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PHASE 1 FLOOD RISK ASSESSMENT

41 EDGE LANE

**MANCHESTER
M21 9JU**

On behalf of:

Ozma Khan

Report No.: A220626-R01

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1 SITE AND DEVELOPMENT OVERVIEW

DEVELOPMENT DESCRIPTION	EXISTING (PRE-DEVELOPMENT)	PROPOSED (POST-DEVELOPMENT)
Site Use	Dwelling (report ref: existing site coverage)	Dwelling Extension (including Basement)
Development Use	Residential (report ref: existing site use)	Residential (report ref: proposed site use)
Use Design Life		100 years (epoch 2115)
Number of Dwellings	1	1
EA Vulnerability Classification	More Vulnerable (ref: existing site vulnerability)	More Vulnerable (ref: proposed site vulnerability)
Development Class		Minor
County Planning Authority	Manchester City Council (ref: district Council)	
District Planning Authority		
Local Sewer Authority	United Utilities (ref: Local Sewer Authority)	
SITE CATCHMENT CHARACTERISTICS	DESCRIPTION	SOURCE
River Basin Catchment	Upper Mersey Management Catchment (report ref: River Basin Catchment)	https://environment.data.gov.uk/catchment-planning
Nearest EA Main River	Mersey 812m to the south west (report ref: EA Main River)	https://environment.maps.arcgis.com/apps/MapSeries/
Nearest Ordinary watercourse or surface waters	Ditches and Land drainage associated with the playing fields on the sites south western boundary	Online Mapping
KEY FLOOD RISK AND DATA SOURCES	DATA TYPE	SOURCE
EA Fluvial and Tidal Planning Data	UK Government Flood Maps for Planning (ref: FMP)	https://flood-map-for-planning.service.gov.uk/
EA Surface Water Data	DEFRA Risk of Flooding from Surface Water Sources GIS Data (ref: RoFSW)	https://environment.data.gov.uk/DefraDataDownload/?Mode=rofsw
EA Long term Flood Risk	UK Government Long term Flood Risk Maps (ref: LTFRM)	https://www.gov.uk/check-long-term-flood-risk
Environment Agency Product 4/5 Data	Upper Mersey 2017 (report ref: EA Product Data)	EA Detailed Flood Model
Historic Flood Risk Data	DEFRA Historic Flood Outlines GIS Data	https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/HistoricFloodMap&Mode=spatial
Strategic Flood Risk Assessment Data	Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA (ref SFRA)	Council Website - https://westlondonsfra.london/
Local Flood Risk Assessment Data	(refer to SFRA)	Council Website- https://westlondonsfra.london/
Topographic Information	DEFRA Opensource LIDAR Data	https://environment.data.gov.uk/DefraDataDownload/?Mode=survey
River or Sea Flood Risk Present	High	Refer Section 1: Table 2
Surface Water Flood Risk Present	Low	Refer Section 1: Table 2
DESIGNATION	FLOOD RISK DESIGNATION	NOTE
EA/LLFA Designated Flood Zone	Flood Zone 3a – High	Designation based on highest flood zone impacting the site and is determined based on the combined risk between River, Sea or Surface Water

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2 INTRODUCTION

- 2.1 The following report is a Phase 1 Flood Risk Assessment (FRA) for the development proposals 41 Edge Lane, Manchester M21 9JU (see site location map, Figure 1).
- 2.2 This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks.

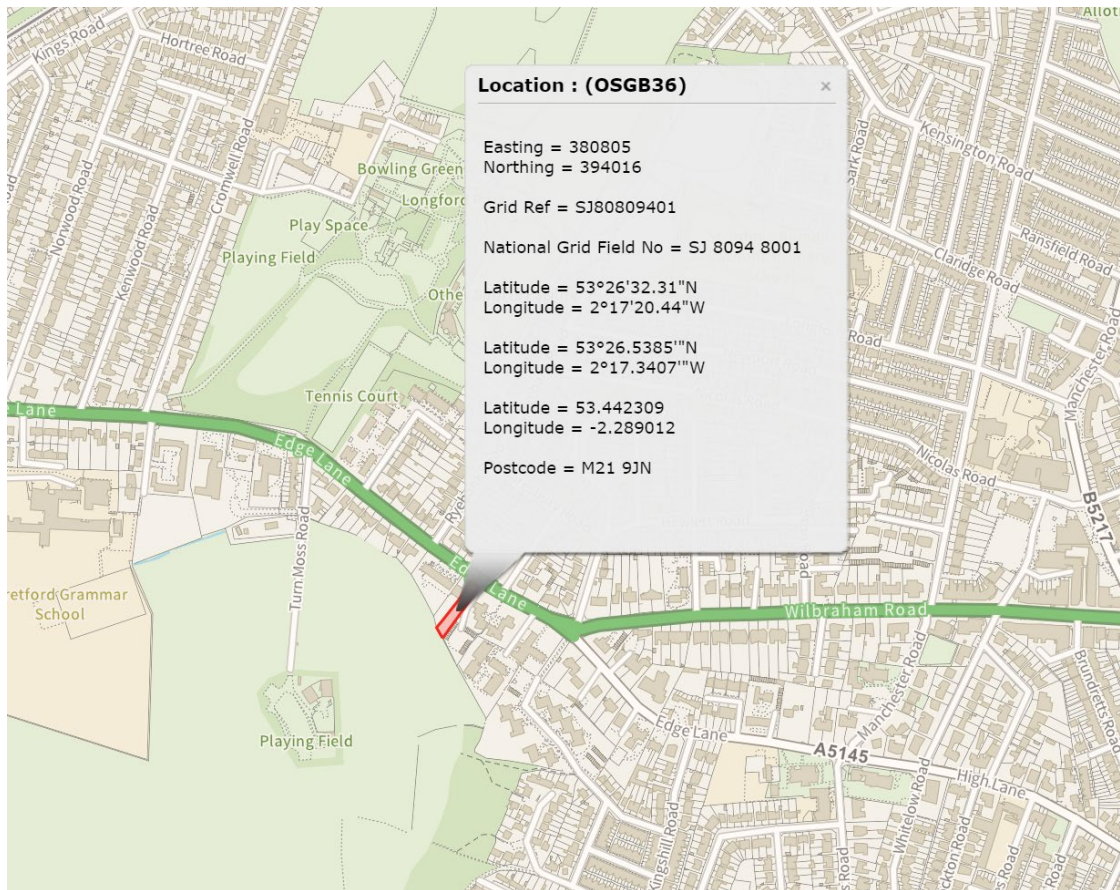


Figure 1 - Site Location Plan (site bordered red) Source: Magic Map

- 2.3 This FRA has been written in general accordance with the National Planning Policy Framework (NPPF) and its Technical Guidance, Environment Agency (EA) Standing Advice, LFRMS, County SFRA and associated guidance. This FRA has relied upon publicly available information and data provided from the EA (where relevant). The interpretation of this data has been undertaken with the understand of its accuracy and to a detail deemed suitable for this development type, location and relevant flood risk.

DEVELOPMENT PROPOSALS

- 2.4 The proposal at 41 Edge Lane, Manchester M21 9JU, is for a rear and side extension to the existing residential property, including a new basement/lower ground floor extension with direct access to the rear garden and loft renovations. Architectural plans are included in Appendix 1. This FRA has been commissioned as part of the due diligence process to advise on flood mitigation and constraints given the sites location to known flood risk sources.

FLOOD RISK ASSESSMENT SCOPE

- 2.5 The purpose of this FRA is to inform the feasibility and appropriateness of the proposals and to ensure the development proposals incorporate flood resilient measures appropriate to its flood risk.

- 2.6 It should be noted, where up to date flood risk or climate change models are not available, best efforts have been made to assess these risks and extrapolate the available data where necessary. However, this approach may require further detailed modelling if deemed necessary by the reviewing authorities. Detailed hydraulic modelling is deemed outside the scope of this report.
- 2.7 This development is considered an extension of the existing use, and therefore the EA Standing Advice on Minor Extensions is applicable (and should be followed) – refer to <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#advice-for-minor-extensions>. This FRA has undertaken a review of the EA's product 4 data to calculate the design flood level and recommend flood resilience and mitigation measures relevant to the sites risk.

FLOOD RISK VULNERABILITY

- 2.8 This FRA has been undertaken with due regard to the statutory requirements of the NPPF (2021) and with reference to the Planning Practice Guidance (PPG) in relation to development and flood risk. This FRA has been undertaken to inform on the current flood risk to the site. Therefore, this FRA aims to ensure that the development proposals take into account the site-specific flood risk and to avoid inappropriate development in areas potentially at risk of flooding.
- 2.9 Annex 3 of the NPPF Flood Risk Vulnerability Classification provides guidance on assigning development vulnerability. A summary of this information is provided in Table 1.

Table 1 – Extract from Annex 3 of the National Planning Policy Framework and Table 2: Flood risk vulnerability classification of PPG detailing Flood Risk Vulnerability Classification by use. (Existing Site Classification is Shaded Gray, Proposed Site specific classification shaded blue).

ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER-COMPATIBLE
Essential transport infrastructure	Police and ambulance stations; fire stations and telecom installations	Hospitals	Police, ambulance and fire stations which are not required to be operational during flooding.	Flood control infrastructure.
Essential utility infrastructure which has to be located in a flood risk area for operational reasons	Emergency dispersal points.	Residential institutions such as residential care homes, prisons and hostels.	Buildings used for commercial purposes and of a non-residential nature	Water transmission infrastructure and pumping stations.
Wind turbines.	Basement dwellings.	Buildings used for dwelling houses and sleeping, drinking establishments	Land and buildings used for agriculture and forestry.	Sewage transmission infrastructure and pumping stations.
Solar farms.	Caravans, mobile homes and park homes intended for permanent residential use.	Non-residential uses for health services, nurseries and educational uses	Waste treatment (except landfill* and hazardous waste facilities).	Sand and gravel working.
	Installations requiring hazardous substances consent.	Landfill* and sites used for waste management facilities for hazardous waste.	Minerals working and processing (except for sand and gravel working).	Docks, marinas and wharves and Navigation facilities.
		Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.	Water treatment and Sewage treatment works which do not need to remain operational during times of flood.	Ministry of Defence installations.

- 2.10 The site is presently considered 'More Vulnerable' in accordance with Table 1 and the NPPF. The development proposals are for an extension of the existing residential use, and therefore there will be no change in vulnerability post development.

SEQUENTIAL TEST/EXCEPTION TEST

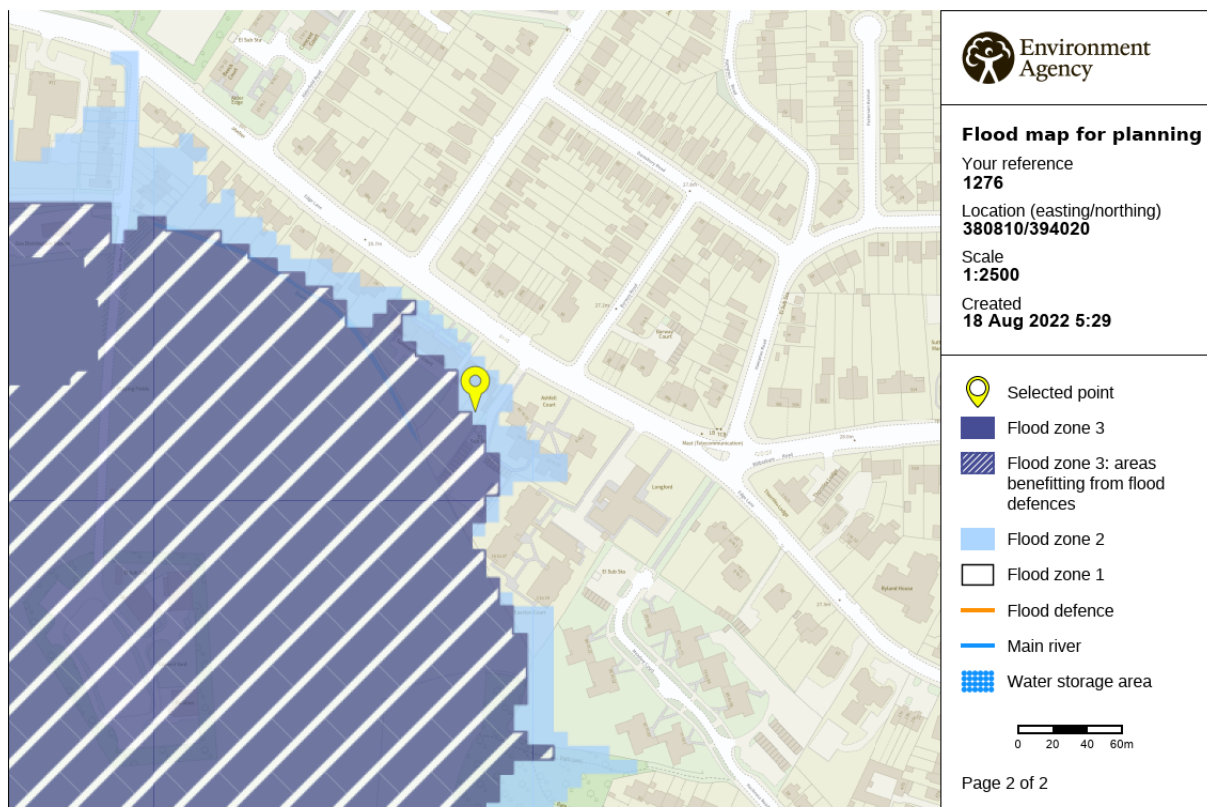
- 2.11 The EA and Local Authorities have designated different areas of the UK based on specific risk to assist and steer developments and ensure suitable flood mitigation measures are in place. Historically, the EA (and their Flood Maps for Planning) have only classified this flood risk by accounting for flooding from either Rivers or Seas. However, with a growing awareness and body of evidence pushing it to the forefront, surface water flood risk is coming to also be considered just as great a risk as river or sea flooding.
- 2.12 Therefore, most local authorities (as the Lead Local Flood Authority) also include the equivalent overland surface water flood risk into these Flood Zones as well. In line with this approach, this FRA has adopted including surface water flood risk into defining a sites overall Flood Zone. This allows a uniform approach in terms of assessing overall flood risk and steering flood mitigation measures. These Flood Zone Classification are:
- Flood Zone 1 - land assessed as having a less than a 1 in 1,000 annual probability (<0.1%);
 - Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river (1% – 0.1%), 1:100 year or greater of surface water flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year;
 - Flood Zone 3 - land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), 1:30 year or greater of surface water flooding (>3.33%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. Flood Zone 3b is land have greater than 1 in 20 to 1 in 30 year annual probability of flooding.
- 2.13 According to NPPF footnote 20, a site-specific FRA should be prepared when the application site is:
- Situated in Flood Zone 2 and 3; for all proposals of new development (including minor development and change of use); or
 - Greater than 1 ha in size and located in Flood Zone 1; or
 - Located in Flood Zone 1 where there are critical drainage problems or within a designated Critical Drainage Area (CDA) as notified to the LPA by the Environment Agency; or
 - At risk of flooding from other sources of flooding, such as those identified in this SFRA; or
 - Where surface water flood risk exists, detailed surface water modelling may be required; or
 - Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding.
 - Major Planning Application
- 2.14 Table 2 summarises the sites flood risk classifications and selected Flood Zone designation for the purpose of this assessment. This classification is based on the EA's Flood Map for Planning (extract provided in Figure 2 below) and the EA's Long Term Flood Risk Maps (LTFRM): Risk of Flooding from Surface Water (RoFSW) (extract provided in Figure 3 below).
- 2.15 According to the EA's flood maps, the site is both affected by Flood Zone 2 (Fluvial), Flood Zone 3 (Fluvial but undefended) and Low Risk of Surface Water Flooding (equivalent Flood Zone 2). Therefore, it is considered the primary flood risk to the site is from Fluvial flooding from the Mersey to the south west and the associated residual flood risk associated with defence breach of failure or an event that would exceed the current level of defences.

