BUROHAPPOLD ENGINEERING

TFL Landholdings at Northwood

Flood Risk Assessment

034233

27 October 2015

Revision 00

Revision	Description	Issued by	Date	Checked
00	Issue for Planning	EAF	27/10/2015	DKP

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date	**27/10/2015**
approved	**David Palmer**
signature	
date	**27/10/2015**

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Contents

Glossary

Term	Definition
EA	Environment Agency
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework (March 2012)
SFRA	Strategic Flood Risk Assessment
SUDS	Sustainable Urban Drainage System

1 Introduction

1.1 Background

This Flood Risk Assessment (FRA) has been prepared on behalf of Transport for London (TfL) for the proposed development, at TfL Landholdings at Northwood, London, HA6 2QB ('the proposed development').

1.2 Site Description

The site is 1.91 ha in area and located on the junction of Green Lane (B469) and Eastbury Road within the London Borough of Hillingdon (LBH). It comprises land north and south of Green Lane including part of the highway. The area of land north of Green Lane comprises a parade of single storey retail units located over the railway bridge with a two storey adjoining unit on the corner of Eastbury Road. The northern part of the site is bounded by the Eastbury Surgery to the north; Green Lane to the south; Eastbury Road to the east and the retail units on the bridge to the west.

The majority of the site lies south of Green Lane, in Northwood and comprises the existing London Underground (LU) station and a mix of A-Class uses, residential flats, a light industrial use, dental practice and area of surface car parking. The southern part of the site is bounded by Green Lane to the north; the London Underground compound to the south; the railway line to the east; and the rear boundaries of the Northwood Central Club, St John's United Reformed Church and residential properties fronting Hallowell Road to the west.

Figure 5—1 of Appendix A illustrates the proposed site plan of the development.

1.3 Proposed Development

Comprehensive redevelopment of the site is proposed involving demolition of existing buildings to provide 93 residential units (C3) and associated car parking, 1,440 sq.m of new retail (A1-A5), a new operational railway station (Sui Generis) with step free access and associated station car parking; new bus interchange, and a new piazza. Outline planning consent for up to 34 residential units, car parking (all matters reserved apart from access) and refurbishment works to existing retail units along Station Approach.

The proposed development will consist of the following land uses:

- new station ticket hall;
- residential units;
- A1-A5 retail space; and
- car parking spaces.

Figure 5—2 of Appendix A illustrates the land use layout of the proposed development.

2 Flood Risk Assessment Overview

2.1 Overview

This FRA has been prepared in accordance with the policies and guidelines applicable to proposed development, outlined within the following publications:

- National Planning Policy Framework (March 2012);
- London Borough of Hillingdon Strategic Flood Risk Assessment (November 2008);
- London Borough of Hillingdon Preliminary Flood Risk Assessment (May 2011); and
- The London Plan (March 2015).

2.2 National Planning Policy Framework

2.2.1 Flood Zone Assessment

The National Planning Policy Framework[1] (NPPF) aims to avoid development in areas at the highest risk of flooding. This is achieved through the use of the Sequential Test, which steers development of particular land use categories towards areas with the lowest flood probability.

The Technical Guidance to the NPPF contains a series of tables that identify the risk of flooding to a development. For reference these tables are set out in Appendix B to Appendix D. Table 1 of Appendix B defines the four Flood Zones by flood risk, provides the land use classification and specifies the requirements of a FRA within each zone. Table 2 of Appendix C identifies specific land use typologies to each flood risk vulnerability classification, for example, hospitals are classified as a more vulnerable use.

For each Flood Zone and flood risk vulnerability classification, Table 3 of Appendix D identifies where development is appropriate and whether the Exception Test is required. Where the Exception Test is required, development may be permitted if it can be demonstrated that the development provides wider sustainability benefits that outweigh flood risk without increasing the risk of flooding elsewhere.

Consulting the NPPF the uses of the proposed development stated in Section 1.3 have a vulnerability classification are assessed as follows:

- new station ticket hall: *essential Infrastructure;*
- residential units: *more vulnerable*;
- retail: *less vulnerable*; and
- basement carparking facilities: *less vulnerable*.

The site is located within Flood Zone 1 and as a result, the above uses are appropriate for development.

2.2.2 Sequential & Exception Test

As the site is located in Flood Zone 1 (as per the EA flood maps[2]), the Sequential Test is satisfied for development.

