

AMBIENTAL

ENVIRONMENTAL ASSESSMENT

Stage 1 Due Diligence Technical Note

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Consultant		Date	Signature
Author	Rachael Holsgrove/ Nick Drewett	19/10/2020	
Document Check	Lydia Sayers	27/10/2020	
Authorisation	Steven Brown	03/11/2020	

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Contact Us:

Ambiental Environmental Assessment
Sussex Innovation Centre,
Science Park Square,
Brighton, BN1 9SB

www.ambiental.co.uk

UK Office: +44 (0) 203 857 8540 or +44 (0) 203 857 8530

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Glossary & Acronyms

AEP

Annual Exceedance Probability is the probability of a rainfall or tidal event occurring within any one year. For example, an event of a 100 year return period has an AEP of 1:100 or 1%.

BGS

British Geological Survey

EA

Environment Agency

Flood Defences

Artificial structures maintained to a set operational level designed to protect land people and property from Tidal and Fluvial flood sources to an established chance of happening in any year threshold.

Flood Source: Fluvial (River)

When flows within watercourses exceed the capacity of the watercourse causing out of bank flows.

Flood Source: Groundwater

Groundwater flooding is usually the result of prolonged wet weather causing groundwater levels to rise sufficiently to either emerge at surface or to cause flooding of below ground infrastructure, such as basements.

Flood Source: Pluvial (Surface Water)

When rainfall causes overland flows which exceed the capacity of the drainage network, causing flooding to land that is normally dry.

Flood Source: Tidal

When high tide events overtop the shoreline to cause flooding to land behind.

Flood Zone 1

Low Probability. Land defined as having a less than 1:1000 annual probability of flooding from tidal and fluvial sources.

Flood Zone 2

Medium Probability. Land defined as having a risk of fluvial flooding between 1:100 annual probability and 1:1000

annual probability. Or Land defined as having a risk of tidal flooding between 1:200 annual probability and 1:1000 annual probability.

Flood Zone 3 (A)

High Probability. Land defined as having a fluvial risk of 1:100 annual probability or greater. Or a tidal risk of 1:200 annual probability or greater.

Flood Zone 3 (B)

Functional Floodplain. Defined by SFRA's as areas where floodwater is stored during lower AEP events, typically the 1:20 annual probability.

Flood Zone Map

The Environment Agency has produced a mapping data set which covers England and provides the general extents of Flood Zones 1, 2, and 3. However the national data set available online does not differentiate between Flood Zone 3 (A) and 3 (B).

LiDAR

Light Detection And Ranging is an accurate ground terrain model obtained by aerial survey. The typical vertical accuracy is +/- 150 mm.

Main River

Defined on the Main River map and relate to rivers on which the Environment Agency have powers to carry out flood defence works.

m AOD

Metres Above Ordnance Datum.

OS

Ordnance Survey

Ordinary Watercourse

A watercourse which does not form part of a Main River, works on Ordinary Watercourses usually require consent from either the Lead Local Flood Authority, or the Internal Drainage Board (where one exists).

RoFSW

Risk of Flooding from Surface Water

SFRA

Strategic Flood Risk Assessment

Source Protection Zone: Inner zone (Zone 1)

Defined as the 50 day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres.

Source Protection Zone: Outer zone (Zone 2)

Defined by a 400 day travel time from a point below the water table. This zone has a minimum radius of 250 or 500 metres around the source, depending on the size of the abstraction.

Source Protection Zone: Total catchment (Zone 3)

Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source. For heavily exploited aquifers, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75. There is still the need to define individual source protection areas to assist operators in catchment management.

NOTE: The Source Protection Zones are not allowed to be displayed over base mapping greater than Ordnance Survey 1:50,000 scale, as the data was only modelled to this level and is not accurate pass this. They should not be compared against field boundaries.

SuDS

Sustainable Drainage Systems, which are designed to manage surface water flows in order to mimic the Greenfield run-off from an undeveloped site.

SWDS

Surface Water Drainage Strategy

1. Summary

- 1.1 Ambiental have been appointed by BeFirst London to undertake a Stage 1 Flood Risk Due Diligence Study to advise on the flood risks for the site at Keir Hardie Way, Dagenham, IG11 9NU. It is understood that this review is to support a portfolio review of existing sites with a view to potentially redeveloping these sites.
- 1.2 The risk summary tables provided below cover tidal, fluvial, pluvial and groundwater flood risk, as well as the residual risks of flooding attributable to reservoir and flood defence failure.

TIDAL (SEA & COAST) AND FLUVIAL (RIVERS) FLOOD RISK		
CLASSIFICATION	ASSESSED RISK	DEFINITION
HIGH	X	High risk means that each year this area has a chance of flooding of greater than 3.3%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped or fail.
MEDIUM	X	Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped or fail.
LOW	X	Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped or fail.
VERY LOW	✓	Very low risk means that each year this area has a chance of flooding of less than 0.1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped or fail.
✓ = Risk present		X = Risk not present

GROUNDWATER FLOOD RISK		
CLASSIFICATION	ASSESSED RISK	DEFINITION
HIGH	X	High risk means that there is the potential for groundwater flooding to occur at the surface.
MEDIUM	✓	Medium risk means that there is the potential for groundwater flooding of property situated below ground level.
LOW	✓	Low risk means that there is limited potential for groundwater flooding to occur.
NO DATA	X	No groundwater flood data is available for the area.
✓ = Risk present		X = Risk not present

PLUVIAL (SURFACE WATER) FLOOD RISK		
CLASSIFICATION	ASSESSED RISK	DEFINITION
HIGH	X	High risk means that each year this area has a chance of flooding of greater than 3.3%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.
MEDIUM	X	Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.
LOW	✓	Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.
VERY LOW	X	Very low risk means that each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.
✓ = Risk present		X = Risk not present

RESERVOIR FLOOD RISK		
CLASSIFICATION	ASSESSED RISK	DEFINITION
MEDIUM	X	Medium risk means that the site is within the area predicted to be at risk of a failure of a reservoir.
VERY LOW	✓	Very low risk means that the site is not within the area predicted to be at risk of a failure of a reservoir.
✓ = Risk present		X = Risk not present

BREACH (FLOOD DEFENCE FAILURE) FLOOD RISK		
CLASSIFICATION	ASSESSED RISK	DEFINITION
MEDIUM	X	Medium risk means that the site is within the area predicted to be at risk of a breach in the flood defences.
VERY LOW	✓	Very low risk means that the site is not within the area predicted to be at risk of a breach in the flood defences.
NO DATA	X	No breach model data is available for this area.
✓ = Risk present		X = Risk not present

2. Introduction

- 2.1 Ambiental have been appointed by BeFirst London to undertake a Stage 1 Flood Risk Due Diligence Study to advise on the flood risks for the site at Keir Hardie Way, London Borough of Barking and Dagenham, IG11 9NU.
- 2.2 It is understood that this review is to support a portfolio review of existing sites with a view to potentially redeveloping these sites.