Table 2 - Summarises the overall Flood Zone designation based on the highest rated flood risk from either rivers and sea or surface water. '✓' means development is affected by this flood zone; with the shaded cells denoting the Flood Zone deemed applicable to the development proposals for the purpose of assessment site from a particular source, and the. Please note:

FLOOD ZONE DESIGNATION			
	FLOOD ZONES AFFECTING THE SITE		
	Flood Zone 1 (Low risk)	Flood Zone 2 (Medium risk)	Flood Zone 3 (High risk)
River Or Sea		✓ (Partial)	✓ (Partial)
Surface Water		✓ (Partial)	
FLOOD ZONE DESIGNATION FOR ASSESSMENT*	Flood Zone 1	Flood Zone 2	Flood Zone 3

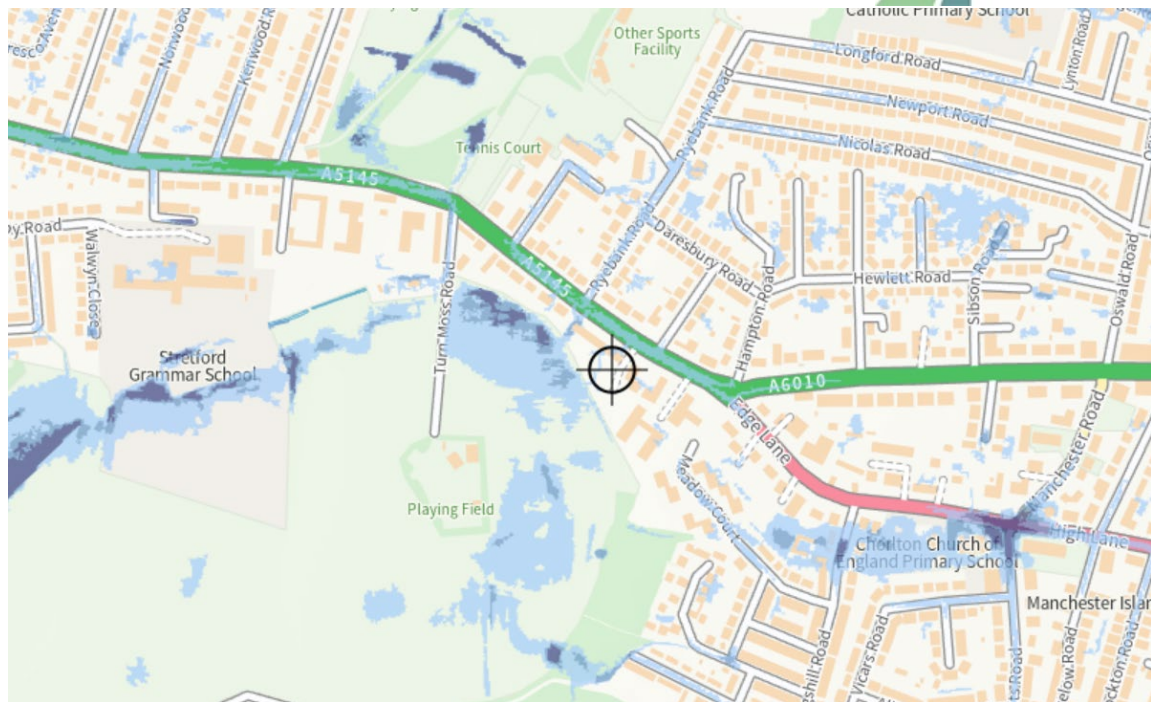
*Flood Zone Designation for assessment is based on the highest flood risk from between river, sea or surface water flooding taken from EA's Flood Map for Planning and EA's LTFRM:RoFSW

- 2.16 Based on Table 2 above and the NPPF footnote 20 given the size of the development area, the development proposals will require a site-specific FRA.



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Figure 2 extract from EA Flood Maps for Planning (Source: DEFRA)



● High ● Medium ● Low ○ Very low ⊕ Location you selected

Figure 3 - extract from the EA's Long-Term Risk of Flooding from Surface Water (RoFSW) maps

- 2.17 Under the NPPF, all new planning applications must also undergo a Sequential Test. At the high-level, this test must be implemented by local planning authorities with a view to locating particularly vulnerable new developments (e.g., residential, hospitals, mobile homes etc.) outside of the floodplain. However, at the site-specific level, the principles of the sequential test should be followed by locating more vulnerable elements of development to lower areas of flood risk within the site itself. Table 2 below presents a helpful guide in identifying the suitability of a site prior to applying the Sequential Tests in its entirety and identifies when the Exception Test is required.

Table 3 - The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Please note: ✓ means development is appropriate; x means the development should not be permitted and should be subject to a full sequential test. Refer to Table 2 for selected Flood Zone Designation

FLOOD RISK VULNERABILITY CLASSIFICATION		ESSENTIAL INFRASTRUCTURE	WATER COMPATIBLE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	x	Exception Test Required	✓
	Zone 3b Functional Floodplain	Exception Test Required	✓	x	x	x

- 2.1 Based on the principles above and given that the proposals are for an extension of the existing use, a development of this nature is considered appropriate and acceptable and full application of the Sequential Test is not deemed necessary at this time. However, given that the development proposals are proposing to include a basement/lower ground floor area with direct external access, an FRA is required to assess the risk to the basement and those whom may be in it during a design flood event. Therefore, this FRA presents the findings of the Exception Test and recommendations for incorporation of flood resilient measures to improve long term flood resilience of the proposals. The following sections undertakes further analysis of the data available from the Local and District Council and EA data sets relating to flooding from a number of sources.

3 LOCAL FEATURES

LOCALITY

- 3.1 The site is located in a largely residential area of Streford. The site is accessed from Edge Lane, which forms the sites north eastern boundary. Residential property forms the sites north western boundary, with large playing fields (Turn Moss Playing Fields) forming the sites south western boundary. Residential apartments form the sites south eastern boundary.

RIVERS AND WATERCOURSES.

- 3.2 The nearest watercourse to the site appears to be the river Mersey, located 830m to the south west. There also appears to be some minor land-drainage associated with the playing fields, forming the south western boundary of the site.

TOPOGRAPHY

- 3.3 Figure 4 below provides cross-sectional data through the site based on the available LIDAR information. This data shows that the existing dwelling has an existing Finish Floor Level of approximately 25mAOD. Levels fall away from the dwellings towards the south western boundary at approximately 5%, to approximately 22mAOD. The playing fields to the south west are largely flat, but fall gradually towards the River Mersey to the south.

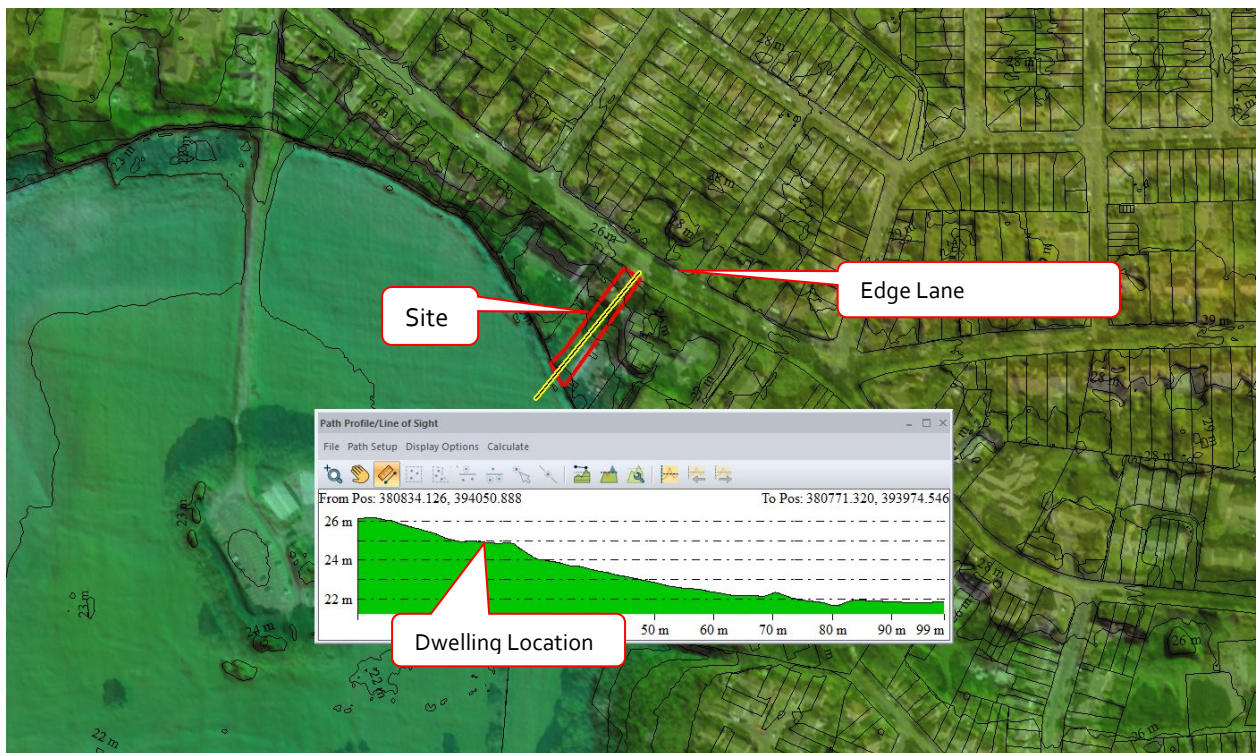


Figure 4 – Contour Mapping and site section (source: DEFRA Lidar Data 1m). Site bordered red, yellow line shows a profile through the site looking east to west

GEOLOGY & HYDROGEOLOGY

- 3.4 The online British Geological Survey (BGS) (Figure 5) shows the site to be underlain by 1:50 000 scale bedrock geology description: Wilmslow Sandstone. Superficial deposits of Devensian – Sand and Gravel are recorded.

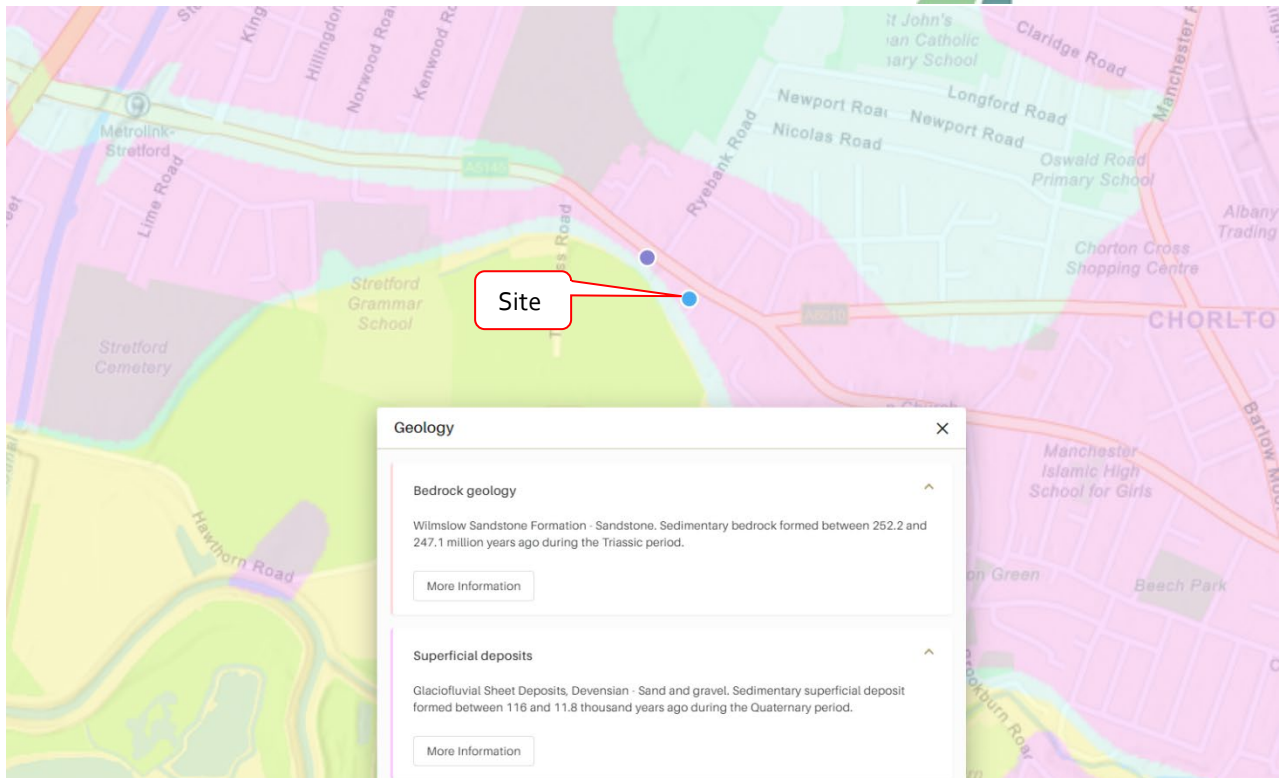


Figure 5 extract from BGS Bedrock and Superficial Deposits Mapping (source: BGS)

3.5 Table 4 below present a summary of the site hydrogeological classifications and considerations.

Table 4 - Summary of Hydrogeology Classifications (source Magic Map, BGS) – applicable classification shaded Blue

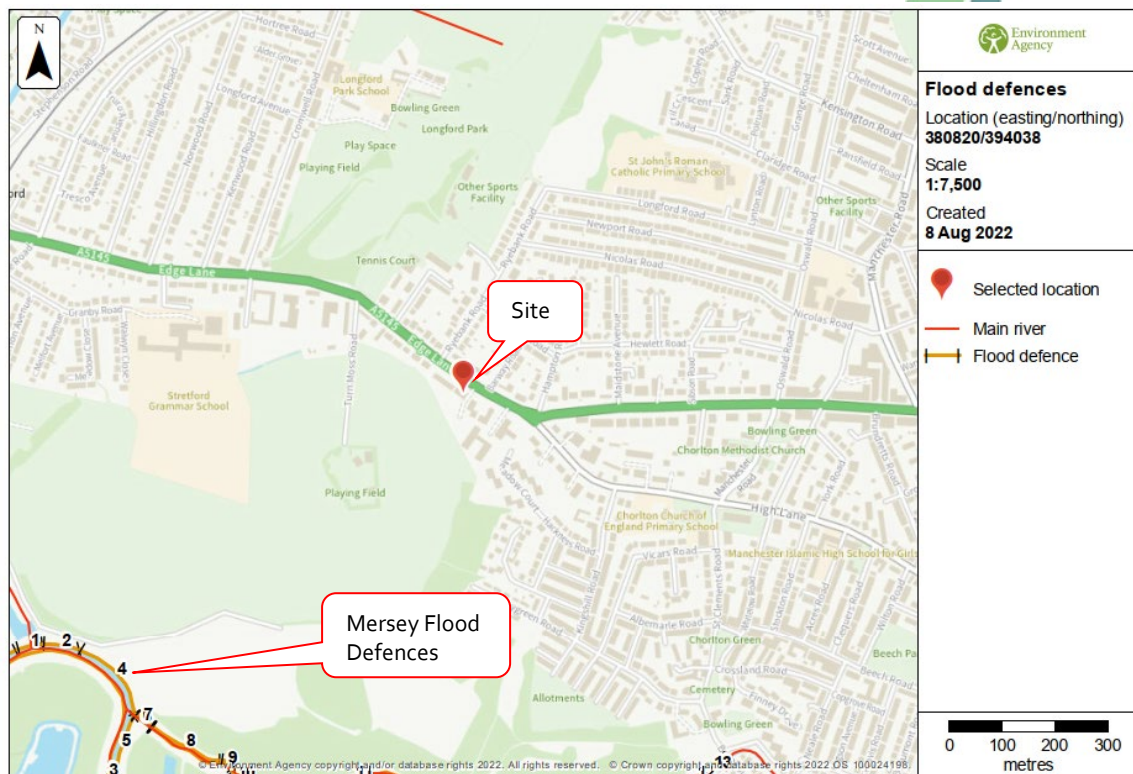
HYDROGEOLOGY CLASSIFICATIONS				
Aquifer Designation (Bedrock)	Principle	Secondary	Unproductive	
Aquifer Designation (Superficial)	Principle	Secondary	Unproductive	
Groundwater Vulnerability	High	Medium	Low	
Located within Source Protection Zone	Yes	No	N/A	
Soluble Rock Risk	Present	Not Present	N/A	

3.6 The sensitivity of the underlying groundwater should be carefully considered in the design of surface water management systems and during construction. Details of groundwater levels and soil permeability are unknown and should be confirmed. The design permeability should be investigated further for the purpose of surface water management on the site.