[1] Department for Communities and Local Government, March 2012; '*National Planning Policy Framework*'
[2] Environment Agency, October 2015; Flood Map for Planning (Rivers and Sea)

As per Table 3 of Appendix D, the uses of the proposed development are appropriate for development within Flood Zone 1 and therefore do not require an exception test to be satisfied, as per Section 10 paragraph 102 of the NPPG[3].

2.2.3 Climate Change

Allowances for the predicted effects of climate change must be taken into account when preparing site-specific FRA's. Table 5 of the Technical Guidance to the NPPF contains sensitivity ranges that are recommended to be applied to peak rainfall intensities, peak river flows, offshore wind speeds and wave heights (given in Table 2-1). The general trend is for each parameter to increase in the future, which in turn increases the risk of flooding to any site.

Table 2-1 Table 5 of the Technical Guidance to the NPPF[4]

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+ 5%	+ 10%	+ 20%	+ 30%
Peak river flow	+ 10%	+ 20%		
Offshore wind speed	+ 5%		+ 10%	
Extreme wave height	+ 5%		+ 10%	

2.3 London Borough of Hillingdon Strategic Flood Risk Assessment

Local authorities are required to carry out a Strategic Flood Risk Assessment (SFRA), which is to be used by developers as guidance on the authority's approach to avoiding, reducing and managing flood risk.

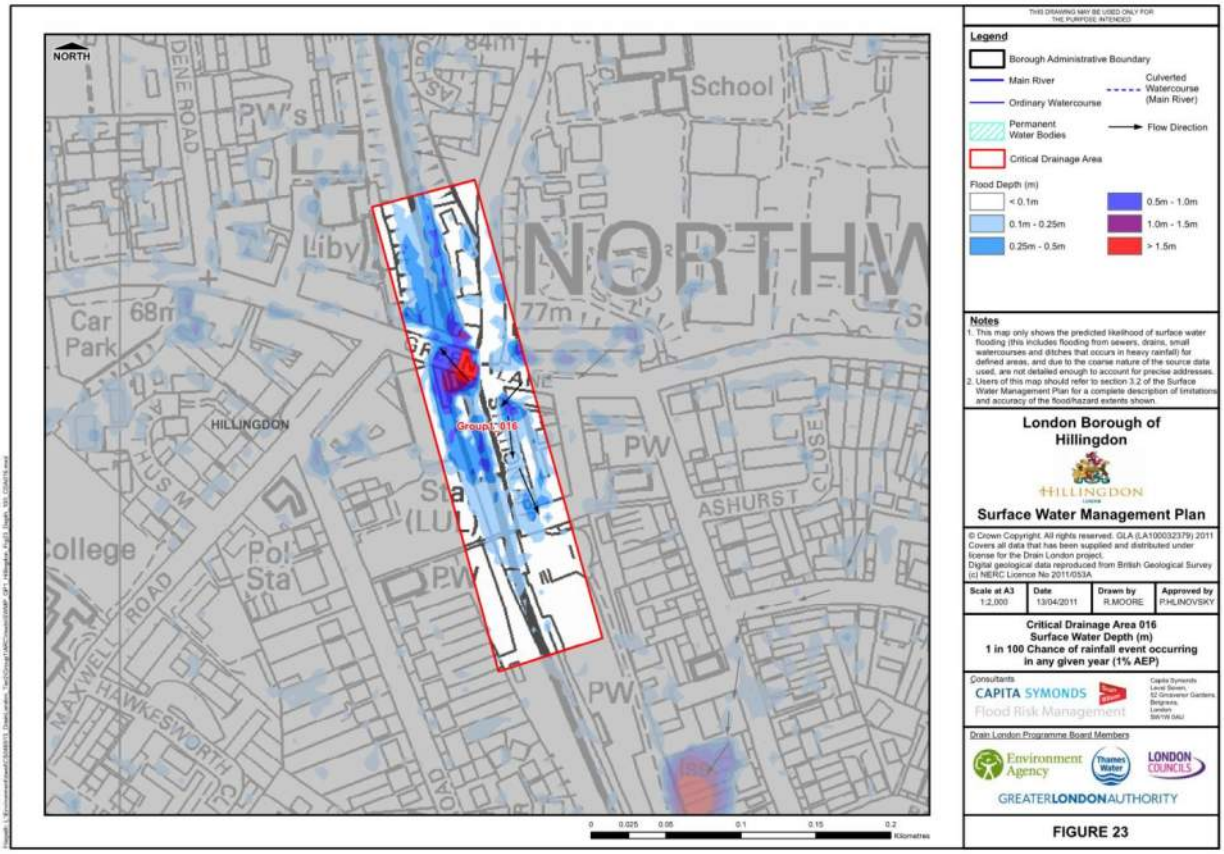
The LBH SFRA[5] has identified the most likely sources of flooding in the borough as:

- fluvial flooding;
- sewer flooding;
- overland flow;
- groundwater flooding; and
- artificial sources.