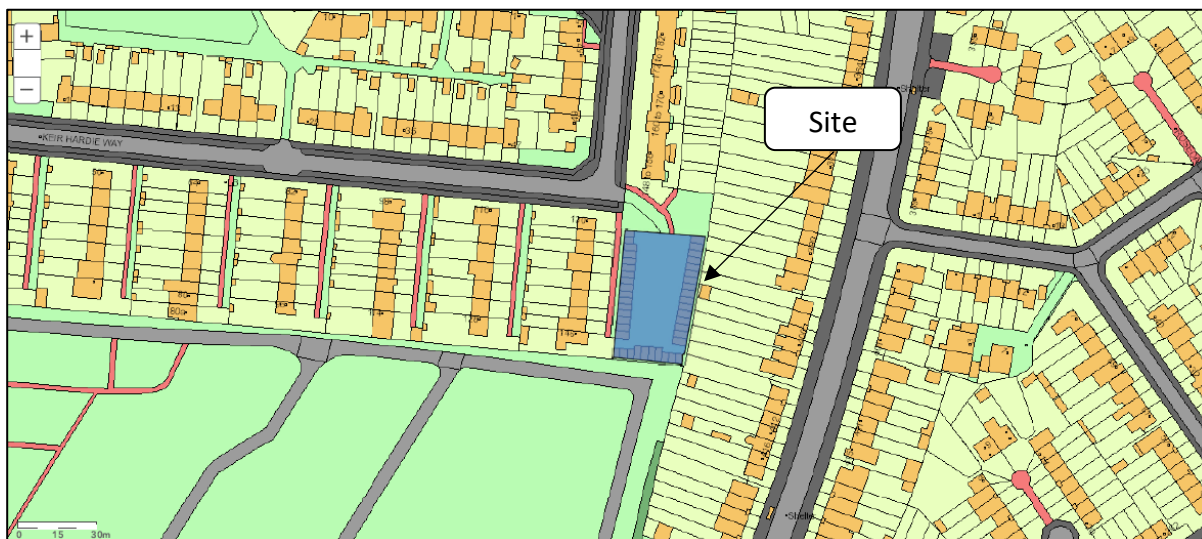


Figure 1: Site Location Map (Source: OS)

- 2.3 This Technical Note will cover the following:
- Flood Hazards
 - Analysis of EA Flood Risk Map for Planning (fluvial/ tidal)
 - Analysis of EA Risk of Flooding from Surface Water (RoFSW) dataset
 - Analysis of BGS Groundwater Data
 - Analysis of EA Reservoir Flood Risk
 - Review of EA Historic Flood Extents Mapping
 - Review of the Strategic Flood Risk Assessment / Surface Water Management Plan.
 - Recommendations to mitigate the risk
- 2.4 This report has been written based on third party data that was available at the time of writing. The data has not been validated and has been relied upon as supplied.

3. Flood Hazards

Fluvial/ Tidal

- 3.1 The EA Flood Map for Planning indicates that the site is located in Flood Zone 1. Flood Zone 1 has a low probability of less than 1 in 1000 (0.1%) of river or tidal flooding in any year.
- 3.2 The proposed development site is located in an area considered to be at Very Low risk of flooding from the rivers or sea (Figure 2). **Very low risk** means that each year this area has a chance of flooding of less than 0.1%. This takes into account the effect of any flood defences in the area.
- 3.3 The nearest areas of Medium and High risk are located approximately 270m north of the site.
- 3.4 As such, the risk of flooding from fluvial and tidal sources could be considered **very low**.