FLOOD DEFENCES

3.7 The Environment Agency releases a range of flood asset information as Open Data through their AIMS Defence (Spatial Flood Defences) GIS mapping. They are the only comprehensive and up-to-date group of datasets in England that show flood defences currently owned, managed or inspected by the EA.

3.8 Figure 6 provides an extract from EA AIMS Defence data (2021). This data shows that the defences along the Mersey at this location vary between Engineered High Ground and Embankements, with vary degree of protection ranging from the 1 in 100 to 1 in 50 year AEP. The defences on the northern side of the Mersey at this location have a minimum crest hieght of 23.35mAOD.



Flood defences data

Label	Asset ID	Asset Type	Standard of protection (years)	Current condition	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)	Effective crest level (mAOD)
1	121975	Embankment	100	Fair	23.39	23.56	
2	121977	Embankment	100	Poor	24.63	25.05	
3	121976	Embankment	100		21.30	19.97	
4	181857	Embankment	100	Fair	24.60	24.63	
5	120567	Embankment	100	Fair	24.74	25.69	
6	32425	Engineered High Ground	50	Good	35.24	36.05	
7	59786	Embankment	50	Fair	24.10	24.47	
8	122257	Embankment	50	Poor	24.47	24.05	
9	122259	Embankment	50	Poor	24.05	24.11	
10	122258	Embankment	50	Poor	24.47	24.17	
11	120856	Embankment	50	Poor	24.11	24.19	
12	120655	Engineered High Ground	50	Fair	23.35	21.72	
13	125813	Embankment			24.51	25.04	

Figure 6 - Extract from EA AIMS Defence Dataset.

CLIMATE CHANGE

- 3.9 In 2016, the EA issued updated guidance on the impacts of climate change on flood risk in the UK15 to support NPPF. This guidance sets out that peak rainfall intensity, sea level, peak river flow; offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change.
- 3.10 The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios (Table 5).

Table 5 - Extract from NPPF designating Flood Risk Climate Change Allowances by Flood Zone and Use. Sites required climate change probability scenario highlighted blue

FLOOD ZONE	ESSIENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER COMPTABLE
1 / 2	Higher Central and Upper End	Higher Central and Upper End	Central and Higher Central	Central	None of these allowances
3a	Upper End	Development should not be permitted	Higher Central and Upper End	Central and Higher Central	Central
3b	Upper End	Development should not be permitted	Development should not be permitted	Development should not be permitted	Central

Increases in Sea and Tidal Levels

- 3.11 There are a range of allowances for each river basin district and epoch for sea level rise. They are set out in *Table 2: sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline)* – the total sea level rise for each epoch is in brackets of the NPPF: Flood risk assessments: climate change allowances and are based on percentiles. A percentile describes the proportion of possible scenarios that fall below an allowance level.
- 3.12 The allowances in Table 2 (of the NPPF) account for slow land movement. This is due to ‘glacial isostatic adjustment’ from the release of pressure at the end of the last ice age. The northern part of the UK is slowly rising and the southern part is slowly sinking. This is why net sea level rise is less for the north-west and north-east than the rest of the country.
- 3.13 For flood risk assessments and strategic flood risk assessments, should assess both the higher central and upper end allowances.
- 3.14 However, given that the site is over 1km from the nearest tidal waterbody, only the climate change allowances for increases in peak river flow and peak rainfall intensity are relevant to this assessment.

Increases in Peak River Flow Allowances

- 3.15 Guidance states that the increases in peak river flow should be assessed as a percentage uplift that varies based on the river basin district and the proposed lifetime of the development and the sites vulnerability and flood zone mapping. Based on the site’s vulnerability classification, Table 6 below highlights the minimum climate change values to be adopted based on the sites River Basin District.

Table 6 - Summary of Table 1: peak river flow allowances by river basin district (base on a 1981 to 2000 baseline). Site required climate change based on Table 5.

Upper Mersey Management Catchment peak river flow allowances			
Design Epoch	Central	Higher	Upper
2020s	13%	17%	27%
2050s	22%	31%	51%
2080s	41%	53%	85%

- 3.16 The Product 4 data provided by the EA only considers climate change allowances up to 70%. This is greater than the base design allowance of 53% required to be designed for (note the Upper End climate change allowances are typically only required to be assessed for particularly vulnerable sites), so therefore it is considered that the Product 4 data represents a conservative estimate of the design flood level relevant to the proposals.

Increases in Surface Water Flooding and Rainfall Allowances

- 3.17 When considering climate change impacts to surface water (pluvial) flooding, The DEFRA peak climate change rainfall allowances details predicted rainfall increase due to climate change in different regions around England. For all developments with a design epoch up to (and presently beyond) 2070, the NPPF states developments should adopt the Upper End and Central allowances. The site specific climate change allowances based on the DEFRA data is summarised in Table 7 below, and should also be adopted for the purposes of surface water drainage design.

Table 7 - Summary of Table 2: peak rainfall intensity allowance in small catchments (less than 5km²) or urban drainage

Irwell Management Catchment peak rainfall allowances 2070's	3.3% Annual Exceedance Probability Event	1% Annual Exceedance Probability Event
Central	30%	30%
Upper End	40%	45%

4 SOURCES OF FLOOD RISK

- 4.1 In order to assist the implementation of the Governments NPPF, the EA has undertaken national scale flood risk mapping. This mapping takes into account a range of sources including flooding from rivers, sea, surface water and reservoir breach. Furthermore, each Council produces a Strategic (county scale) Flood Risk Assessments (SFRA) that aim to specifically identify local flood risk issues (such as critical drainage areas and local groundwater flooding).
- 4.2 The following section reviews both the EA data as well as the relevant information available from the SFRA.

FLUVIAL (RIVER) AND TIDAL (SEA)

- 4.3 The EA have undertaken fluvial and tidal modelling of the nation's main rivers in flood to support and ensure developments are steered away from flood prone areas or are designed to ensure risk to people is not increased as a result.
- 4.4 The EA's Flood Maps for Planning shows that the site is located within Flood Zone 2 and 3, although the EA data does show that the site is defended in the present day 1 in 100 year event.
- 4.5 It should be noted that the EA's Flood Maps for Planning do not allow for the presence of defences and so illustrate a conservative representation of flood risk from rivers or seas.

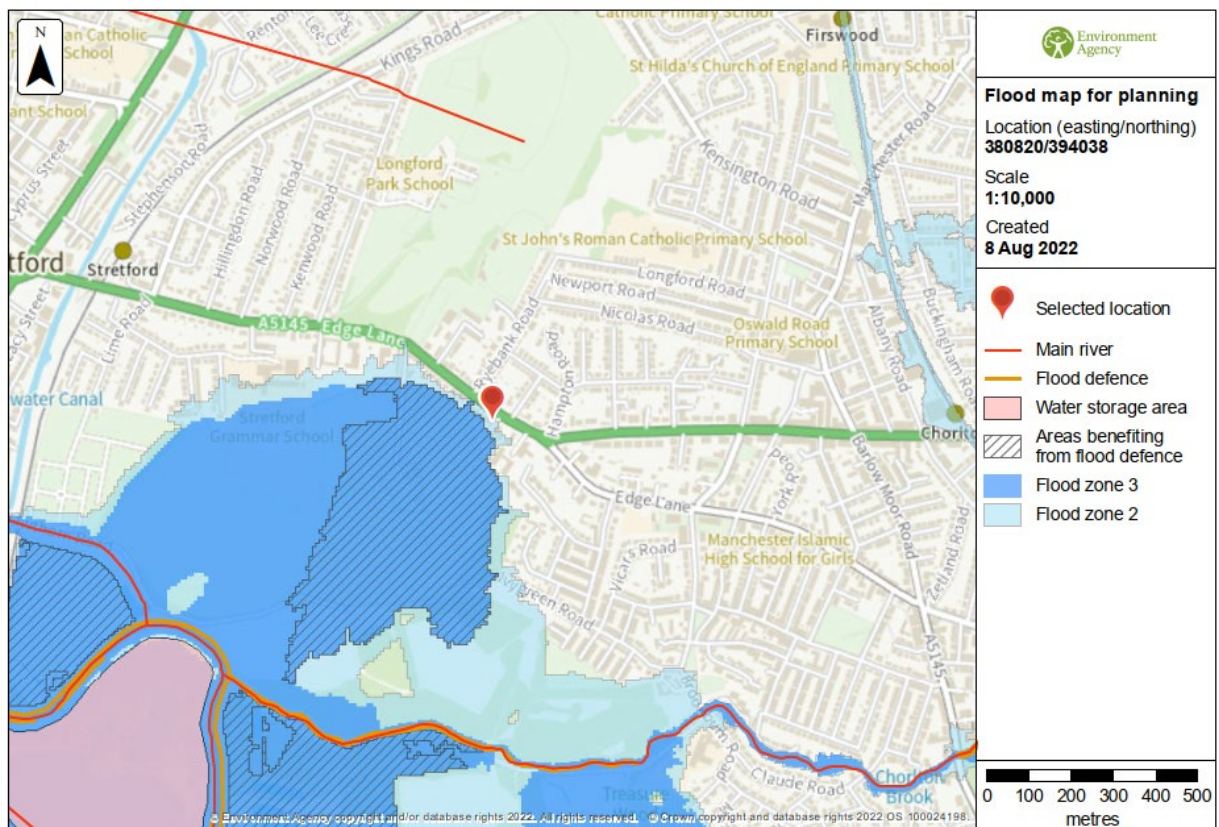


Figure 7 EA Flood Map for Planning overlain in GIS with Site (Lidar) Topography (source Environment Agency Flood Maps)

The EA has provided both defended and undefended scenarios from their Upper Mersey 2017 model to demonstrate real and worst case fluvial flood risk to sites and their users.



- 4.6 Figure 8 below provides the location of the data points the EA have provided specifically relevant to the site. Most importantly, the EA have provided 2D depth data that has been used to estimate the design flood level.
- 4.7 Appendix 2 includes the EA's product 4 data relevant to the site, and includes the relevant depths associated with both the defended and undefended scenarios, up to the 70% climate change event.

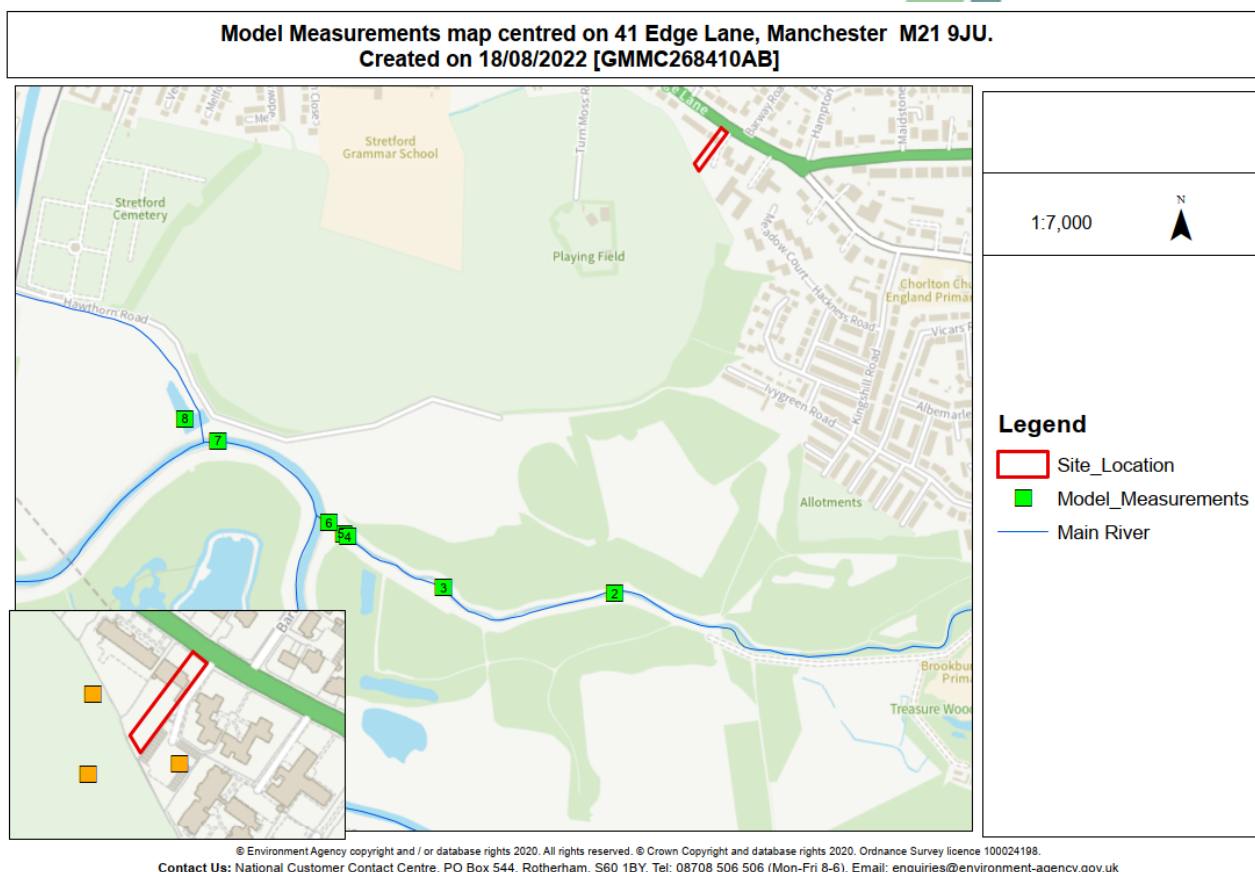


Figure 8 - Product 4 Data for the site (refer to Appendix 2 for all Product 4 data outputs). Lower image shows point data locations

4.8 Based on the EA product 4 data, Point 2 is considered the most relevant point to the site for assessing and determining the design flood level. The following provides a summary of the flood levels at node point 2 for the key flood event scenarios (refer to Appendix 2 for full Product 4 data):

⇒ Undefended: 1 % AEP (1 in 100 year)	= 23.35mAOD
⇒ Undefended: 1 % AEP (1 in 100 year) + 70% increase in flow	= 24.89mAOD
⇒ Undefended: 0.1 % AEP (1 in 1000 year)	= 25.06mAOD
⇒ Defended: 1 % AEP (1 in 100 year)	= Not Affected
⇒ Defended: 1 % AEP (1 in 100 year) + 70% increase in flow	= 24.94mAOD (DESIGN FLOOD LEVEL)
⇒ Defended: 0.1 % AEP (1 in 1000 year)	= 25.43mAOD

4.9 Based on an approximated existing finish floor level of 25mAOD, the existing ground floor would be unaffected by all modelled 1 in 100 year events. However, for the 0.1% AEP the site could be affected by up to 430mm in the defended and 60mm in the undefended event.