The LBH has produced a 'Surface Water Management Plan' that highlights critical drainage areas within the borough. The site is located within critical drainage area 016, illustrated in Figure 2—1.

[3] Department for Communities and Local Government, April 2015; '*National Planning Practice Guidance*'
[4] Department for Communities and Local Government, March 2012; '*National Planning Policy Framework*'
[5] London Borough of Hillingdon, November 2008; 'Strategic Flood Risk Assessment'

Figure 2—1: Surface water depth map of Critical Drainage Area 016[6]



It is noted that the area shown to have flood depths above 1.5 m in Figure 2—1 (shown as red) is located at track level and will not be exacerbated by the proposed development. This is discussed further in Section 4.1 of the Drainage Strategy.

Station Approach is shown to be at risk of surface water flooding.

2.4 The London Plan

The London Plan[7] sets out the overall development strategy for London over the next 20 to 25 years, consisting of an integrated economic, environmental, transport and social framework. It contains policies specific to flood risk management and the use of sustainable drainage.

The flood risk management policy (5.12) reiterates that set out in the NPPF.

[6] London Borough of Hillingdon, April 2011, Surface Water Management Plan Maps
[7] Greater London Authority, March 2015; '*The London Plan: Spatial Development Strategy for Greater London*'

The sustainable drainage policy (5.13) states that unless there are practical reasons for not doing so, development should utilise sustainable urban drainage systems (SUDS). Such development should aim to achieve greenfield run-off rates in line with a drainage hierarchy that puts infiltration and the storage of water for later use as the most preferential mechanisms and discharge to combined sewers as the least preferential mechanism of discharge.

3 Appraisal of Flood Risk

3.1 Overview

This section describes an assessment of flooding from each of the flood sources identified in Section 3.3 against the proposed development.

3.2 National Planning Policy Framework

The Flood Zone map produced by the Environment Agency (EA) shows that the proposed development lies within Flood Zone 1. By definition, the risk of flooding from rivers or the sea in Zone 1 is classified as low. In line with EA guidance, the focus of this FRA will therefore be on the management of surface water run-off and the risk of flooding from other sources.

3.3 Flood Risk to Proposed Development

3.3.1 Fluvial Flooding

Baseline

The site is in Flood Zone 1, where there is less than a 1 in 1,000 annual probability of river or sea flooding affecting the site (<0.1%).

Figure 5—3 and Figure 5—4 of Appendix E illustrates that the site (outlined in red) is not within an area identified at risk of significant fluvial flooding and is not located in an area that has been affected by historical flood events.

Proposed

The proposed development is within Flood Zone 1, which has a low risk (< 0.1% probability) of flooding from rivers. Additional measures to reduce the risk of fluvial flooding are not considered to be necessary, as the proposed development:

- will not increase the risk of fluvial flooding of the site;
- is located in the lowest category of flood risk defined by the EA and the NPPF; and
- is not shown to be affected by historical flood events.

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3.3.2 Surface Water Flooding

Baseline

Surface water flooding occurs when intense rainfall is unable to naturally soak into the ground due to impermeable ground covering such as concrete or tarmac. There is a 300 mm dia. surface water sewer which runs north to south on the western side of Station Approach. Thus sewer runs parallel with the railway until the car park entrance where it turns through 135 degrees across the northern part of the car park then southwards along the western boundary of the properties on Hallowell Road. The sewer discharges into an open ditch and then into a culvert, which crosses at a right angle under the railway and emerges as an open watercourse which runs in a south westerly direction along the rear gardens of properties in North Brook Drive.

The site lies within a critical drainage area as defined by LBH (Group1_016). This means that it is likely that surface water flooding could occur due to the existing surface water drainage system being unable to cope with an estimated 1 in 100 AEP rainfall event.

During a rainfall event, surface water from external catchments unable to enter the drainage system flows south along Eastbury Road to the junction with Green Lane (see the Drainage Strategy for more details). Some of the surface water flows west-wards along Green Lane, however, there remains a proportion which will flow south along Station Approach into the existing car park and most likely some will flow onto the railway track.

Surface water flooding is considered to be the principal existing source of flood risk to the site.

