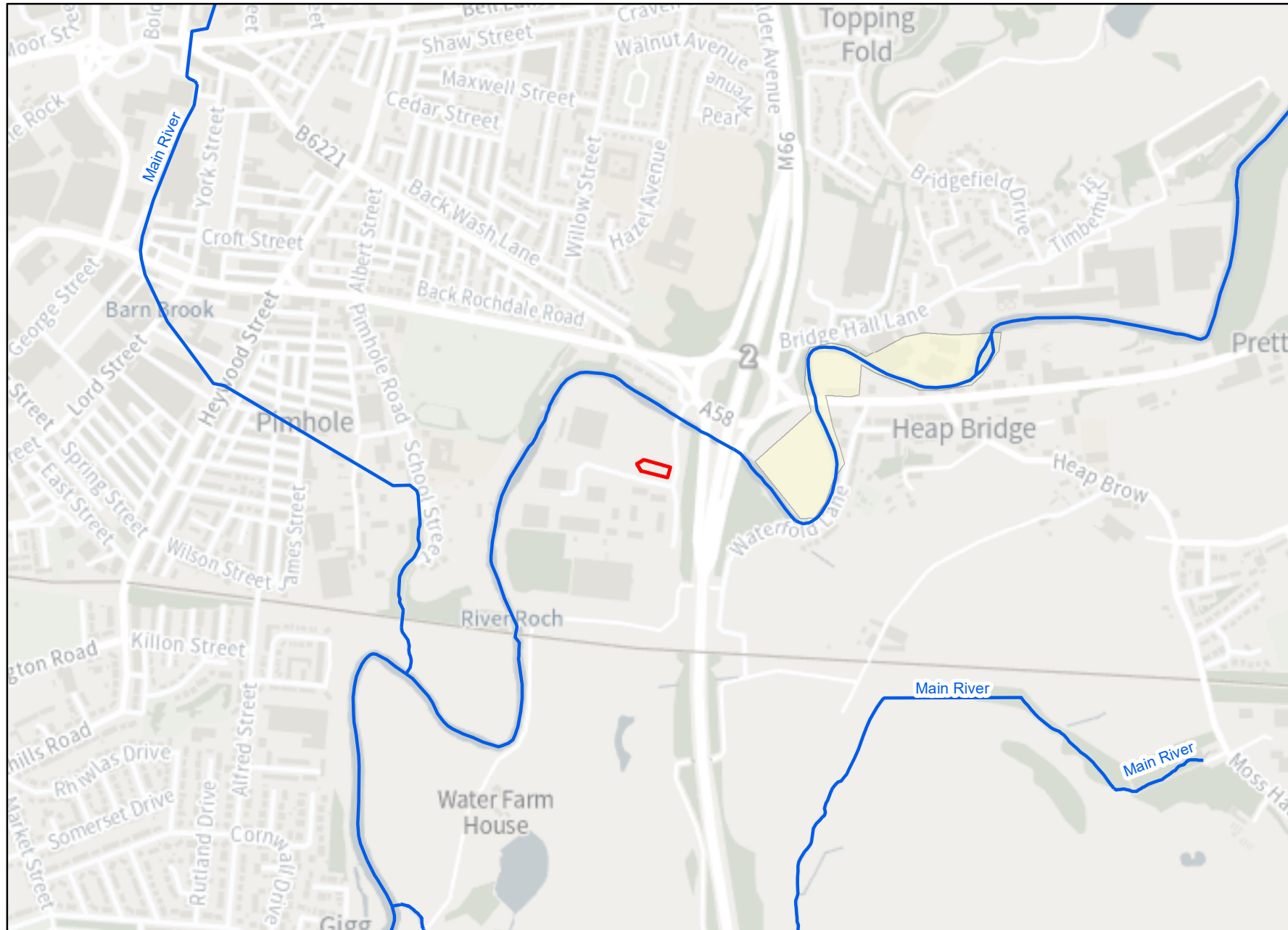


Environment Agency data

Detailed Flood Map Centred on Waterfold Business Park, Rochdale Rd, Bury BL9 7BQ. Created 25/10/2023 [GMMC331339AB]



Recorded Flood Outline Map Centred on Waterfold Business Park, Rochdale Rd, Bury BL9 7BQ. Created 25/10/2023 [GMMC331339AB]