4.10 Therefore, the ground floor extension will need to ensure that finish floor levels are set no lower than existing (assumed to be approximately 25mAOD) to remain flood free in the 1% AEP event. The new basement extension (which is presently shown to have level access to the rear garden and an approximate finish floor level of 22.5mAOD) will need to be designed to either fully exclude flood waters (i.e., is water tight) or acknowledge that this area is at risk of full inundation. In this case, there should be no sleeping accommodation permitted in the basement, with internal access maintained to the ground and upper floors. In addition, any structural elements (such as posts or walls supporting the proposals) that could be exposed to flood waters, should be designed to withstand these hydraulic pressures.

Impacts of Climate Change

4.11 The EA recommends a minimum climate change increase in peak river flows for the Mersey catchment of 53%. The EA data only provides the 30, 35 and 70% climate change allowances. Therefore, it is deemed appropriate to apply the 70% climate change allowance given the absence of more detailed studies.

4.12 This information shows that for the design 1 in 100 year plus 70% climate change defended scenario, the ground floor of the development proposals would likely remain unaffected, however the basement room would be full inundated (similarly for un-defended plus 70% climate change event).

4.13 However, the data does demonstrate the entire site would be at risk of fluvial flooding in the 1 in 1000 year event. Although flood risk from this extreme event is considered low.

PLUVIAL (SURFACE WATER)

4.14 Surface water flooding is the term applied to when intense rainfall overwhelms the ability of the land to infiltrate water, or in urban areas for the sewers and road drains to drain the water away, resulting in surface water runoff and consequent flooding. It is a particular problem in urban areas where the excess water will often travel along streets and paths, between and through buildings and across open space. It can result in indiscriminate flooding to properties when not controlled. The high-profile flooding across the UK in the summer of 2007 was largely attributed to excess runoff where the capacity of the drains was exceeded by intense summer rain storms and led to the Government commissioning the independent Pitt Review in 2008.

4.15 These Maps use remotely sensed LiDAR data to determine large areas of topography. In many areas this LiDAR has been edited to remove the buildings. This editing process results in a slightly un-even surface profile, which can result in the production of small depressions that fill with water but in reality, are not at risk of surface water

flooding. This has been taken into account, when assessing the sites surface water flood risk and where very localised areas of flooding are evident and are independent of wider surface water flood flows and routes.

- 4.16 The EA has produced national scale surface water flood risk mapping. This mapping shows 3 event scenarios for the 1 in 30 (3.3% chance of occurring in any one year) return period (high risk – Figure 9), 1 in 100 (1% chance of occurring in any one year) return period (medium risk – Figure 10) and 1 in 1000 (0.1% chance of occurring in any one year) return period (low risk – Figure 11).
- 4.17 Figure 9 shows the high-risk scenario (1 in 30-year event), and demonstrates that the entire site is unaffected by surface water flooding.



Figure 9 EA Long Term Flood Risk Maps (Depths) – High Risk of surface water flooding (source: EA Long Term Flood Risk Maps), site bordered red.

- 4.18 Figure 10 present the medium risk scenario (1 in 100-year return period) and shows the site remains wholly unaffected by surface water flooding.



Figure 10 EA Long Term Flood Risk Maps – Medium Risk of surface water flooding depths (source: EA Long Term Flood Risk Maps), site bordered red

- 4.19 The low-risk scenario (1 in 1000-year event) continues to show that the majority of the site remains largely unaffected by surface water flooding. There appears to be a minor flow path from Edge Lane through the site and connecting into the lower areas of the playing fields to the west. However, this flow path appears to be diverted around the existing and adjacent dwelling and then to the south western boundary. It does not appear that the pluvial flood extents in this event would impact on the development extension, with ground levels directing surface flows quickly to the south west and away from the dwelling.

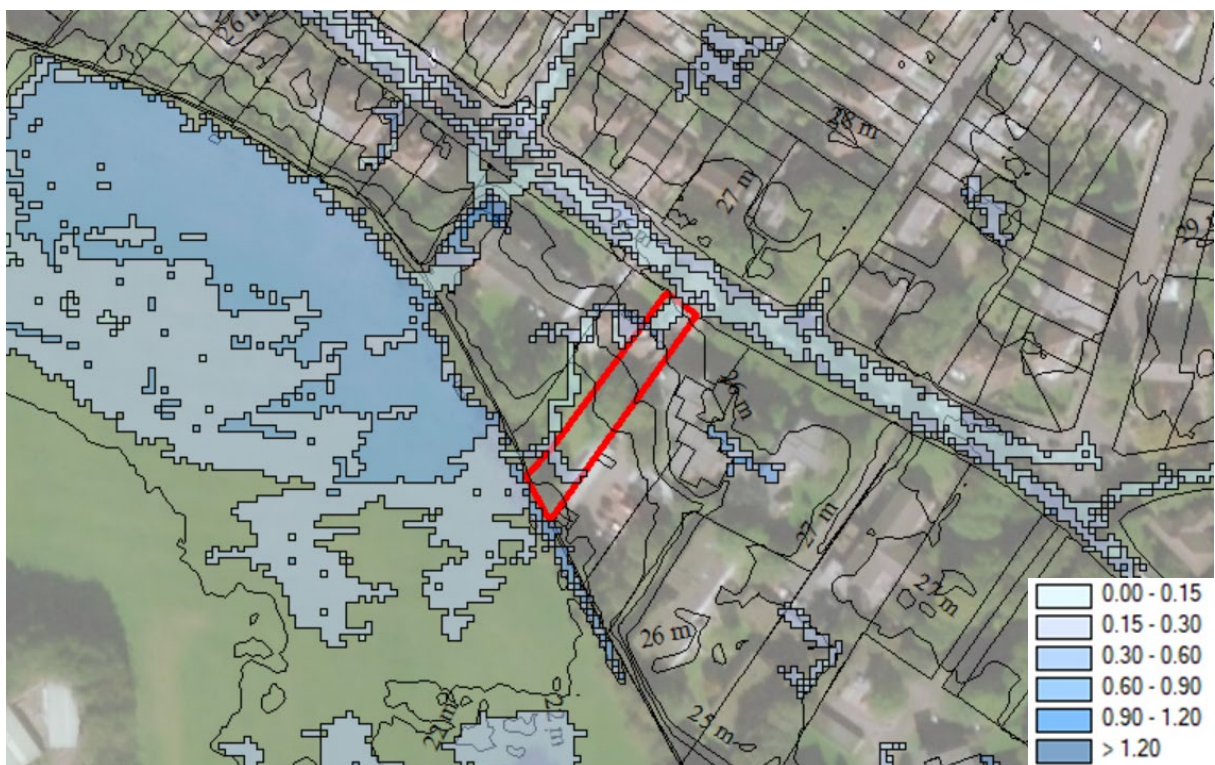


Figure 11 EA Long Term Flood Risk Maps – Low risk of surface water flooding depth (source: EA Long Term Flood Risk Maps), site bordered red.

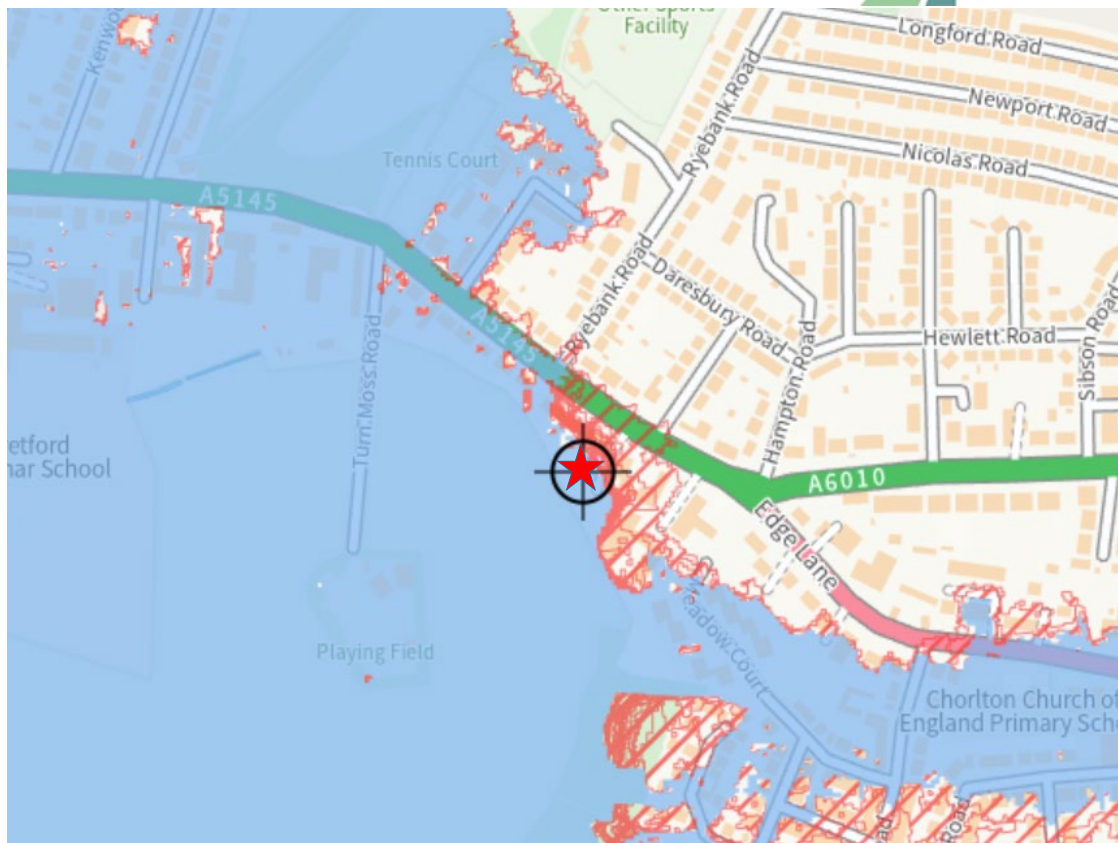
- 4.20 From the RoFSW data, flood risk from surface water sources to the proposed dwelling appears to be low, given that the site is only marginally affected by low level flooding even in the 1 in 1000 year event.

Impacts of Climate Change

- 4.21 With changes in climate profiles, it is expected that rainfall intensities and frequencies will increase, and as such the risk to property will increase with this. However, the risk of flooding to the proposed buildings from increase in overland flow extents because of climate change is considered to remain low. Nevertheless, it is important to ensure that the proposals do not increase flood risk as a result, incorporates flood resilient building measures and Sustainable Drainage Systems (SuDS) where possible.
- 4.22 The SFRA: Susceptibility to Surface Water Flooding - Future Scenario shows that the site remains at low risk of surface water flooding, and therefore the risk of surface water flooding on site remains low into the future as well.

RESERVOIR FLOODING (BREACH)

- 4.23 Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoirs Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low. Recent changes to legislation under the Flood and Water Management Act require the Environment Agency to designate the risk of flooding from these reservoirs. The Environment Agency is currently progressing a 'Risk Designation' process so that the risk is formally determined.
- 4.24 Reservoir flooding is very different from other forms of flooding. It may happen with little or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate, but it is less likely than flooding from rivers or surface water. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure. The risk of inundation to the study area as a result of reservoir breach or failure of a number of reservoirs within the area was assessed as part of the National Inundation Reservoir Mapping (NIRIM) study. Several reservoirs are located within the study area. However, there are also reservoirs outside of the area whose inundation mapping is shown to affect the study area.
- 4.25 The EA has undertaken failure scenarios of the UK reservoirs and summarised these extents through their Long-Term Flood Risk Maps for Reservoir Flooding. Figure 12 shows the extent of river flooding added to the reservoir model to determine worst case reservoir flood event.
- 4.26 Such a scenario is extremely unlikely to occur and reservoirs in the UK have an excellent safety record. Since the first reservoir legislation was introduced in the 1920s, the UK has not had a single reservoir failure resulting in loss of life. The maps on the Environment Agency website do not give any information about the depth or speed of the flood waters or the length of time it would take for the flood waters to reach any location. Even in a worst case scenario many areas shown as being at risk of reservoir flooding would be expected to receive no more than one or two centimetres of flood water. Emergency planners do have access to maps containing additional information. However, due to the sensitive nature of the information from a national security perspective, this information is not publicly available.
- 4.27 Therefore, although the site is located within a reservoir failure area, the actualised risk of a such a failure occurring is considered to be very low.



Maximum extent of flooding from reservoirs:

● when river levels are normal ■ when there is also flooding from rivers ⊕ Location you selected

Figure 12 extract from EAs LTFRM Reservoir Flood Risk (star marks approximate site location)

HISTORICAL, SEWERS AND DRAINAGE

- 4.1 A common source of flooding is a result of sewer or other drainage infrastructure becoming surcharged and flooding. Limited information on sewer and historical flooding is available for the site. The EA Historical Flood Risk data does not show the site to have been affected in past.
- 4.2 There have been no other noted flood events specifically at the site, however this does not directly indicate that the site has not flooded in the past or may flood in the future.
- 4.3 Therefore, it is considered the risk of sewer flooding to the site is considered low, assuming that any new development flows include appropriate protective measures to manage runoff and not increase the risk of sewer flooding.

GROUNDWATER

- 4.4 Groundwater flooding is the emergence of groundwater at the ground surface or into subsurface voids arising as a result of:
 - ⇒ abnormally high groundwater heads or flows;
 - ⇒ the introduction of an obstruction to groundwater flow; or
 - ⇒ the rebound of previously depressed groundwater levels.
- 4.5 Groundwater flooding usually occurs following a prolonged period of low intensity rainfall. As groundwater flow is much slower than surface flow, the flooding may not recede for long periods of time, typically weeks or even

months. It is important to recognise the risk of groundwater flooding is typically highly variable and heavily dependent upon local geology, topography and weather conditions, as well as local abstraction regimes. Groundwater flooding is hard to predict and challenging to mitigate.

