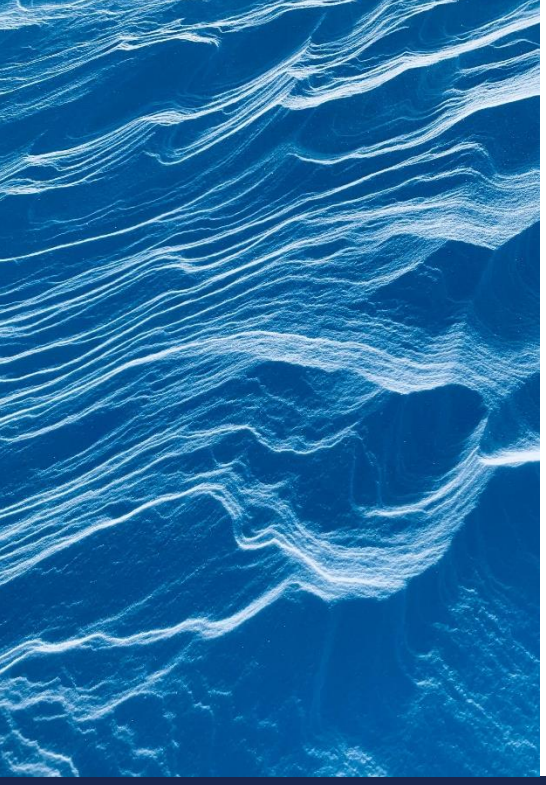

Flood Risk Assessment
AEG0830_BL9_Bury_07

Site Address: 23 Meadway
Bury
BL9 9TY

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Flood risk, water and environment

UK Experts in Flood Modelling, Flood Risk Assessments, and Surface Water Drainage Strategies

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Document Issue Record

Project: Flood Risk Assessment

Prepared for: SAC Developments

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Site Location: 23 Meadway, Bury, BL9 9TY

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Flood risk, water and environment

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Summary

Development Description	Existing	Proposed
Development Type	Greenfield Site	Construction of two Residential Dwellings
EA Vulnerability Classification	N/A	More Vulnerable
Ground Floor Level	Based on LiDAR data, existing ground elevations on site range between 68.36m AOD and 69.70m AOD	Location of proposed dwelling footprints lie outside the modelled 1.0%AEP+35%CC fluvial extent, and modelled 0.1%AEP pluvial extent. FFLs of both dwellings should be raised above the 0.1%AEP fluvial event to 69.48m AOD
Level of Sleeping Accommodation	N/A	Unknown, current drawings do not include floor plans
Impermeable Surface Area	Greenfield Site – 0m^2	Approximately 180m^2
Surface Water Drainage	N/A[1]	Surface Water Drainage Strategy recommended in order to suggest appropriate SuDS elements that could be included
Site Size	Approximately 1170m^2	No change
Risk to Development	**Summary**	**Comment**
EA Flood Zone	Flood Zone 1 and Flood Zone 2	
Flood Source	Fluvial	River Roch
SFRA Available	Yes - Level 1 Strategic Flood Risk Assessment for Greater Manchester (2019)	
Management Measures	**Summary**	**Comment**
Ground floor level above extreme flood levels	Yes	Location of proposed dwelling footprints lie outside the modelled 1.0%AEP+35%CC fluvial extent and modelled 0.1%AEP pluvial extent. FFLs of both dwellings to be raised above the 0.1%AEP fluvial event to 69.48m AOD

Safe Access/Egress Route	Not available	Safe access/egress from the site may not be possible in any of the modelled pluvial flood events via Meadway Road as such safe refuge should be sought on site. In the modelled 1.0%AEP+35%CC and 0.1%AEP fluvial events safe access/egress via Meadway Road may not be possible and safe refuge should be sought on site.
Flood Resilient Design	Yes	Details of flood resilience and resistance techniques to be included in accordance with '*Improving the flood performance of new buildings*' (DCLG, 2007).
Site Drainage Plan	Not available	Surface Water Drainage Strategy recommended in order to suggest appropriate SuDS elements that could be included
Flood Warning & Evacuation Plan	Recommended	Sign up to the River Roch at Hollins EA Flood Warning Service and Met Office Severe Weather Warning alerts
Offsite Impacts	**Summary**	**Comment**
Displacement of floodwater	Negligible	The location of the proposed dwellings has been shown to lie outside the modelled 1.0%AEP+35%CC fluvial flood extent, and the modelled 0.1%AEP pluvial extent. As such, the development should not increase flood risk elsewhere through displacement of flood water.
Increase in surface run-off generation	Not available	Surface Water Drainage Strategy recommended in order to suggest appropriate SuDS elements that could be included
Impact on hydraulic performance of channels	Negligible	Does not impact channel.

[1] not required for this assessment

[2] data not available.

1. Introduction

1.1. Aegaea were commissioned by SAC Developments to undertake a Flood Risk Assessment (FRA) to facilitate a planning application for the proposed development. This FRA has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.

1.2. This FRA is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Site Overview

1.3. The site of the proposed development is 23 Meadway, Bury, BL9 9TY (Figure 1). It is understood that the proposed development is for the construction of two dwellings on existing greenfield land. A copy of the development proposals will be included in Appendix A of this report.

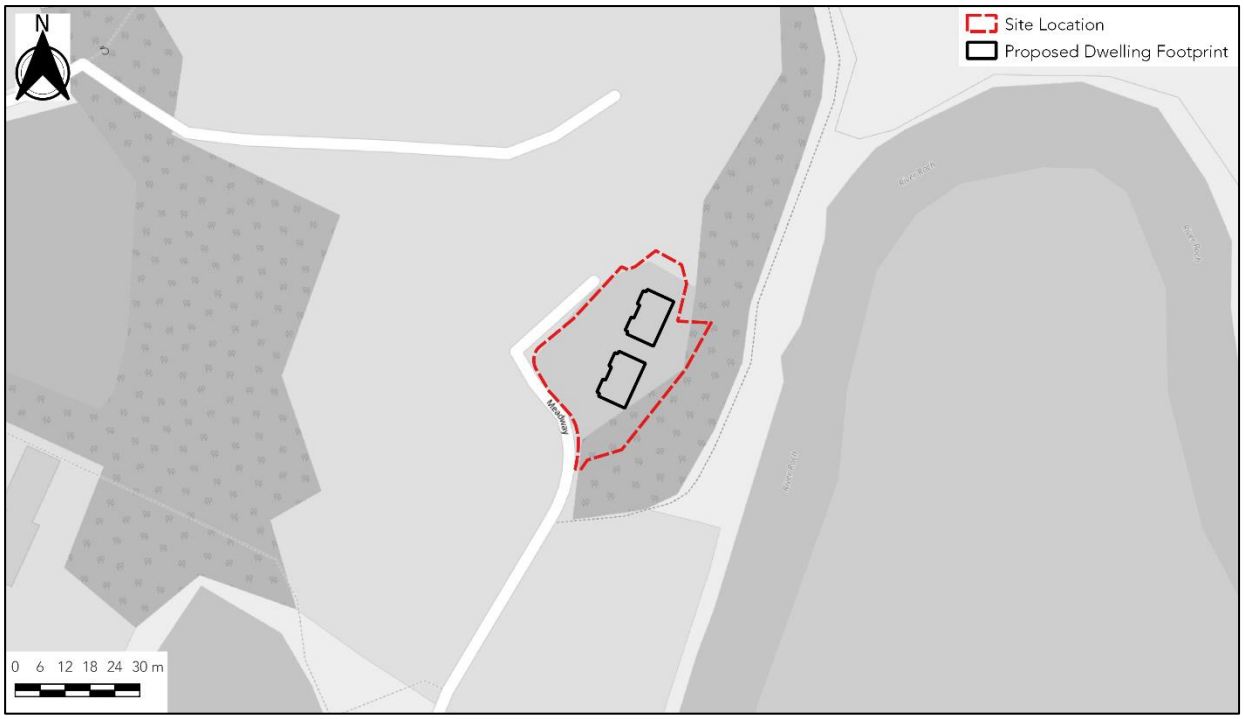

Figure 1: Site Location (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

1.4. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model (1m resolution) has been utilised to review the topography of the site (Figure 2). The LiDAR data shows the ground elevation of the site varies between

approximately 68.36 metres Above Ordnance Datum (m AOD) and 69.70m AOD (1m LiDAR data). At the location of the northern proposed dwelling, existing ground levels vary between approximately 69.34m AOD and 69.48m AOD, whilst for the southern proposed dwelling existing ground levels vary between approximately 69.23m AOD and 69.57m AOD.

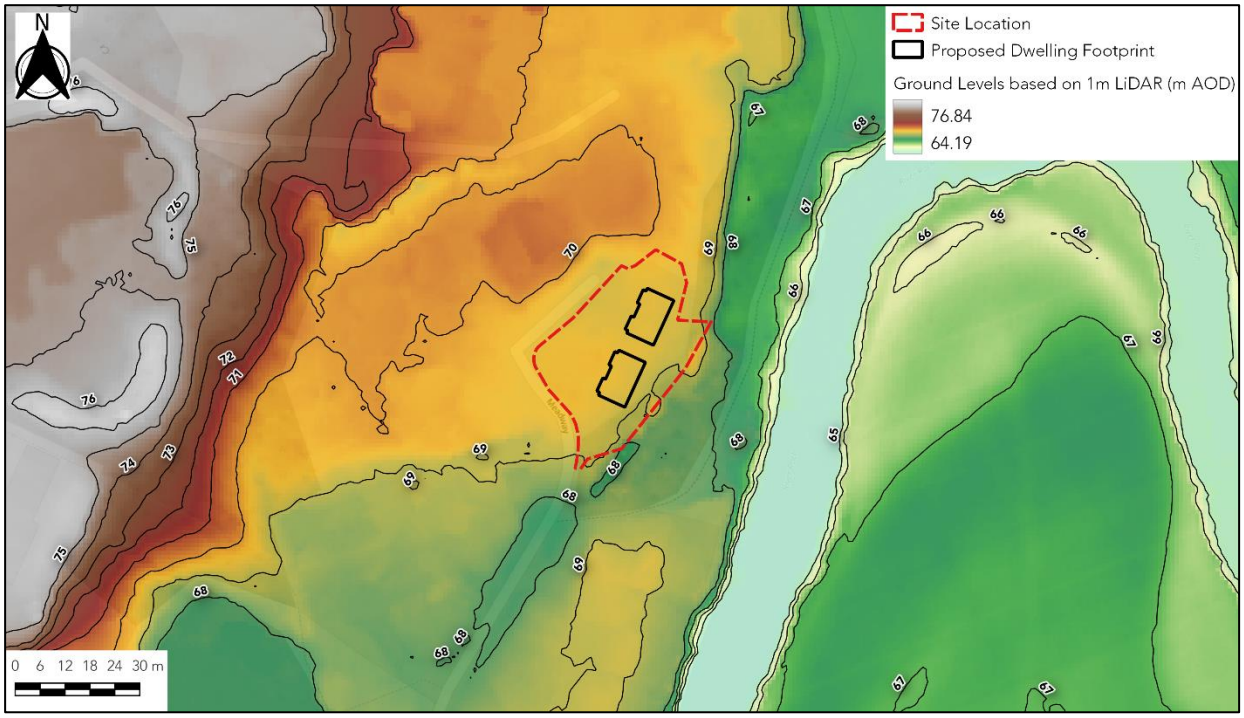

Figure 2: Site Topography (Source: Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA) © https://www.openstreetmap.org and contributors. Contains public sector information licensed under the Open Government License v3.0)

1.5. Bury Council is the Local Planning Authority (LPA) for the site, and also the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's Greater Manchester Merseyside and Cheshire region.