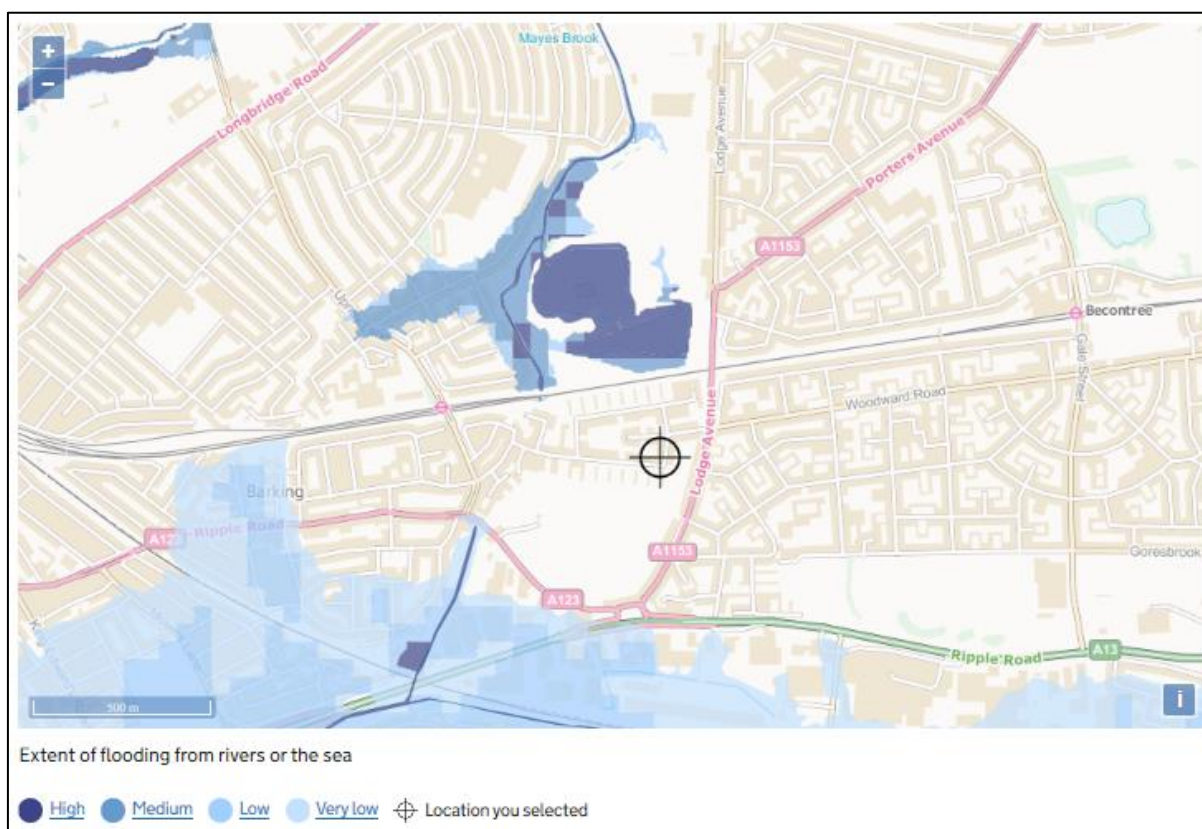


Figure 2: Risk of Flooding from Rivers or Sea (Sources: EA, OS)

Tidal Defence Breach

- 3.5 The site is located approximately 1.5km north east of the EA's modelled 1:1000 year (2115) tidal breach extent on the River Thames downriver of the Thames Barrier (Figure 3). As such, the risk of flooding following defence breach could be considered **very low**.

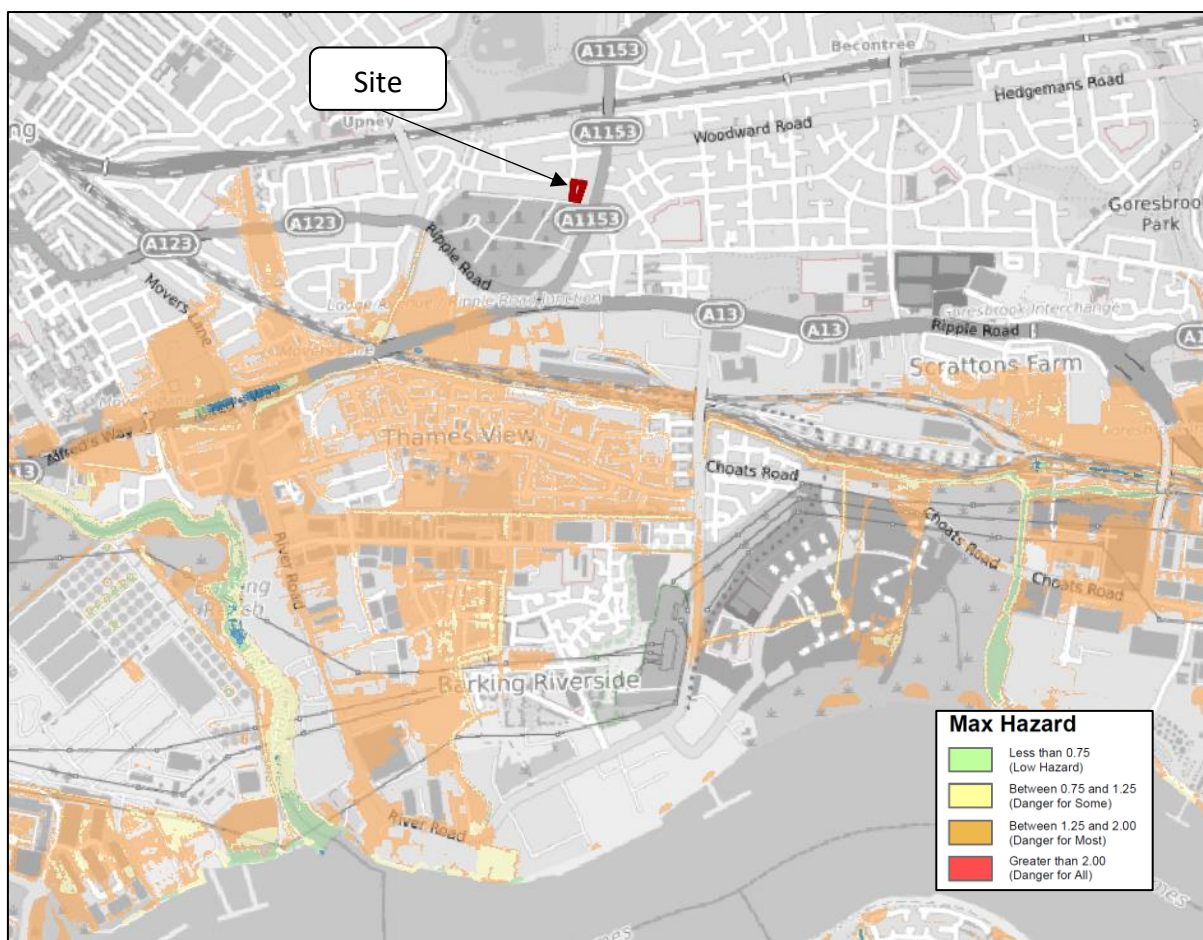


Figure 3: EA Modelled 1:1000 year (2115) Downriver Breach Extent shown as orange shading (Sources: EA, OS)

Pluvial (Surface Water)

- 3.6 The EA's Risk of Flooding from Surface Water (RoFSW) dataset indicates that the site itself may remain unaffected in the 1:30 year and 1:100 year events, but may be affected in the 1:1000 year event (Figures 4, 5 and 6, respectively).