- 4.6 Records of groundwater flooding in the area are limited. However, this is likely because groundwater flooding is often perceived as surface water flooding as is therefore not accurately recorded, rather than groundwater flooding not being a potentially significant source of flood risk. The SFRA shows that the site is in an area at potential risk of groundwater flooding (Figure 13).
- 4.7 Should groundwater flooding occur on the site (although the risk is considered low), ground water flooding is typically of low depth and velocity and would follow the natural fall of the land. In the case of this development, levels fall sharply to the field to the south west, and any groundwater flooding would similarly flow in this direction.
- 4.8 In addition to the site being at low risk, there are also no specific records of groundwater flooding specifically impacting the site, it is considered that groundwater flood risk is low.

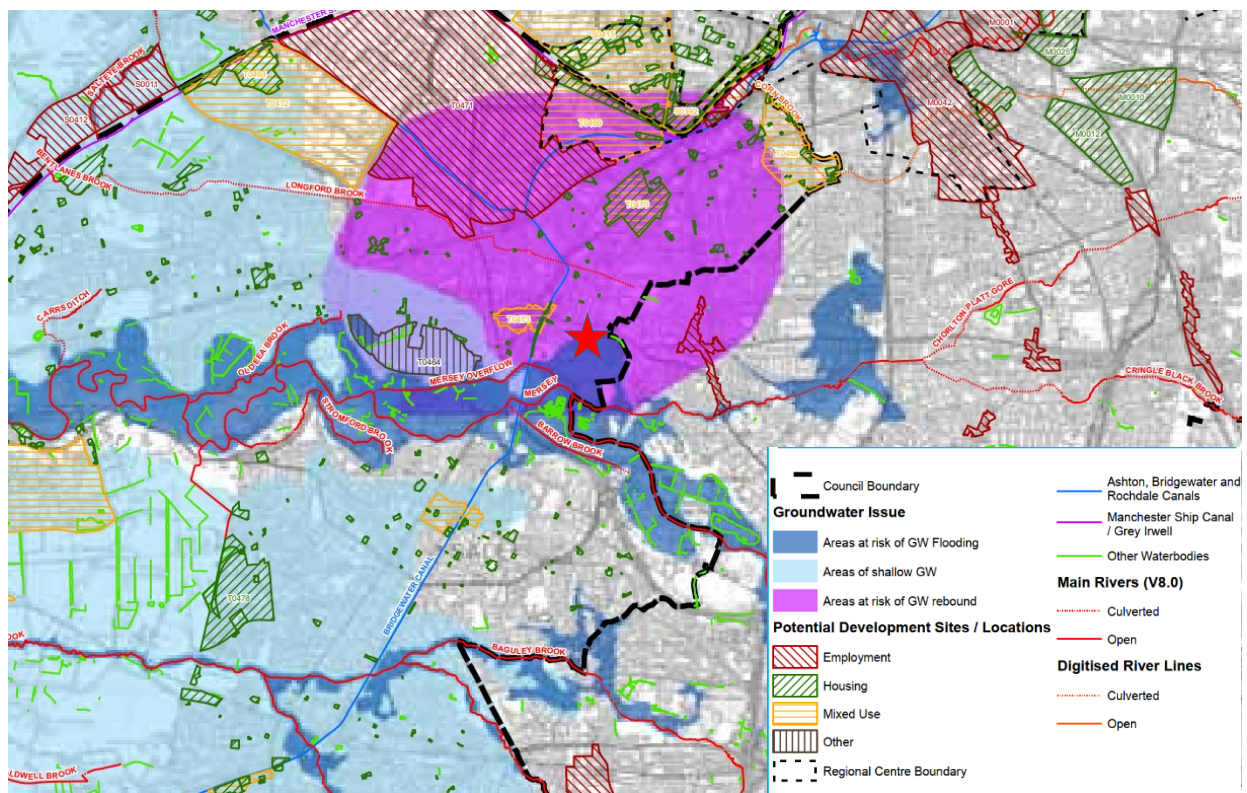


Figure 13 - Groundwater flood risk based on the EA 2017 Susceptibility to Groundwater Flooding data

Impacts of Climate Change

- 4.9 The potential effects of climate change on groundwater levels are uncertain. Greater seasonality in groundwater level fluctuation is a potential outcome under a pattern of higher winter rainfall and less summer rainfall. Broad predictions of the impacts of climate change on groundwater levels are difficult to make at the present time

SUMMARY OF RISKS

- 4.10 Section 3 outlines the likely sources of flooding based on the available data, the below is a summary of these risks:
 - **Fluvial** – Risk from this source is considered **medium**, given that the proposed basement could be affected by the design flood event, however the ground floor is shown to be located above all modelled 1% AEP events. In order to reduce the risk to users of the proposed basement, no sleeping accommodation should be permitted and internal access to the upper floors maintained at all times.

- **Tidal** – Risk from this source is not applicable as the site is not in an area at risk of tidal flooding.
- **Surface Water** – Risk from this source is considered **low**.
- **Reservoir** – Risk from this source is considered **low**.
- **Sewers and Drainage** – Risk from this source is considered very **low** given no historical data points directly to the site having flooding from this source previously.
- **Groundwater** – Risk from this source is considered a **medium** risk, based the SFRA mapping. However, as long as the construction detailing considers the presence of high groundwater, this risk can largely be mitigated.

RESIDUAL RISKS

- 4.11 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:
- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
 - failure of a reservoir, or;
 - a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.
- 4.12 Presently, the site is shown to be protected by existing flood defences up to the 1 in 200 year event. However, the new basement area could be affected when considering climate change impacts (in either the defended or undefended event). Therefore, to mitigate the risk to site users, the development proposals presently show that all sleeping accommodation remains on the first floor and above, which are positioned c.2m above the 0.1% AEP event, with ground floor shown to above all modelled 1 % AEP events (including climate change).
- 4.13 A number of mitigation measures have been proposed below in Section 5 in order to minimise/mitigate flood risk from the above sources.

5 FLOOD MITIGATION MEASURES

- 5.1 The proposals allow the opportunity to improve flood resilience of the site by incorporating a number of flood mitigation measures, both through the incorporation of flood resilient building materials, surface water drainage improvements and signing up to the EA Flood Warning/Alert System.
- 5.2 Therefore, to meet the requirements of the Council SFRA and NPPF, it is recommended that the development proposals consider:
- Building to incorporate flood resilient measures (see below);
 - Any new drainage should be designed in accordance with Building Regulations Part H, SuDS Manual and 'DCG' guidance, ensuring drainage proposals include an allowance for climate change;
 - Site investigations should be undertaken to determine the depth of the groundwater table, with the basement and foundations designed by a competent professional taking into the specific site and ground conditions;
 - The ground floor extension will need to ensure that finish floor levels are set no lower than existing (assumed to be approximately 25mAOD) to remain flood free in the 1% AEP event. The new basement extension (which is presently shown to have level access to the rear garden and an approximate finish floor level of 22.5mAOD) will need to be designed to either fully exclude flood waters (i.e., is water tight) or acknowledge that this area is at risk of full inundation. In this case, there should be no sleeping accommodation permitted in the basement, with internal access maintained to the ground and upper floors.
 - Any structural elements (such as posts or walls supporting the proposals) that could be exposed to flood waters, should be designed to withstand these hydraulic pressures.
 - The Ground Floor and Basement construction should follow the guidance within <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#extra-floodresistance-and-resilience-measures>, given that it is not deemed possible to raise finish floor level of the ground floor or basement extension 300mm above the design flood level of 24.94mAOD.

BUILDING MATERIAL MITIGATIONS

- 5.3 The national government produced guidance for improving the flood resilience of building in the Communities and Local Government (CLG) 2007 'Improving the Flood Performance of New Buildings' publication. This publication provides recommendations on how to protect buildings in the case of a flood event, and propose two scenarios based on maximum expected flooded depths:

Water exclusion strategy – where emphasis is placed on minimising water entry whilst maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (not more than 0.3m). According to the definitions adopted in this Guidance, this strategy can be considered as a resistance measure but it is part of the aim to achieve overall building resilience

Water entry strategy – where emphasis is placed on allowing water into the building, facilitating draining and consequent drying. Standard masonry buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m) by utilising resilient materials, and construction methods.

- 5.4 Given the primary risk is related to surface water flooding most likely from an exceedance event or failure of onsite drainage, it is considered that some key principles of the **Water Entry Strategy** should be adopted for the basement

(unless this will be designed to watertight). The ground floor extension should consider a **Water Exclusion Strategy**. Some simple construction measures can greatly protect buildings during such an event without incurring large additional construction costs. Some recommendations include:

- The route of all electrical services will run from ceilings at ground floor (where possible),
- All plumbing insulation to be of closed-cell design;
- Non-return valves to be fitted to all drain and sewer outlets;

5.5 Further detail can be found at <https://assets.publishing.service.gov.uk/>:

5.6 Further information and advice on what to do in an emergency, and can be found on www.environment-agency.gov.uk/floodline. It is advised that:

On receipt of a FLOOD ALERT, the individual property owners and occupiers should:

- ⇒ Monitor the situation via local media;
- ⇒ Make themselves aware of forecast local weather conditions;
- ⇒ Alert both current visitors, and those scheduled to arrive, of the situation;
- ⇒ Prepare to evacuate if necessary.

On receipt of a FLOOD WARNING, the individual property owners and occupiers should:

- ⇒ Follow advice to “go in, stay in, and tune in”;
- ⇒ Move all vehicles to an area outside of the potential flood extent, if safe to do so;
- ⇒ Alert scheduled visitors that they should seek alternative accommodation;
- ⇒ Be prepared to follow instruction from the Emergency Services.

On receipt of a SEVERE FLOOD WARNING, the individual property owners and occupiers should:

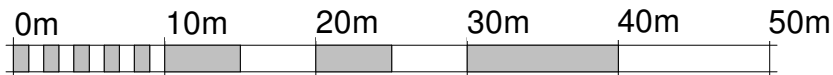
- ⇒ Follow advice to “go in, stay in, and tune in”;
- ⇒ Remain attentive to local media forecasts and news bulletins;
- ⇒ Do not evacuate unless instructed to do so by the Emergency Services;

5.7 If flood waters along the proposed evacuation route have exceed 25cm, site users are advised to seek advice from emergency services.

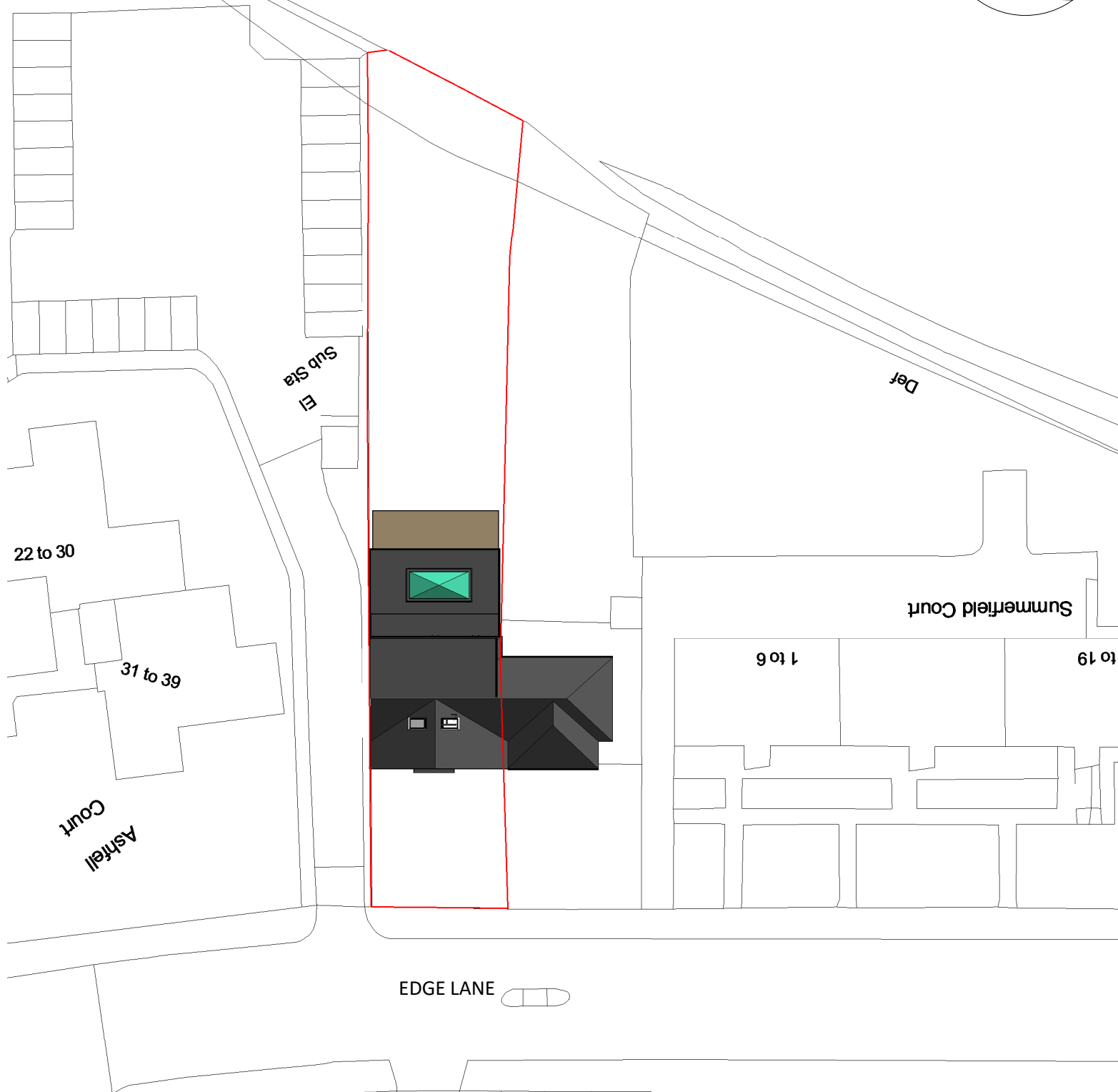
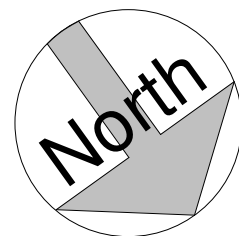
6 CONCLUSION

- 6.1 This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks
- 6.2 Table 2 summarises the sites flood risk classifications and selected Flood Zone designation for the purpose of this assessment. This classification is based on the EA's Flood Map for Planning (extract provided in Figure 2 below) and the EA's Long Term Flood Risk Maps (LTFRM): Risk of Flooding from Surface Water (RoFSW) (extract provided in Figure 3 below).
- 6.3 According to the EA's flood maps, the site is both affected by Flood Zone 2 (Fluvial), Flood Zone 3 (Fluvial but undefended) and Low Risk of Surface Water Flooding (equivalent Flood Zone 2). Therefore, it is considered the primary flood risk to the site is from Fluvial flooding from the Mersey to the south west and the associated residual flood risk associated with defence breach of failure or an event that would exceed the current level of defences.
- 6.4 Based on an approximated existing finish floor level of 25mAOD, the EA Product 4 data shows that the existing ground floor would be unaffected by all modelled 1 in 100 year events, but the proposed basement would be inundated for events subject to climate change, defence breach/failure or greater than the 1 in 200 year event. For the 0.1% AEP the site could be affected by up to 430mm in the defended and 60mm in the undefended event.
- 6.5 A review of flood risk from all other sources, has been undertaken, and flood risk is considered low from all other sources assessed (including Pluvial, Tidal, Groundwater and Sewer flood risk).
- 6.6 Nevertheless, any future development proposals should consider adopting the recommendations of this report, the core of these include:
 - Building to incorporate flood resilient measures;
 - Any new drainage should be designed in accordance with Building Regulations Part H, SuDS Manual and 'DCG' guidance, ensuring drainage proposals include an allowance for climate change;
 - Site investigations should be undertaken to determine the depth of the groundwater table, with the basement and foundations designed by a competent professional taking into the specific site and ground conditions;
 - The ground floor extension will need to ensure that finish floor levels are set no lower than existing (assumed to be approximately 25mAOD) to remain flood free in the 1% AEP event. The new basement extension (which is presently shown to have level access to the rear garden and an approximate finish floor level of 22.5mAOD) will need to be designed to either fully exclude flood waters (i.e., is water tight) or acknowledge that this area is at risk of full inundation. In this case, there should be no sleeping accommodation permitted in the basement, with internal access maintained to the ground and upper floors.
 - Any structural elements (such as posts or walls supporting the proposals) that could be exposed to flood waters, should be designed to withstand these hydraulic pressures.
 - The Ground Floor and Basement construction should following the guidance within <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#extra-floodresistance-and-resilience-measures>, given that it is not deemed possible to raise finish floor level of the ground floor or basement extension 300mm above the design flood level of 24.94mAOD, it is considered possible to place all vulnerable sleeping areas on the first floor and above c2m above the modelled events.
- 6.7 This report demonstrates that the proposals could be accommodated within the site by in accordance with the EA guidance, Council SFRA, and the NPPF. It is considered that as long as the development follows the advice presented in this report, that the development proposals may be considered appropriate at this location.