Planning Policy and Guidance

1.6. UK government planning guidance states[1] that an FRA is required for sites which are:

- *In Flood Zone 2 or 3 including minor development (in terms of flood risk) and change of use*
- *More than 1 hectare in Flood Zone 1*
- *Less than 1 ha in Flood Zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than river and the sea (for example surface water drains or reservoirs)*
- *In an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency*

1.7. The site lies partly within Flood Zone 2 based on the EA Flood Map for Planning and therefore the NPPF states that an FRA is required.

1.8. The objective of this FRA is to demonstrate that the proposals are acceptable in terms of flood risk. This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:

- Fluvial flood risk
- Surface water flood risk
- Risk of flooding from other sources

[1] **https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment**

2. Planning Policy

National Planning Policy Framework

2.1. Inappropriate development in a flood risk area could pose significant risk in terms of personal safety and damage to property for the occupiers of the development or for people elsewhere. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. This section summarises the key policies and guidance relevant to the proposed development.

2.2. The National Planning Policy Framework[2] (NPPF) (DLUHC, 2021) which includes UK Government policy on development and flood risk states:

> *"159. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.*
>
> *167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*
>
> *a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
>
> *b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
>
> *c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*

[2] https://www.gov.uk/guidance/national-planning-policy-framework, **last updated July 2021**

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

2.3. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having less than 1 in 1,000 annual probability of river or sea flooding (all land outside Zones 2 and 3).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

2.4. An FRA should be appropriate to the scale, nature, and location of the development. It should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.

2.5. An assessment of hydrological impacts should be undertaken, including to surface water runoff and impacts to drainage networks in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

Local Planning Policy

2.6. The Local Plan prepared by the Local Planning Authority, Bury Council, sets out the policies for development in the local area. The proposed site lies under the jurisdiction of this LPA and therefore will be required to adhere to the local plan policies. Bury Council are currently in the process of preparing a new Local Plan. Therefore, the Adopted Bury Unitary Development Plan provides the current policies for development in Bury. The Bury Unitary Development Plan (Adopted 1997)[3] document provides the following policy on flood risk management;

EN5 - Flood Protection and Defence

The Council will seek to control development in a manner consistent with flood protection and the maintenance of flood defence systems.

EN5/1 - New Development and Flood Risk

The Council will not permit new development, including the raising of land and the intensification of development, where such development would be at risk from flooding, would be likely to increase the risk of flooding elsewhere, or would adversely affect river flood defences. When assessing proposals against this policy, the following criteria will apply:

- *the impact on the floodplain;*
- *the increase in surface water run-off as a result of the proposal;*
- *the impact on fluvial flood defences;*
- *the incorporation of mitigating works.*

[3] **https://www.bury.gov.uk/CHttpHandler.ashx?id=1484&p=0**

Sequential and Exception Tests

2.7. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.

Sequential Test

2.8. Under the NPPF all new planning applications should undergo a Sequential Test unless a Minor Development or a change of use application in accordance with paragraph 168 and footnotes 55 and 56. This test should be implemented by local planning authorities with a view to location particularly vulnerable new developments outside of the flood plain.

2.9. The proposed dwellings have been located in a sequentially preferable location, outside of the highest risk flood zone (Flood Zone 3) and outside of the extent of the modelled 1.0%AEP+35%CC allowance event. The proposed dwellings also lie outside the extent of the modelled 0.1%AEP pluvial flood event too.

Exception Test

2.10. The Exception Test is applied to sites based on the Flood Zone and the nature of the development. As the proposed development consists of the construction of two residential dwellings it would be classed as 'More Vulnerable' in line with government development use classes.

2.11. The Flood Risk Vulnerability Classification table[4] provided below in Table 2 shows which vulnerabilities are appropriate in each Flood Zone.

2.12. The proposed development sits wholly within Flood Zone 2. Table 2 shows Flood Zone 2 is an appropriate location for 'More Vulnerable' uses without the need for an Exception Test.

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4 https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2

Table 2: Flood Risk Vulnerability Classification

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	x	Exception Test required	✓	✓
Zone 3b	Exception Test required	x	x	x	✓

Summary

2.13. This flood risk assessment has been prepared with due consideration to the above local and national policy.

3. Consultation and Review

Consultation

3.1. The site sits within the Environment Agency's (EA) Greater Manchester Merseyside and Cheshire region. The EA were contacted in November 2022 and asked to provide detailed modelling data for the proposed development location. In response, the EA provided both Product 4 and Product 6 data from the Lower Roch (2017) flood model relating to the site. This information will be used in Section 4 of this report in order to determine the flood risk to the site. A full copy of the Product 4 information will be provided in Appendix B of this report.

Documents and Online Mapping

3.2. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.

3.3. The following sources of information have been reviewed for this assessment:

- Flood Map for Planning on the Environment Agency website *https://flood-map-for-planning.service.gov.uk/*
- Long Term Flood Risk Information on the Environment Agency website *https://www.gov.uk/check-long-term-flood-risk*
- National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2021)
- Planning Practice Guidance - Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022)
- Geoindex Onshore (British Geological Survey, 2022)
- Bury Unitary Development Plan (Bury Council, Adopted 1997)

- Bury Council Preliminary Flood Risk Assessment[5] (Bury Council, 2011)
- Level 1 Strategic Flood Risk Assessment for Greater Manchester[6] (Greater Manchester Combined Authority, 2019)
- Bury Council Local Flood Risk Management Strategy[7] (Bury Council, 2018)
- Greater Manchester Surface Water Management Plan[8] (AGMA, 2012)

Preliminary Flood Risk Assessment (PFRA)

3.4. The PFRA, published in 2011, is a high-level appraisal of flood risk across Lead Local Flood Authority Bury Council. The flood risk from all sources, including fluvial, surface water, groundwater and surcharged sewers is evaluated. It is the basis upon which the Local Flood Risk Management Strategy (described below) is produced.

3.5. The PFRA summarises historical flood incidents in Bury Council. The site is not recorded as having been affected by any flood event.

Strategic Flood Risk Assessment (SFRA)

3.6. The SFRA, published in 2019, provides the evidence base for the Local Planning Authority Bury Council Local Plan and guidance for consideration when determining planning applications.

3.7. The SFRA seeks to place new development into areas of lower flood risk taking into account current flood risk, future flood risk, and the effect a proposed development would have on the risk of flooding.

3.8. The SFRA mapping provided by Greater Manchester Combined Authority has been used throughout production of this report as a source of information, particularly pertaining to historical flood incidents.

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[5] **https://www.bury.gov.uk/CHttpHandler.ashx?id=8904&p=0**
[6] **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**
[7] **https://www.bury.gov.uk/CHttpHandler.ashx?id=18906&p=0**
[8] **https://www.bury.gov.uk/CHttpHandler.ashx?id=11439&p=0**

Local Flood Risk Management Strategy (LFRMS)

3.9. The LFRMS (2018) sets out roles and responsibilities for flood risk management, assesses the risk of flooding in the area, where funding can be found to manage flood risk, and what the policies, objectives and actions of the Lead Local Flood Authority are.

3.10. The Bury LFRMS, as mentioned above, assesses the risk of flooding in the county and will be used within this report to identify whether the proposed site is at risk.

Surface Water Management Plan (SWMP)

3.11. The SWMP (2012) outlines the preferred surface water management strategy in a given location. In this context surface water flooding describes flooding from sewers, drains, groundwater, and runoff from land, ordinary watercourses and ditches that occurs as a result of heavy rainfall.

3.12. The SWMP has been used to inform the surface water flood risk to the proposed site throughout this report.

4. Sources of Flood Risk

Fluvial Flood Risk

4.1. Flooding from watercourses arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.

Main Rivers and Ordinary Watercourses

4.2. The nearest EA main river to the site is the River Roch, located approximately 18m east of the site boundary.

4.3. The EA main rivers, the Hollins Brook (approximately 280m south) and River Irwell (approximately 425m southwest) also lies within the vicinity of the site location.

4.4. There is also a lake located within the vicinity of the site, approximately 80m southwest of the site boundary.

4.5. There are no other ordinary watercourses within the vicinity of the site.

EA Flood Map for Planning

4.6. The site is located within Flood Zone 1 and Flood Zone 2 (Figure 3). Flood Zone 1 denotes land having less than 1 in 1,000 (0.1%) annual probability of river or sea flooding (all land outside Zones 2 and 3). Flood Zone 2 denotes a risk of flooding from fluvial sources between a 1 in 100 (1%) and 1 in 1,000 (0.1%).

4.7. Approximately 50% of the site boundary lies within Flood Zone 2, with the remaining half lying within Flood Zone 1 (Figure 4). Both proposed dwelling footprints lie within the extent of Flood Zone 2. The site also lies within close proximity to Flood Zone 3 (risk of flooding from fluvial sources greater than 1 in 100 (1%) which lies immediately east of the site boundary.