Proposed

The Drainage Strategy outlines the proposed strategy for managing the proposed development's surface water runoff and foul drainage.

The London Plan requires the design of surface water runoff management to be carried out following a sustainable drainage hierarchy. A preliminary assessment of the site has considered this hierarchy and concluded that:

- the use of infiltration for the management of surface water runoff is not appropriate due to the expected impermeable nature of the underlying soils e.g. London Clay;
- the configuration of the development does not support the use of ponds or swales on site; and
- the most appropriate mitigation for surface water runoff from on-site sources is to store surface water runoff in tanks and discharge the attenuated runoff into the local sewers at a controlled rate of three times the greenfield runoff rate in accordance with the London Plan.

Preliminary design calculations for on-site drainage have established the volume of rainfall that will be stored on site (via underground tanks) following a 1 in 100 year rainfall event including an allowance made for climate change. The runoff from the site will be reduced to three times the green field runoff rates in accordance with the London Plan. For further details of the calculations and proposed drainage design please refer to the Drainage Strategy.

Surface water runoff from off-site catchments that would currently flow down Station Approach will be intercepted by a new kerb laid on the southern side of Green Lane. The collected runoff will be directed to a new surface water sewer located along Central Way. At the southern end of the new surface water sewer, 'oversized pipes' will be introduced to attenuate the runoff to the same level that would have been experienced from the site in its current state for events up to and including the 1 in 100 year event with an allowance for climate change. The flow that enters the culvert /ditch system to the south of the development will not exceed the existing rate of run off, therefore, the flood risk to areas downstream of the site is considered to be unaffected.

Based on the above strategy the risk of surface water flooding to the site is considered to be low. Given that the runoff from the site will be reduced to three times the greenfield runoff rate and that offsite surface water runoff will be diverted and stored ('oversized pipes') prior to release, the risk of surface water flooding will not increase as a result of the development both on-site and off-site for events up to and including the 1 in 100 year event with an allowance for climate change.

3.3.3 Flooding From Sewers

Baseline

There are two foul sewers which are within the development area. The first is a 225 mm dia. pipe located in Station Approach which runs from north to south before turning a right angle at the existing car park entrance. It then runs westwards under the railway line and connects with the foul sewer in Murray Road. The second sewer is a 375 mm dia. pipe laid in Central Way and runs southwards from Green Lane along the eastern boundary of the station car park towards Highfield Road.

The majority of sewers within the LBH have been built to guidelines set out within the 'sewers for adoption[8]'. As a minimum these sewers are designed to convey storm events up to and including the 1 in 30 year event[9]. It is likely that these systems will surcharge during storm events larger than a 1 in 30 year (3.33 % annual exceedance probability).

Records of historical sewer flooding are not of a comprehensive standard, however, Thames Water have indicated that within the HA6 post code in the last 10 years[10]:

- 37 properties have been flooded from overloaded sewers;
- 25 of these 37 properties were flooded by surface water from overloaded sewers; and
- 12 of these 37 properties were flooded by foul water from overloaded sewers.

Proposed

The development's foul water discharges will be collected in a separate foul drainage system and connected to the existing public foul sewers. The points of connection will be subject to agreement with the drainage undertaker Thames Water Utilities Limited. It will also be necessary for a capacity check to be carried out on the receiving sewers to establish whether any up-grading of the system downstream of the development will be required.

The risk of flooding from sewers will be decreased by reducing the demand on the combined sewer system (removing the surface water runoff from the site which will be collected in storage tanks).

3.3.4 Groundwater Flooding

Baseline

Groundwater flooding occurs when groundwater levels rise above the surrounding ground surface elevation. Figure 5—5 of Appendix E indicates the locations of recorded instances of groundwater flooding in the LBH. This figure confirms that there are no recorded instances of groundwater flooding at the site.

[8] WRc plc, 2006; 'Sewers for Adoption 6th Edition – design & construction guide for developers'
[9] London Borough of Hillingdon, November 2008; 'Strategic Flood Risk Assessment'
[10] London Borough of Hillingdon, November 2008; 'Strategic Flood Risk Assessment'

Figure 5—6 of Appendix E illustrates the geology of the LBH. The site is shown to be located in an area with geology classified as London Clay. Given the low permeability of clay the risk of rising groundwater causing flooding is expected to be low.

Proposed

The proposed development will not increase the risk of groundwater flooding to the site. The risk of groundwater flooding is still considered to be low.