Annual Exceedance Probability	Onsite Flood Depth	Road Network Flood Depth	Access / Egress Potential
3.33% (1:30)	None	Up to 0.15m	Safe access/ egress possible
1.00% (1:100)	None	0.15m to 0.3m	Safe access/ egress possible
0.1% (1:1000)	Up to 0.15m	0.15m to 0.3m	Safe access/ egress possible

- 3.7 In the 1:30 year and 1:100 year event, the site would remain unaffected. However, there is a risk of flooding further along Keir Hardie Way (close to Stratford Close) in the 1:30, 1:100 and 1:1000 year events, which may impact safe access/egress.

- 3.8 The site is unaffected in the 1:30 year pluvial event (figure 4). Furthermore, flood depths on Keir Hardie Way and Meadow Road are expected to be less than 150mm, and therefore safe access/egress will not be affected.

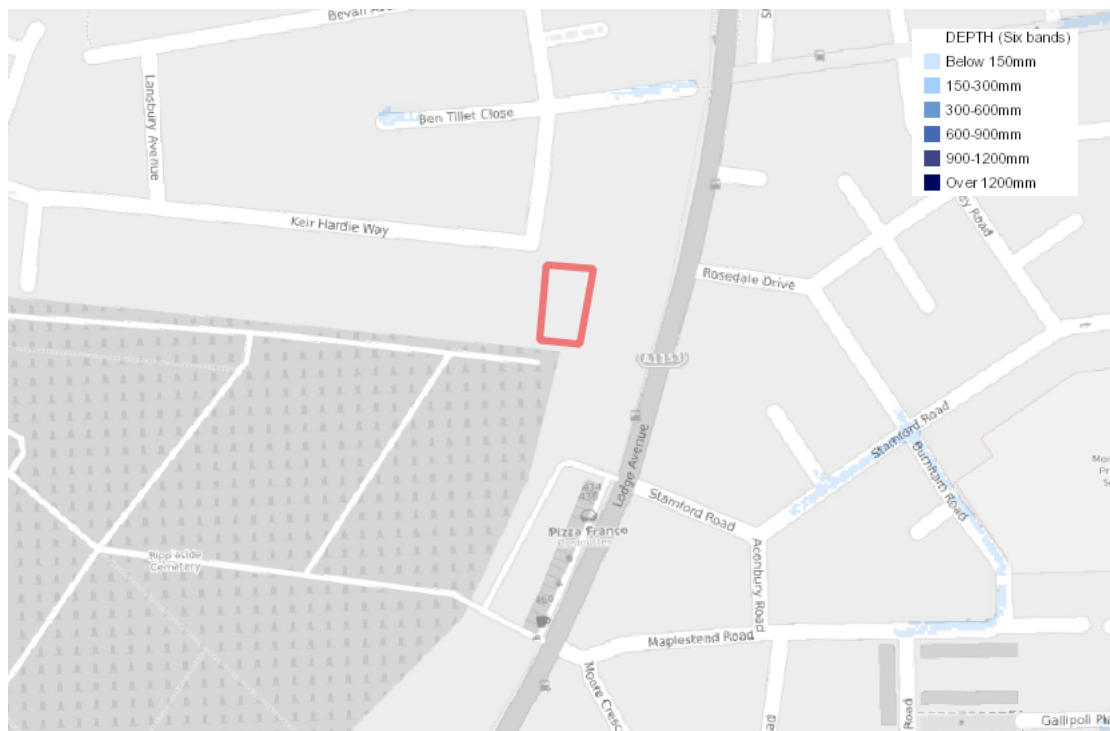


Figure 4: 1:30 year pluvial flood depths (Sources: EA RoFSW, OS, BeFirst London)