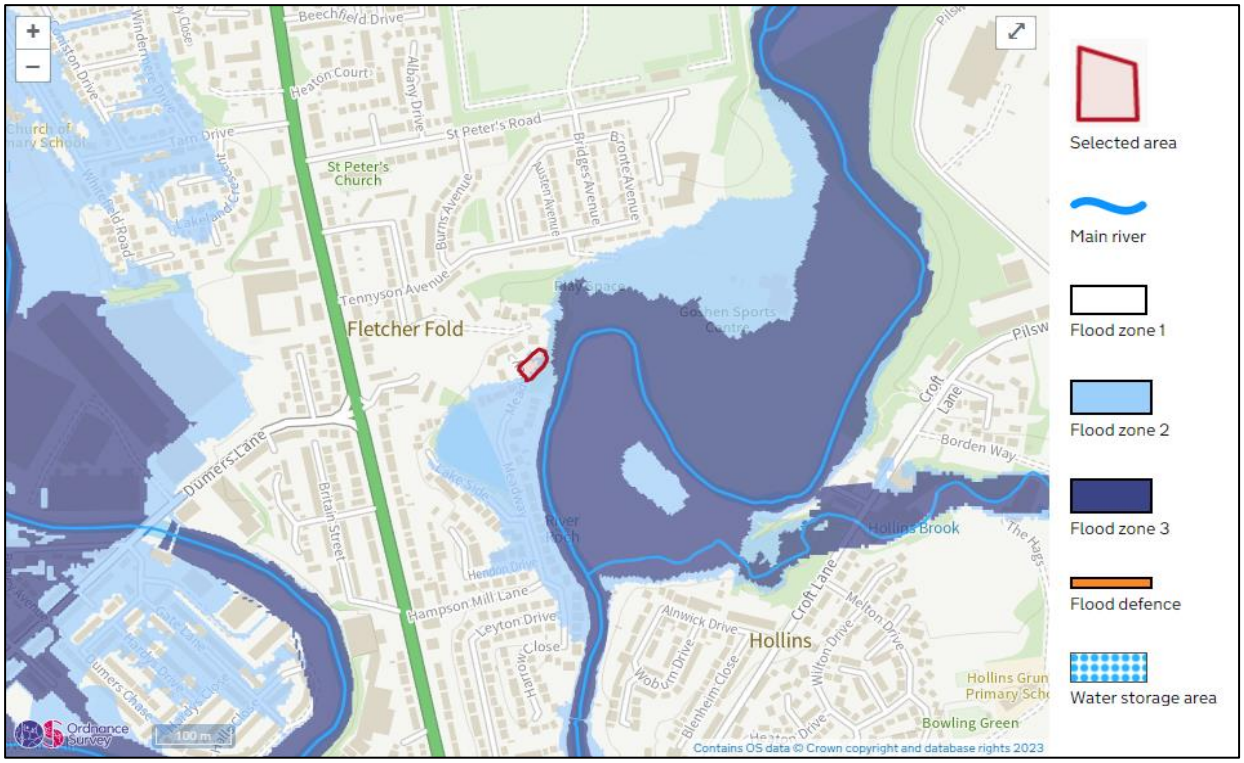


Figure 3: EA Flood Map for Planning

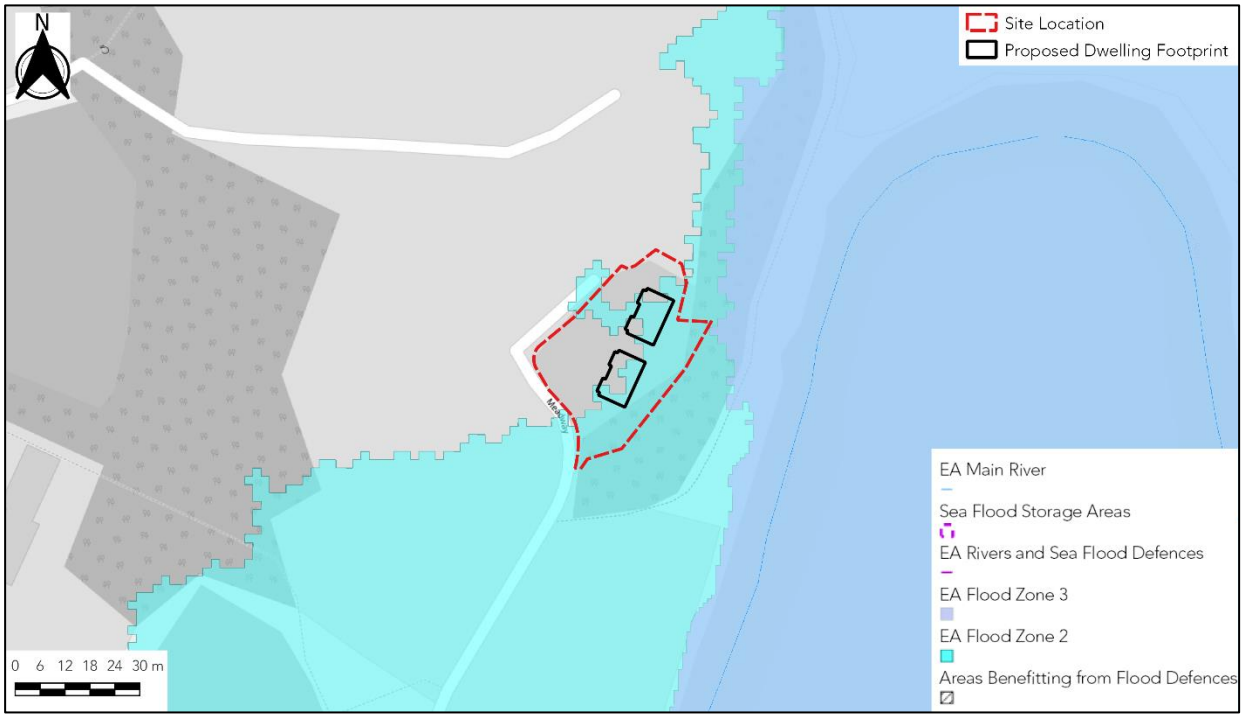


Figure 4: Site Specific Flood Zones from EA Flood Zone for Mapping GIS Layers (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

Lower Roch Model (2017) Data

4.8. Following consultation with the EA, Aegaea were provided detailed modelling data for the River Roch (Lower Roch Model, 2017) in order to analyse the fluvial flood risk to the site. The model includes several return period events in additional to scenarios including various climate change allowances.

4.9. Figure 5 shows the modelled flood extent and depths for the 1.0% Annual Exceedance Probability (AEP) event. In this modelled event, the site remains unaffected by fluvial flooding, though the nearest extent lies immediately to the east of the site boundary. The modelled flood level given in this event is 67.74m AOD (0.62m below the lowest topographic level on site (68.36m AOD)).

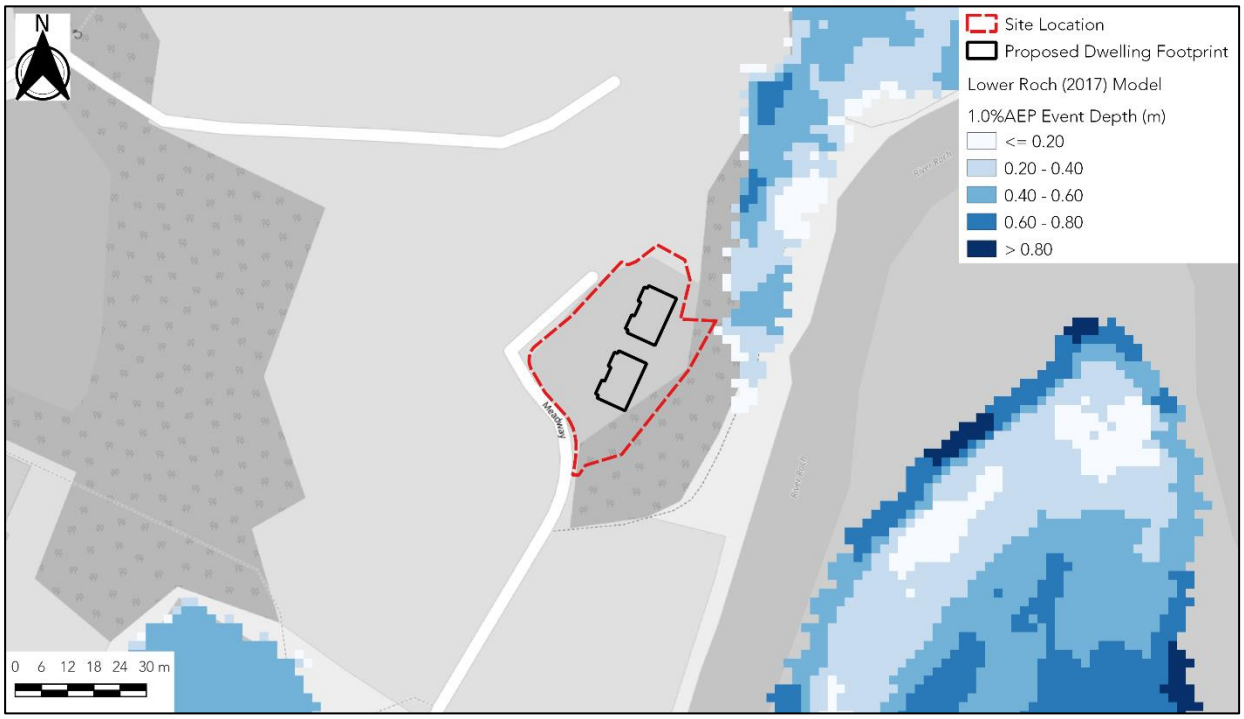


Figure 5: Lower Roch 2017 Modelled Flood Depths 1.0%AEP event (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

4.10. Figure 6 shows the flood extent and depths for the modelled 0.1% AEP event. In this event the site is affected by fluvial flooding. The flood level given for this event is 69.48m AOD. Based on existing ground levels provided by LiDAR data, the depths across the site could range up to 1.12m. The greatest depths are shown along the eastern boundary of the site. Based on LiDAR data, the flood depths at the location of the proposed northern dwelling range up to 0.14m, and at the location of the proposed southern dwelling flood depths range up to 0.25m.

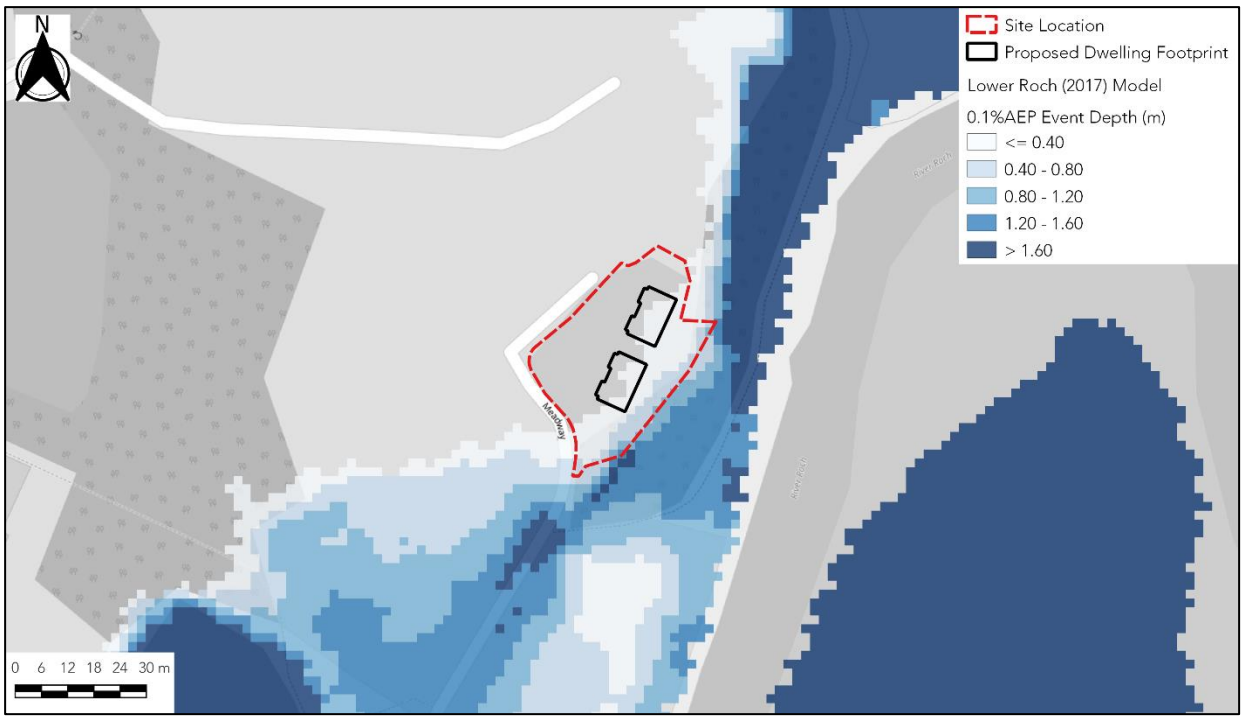


Figure 6: Lower Roch 2017 Modelled Flood Depths 0.1%AEP event (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

Climate Change

4.11. The site is located within the Irwell Management Catchment, which has peak flow river allowances for the central scenario of: 12% for the 2020s, 19% for the 2050s, and 35% for the 2080s. As the development is for the construction of residential dwellings the peak flow allowance of 35% for the 2080s would be required for fluvial flood flows ('+35%CC').

4.12. The climate change (CC) impact will be analysed via interrogating the Lower Roch model data. The Lower Roch model includes a +35%CC scenario which will be used to determine climate change risk to the site.

4.13. Figure 7 shows the flood extent and depths from the Lower Roch model (2017), for the modelled 1.0% AEP+35%CC allowance event. The flood level in this event is 68.79m AOD. Based on existing ground levels provided by LiDAR data, the depths across the site could range up to 0.43m. However, the location of both the proposed northern and southern dwellings remains unaffected in this event. The proposed northern and southern dwellings are location on land 0.55m and 0.44m above the flood level respectively.

4.14. In the modelled 1.0%AEP+35%CC event, the modelled hazard rating for the flood extent within the site boundary is 'Low' (Figure 8). However, on Meadway Road to the south of the site the hazard rating is shown to be mainly 'Moderate', as such, safe access/egress from the site may not be possible in this event if flooding has occurred and is present. Safe refuge should be sought on site within the proposed dwellings.