3.3.5 Flooding from Artificial Sources

The LBH SFRA recommends that the residual risk of water body overtopping within a 1 km radius of any site should be assessed. The Ruislip Lido is located approximately 1.2 Km south east of the site. The EA's risk of flooding from reservoirs map confirms that the site is shown not to be affected by flooding from any reservoirs including the Ruislip Lido.

3.4 Residual risk

The principal flood risk associated with flooding (surface water flooding) has been mitigated via the interventions detailed in the Drainage Strategy. Residual risk from all other sources of flooding is considered to be negligible.

4 Summary & Conclusion

This Flood Risk Assessment has been prepared on behalf of Transport for London for the proposed development, of TfL Landholdings at Northwood, London.

The site is located on the junction of Green Lane (B469) and Eastbury Road within the London Borough of Hillingdon (LBH).

The majority of the site lies south of Green Lane, in Northwood and comprises the existing London Underground (LU) station and a mix of A-Class uses, residential flats, a light industrial use, dental practice and area of surface car parking. The southern part of the site is bounded by Green Lane to the north; the London Underground compound to the south; the railway line to the east; and the rear boundaries of the Northwood Central Club, St John's United Reformed Church and residential properties fronting Hallowell Road to the west.

Comprehensive redevelopment of the site is proposed involving demolition of existing buildings to provide 93 residential units (C3) and associated car parking, 1,440 sq.m of new retail (A1-A5), a new operational railway station (Sui Generis) with step free access and associated station car parking; new bus interchange, and a new piazza. Outline planning consent for up to 34 residential units, car parking (all matters reserved apart from access) and refurbishment works to existing retail units along Station Approach.

The proposed development is within Flood Zone 1, which has a low risk (< 0.1% probability) of flooding from rivers, as a result, the land uses from the above development are considered appropriate for development.

Surface water is considered to be the principal source of existing flood risk to the site. The risk of flooding from onsite and offsite surface water flooding has been mitigated by the interventions set out in the Drainage Strategy.

Preliminary design calculations for on-site drainage have established the volume of rainfall to be stored on site (via underground tanks) following a 1 in 100 year rainfall event with an allowance made for climate change. The runoff from the site will be reduced to three times the green field runoff rates in accordance with the London Plan.

Surface water runoff from off-site catchments that would currently flow down Station Approach will be intercepted by a new kerb laid on the southern side of Green Lane. The collected runoff will be directed to a new surface water sewer located along Central Way. At the southern end of the new surface water sewer, 'oversized pipes' will be introduced to attenuate the runoff to the same level that would have been experienced from the site in its current state for events up to and including the 1 in 100 year event with an allowance for climate change. The flow that enters the culvert /ditch system to the south of the development will not exceed the existing rate of run off , therefore, the flood risk to areas downstream of the site is considered to be unaffected.

The risk of surface water flooding will not increase as a result of the development both on site and off site for events up to and including the 1 in 100 year event with an allowance for climate change.

The risk of flooding from sewers will be decreased by reducing the demand on the combined sewer system (removing the surface water runoff from the site which will be collected in storage tanks).

The site is not expected to be at risk of flooding from groundwater or artificial sources.

The principal flood risk associated with flooding has been mitigated via surface water drainage strategy. Residual risk from all other sources of flooding is considered to be negligible.

5 References

Department for Communities and Local Government, March 2012; '*National Planning Policy Framework*'

Greater London Authority, March 2015; '*The London Plan: Spatial Development Strategy for Greater London*'

London Borough of Hillingdon, May 2011; '*Preliminary Flood Risk Assessment*'