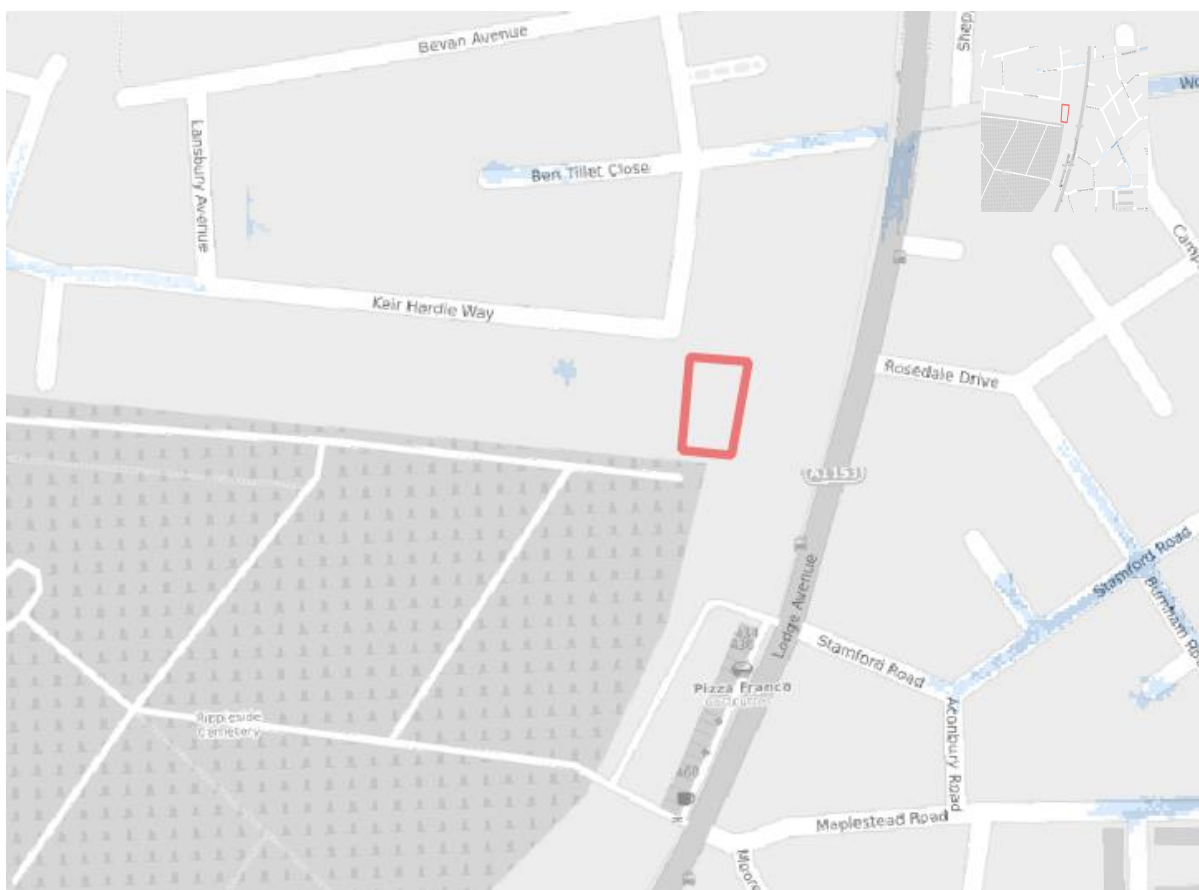


Figure 5: 1:100 year pluvial flood depths (Sources: EA RoFSW, OS, BeFirst London)

- 3.9 The site is unaffected in the 1:100 year pluvial event (figure 5). Flood depths on Keir Hardie Way and Meadow Road are expected to be between 300mm and 600mm in some areas, which may impact safe access/egress.
- 3.10 In the 1:1000 year event, the site would be affected with flood depths of between 300mm and 600mm (Figure 6). In addition, flooding on Keir Hardie Way and Meadow road is expected to be between 300mm and 600mm in some areas, which may impact safe access/egress.
- 3.11 In the 1:1000 year event, the majority of the affected area on site would have a hazard rating of less than 0.75 (Low Hazard) with a small amount of the site with a hazard rating of 0.75 to 1.25 (Medium Hazard). The access route along Keir Hardie Way onto Meadow Close, has a hazard of 1.25 to 2.00 (High hazard) which may prevent safe access/ egress.

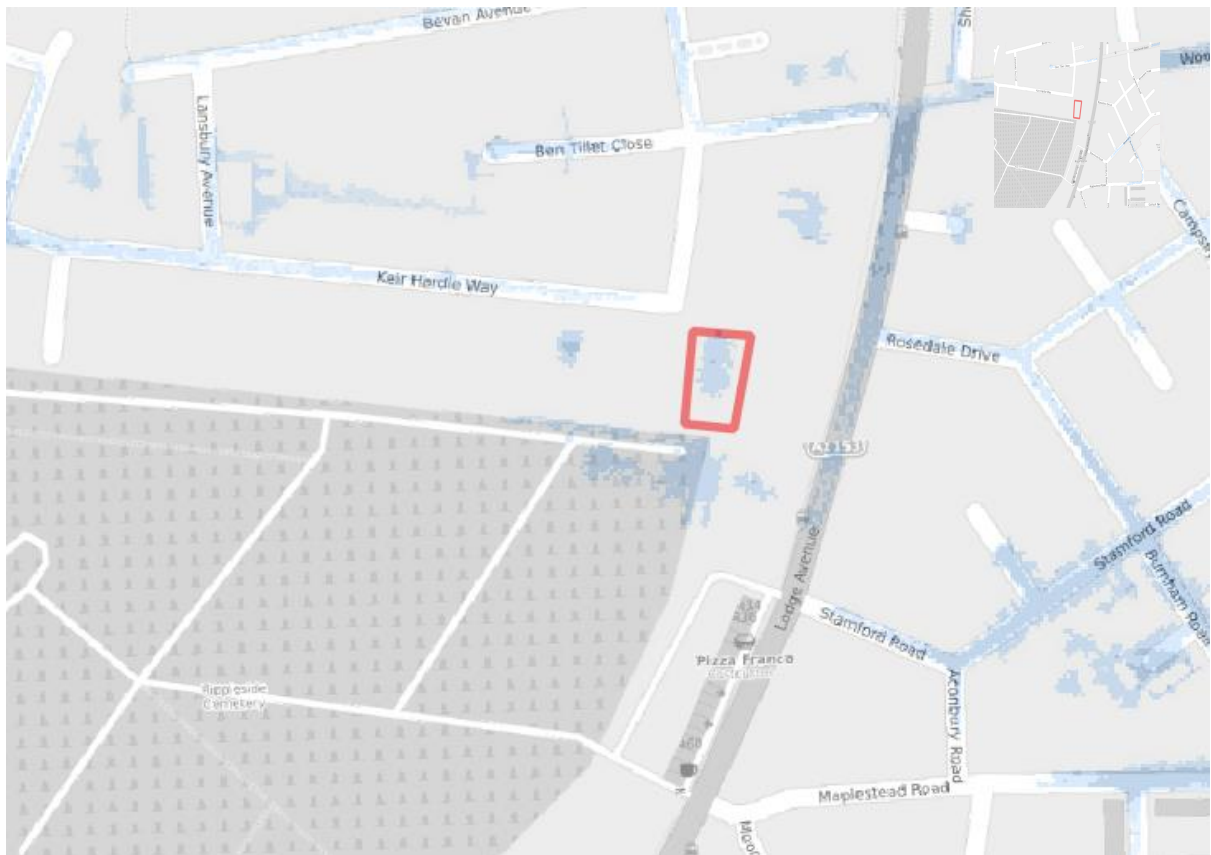


Figure 6: 1:1000 year pluvial flood depths (Sources: EA RoFSW, OS, BeFirst London)