1:10,001



Legend

 Site Location

 Main Rivers

Recorded Flood Outline

Start Date

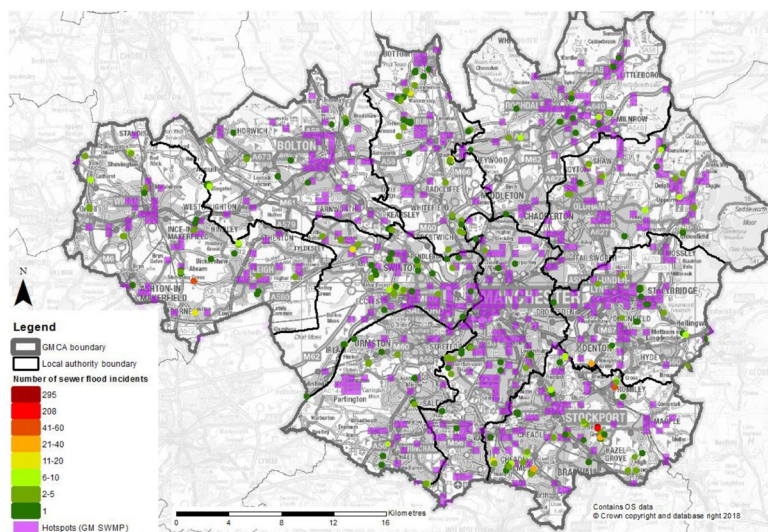
 26/12/2015



Local Council Document Mapping

JBA
consulting

Figure 6-8: UU historic sewer flooding incidents and GM SWMP Hotspots

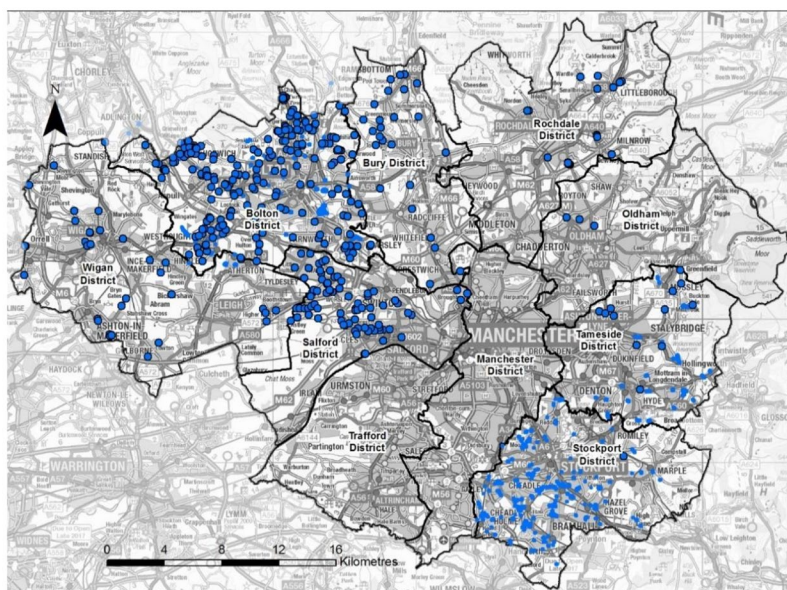


2021s0741 GMCA Level 1 SFRA Update Final Report WCAG v1.0

110

JBA
consulting

Figure 6-7: GM LLFA historic flood incidents



2021s0741 GMCA Level 1 SFRA Update Final Report WCAG v1.0

107

Disclaimer

This report has been prepared by GeoSmart in its professional capacity as soil, groundwater, flood risk and drainage specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by GeoSmart solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to GeoSmart at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, GeoSmart may, by prior written agreement, agree to such release, provided that it is acknowledged that GeoSmart accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. GeoSmart accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual or otherwise, against GeoSmart except as expressly agreed with GeoSmart in writing.

For full T&Cs see <http://geosmartinfo.co.uk/terms-conditions>

Important consumer protection information

This search has been produced by GeoSmart Information Limited, Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU.

Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

GeoSmart Information Limited is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom.
- sets out minimum standards which firms compiling and selling search reports have to meet.
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.
- By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports.
- act with integrity and carry out work with due skill, care and diligence.
- at all times maintain adequate and appropriate insurance to protect consumers.
- conduct business in an honest, fair and professional manner.
- handle complaints speedily and fairly.
- ensure that products and services comply with industry registration rules and standards and relevant laws.
- monitor their compliance with the Code.

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs contact details:

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk. Please ask your search provider if you would like a copy of the search code

Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly. If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

Martin Lucass

Commercial Director

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

martinlucass@geosmartinfo.co.uk

12. Terms and conditions, CDM regulations and data limitations



Terms and conditions can be found on our website:

<http://geosmartinfo.co.uk/terms-conditions/>

CDM regulations can be found on our website:

<http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/>

Data use and limitations can be found on our website:

<http://geosmartinfo.co.uk/data-limitations/>