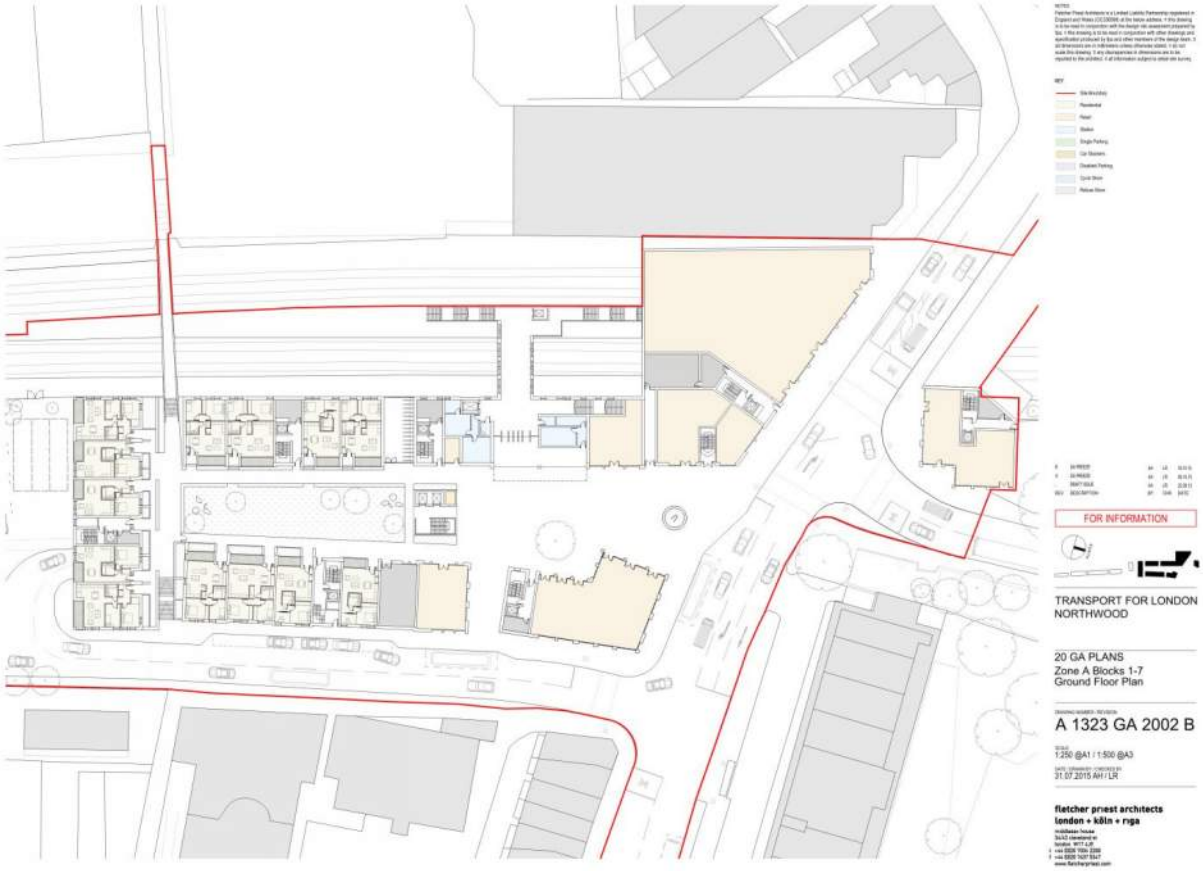
London Borough of Hillingdon, November 2008; '*Strategic Flood Risk Assessment*'

WRc plc, 2006; '*Sewers for Adoption 6th Edition- design & construction guide for developers*'

Appendix A – Site Plan of the Proposed Development

Figure 5—1: Proposed development site plan

Figure 5—2: Proposed development ground floor land use layout plan



Appendix B - NPPF Technical Guidance Table 1: Flood Zones[11]

Zone 1 - low probability

Definition

This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

Appropriate uses

All uses of land are appropriate in this zone.

Flood risk assessment requirements

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention.

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems.

Zone 2 - medium probability

Definition

This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river 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.

Appropriate uses

Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table 2, are appropriate in this zone. The highly vulnerable uses are *only* appropriate in this zone if the Exception Test is passed.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage systems.

[11] Department for Communities and Local Government, March 2012; '*National Planning Policy Framework*'

Zone 3a - high probability

Definition

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses

The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.

The more vulnerable uses and essential infrastructure should only be permitted in this zone

if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land in zones with a lower probability of flooding; and
- create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b - the functional floodplain

Definition

This zone comprises land where water *has* to flow or be stored in times of flood.

Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land with a lower probability of flooding.

Appendix C NPPF Technical Guidance Table 2: Flood risk vulnerability classification[12]

Essential infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable

- Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure").

More vulnerable

- Hospitals.
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste6.
- Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan.*

Less vulnerable

- Police, ambulance and fire stations which are *not* required to be operational during flooding.
- Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non–residential institutions not included in "more vulnerable", and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do *not* need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

[12] Department for Communities and Local Government, March 2012; '*National Planning Policy Framework*'

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, *subject to a specific warning and evacuation plan*.