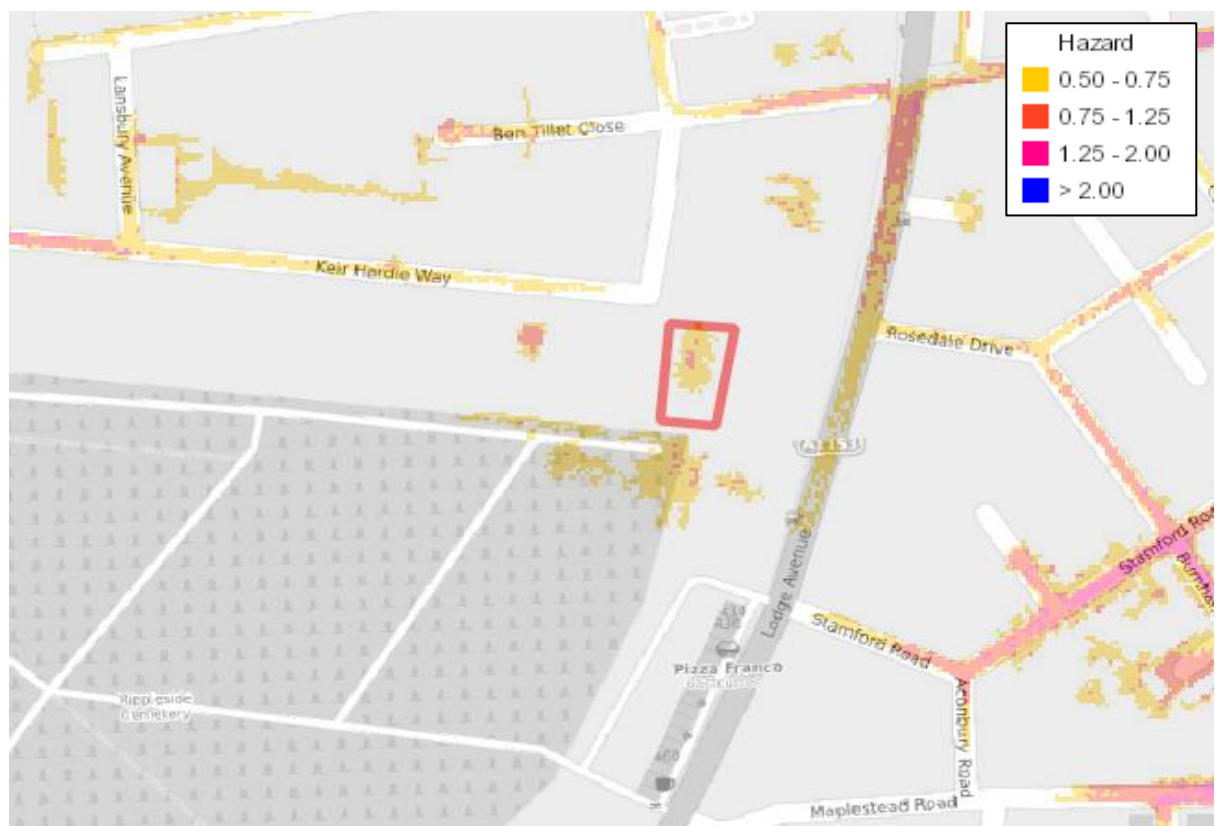


Figure 7: 1:1000 year pluvial flood hazards (Sources: EA RoFSW, OS, BeFirst London)

3.12 As such, the risk of flooding from pluvial sources could be considered **low**.

Groundwater

3.13 The British Geological Survey (BGS) Groundwater Susceptibility dataset indicates that the site is located within an area considered to have potential for groundwater flooding of property below ground level and at the surface (Figure 8).

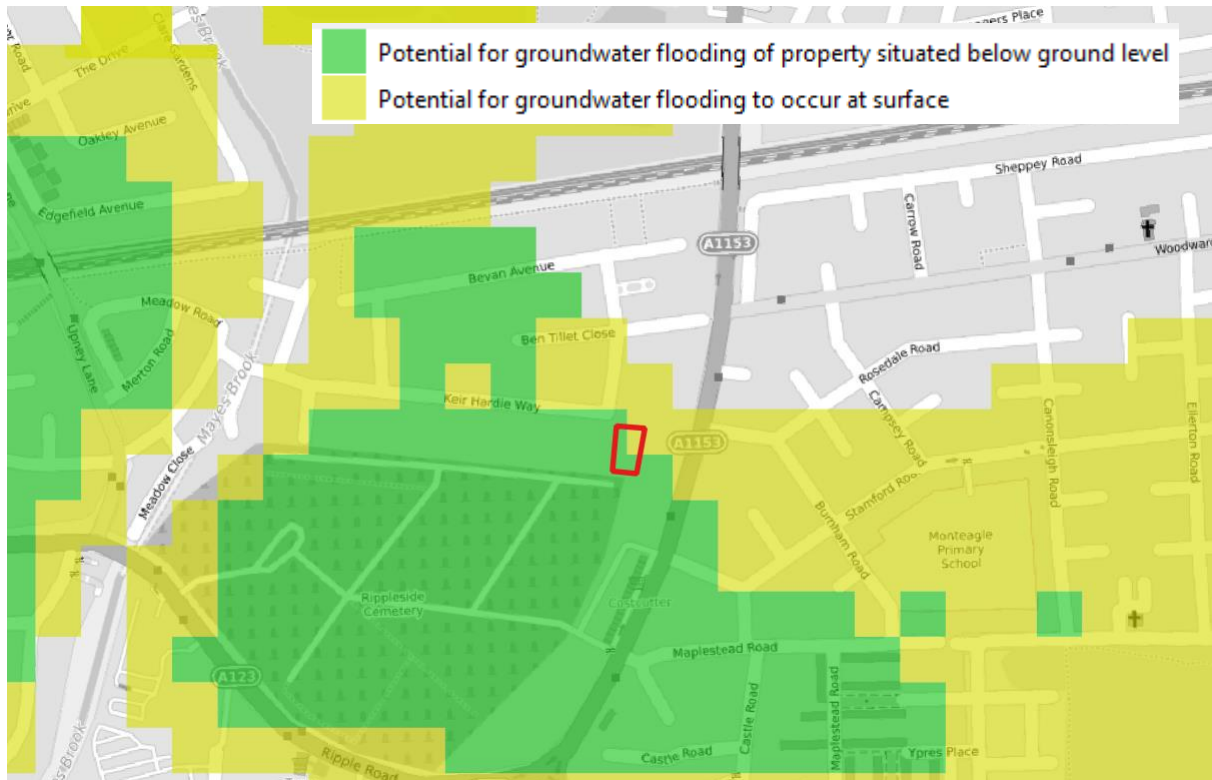


Figure 8: Groundwater Susceptibility (Sources: BGS, OS)

3.14 The BGS Geology of Britain Viewer indicates that the bedrock geology below the site is the London Clay Formation, comprised of clay, silt and sand; and the superficial deposits over this are the Taplow Gravel Member comprised of sand and gravel.