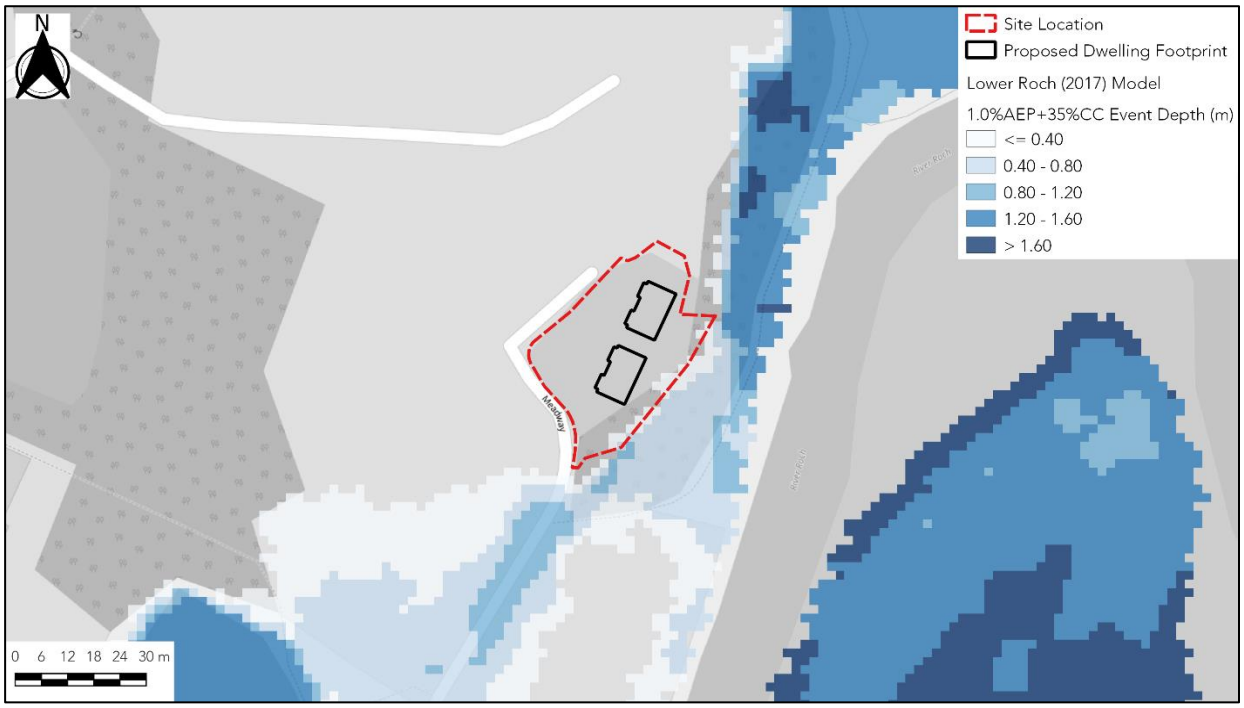


Figure 7: Lower Roch 2017 Modelled Flood Depths 1.0%AEP+35%CC event (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

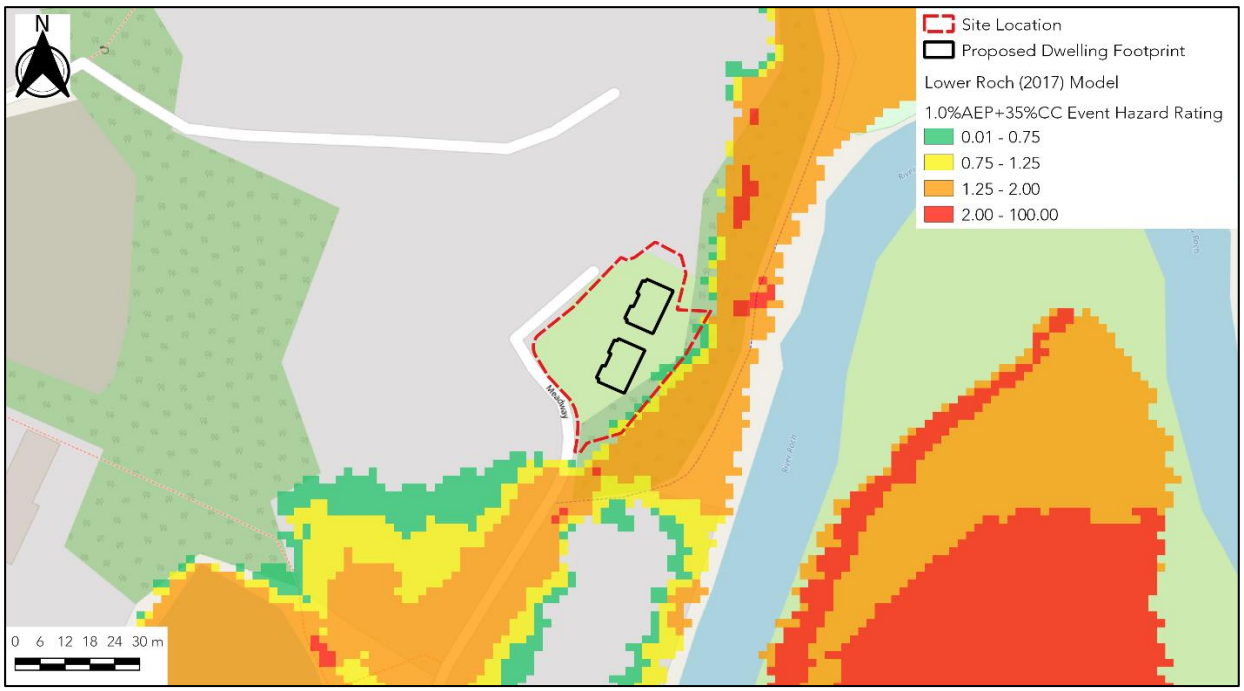


Figure 8: Lower Roch 2017 Modelled Flood Hazard Ratings 1.0%AEP+35%CC event (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

Historical Flooding

4.15. The EA Recorded and Historical Flood Outlines show that the site lies at a distance of approximately 450m east of the nearest recorded flood event extent (Figure 9).

4.16. In addition to the EA data, the SFRA (2019) includes mapping which shows that the location of the site lies well outside the vicinity of any recorded flood incidents, as recorded by Greater Manchester LLFA (Figure 10). The nearest recorded flood event based on this mapping is approximately 2km west of the proposed development location.

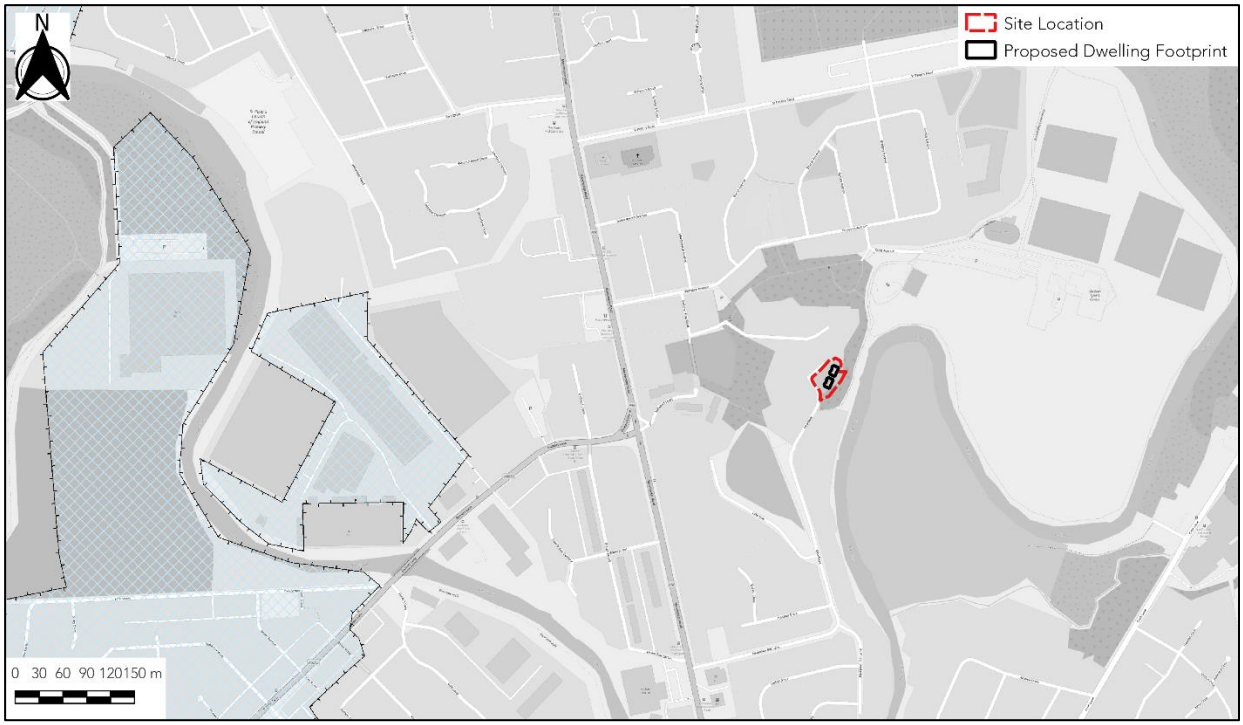


Figure 9: EA Historic Flood Mapping (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

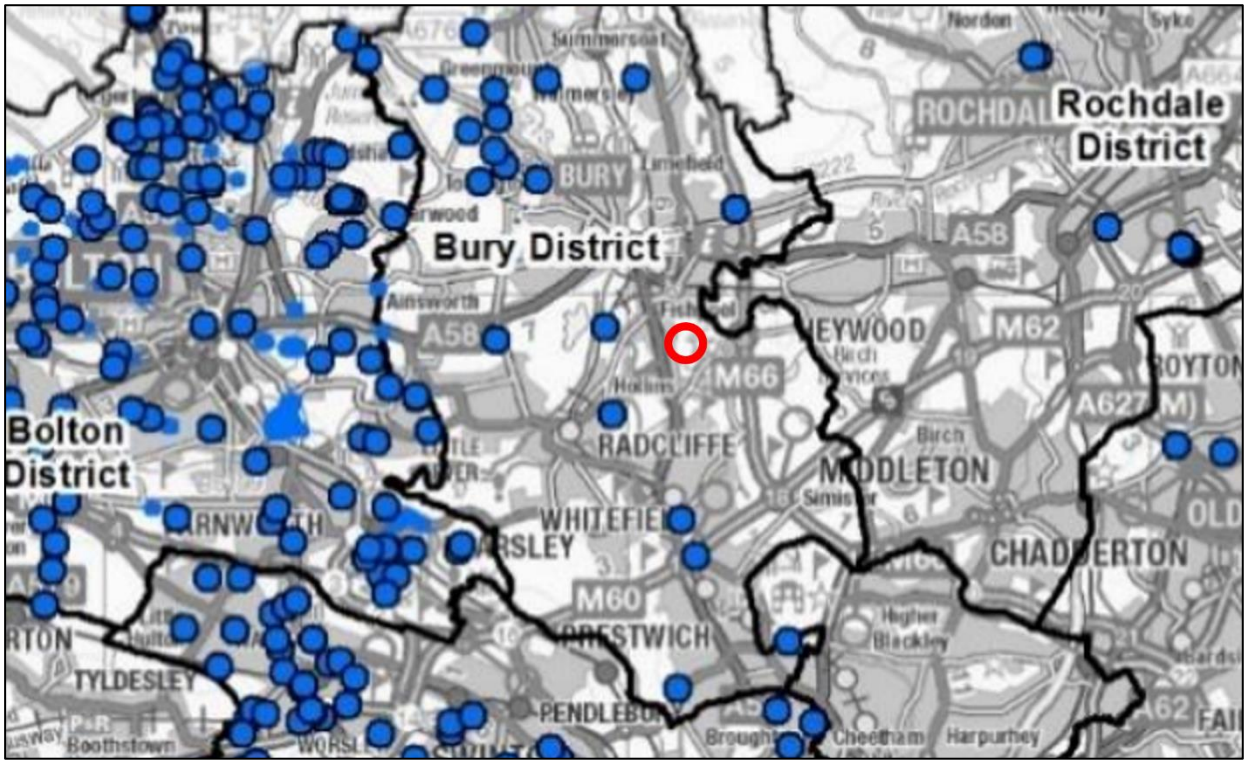


Figure 10: Greater Manchester LLFA Historical Flood Incidents (Recorded Incidents shown at Blue Dots, Site Location at Red Circle)

Fluvial Flood Risk Summary

4.17. Based on the information above, the proposed development is considered to be at a low risk of fluvial flooding. However, the location of the proposed dwellings are affected in the modelled 0.1%AEP fluvial flood event and as such there is a residual risk.