Appendix D – NPPF Technical Guidance Table 3: Flood risk vulnerability and flood zone 'compatibility'[13]

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

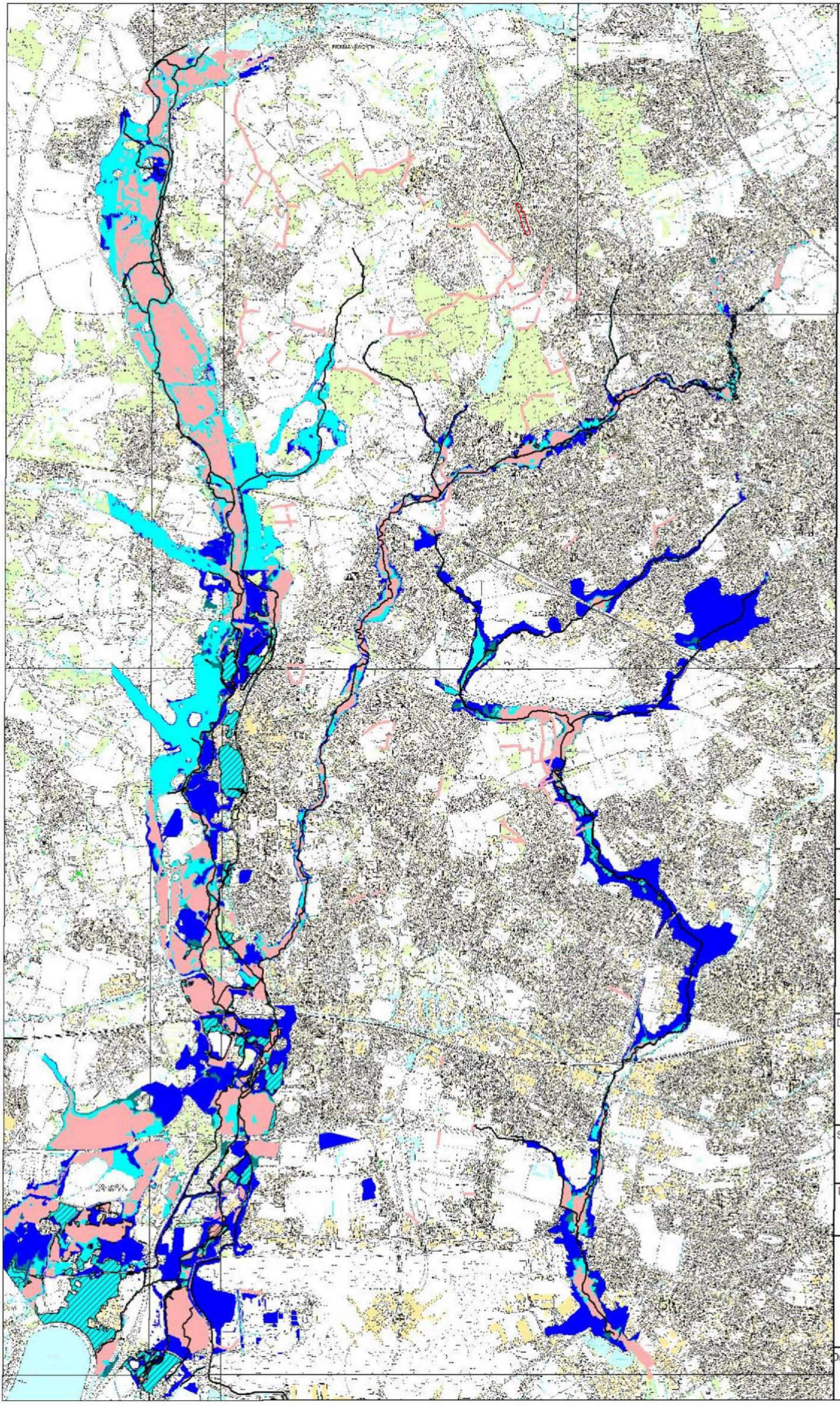
Key: ✓ Development is appropriate.
× Development should not be permitted.