3.15 BGS borehole record TQ48SE490 is located approximately 400m north of the site. This borehole record indicates a 5m layer of flood plain gravels, underlain by the London Clay Formation to a depth of 38m. The borehole log does not indicate that groundwater was struck within this borehole.

3.16 The London Borough of Barking and Dagenham SFRA (2008) states:

“Where the borough of Barking & Dagenham overlays London Clay the risk of groundwater flooding will typically be low. However, where alluvial drift deposits, such as gravels, sit over the impermeable clay geology [such as at this site] a perched water table can occur. This can lead to minor groundwater flooding.”

3.17 However, the SFRA further notes that no observed incidents of groundwater flooding were available for the report.

3.18 As such, no records could be found to indicate historic groundwater flooding at or in the immediate vicinity of the site.

3.19 As such, the risk of flooding from groundwater could be considered **relatively low to moderate**.

- ## Reservoirs

- 3.21 The EA Risk of Flooding from Reservoirs Map indicates that the site is located outside the maximum modelled flood extent following reservoir failure (Figure 9).
- 3.22 As such, the risk of flooding following reservoir failure could be considered **very low**.



Sewers

- 3.23 Appendix J of the London Borough of Barking and Dagenham SFRA (2008) indicates that the IG11 postcode area, within which the site is located, had not experienced any incidents of sewer flooding in the 10 years prior to 2008 (Figure 10). The risk of flooding from sewers can be considered **low**.

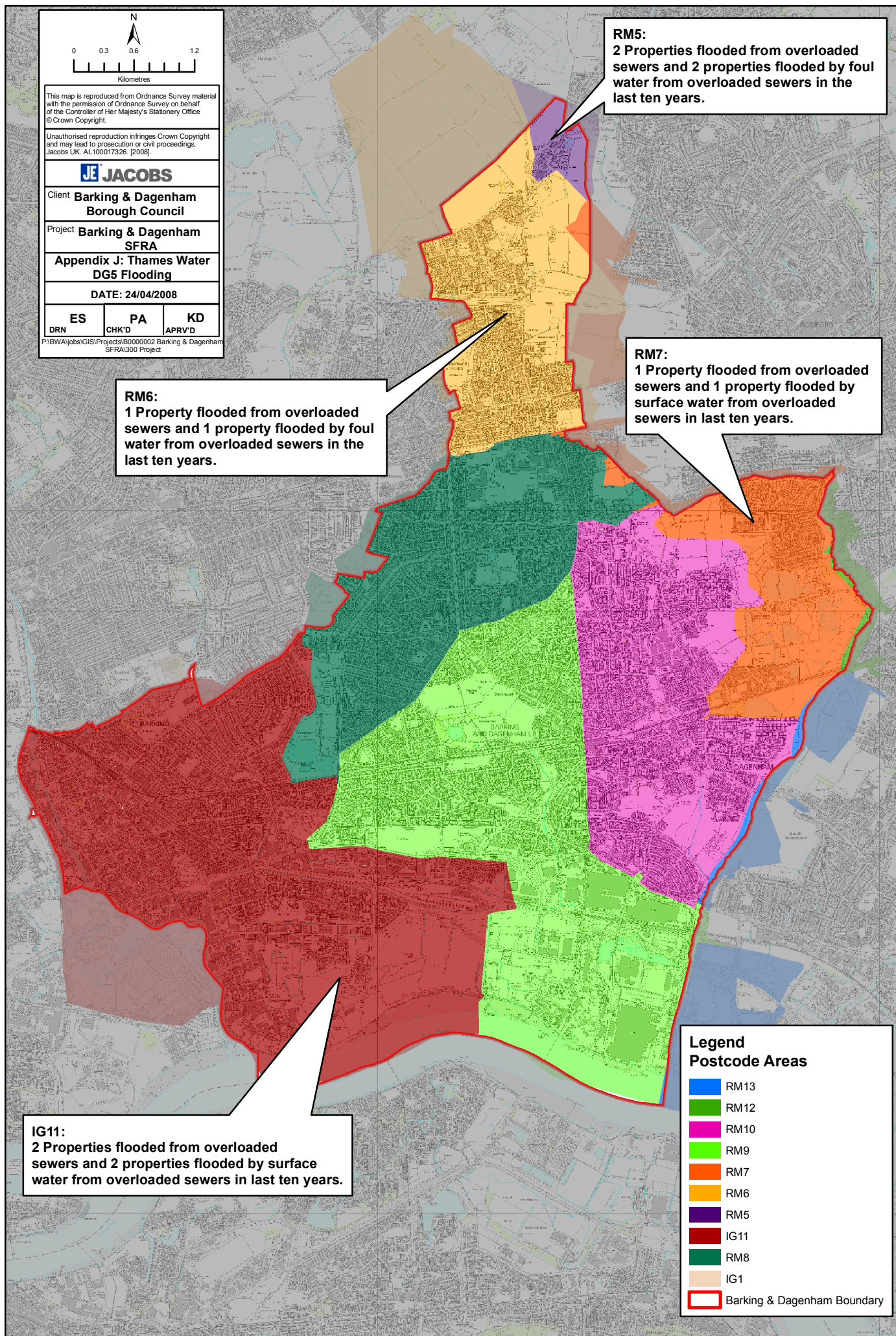


Figure 10: Thames Water DG5 flooding (Source: SFRA based on DG5 register)

Historical Flooding/ SFRA

- 3.24 Appendix M of the London Borough of Barking and Dagenham SFRA (2008) indicates that the site is located outside the recorded flood outlines from all historical fluvial/ tidal events provided by the EA since 1707 (Figure 11). The site is located approximately 1km south west of the maximum extent of the 1928 flood extent.
- 3.25 No records could be found to indicate flooding from any source at the site. However, it should be noted that sources are not exhaustive, and this does not necessarily mean that the site has not flooded in the past and will not flood in the future.