Tidal Flooding

4.18. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the riverbank or river defences when tide levels are high.

4.19. The site is a significant distance from any tidal source and above the anticipated extreme tidal levels, even when considering the impacts of climate change. The risk of flooding from tidal sources is considered low.

Canals

4.20. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders and boreholes and manages water levels by transferring it within the canal system.

4.21. Water in a canal is typically maintained at predetermined levels by control weirs. When rainfall or other water enters the canal, the water level rises and flows out over the weir. If the level continues rising it will reach the level of the storm weirs. The control weirs and storm weirs are normally designed to take the water that legally enters the canal under normal conditions. However, it is possible for unexpected water to enter the canal or for the weirs to become obstructed. In such instances the increased water levels could result in water overtopping the towpath and flowing onto the surrounding land.

4.22. Flooding can also occur where a canal is impounded above surrounding ground levels and the retaining structure fails.

4.23. The nearest canal lies at a distance greater than 1km from the site, as such the risk of canal flooding is considered to be low.

Pluvial Flood Risk

4.24. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.

4.25. The following definitions of the annual surface water flood risk labels are given by the EA:

- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).
- 'Medium Risk'; 3.3% to 1.1% AEP (annual probability between 1 in 30 and 1 in 100).
- 'Low Risk'; 1% to 0.1% AEP (annual probability between 1 in 100 and 1 in 1000).
- 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).

4.26. Examination of EA's Flood Risk from Surface Water mapping (Figure 11) for the modelled 3.3% (high risk), 1% (medium risk) and 0.1% (low risk) Annual Exceedance Probability (AEP) flood events shows the site is at risk of flooding during the 'Low' risk surface water flood event only.

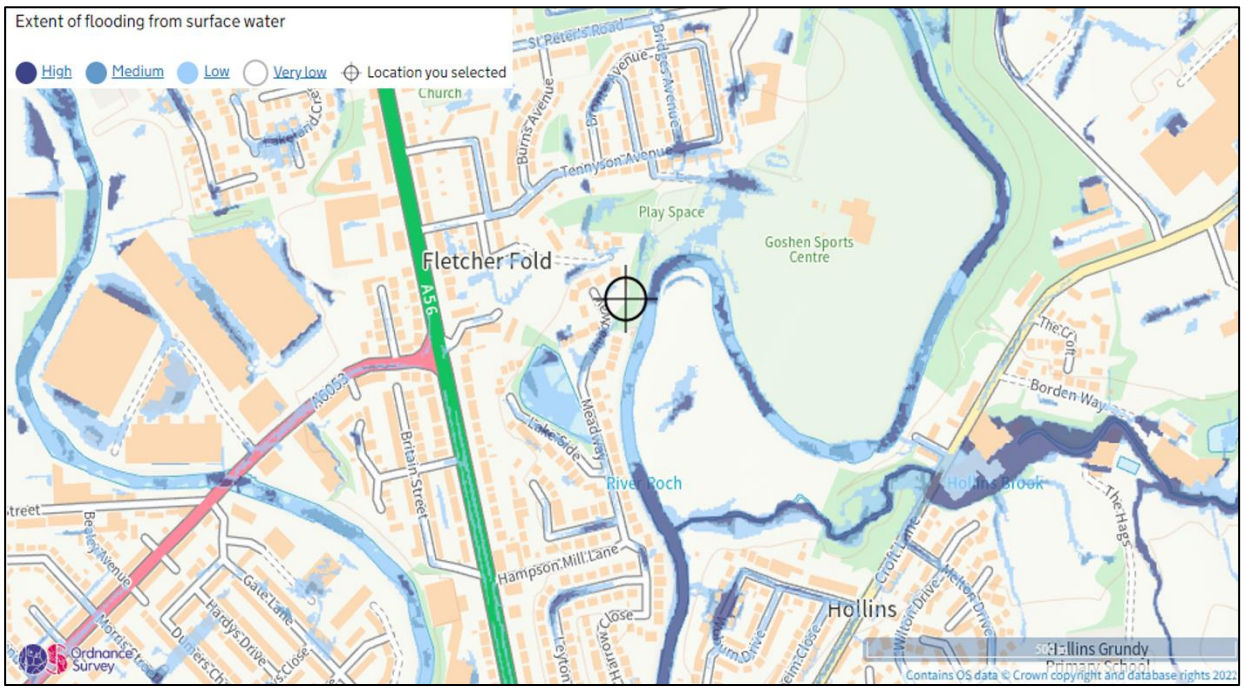


Figure 11: EA Surface Water Flood Risk Mapping

4.27. The Risk of Flooding from Surface Water (RoFSW) datasets provided by DEFRA have also been used to determine the pluvial flood risk to the site. This dataset is available at a closer scale and is therefore more relevant in determining the risk to the site.

4.28. In the modelled 3.3%AEP event (Figure 12), the site remains unaffected by surface water flooding. Meadway Road which serves as access to the site could experience flood depths up to 600mm to the south of site in the modelled 3.3%AEP event. The modelled hazard rating attributed to the flood extent to the south of the site on Meadway Road is 'Low' and 'Moderate'. As such, safe access/egress from the proposed development may not be possible and refuge should be sought on site.

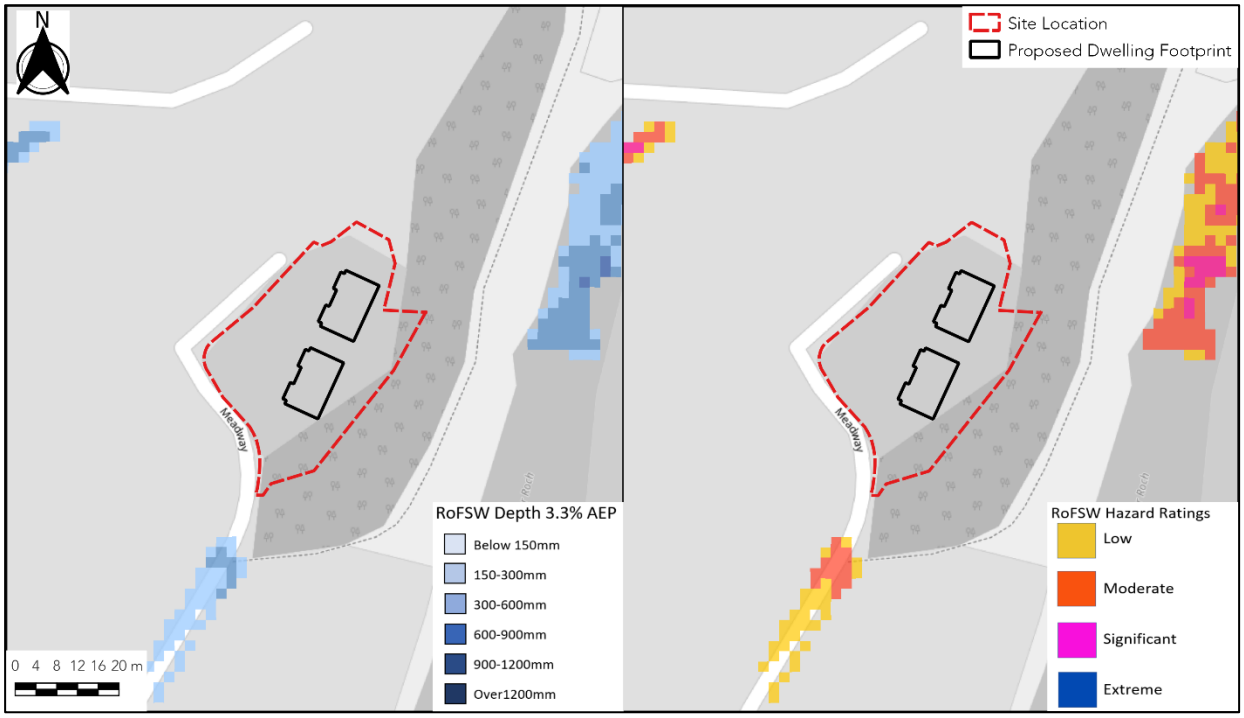


Figure 12: EA Surface Water Flood Risk Mapping 3.3% AEP (Source: Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors, © EA copyright and/or database right 2015)

4.29. In the modelled 1.0%AEP event (Figure 13), the site remains unaffected by surface water flooding. Meadway Road could experience flood depths up to 900mm to the south of site in the modelled 1.0%AEP event. The modelled hazard rating attributed to the flood extent to the south of the site on Meadway Road is 'Low', 'Moderate', and 'Significant'. As such, safe access/egress from the proposed development may not be possible and refuge should be sought on site.