APPENDIX 1 – SITE PLAN



VISUAL SCALE 1:500 @ A4



Rev	Date	Int	Description
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41 Edge Lane Proposed Site Plan

Job No:

162

Scale @ A4:

1 : 500

Mr Imran Sarfraz

Drawn By:

OJK

Date:

28/05/22

Drawing No:

P103

Rev:

DO NOT SCALE FROM THIS DRAWING
ALL DIMENSIONS MUST BE CHECKED ON SITE BY
CONTRACTOR PRIOR TO CONSTRUCTION

APPENDIX 2 – EA DATA

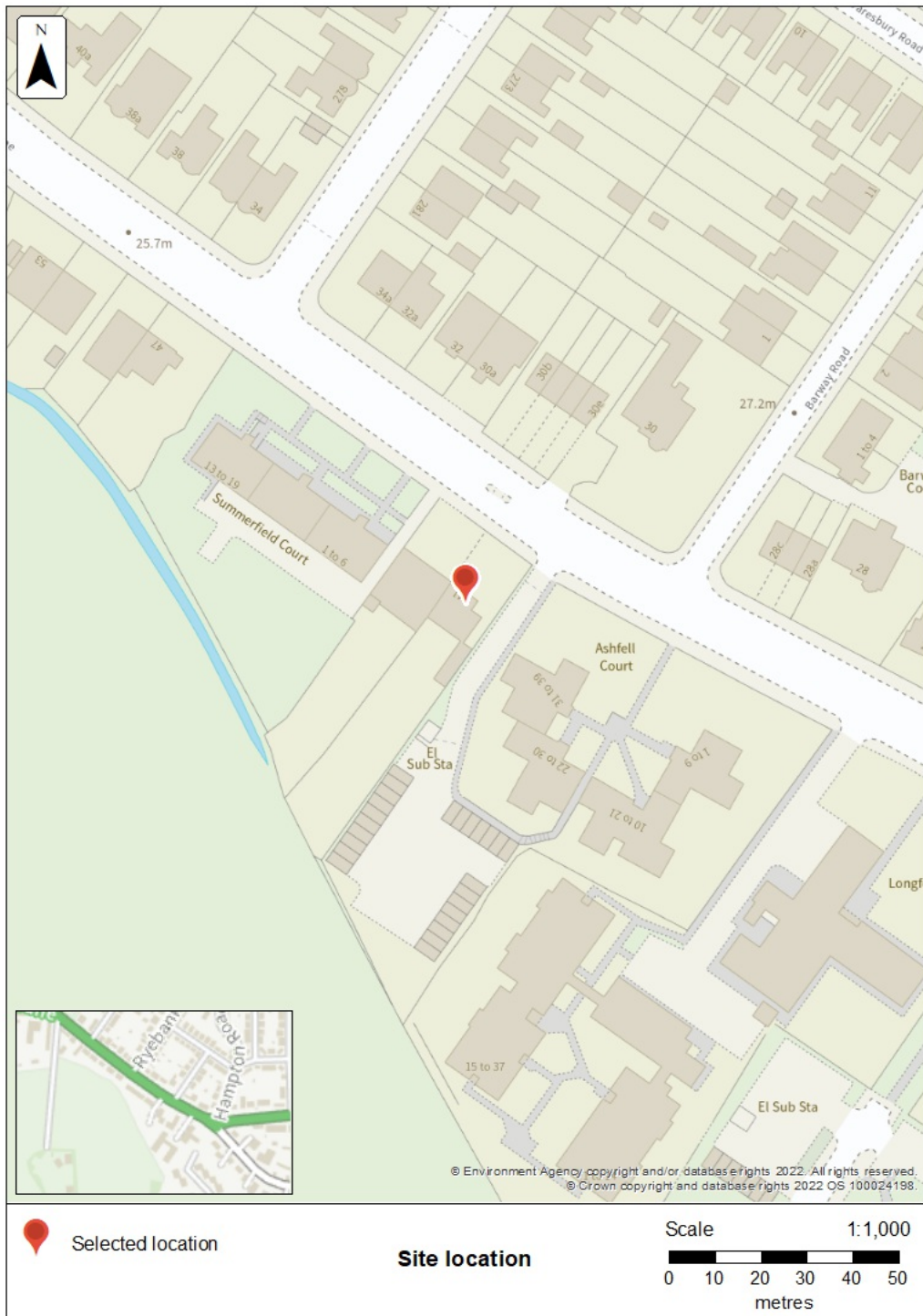
Flood risk assessment data

Location of site: 380820 / 394038 (shown as easting and northing coordinates)

This information was previously known as a product 4.

Customer reference number: GMMC268410AB/C9PGXXY4XHMY

Map showing the location that flood risk assessment data has been requested for.



How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

We recommend that you work with a flood risk consultant to get your flood risk assessment.

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- areas benefiting from defences
- flood defences and attributes
- modelled data
- climate change modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Information that's unavailable

This document **does not** contain:

historic flooding

We do not have historic flooding data for this location.

Please note that:

- flooding may have occurred that we do not have records for
- flooding can come from a range of different sources
- we can only supply flood risk data relating to flooding from rivers or the sea

You can contact your Lead Local Flood Authority or Internal Drainage Board to see if they have other relevant local flood information. Please note that some areas do not have an Internal Drainage Board.

Surface water and other sources of flooding

Use the [long term flood risk service](#) to find out about the risk of flooding from:

- surface water
- ordinary watercourses
- reservoirs

For information about sewer flooding, contact the relevant water company for the area.

About the models used

Model name: Upper Mersey 2017

Scenario(s): Defended fluvial, defences removed fluvial, defended climate change fluvial, defences removed climate change fluvial

Date: 14 April 2022

These models contain the most relevant data for your area of interest.

Terminology used

Annual exceedance probability (AEP)

This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1% chance of occurring in any one year, is described as 1% AEP.

Metres above ordnance datum (mAOD)

All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

Flood map for planning (rivers and the sea)

Your selected location is in flood zone 2.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change

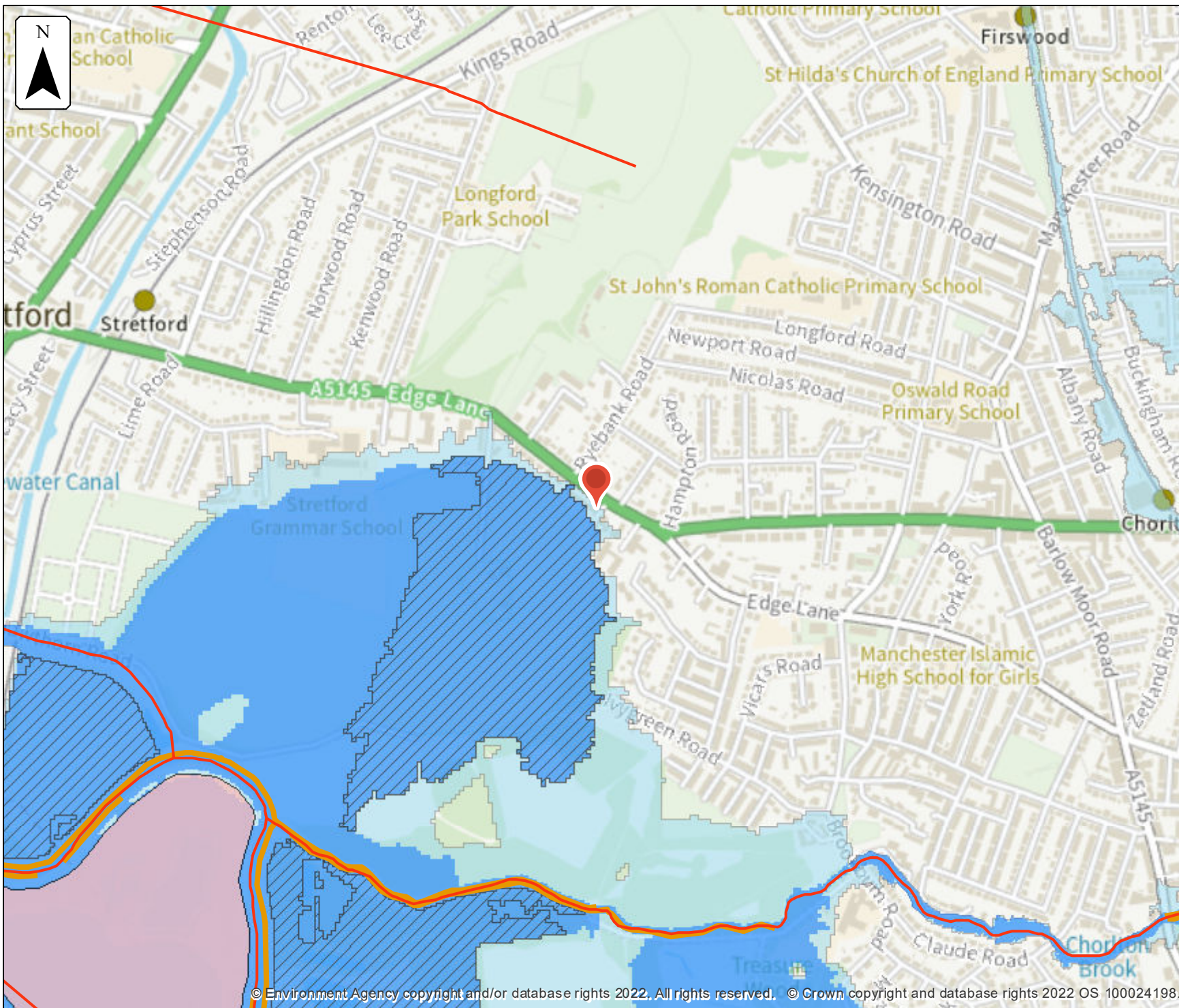
This data is updated on a quarterly basis as better data becomes available.

Areas benefiting from defences

This map shows the areas benefiting from defences for 2 possible events:

- fluvial (river flooding) event that has a 1% annual exceedance probability (AEP), this means a 1% chance of occurring in any one year
- tidal or coastal event that has a 0.5% annual exceedance probability (AEP), this means a 0.5% chance of occurring in any one year

[Download the GIS dataset for areas benefiting from defences](#)



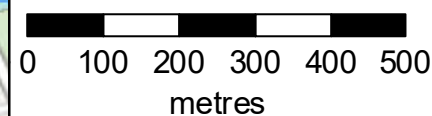
Flood map for planning

Location (easting/northing)
380820/394038

Scale
1:10,000

Created
8 Aug 2022

-  Selected location
-  Main river
-  Flood defence
-  Water storage area
-  Areas benefiting from flood defence
-  Flood zone 3
-  Flood zone 2

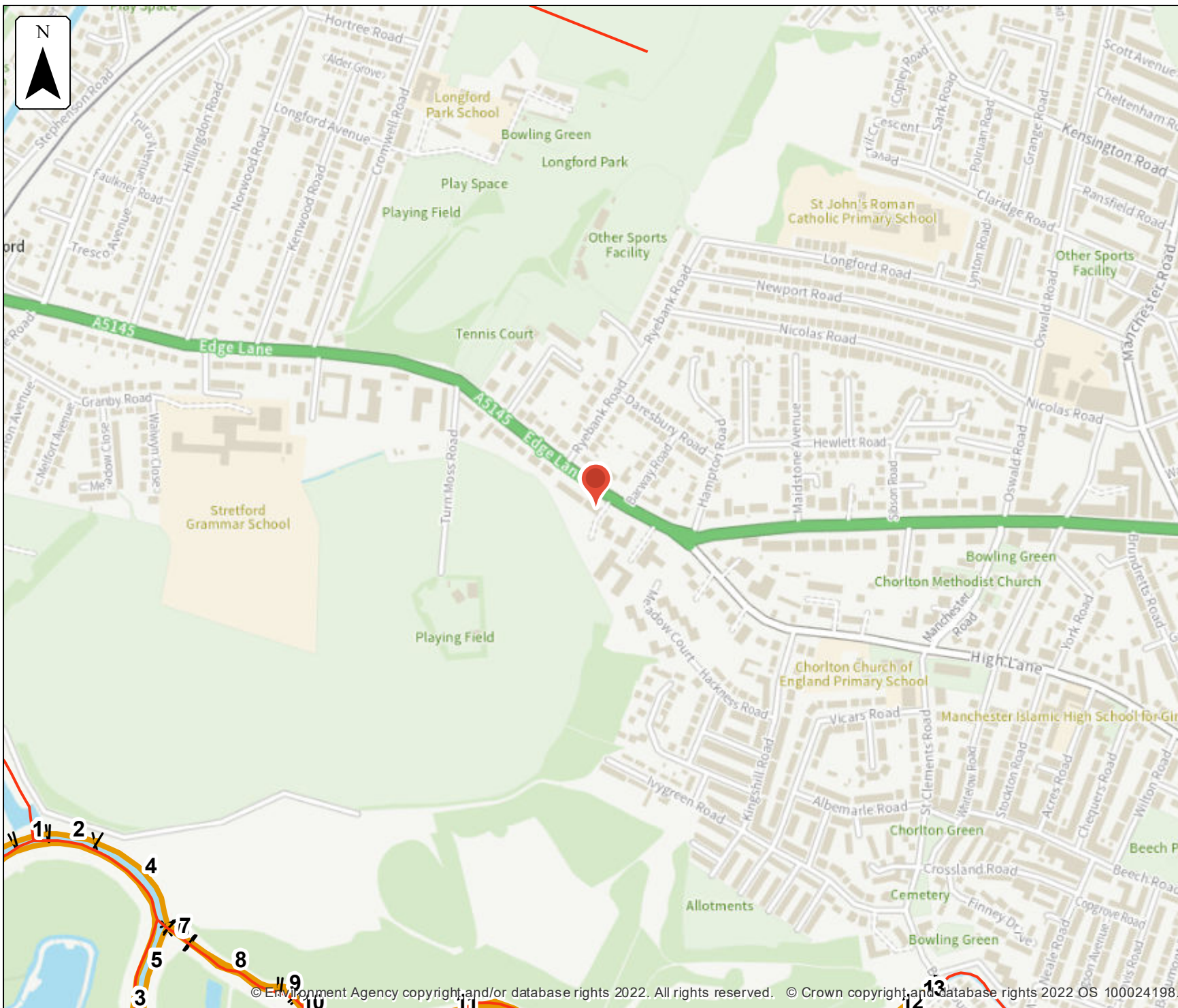


Flood defences and attributes

The flood defences map shows the location of the flood defences present.