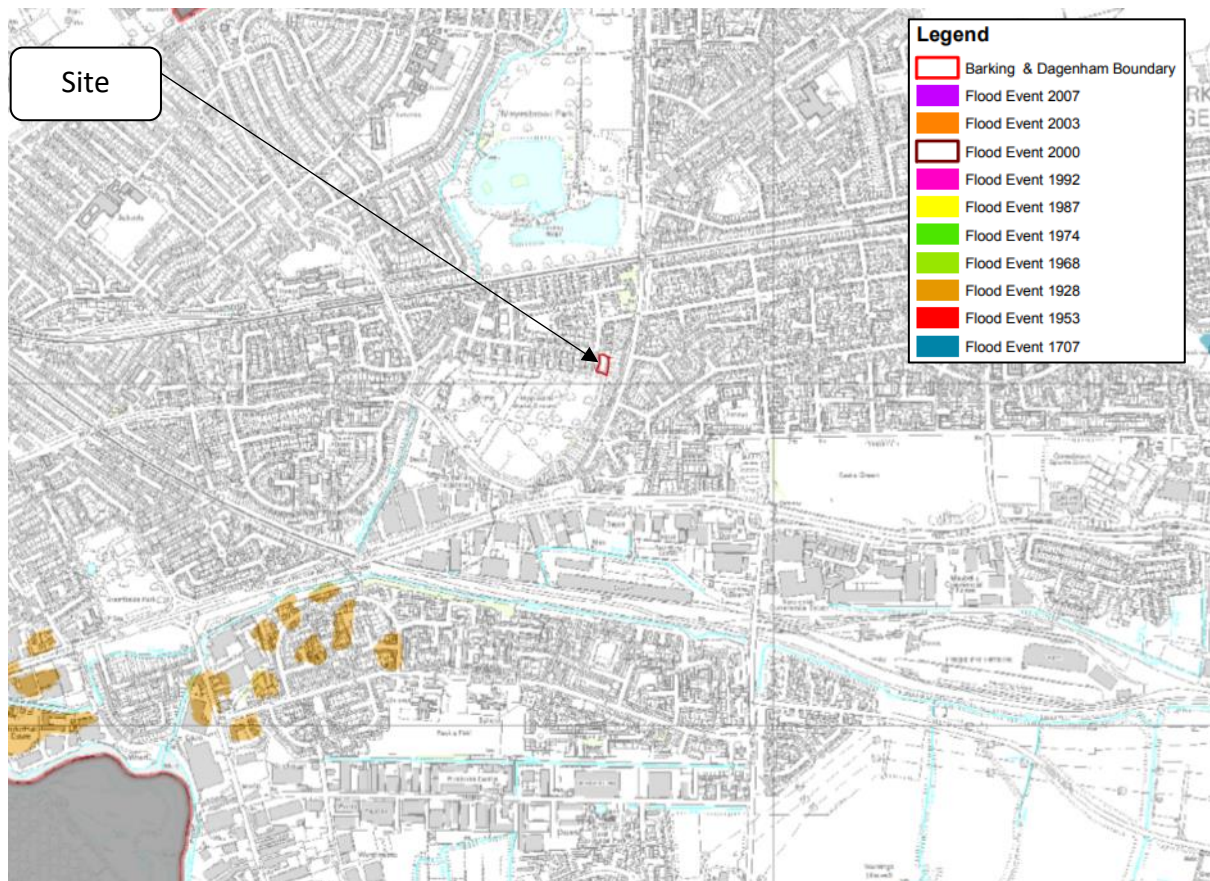


Figure 11: Historical Flooding Events (Source: SFRA, 2008)

4. Flood Mitigation Measures

- 4.1 The data reviewed as part of this due diligence Technical Note has indicated that the risk of flooding from the sources identified could be considered **low**, except for groundwater flooding which could be considered **relatively low to moderate**.
- 4.2 If the site is to be redeveloped, the planning application may not need to be accompanied by a Flood Risk Assessment due to being in an area of low flood risk. However, if the development was for more than 10 residential dwellings it would be classified as a major development and would then need to be accompanied by a Flood Risk Assessment. However as the site is located in Flood Zone 1 it may not need a Sequential Test.
- 4.3 It is recommended that any below ground construction is of flood proof design/ tanked to negate ingress of groundwater.
- 4.4 Given the distance between the site and the nearest watercourse (more than 16m) a Flood Risk Activity Permit (FRAP) and Ordinary Watercourse Consent (OWC) wouldn't be required.
- 4.5 In addition, it is recommended that Sustainable Drainage Systems (SuDS) are used to manage runoff from any development on site in accordance with Policy 5.13 of the Adopted London Plan (2016) which states:
"A development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible"
- 4.6 As such, if the site is to be redeveloped, once development proposals are finalised it is recommended that a Surface Water Drainage Strategy (SWDS) is produced to demonstrate compliance with Policy 5.13 of the Adopted London Plan (2016). Liaison with Thames Water would be required for any proposed connection to a public sewer.
- 4.7 A checklist/ summary is provided below for the client's ease.

Item	Required for Planning if Site Redeveloped
Site-Specific Flood Risk Assessment	X (assuming development is a minor development)
Sequential Test	X
Surface Water Drainage Strategy	✓
Thames Water Approval (for drainage connections)	✓
Flood Risk Activity Permit	X
Ordinary Watercourse Consent	X

5. Conclusions

- 5.1 The data reviewed as part of this due diligence Technical Note has indicated that the risk of flooding from the sources identified could be considered **low**, except for groundwater flooding which could be considered **relatively low to moderate**.
- 5.2 Should the site be re-developed, it is recommended that any below ground construction is of flood proof design/ tanked to negate ingress of groundwater.
- 5.3 Furthermore, a SWDS should be produced should the site be redeveloped to demonstrate compliance with Policy 5.13 of the Adopted London Plan (2016).
- 5.4 Liaison with Thames water will also be required for any proposed connection to a public sewer.