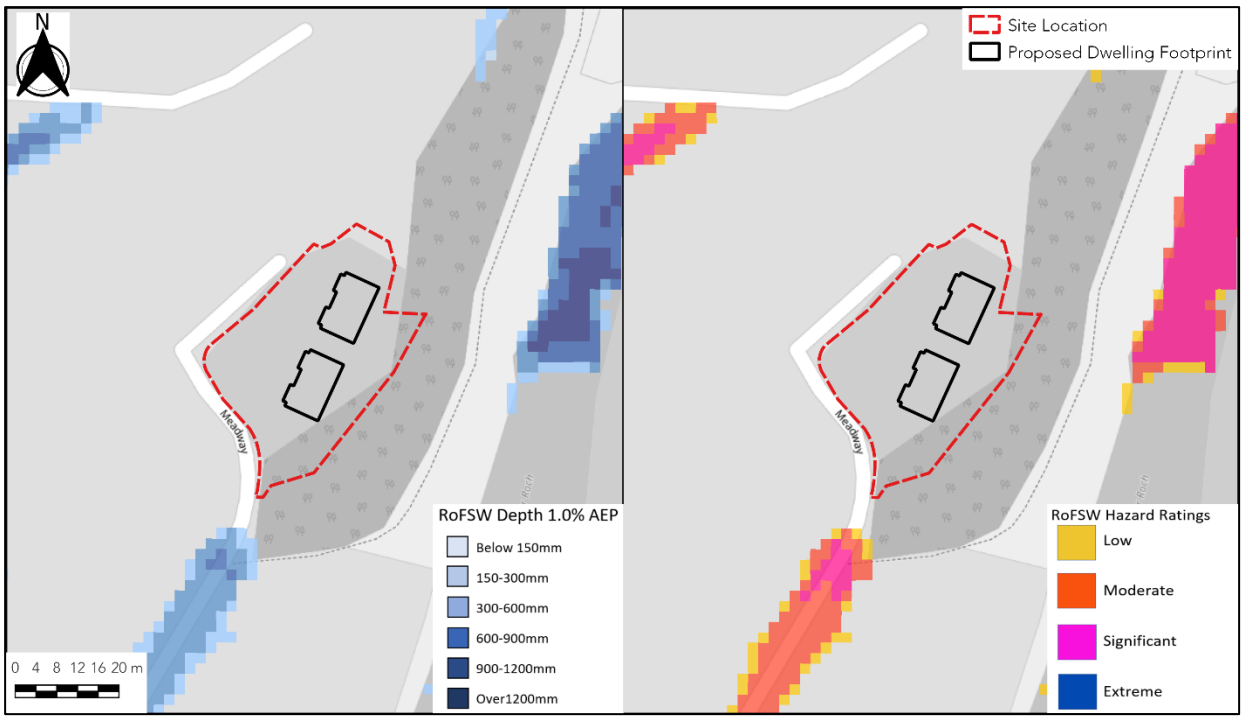


Figure 13: EA Surface Water Flood Risk Mapping 1.0% AEP (Source: Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors, © EA copyright and/or database right 2015)

4.30. In the modelled 0.1%AEP event, the proposed development remains unaffected by surface water flooding, though the flood extent does encroach on the site boundary slightly to the north and south. Meadway Road could experience flood depths up to 900mm to the south of site in the modelled 0.1%AEP event. The modelled hazard rating attributed to the flood extent to the south of the site on Meadway Road is 'Low', 'Moderate', and 'Significant'. As such, safe access/egress from the proposed development may not be possible and refuge should be sought on site.

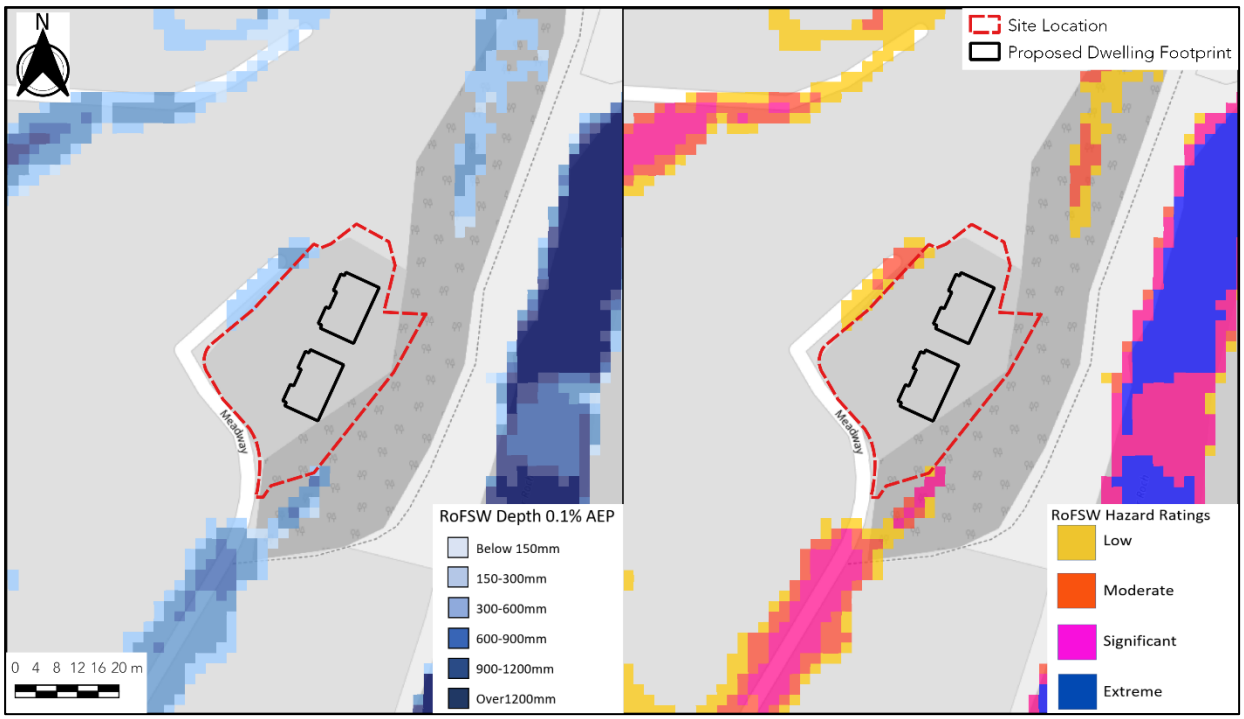


Figure 14: EA Surface Water Flood Risk Mapping 0.1% AEP (Source: Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors, © EA copyright and/or database right 2015)

4.31. Based on the information above, the site is considered to be at a low risk of surface water flooding, though Meadway Road is at a high risk of pluvial flooding.

Reservoirs

4.32. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain water in times of flood. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.

4.33. According to the EA's Flood Risk from Reservoirs mapping (Figure 15) the site is at risk of flooding in the event of a breach at multiple reservoirs. The worst reservoir failure model is a 'dry day' scenario meaning that it could be caused by reservoir walls failing due to old age, accident, or because excess flood water has been added to the reservoir.

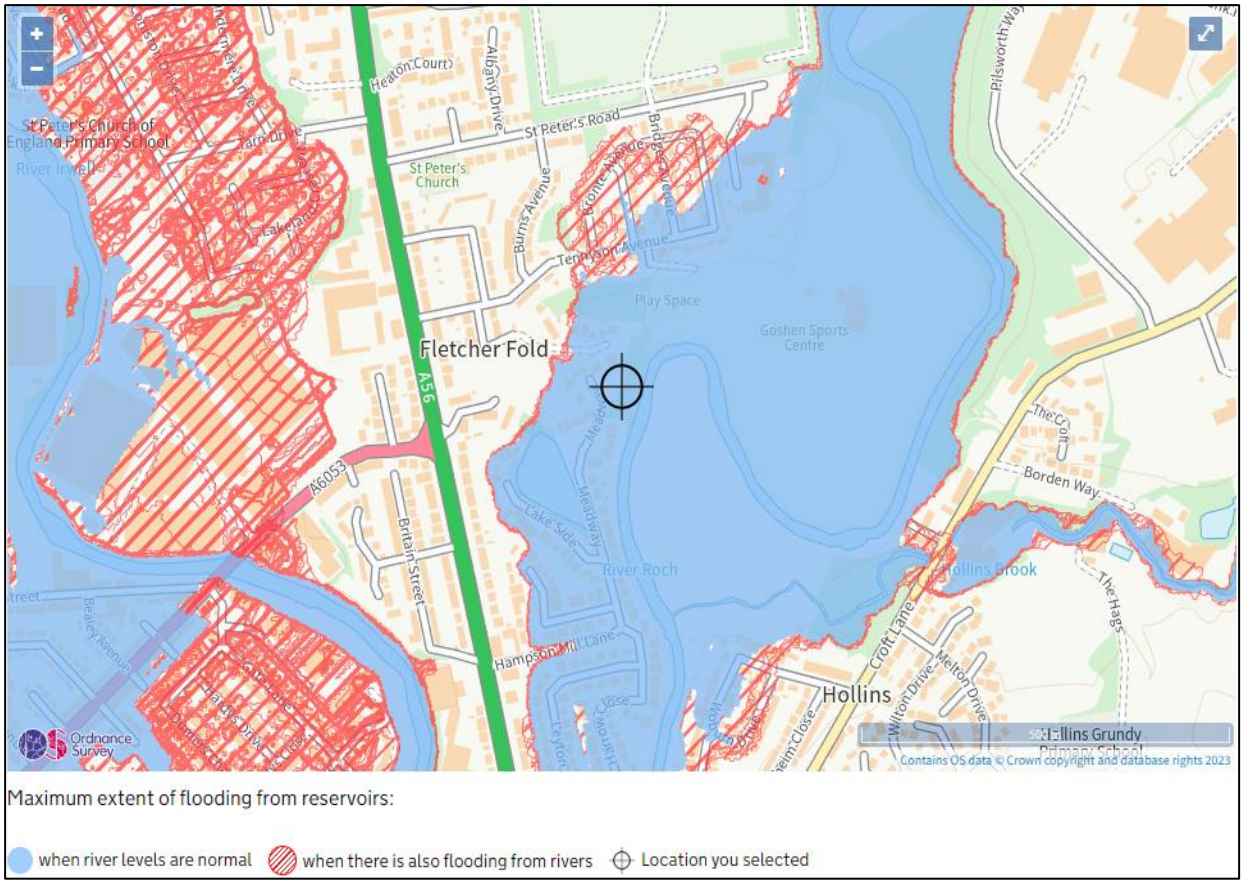


Figure 15: EA Reservoir Flood Risk Mapping

4.34. According to the EA, there has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers as detailed by the enforcement authority for the Reservoirs Act 1975 in England. The EA are responsible to ensure that reservoirs are inspected regularly, and essential safety work carried out. As reservoir flooding is unlikely and the modelled flood depths are based on the worst-case scenario, flooding from this source may be considered as a relatively low risk.

Groundwater

4.35. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.

4.36. The British Geological Survey's (BGS) mapping shows superficial deposits of Alluvium comprising of clay, and permeable River Terrace Deposits comprising of sand, silt, sand, and gravel underlying the site. The bedrock underlying the site is Trencherbone Rock comprising of sandstone.

4.37. A historic BGS borehole (ref: SD80NW145) located approximately 100m northwest of the site, struck water at 2.05m below ground level within the 6.20m deep borehole.

4.38. The LFRMS presents the EA's Areas Susceptible to Groundwater Flooding mapping. The site is within a 1km square grid of which "between 50% and 75%" is susceptible to groundwater flooding (Figure 16).