The flood defences data table shows the type of defences, their condition and the standard of protection. It shows the height above sea level of the top of the flood defence (crest level). The height is in mAOD which is the metres above the mean sea level at Newlyn, Cornwall.

It's important to remember that flood defence data may not be updated on a regular basis. The information here is based on the best available data.



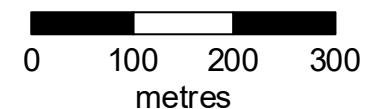
Flood defences

Location (easting/northing)
380820/394038

Scale
1:7,500

Created
8 Aug 2022

-  Selected location
-  Main river
-  Flood defence



Flood defences data

Label	Asset ID	Asset Type	Standard of protection (years)	Current condition	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)	Effective crest level (mAOD)
1	121975	Embankment	100	Fair	23.39	23.56	
2	121977	Embankment	100	Poor	24.63	25.05	
3	121976	Embankment	100		21.30	19.97	
4	181857	Embankment	100	Fair	24.60	24.63	
5	120567	Embankment	100	Fair	24.74	25.69	
6	32425	Engineered High Ground	50	Good	35.24	36.05	
7	59786	Embankment	50	Fair	24.10	24.47	
8	122257	Embankment	50	Poor	24.47	24.05	
9	122259	Embankment	50	Poor	24.05	24.11	
10	122258	Embankment	50	Poor	24.47	24.17	
11	120856	Embankment	50	Poor	24.11	24.19	
12	120655	Engineered High Ground	50	Fair	23.35	21.72	
13	125813	Embankment			24.51	25.04	

Any blank cells show where a particular value has not been recorded for an asset.

Modelled data

This section provides details of different scenarios we have modelled and includes the following (where available):

- outline maps showing the area at risk from flooding in different modelled scenarios
- modelled node point map(s) showing the points used to get the data to model the scenarios and table(s) providing details of the flood risk for different return periods
- map(s) showing the approximate water levels for the return period with the largest flood extent for a scenario and table(s) of sample points providing details of the flood risk for different return periods

Climate change

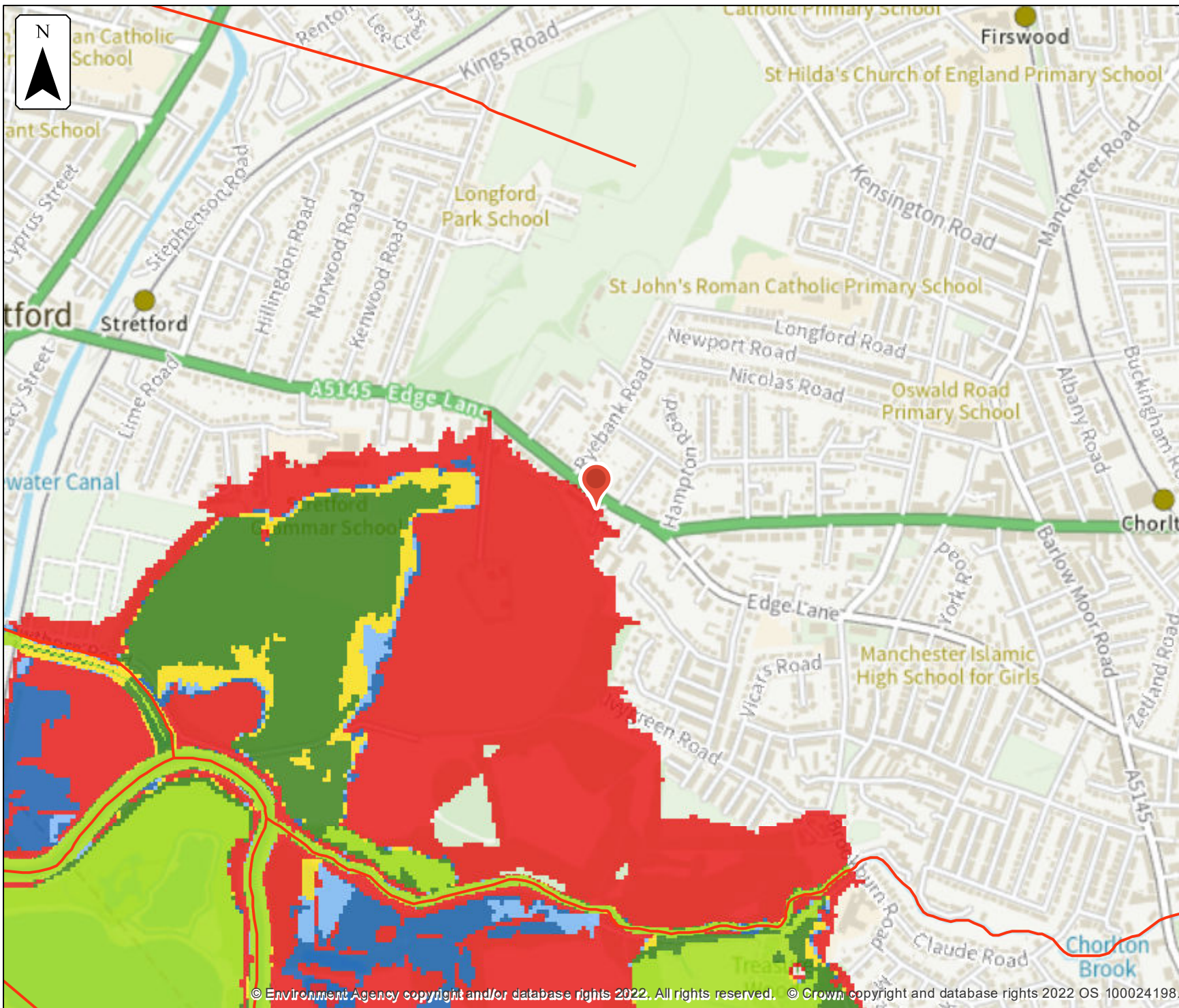
The climate change data included in the models may not include the latest [flood risk assessment climate change allowances](#). Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

Modelled scenarios

The following scenarios are included:

- Defended modelled fluvial: risk of flooding from rivers where there are flood defences
- Defences removed modelled fluvial: risk of flooding from rivers where flood defences have been removed
- Defended climate change modelled fluvial: risk of flooding from rivers where there are flood defences, including estimated impact of climate change
- Defences removed climate change modelled fluvial: risk of flooding from rivers where flood defences have been removed, including estimated impact of climate change



Defended modelled fluvial extent

Location (easting/northing)
380820/394038

Scale Created
1:10,000 8 Aug 2022

Model name
Upper Mersey 2017

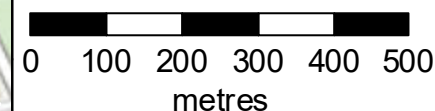
 Selected location

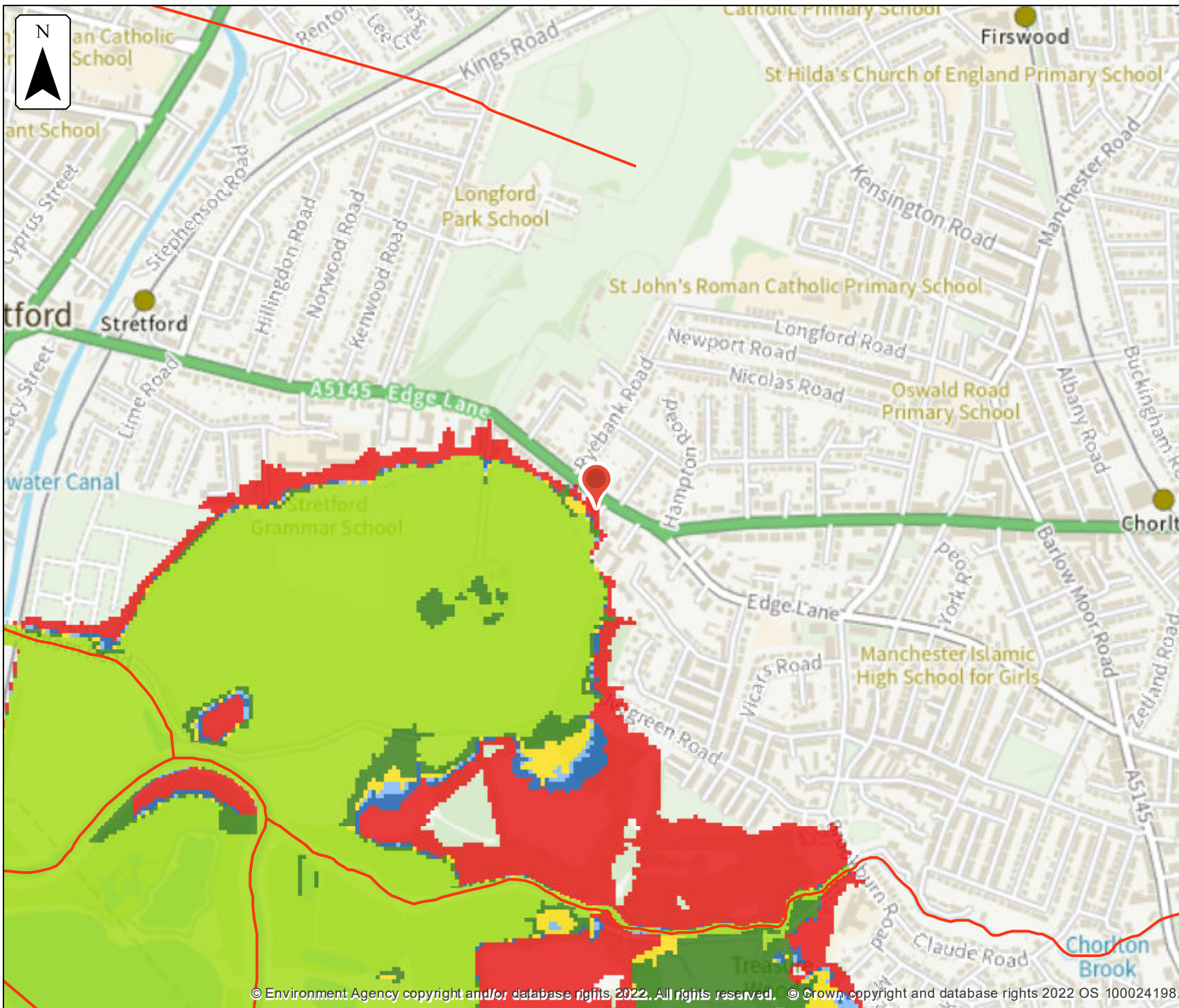
 Main river

Modelled flood extent

-  5% AEP
-  2% AEP
-  1.33% AEP
-  1% AEP
-  0.5% AEP
-  0.1% AEP

Flood extents may not be visible where they overlap other return periods





Defences removed modelled fluvial extent

Location (easting/northing)
380820/394038

Scale Created
1:10,000 8 Aug 2022

Model name
Upper Mersey 2017

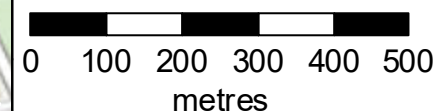
 Selected location

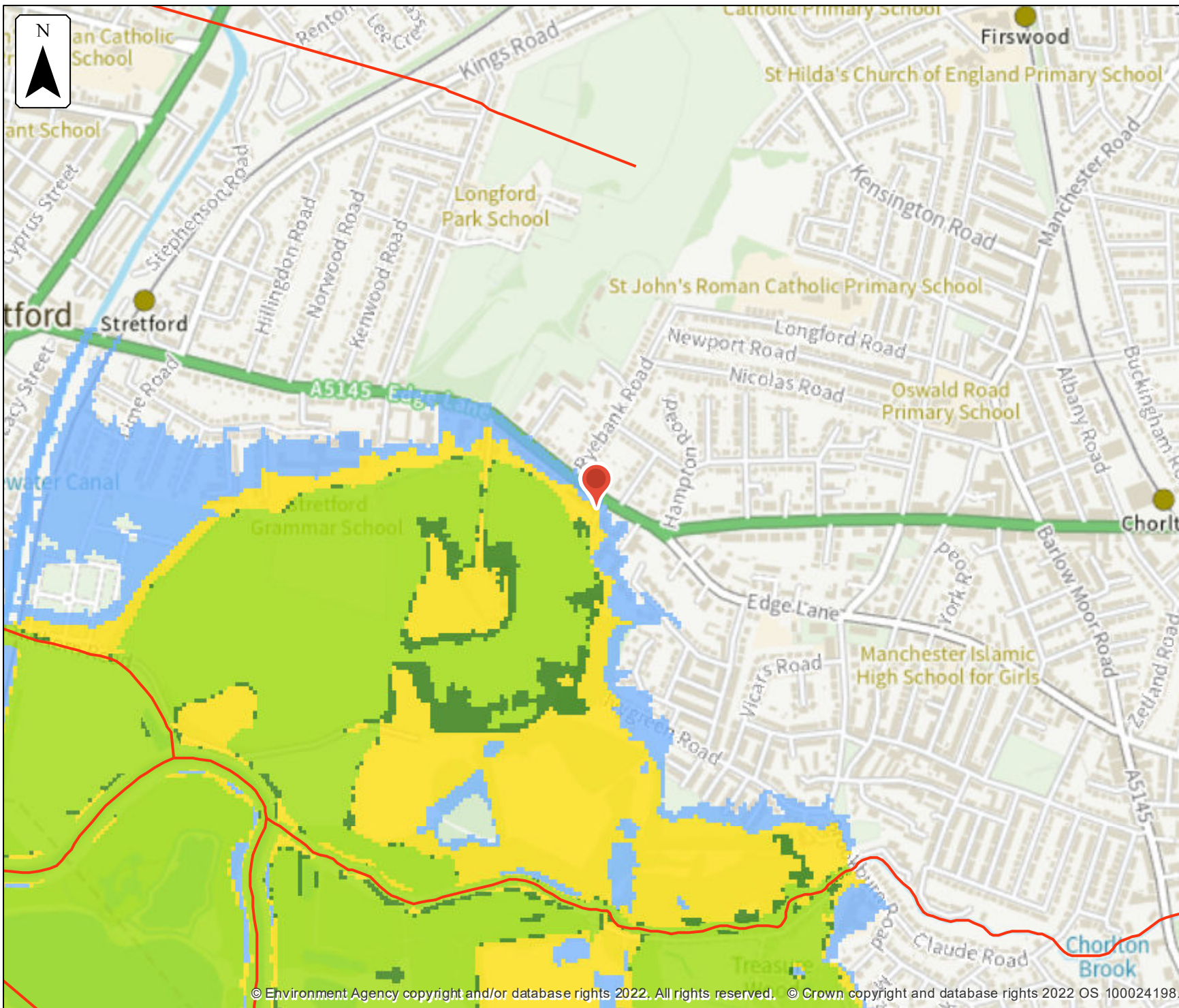
 Main river

Modelled flood extent

-  5% AEP
-  2% AEP
-  1.33% AEP
-  1% AEP
-  0.5% AEP
-  0.1% AEP

Flood extents may not be
visible where they overlap
other return periods





Defended climate change modelled fluvial extent

Location (easting/northing)
380820/394038

Scale Created
1:10,000 8 Aug 2022

Model name
Upper Mersey 2017

 Selected location

 Main river

Modelled flood extent

 1.0% AEP (+30%)

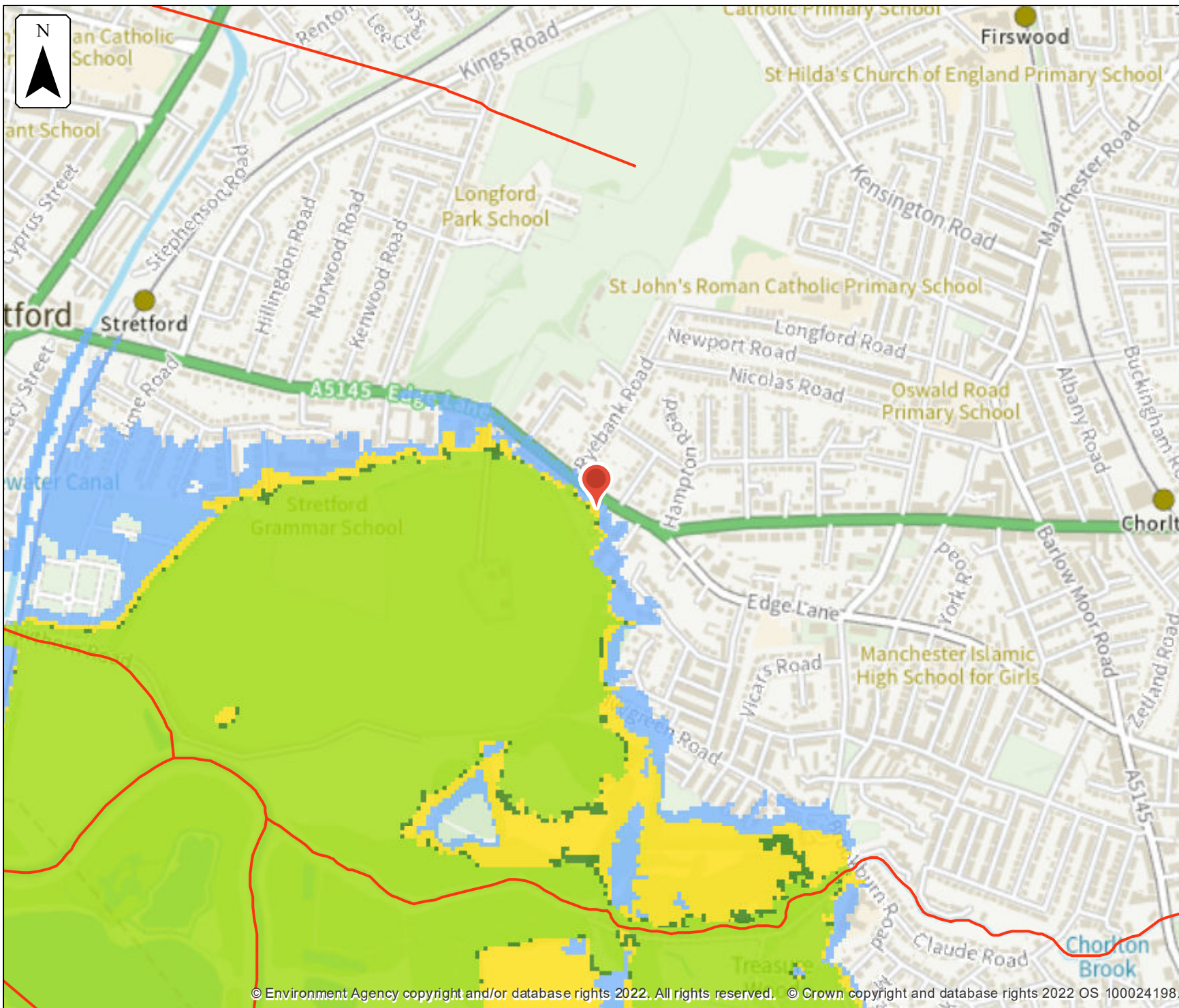
 1.0% AEP (+35%)

 1.0% AEP (+70%)

 0.1% AEP (+30%)

Flood extents may not be
visible where they overlap
other return periods


0 100 200 300 400 500
metres



Defences removed climate change modelled fluvial extent

Location (easting/northing)
380820/394038

Scale Created
1:10,000 8 Aug 2022

Model name
Upper Mersey 2017

 Selected location

 Main river

Modelled flood extent

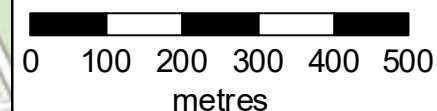
 1.0% AEP (+30%)

 1.0% AEP (+35%)

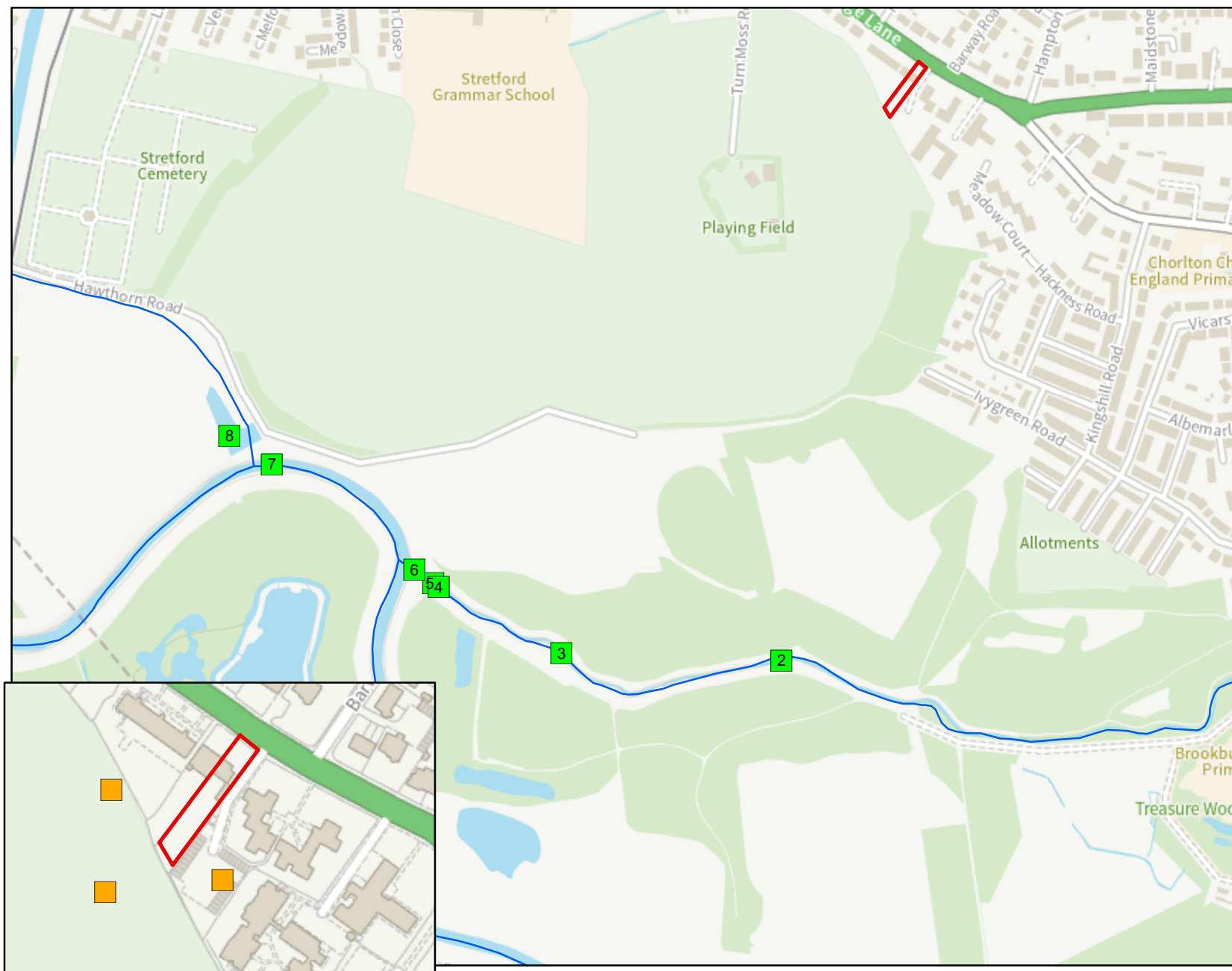
 1.0% AEP (+70%)

 0.1% AEP (+30%)

Flood extents may not be
visible where they overlap
other return periods



Model Measurements map centred on 41 Edge Lane, Manchester M21 9JU.
Created on 18/08/2022 [GMMC268410AB]



1:7,000



Legend

-  Site_Location
-  Model_Measurements
-  Main River

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)	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)		
1	ea013_0243_CHORLTON	381306	393336	Modelled Water Level (m aodN)	22.95	23.23	23.43	23.71	23.84	23.95	24.00	24.03	24.25	24.29	24.89	24.08	25.03	22.95	23.41	23.62	23.80	23.90	24.00	24.03	24.06	24.24	24.41	25.34	24.09	25.77		
				Modelled Flow (cumecs)	7.90	11.60	14.50	19.00	21.90	25.40	27.10	28.10	36.53	37.94	48.00	30.10	31.10	7.90	11.60	14.50	19.00	21.90	25.40	27.10	28.10	36.53	37.94	48.00	30.10	31.10		
2	ea013_0243_gore3.01	380655	393312	Modelled Water Level (m aodN)	21.91	22.48	22.65	22.83	22.91	23.14	23.29	23.36	24.02	24.07	24.88	23.58	25.03	22.84	23.24	23.37	23.63	23.70	23.79	23.88	23.93	24.09	24.14	24.94	23.96	25.28		
				Modelled Flow (cumecs)	7.86	11.56	14.46	18.30	20.35	21.81	22.37	22.58	24.84	26.64	38.75	23.00	30.07	7.71	11.21	13.95	18.14	20.43	22.38	23.04	23.36	25.06	32.91	92.29	23.84	125.65		
3	ea013_0243_gore2.01	380382	393322	Modelled Water Level (m aodN)	21.88	22.42	22.62	22.81	22.89	23.13	23.28	23.36	23.97	24.04	24.87	23.57	25.01	22.83	23.23	23.36	23.62	23.70	23.79	23.88	23.93	24.10	24.17	24.94	23.97	25.38		
				Modelled Flow (cumecs)	7.83	11.59	14.44	18.90	20.64	21.39	21.64	21.77	30.95	42.85	26.70	21.98	51.30	7.48	10.88	13.50	17.61	19.91	21.65	22.06	22.38	24.00	24.16	63.57	22.79	75.47		
4	ea013_0243_gore1u	380232	393403	Modelled Water Level (m aodN)	21.87	22.39	22.60	22.81	22.89	23.13	23.28	23.36	23.98	24.03	24.91	23.57	25.03	22.83	23.22	23.35	23.62	23.70	23.79	23.88	23.93	24.10	24.17	24.97	23.97	25.45		
				Modelled Flow (cumecs)	7.80	11.56	14.43	18.87	20.61	21.38	21.62	21.76	22.63	22.98	24.30	21.95	21.85	7.33	10.66	13.23	17.28	19.57	21.17	21.62	21.87	23.36	23.54	24.37	22.24	19.39		
5	ea013_0243_gore1d	380222	393409	Modelled Water Level (m aodN)	21.85	22.30	22.52	22.76	22.86	23.12	23.28	23.36	24.03	24.08	25.15	23.57	25.30	22.82	23.16	23.25	23.60	23.68	23.78	23.88	23.94	24.17	24.20	24.95	24.00	25.42		
				Modelled Flow (cumecs)	7.80	11.56	14.43	18.87	20.61	21.38	21.62	21.76	22.63	22.98	24.30	21.95	21.85	7.33	10.66	13.23	17.28	19.57	21.17	21.62	21.87	23.36	23.54	24.37	22.24	19.39		
6	ea013_0243_chorconu	380200	393424	Modelled Water Level (m aodN)	21.85	22.30	22.52	22.76	22.86	23.12	23.28	23.36	24.00	24.06	24.89	23.57	24.93	22.82	23.16	23.25	23.60	23.68	23.78	23.88	23.94	24.17	24.20	24.95	24.00	25.42		
				Modelled Flow (cumecs)	7.79	11.55	14.43	18.87	20.61	21.37	21.62	21.74	22.62	22.97	24.28	21.94	21.84	7.29	10.60	13.15	17.19	19.48	21.07	21.53	21.80	23.25	23.43	24.25	22.14	19.25		
7	ea013_0243_MERS02_3508	380025	393554	Modelled Water Level (m aodN)	21.72	22.21	22.46	22.71	22.82	23.10	23.27	23.33	24.01	23.95	24.89	23.54	25.03	22.62	22.97	23.05	23.42	23.51	23.60	23.73	23.80	24.02	24.05	24.89	23.86	25.36		
				Modelled Flow (cumecs)	123.50	129.98	133.03	136.75	138.63	141.80	142.81	143.35	146.75	147.49	148.24	144.39	144.90	206.02	233.49	239.78	267.99	274.28	282.69	286.51	292.00	321.81	332.43	402.29	295.34	410.37		
8	ea013_0243_OFSWEET	379972	393591	Modelled Water Level (m aodN)	21.71	22.24	22.51	22.76	22.85	23.11	23.50	23.65	24.37	24.33	24.86	24.01	25.04	20.28	20.28	20.28	20.28	20.28	21.07	21.47	21.71	22.30	22.47	24.91	21.90	25.42		
				Modelled Flow (cumecs)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		

Model data taken from Upper Mersey 2017
AEP - Annual Exceedence Probability
m aodN - metres above ordnance datum Newlyn
cumecs - cubic metres per second

Notes:

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

Map Reference	Model Node Reference	Easting	Northing	Data	Undefended						Defended					
					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)	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)
1	Upper Mersey 2017	380755	394028	Modelled Water Level (m aodN)	23.35	24.03	0.00	24.89	23.57	25.06	0.00	22.24	22.52	24.94	0.00	25.43
2		380815	393978	Modelled Water Level (m aodN)	23.35	24.11	24.19	24.89	23.57	25.06	0.00	0.00	0.00	24.94	0.00	25.43
3		380751	393972	Modelled Water Level (m aodN)	23.35	24.04	24.12	24.90	23.57	25.06	0.00	22.24	22.52	24.94	0.00	25.43

Model data taken from Upper Mersey 2017

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

Notes:

Climate Change Scenario	Caveat
30%, 35% and 70%	*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.

Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site specific flood risk assessment.

This should give you information about:

- the potential impacts of climate change in this catchment
- areas defined as functional floodplain
- flooding from other sources, such as surface water, ground water and reservoirs

About this data

This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some developments may require an environmental permit for flood risk activities from the Environment Agency. This includes any permanent or temporary works that are in, over, under, or nearby a designated main river or flood defence structure.

[Find out more about flood risk activity permits](#)

Help and advice

Contact the Greater Manchester Merseyside and Cheshire Environment Agency team at inforequests.gmmc@environment-agency.gov.uk for:

- [more information about getting a product 5, 6, 7 or 8](#)
- general help and advice about the site you're requesting data for