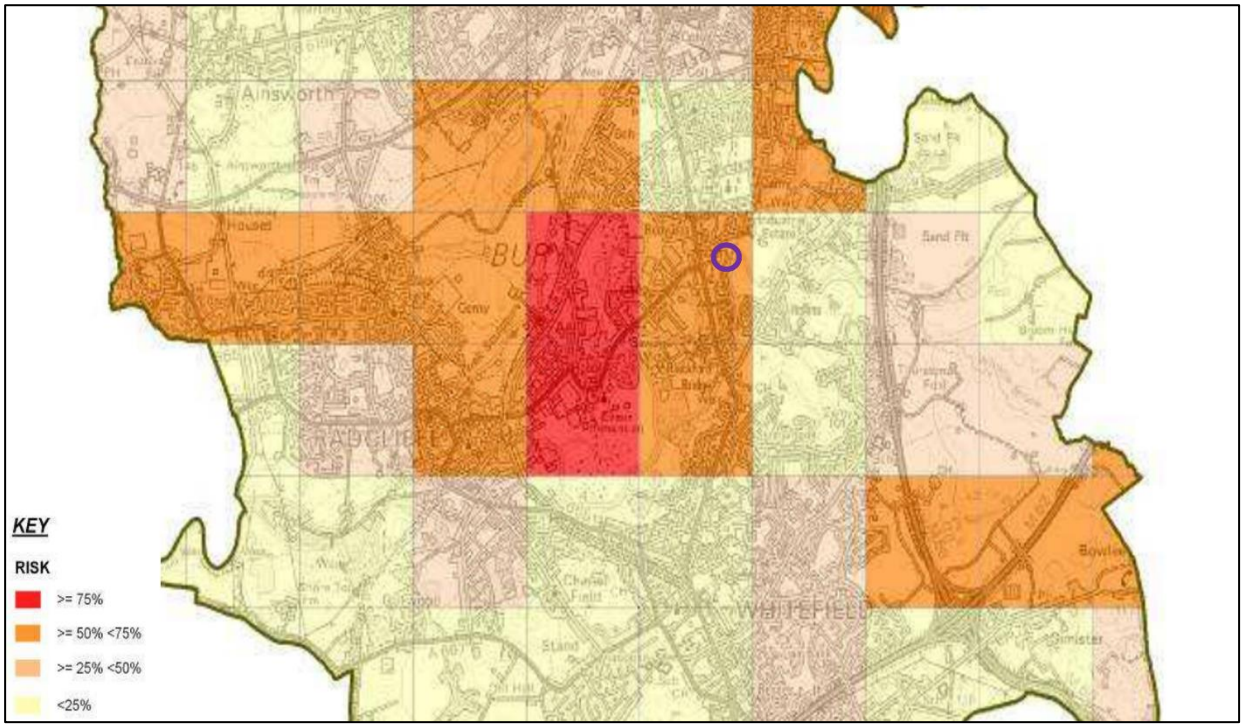


Figure 16: LFRMS (2018) Areas Susceptible to Groundwater Flooding (AStGWF) Mapping – Site Location in Purple Circle

4.39. Additionally, the LFRMS states the following in relation to groundwater flooding within Bury;

> *Bury lies over an aquifer with geology consisting predominately o sands and gravels which have high permeability. However, there are areas of clay which have low permeability. There are a number of flood defences along the River Irwell through Ramsbottom which elevate river levels above the flood plain. There is the possibility that alluvial groundwater flooding could occur in these areas.* ***<u>However, there are relatively few reported incidents of groundwater flooding in Bury.</u>***

4.40. Based on the information above and considering that the proposed development does not contain any subterranean elements, the site is considered to be at a low risk of groundwater flooding.

Sewer Flooding

4.41. Sewers can be a cause of flooding where the drainage network has become overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.

4.42. The SFRA provides mapping of historical sewer flood incident records based on data provided by United Utilities, the sewerage provider to the site (Figure 17). No historical sewer surcharging incidents have been recorded in the vicinity of the site.

4.43. Figure 17 also includes the location of 'Hotspots' identified in the Greater Manchester SWMP (shown as purple squares in the mapping). The site is shown to lie outside of any of the identified 'Hotspots'.

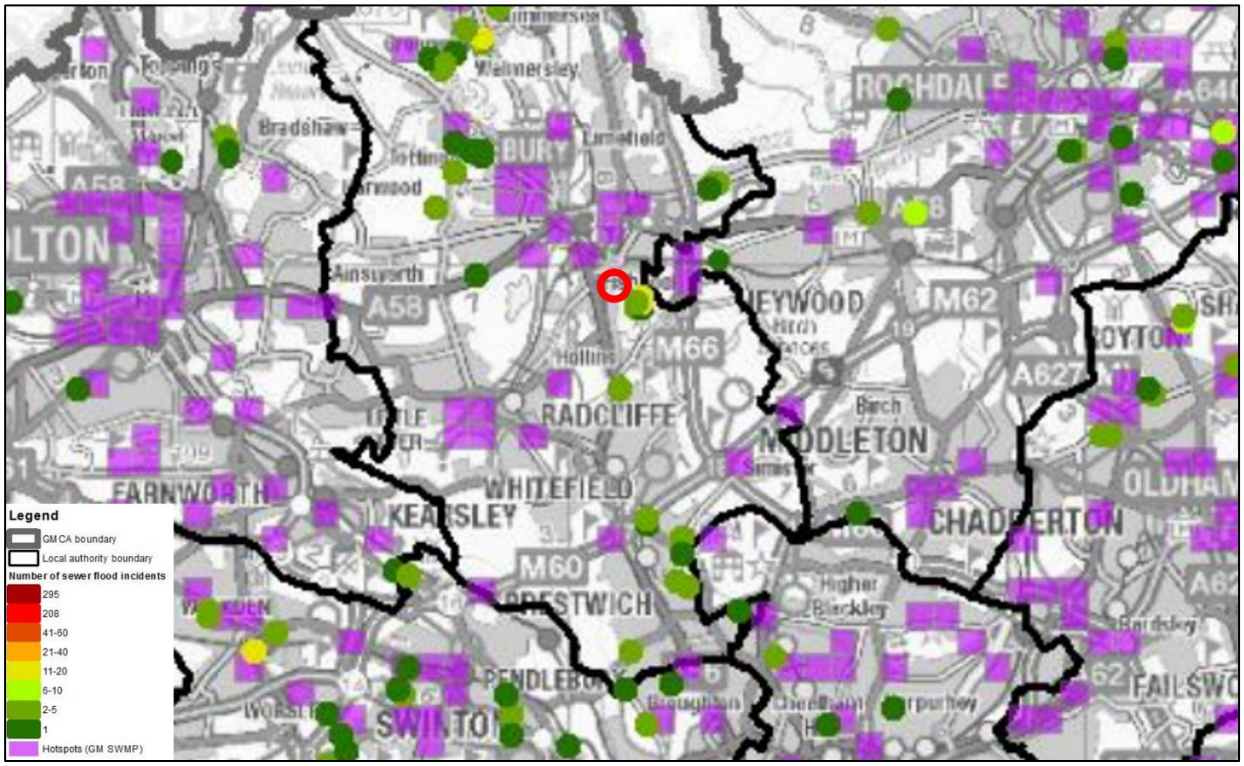


Figure 17: SFRA (2019) United Utilities Historical Sewer Flooding Incidents and Greater Manchester SWMP (2012) Hotspots (Site Located at Red Circle)

4.44. Based on the information above the site is considered to be at a low risk of sewer flooding.

4.45. It is understood that a United Utilities sewer may flow below the proposed parking area. United Utilities should be consulted on the planning application for their views on works in proximity to

the sewer. Any new sewer connection from the site should be agreed with the local sewer provider.

5. Flood Risk Mitigation

Fluvial

5.1. The proposed development is considered to be at a low risk of fluvial flooding, though the location of the proposed dwellings is affected in the modelled 0.1%AEP fluvial flood event and as such there is a residual risk.

5.2. The flood depths present at the location of the proposed northern and southern dwelling in the 0.1%AEP event are 0.14m and 0.25m respectively. Given the fairly low depths it is recommended that FFLs of each dwelling are raised above the 0.1%AEP flood level to 69.48m AOD.

5.3. Additionally, best practise would be to incorporate flood resilience and resistance measures within the ground floor of the proposed dwellings where appropriate, in accordance with the CLG Report *'Improving the Flood Performance of New Buildings - Flood Resilient Construction'* (2007) including, but not limited to, measures such as the below:

- *Water resistant materials to be used where possible*
- *Raised wiring and power outlets at ground level.*
- *Waterproof plasterboard used at ground floor.*
- *Air brick covers to be installed.*
- *Non-return valves should be installed on all new drainage.*
- *Finish shall be water resistant render with lime-based plaster finish, hydraulic lime coating or ceramic tiles. Plasterboard placed horizontally as a sacrificial material, not vertically.*
- *Insulation to be low absorption board or semi-rigid self-draining wool bats.*
- *Flood doors provided at entrances/exits.*

5.4. Meadway Road which serves as the access/egress route to the site is affected by fluvial flooding in both the modelled 1.0%AEP+35%CC and 0.1%AEP events. In the 1.0%AEP+35%CC event the flood extent affecting Meadway Road to the south of the site has a hazard rating of 'Significant'. Therefore, safe access/egress from the proposed development may not be possible and safe refuge should be sought on site. Additionally, residents of the proposed dwellings should sign up to flood warning services, further details of this are given in the section below.

Pluvial

5.5. The site is considered to be at low risk of surface water flooding, with the location of the proposed dwellings considered to be at a very low risk of surface water flooding. Therefore, no further mitigation is necessary beyond those mentioned to manage the fluvial flood risk.

5.6. However, Meadway Road which serves as the access/egress route to the site is considered to be at a high risk of pluvial flooding. Therefore, safe access/egress from the proposed development may not be possible in each of the modelled pluvial 3.3%AEP, 1.0%AEP, and 0.1%AEP events and safe refuge should be sought on site. Additionally, residents of the proposed dwellings should sign up to flood warning services, further details of this are given in the section below.

Other Sources

5.7. Flood risk from other sources is considered to be low, therefore no further specific mitigation is required.

Increase to Flood Risk Elsewhere

5.8. The location of the proposed dwellings has been shown to lie outside the modelled 1.0%AEP+35%CC fluvial flood extent, and the modelled 0.1%AEP pluvial extent. As such, the proposed development should not increase flood risk elsewhere through displacement of flood water.

Flood Warning Services

5.9. As a further precaution and risk reduction, the residents of the site should sign up the River Roch at Hollins EA flood warning service. This service allows site owners to register an address, which is at risk of flooding, along with contact details so that in the event of a flood being forecast, the site owner will be sent an alert directly to their chosen method of contact.

5.10. Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides site residents some notice before a flood event. The amount of time afforded before a flood occurs depends on the site specific location (e.g. proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g. bank over topping versus a breach event). Flood alerts and warnings provide site managers with time to take necessary

action, e.g. communication of the risk of flooding to occupants/employees etc, evacuation of occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site specific flood defences.

5.11. Due to Meadway Road being at a high risk of pluvial flooding, residents should sign up to the Met Office Severe Weather Warning Service. The Met Office issues weather warnings up to 5 days in advance, through the National Severe Weather Warning Service, when severe weather has the potential to bring impacts to the UK. It is also possible to stay up to date with weather warnings through the Met Office app (available on both android and apple), social media (twitter, Facebook) or email alerts.

5.12. During periods of bad weather, site users should monitor local weather reports and sign up for the Met Office UK weather warnings. Warnings can be monitored through an Apple/Android app, Twitter or directly via emails.

6. Conclusions

6.1. This FRA has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at 23 Meadway, Bury, BL9 9TY. It has been written to support a planning application and has been prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.

Source of Flooding	Flood Risk Summary
Fluvial	The proposed development is considered to be at a low risk of fluvial flooding, though the location of the proposed dwellings is affected in the modelled 0.1%AEP fluvial flood event and as such there is a residual risk. As such, it is recommended that FFLs of both proposed dwellings are raised above the 0.1%AEP flood level to 69.48m AOD, and flood resilience and resistance measures are included at the ground floor of both dwellings.
Pluvial	The site is considered to be at low risk of surface water flooding. However, Meadway Road which serves as the access/egress route to the site is considered to be at a high risk of pluvial flooding.
Other Sources	The site is considered to be at low risk from other sources.

6.2. The following conclusions can be drawn from this level 1 FRA:

- Safe access/egress from the site may not be possible in any of the modelled pluvial flood events via Meadway Road as such safe refuge should be sought on site. In the modelled 1.0%AEP+35%CC and 0.1%AEP fluvial events safe access/egress via Meadway Road may not be possible and safe refuge should be sought on site.
- Appropriate flood resilience measures could be incorporated at the ground floor of the development in accordance with the SFRA (2019) and CLG Report 'Improving the Flood Performance of New Buildings - Flood Resilient Construction' (2007).
- The location of the proposed dwellings has been shown to lie outside the modelled 1.0%AEP+35%CC fluvial flood extent, and the modelled 0.1%AEP pluvial extent. As such, the proposed development should not increase flood risk elsewhere through displacement of flood water.

- Residents could sign up to the EA Flood Warning service covering the site and Met Office Severe Weather Warnings.

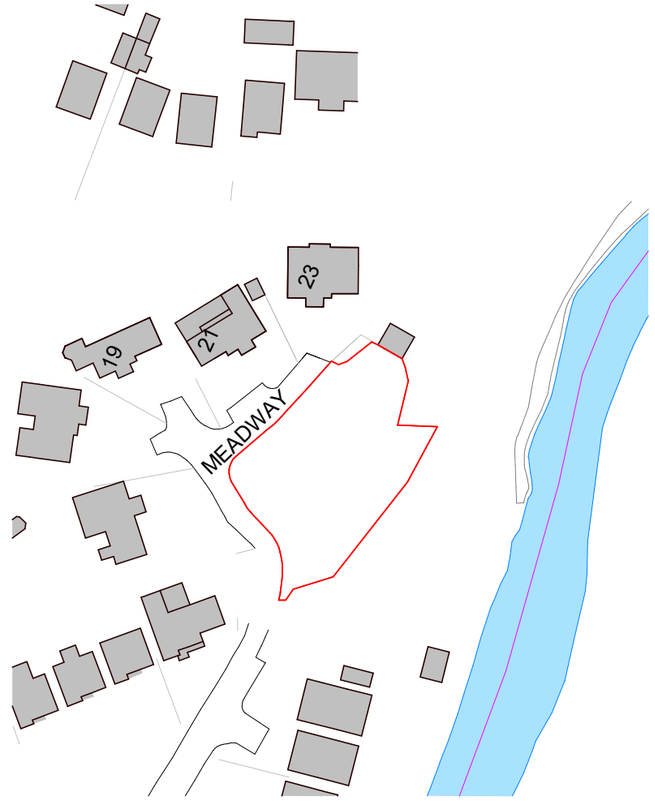
6.3. This Flood Risk Assessment should be submitted as part of the planning application to satisfy the requirements under NPPF.

Appendix A - Development Proposals

1 Site - Block Plan
1 : 500

5 0 5 10 15 20 25
SCALE 500 m
1:

North



2 Site - Location Plan
1 : 1250

North

10 0 10 20 30 40 50
SCALE 1250 m
1:

Site Boundary determined using OS DATA

Legend - Boundaries

Site Boundary

Site Ownership

PROJECT	Meadway, Bury	PROJECT NUMBER	DRAWING NUMBER	REV
		GSS22015	001	
TITLE	Site - Location and Block Plan	DRAWN BY	CHECKED BY	DATE	SCALE (@ A1)
CLIENT	Overhaul Limited	SG	SG	12/07/2022	As indicated

No.	Description	Date

STATUS PLANNING

GOLD SKETCH
S T U D I O S
www.goldsketch.co.uk info@goldsketch.co.uk 0161 792 9595

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1 Site - Proposed
1 : 200

2 0 2 4 6 8 10
SCALE 200 m
1:

North

PROJECT	Meadway, Bury	PROJECT NUMBER	DRAWING NUMBER	REV
		GSS22015	004	1
TITLE	Proposed Site	DRAWN BY	CHECKED BY	DATE	SCALE (@ A1)
CLIENT	Overhaul Limited	SG	SG	12/07/2022	1 : 200

No.	Description	Date
1	Revised Design	19/07/2022

STATUS PLANNING

GOLD SKETCH
S T U D I O S
www.goldsketch.co.uk info@goldsketch.co.uk 0161 792 9595

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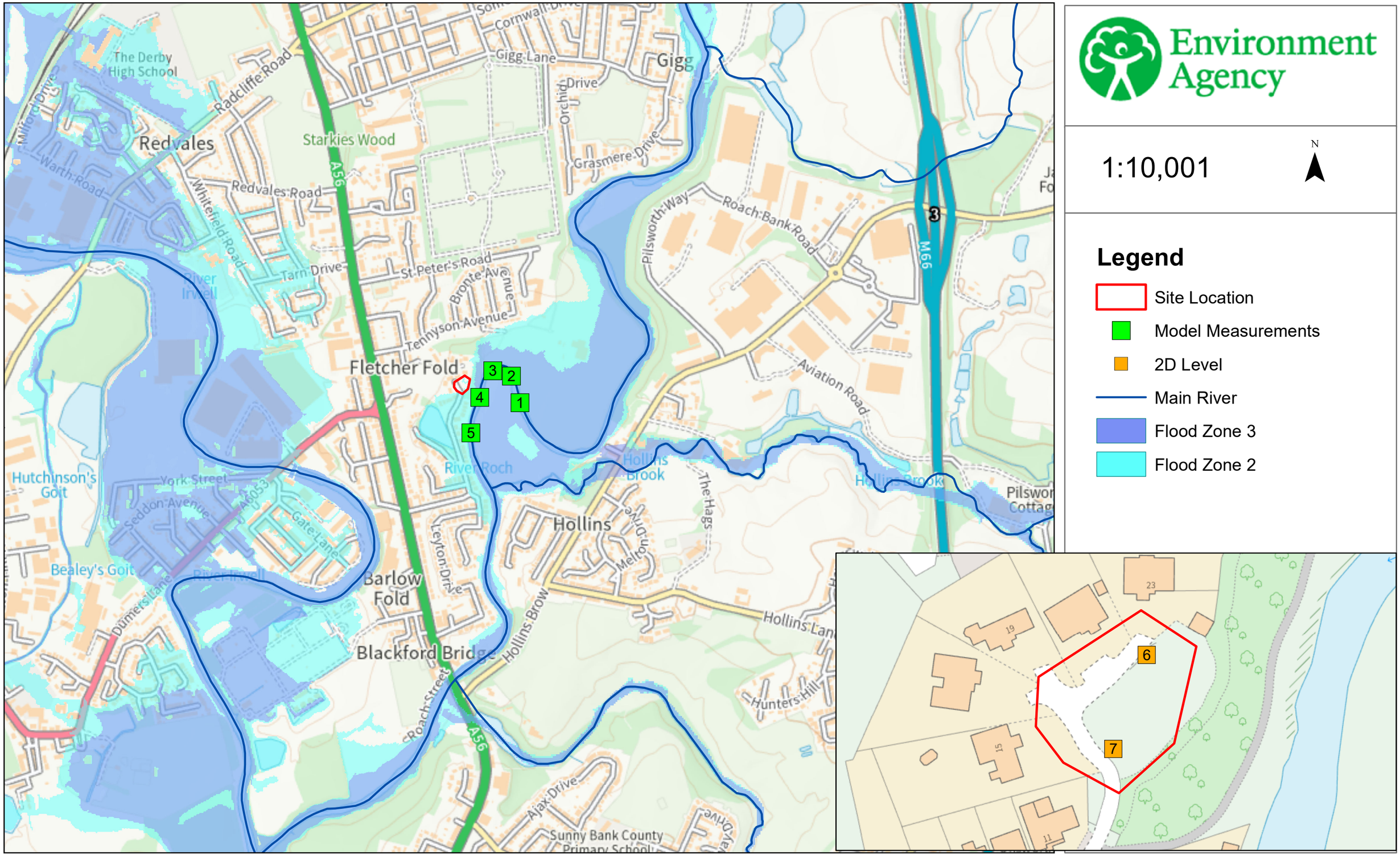
Appendix B - EA Product 4 Data

Detailed Flood Map Centred on Meadway, Bury, BL9 9TY. Created 13/12/2022 [GMMC289899SW]



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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Map Reference	Model Node Reference	Easting	Northing	Data	Undefended															Defended													
					50 % AEP (1 in 2 year)	20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	5 % AEP (1 in 20 year)	4 % AEP (1 in 25 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% increase in flow	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year) + 30% increase in flow	50 % AEP (1 in 2 year)	20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	5 % AEP (1 in 20 year)	4 % AEP (1 in 25 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% increase in flow	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year) + 30% increase in flow
1	ROCHES_01989	380930	408603	Modelled Water Level (m aodN)	66.32	66.71	66.95	67.18	67.26	67.51	67.68	67.80	68.61	68.83	69.78	67.68	69.49	70.29	66.46	66.82	67.06	67.28	67.36	67.59	67.73	67.85	68.61	68.80	69.76	68.25	69.48	70.26
				Modelled Flow (cumecs)	57.79	73.70	85.39	95.78	98.09	102.60	103.85	104.91	100.64	100.62	101.48	104.57	101.71	101.87	57.80	73.72	84.73	92.95	94.35	96.42	97.10	97.56	93.87	94.01	94.73	97.61	95.31	94.62
2	ROCHES_01907	380910	408669	Modelled Water Level (m aodN)	66.27	66.66	66.92	67.15	67.24	67.49	67.67	67.79	68.61	68.83	69.78	67.67	69.49	70.29	66.32	66.71	66.95	67.18	67.26	67.51	67.68	67.82	68.61	68.80	69.76	68.25	69.48	70.26
				Modelled Flow (cumecs)	57.79	73.69	85.38	95.78	98.14	102.93	104.14	105.19	101.58	101.56	102.54	104.67	101.75	102.51	57.79	73.70	85.39	95.78	98.10	102.60	103.85	104.99	100.85	100.89	101.87	104.57	101.71	101.86
3	ROCHES_01836	380865	408681	Modelled Water Level (m aodN)	66.04	66.44	66.71	66.96	67.05	67.35	67.55	67.71	68.61	68.82	69.78	67.55	69.49	70.28	66.20	66.60	66.87	67.12	67.21	67.47	67.65	67.80	68.61	68.80	69.76	68.25	69.48	70.26
				Modelled Flow (cumecs)	57.78	73.67	85.35	95.74	98.04	102.88	104.03	104.90	102.59	102.55	103.34	104.05	101.07	103.45	57.78	73.68	85.37	95.77	98.12	103.24	104.56	105.64	102.27	102.28	103.11	104.99	102.00	103.23
4	ROCHES_01744	380817	408612	Modelled Water Level (m aodN)	65.83	66.22	66.49	66.76	66.87	67.21	67.43	67.60	68.59	68.81	69.77	67.43	69.49	70.28	66.04	66.44	66.71	66.96	67.05	67.35	67.55	67.73	68.61	68.79	69.76	68.23	69.48	70.26
				Modelled Flow (cumecs)	57.77	73.66	85.34	95.72	98.00	103.82	105.34	106.18	104.53	104.40	105.20	105.49	102.45	105.41	57.78	73.67	85.35	95.74	98.04	102.88	104.04	104.87	102.59	102.61	103.34	104.05	101.07	103.42
5	ROCHES_01638	380799	408507	Modelled Water Level (m aodN)	65.66	66.07	66.36	66.63	66.74	67.06	67.29	67.47	68.57	68.80	69.77	67.29	69.48	70.28	65.83	66.22	66.49	66.76	66.87	67.21	67.43	67.63	68.59	68.78	69.75	68.20	69.47	70.26
				Modelled Flow (cumecs)	57.77	73.65	85.33	97.66	101.61	115.97	122.42	124.40	124.59	124.41	124.98	123.96	119.87	125.40	57.77	73.66	85.34	95.72	98.00	103.82	105.34	106.30	104.54	104.50	105.19	105.49	102.46	105.41

Map Reference	Model Node Reference	Easting	Northing	Data	Undefended	
					1 % AEP (1 in 100 year) + 70% increase in flow	0.1 % AEP (1 in 1000 year) + 30% increase in flow
6	2D Level:	380773	409666	Modelled Water Level (m aodN)	69.75	70.26
7		380764	499540	Modelled Water Level (m aodN)	69.75	70.25

Model data taken from Lower Roch 2017

AEP - Annual Exceedence Probability

m aodN - metres above ordinance datum Newlyn

cumecs - cubic metres per second

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