[13] Department for Communities and Local Government, March 2012; '*National Planning Policy Framework*'

Appendix E Information from the Borough of Hillingdon SFRA

Figure 5—3: Fluvial Sources of Flood Risk in the LBH[14]

[14] London Borough of Hillingdon, November 2008; 'Strategic Flood Risk Assessment'



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Legend

- Flood Zone 3b
- Flood Zone 3a
- Flood Zone 3a + Climate Change
- Flood Zone 2
- Areas Benefiting from Defences
- Main River
- Site Boundary

Drawing Status

FINAL

Job Title

London Borough of Hillingdon SFRA

Drawing Title

Fluvial Sources of Flood Risk

Scale at A3

1:50000

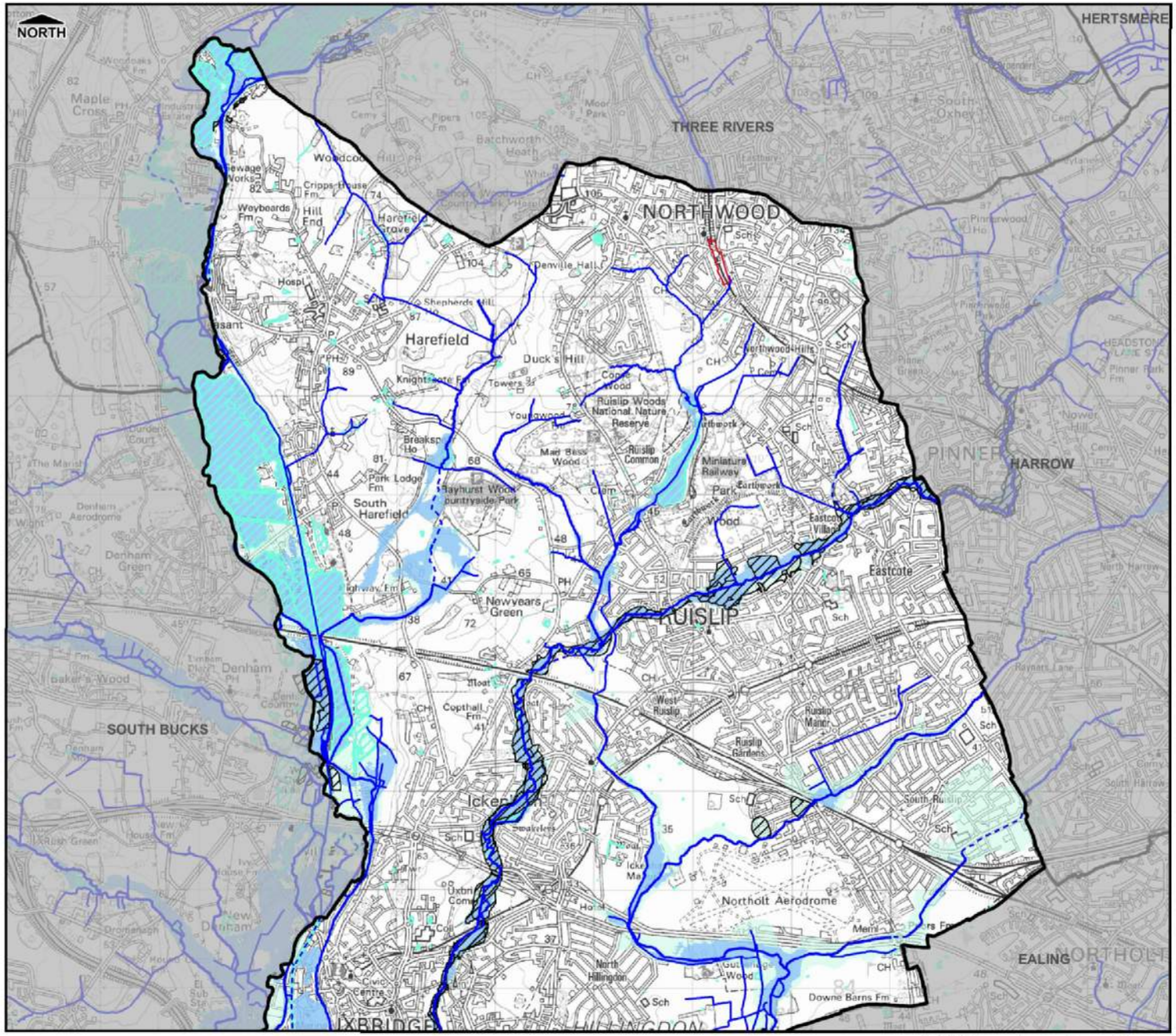
Drawn	Approved
MK	JR

Drawing Number

Figure 3

Figure 5—4: Historical Flood Events Recorded in the LBH[15]

[15] London Borough of Hillingdon, November 2008; 'Strategic Flood Risk Assessment'



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED

Legend

- Borough Administrative Boundary
- Main River
- Ordinary Watercourse
- Culverted Watercourse (Main River)
- Permanent Water Bodies
- Fluvial Flooding Incidents
- Historic Fluvial Flood Outline
- Environment Agency Flood Zone 3
- Environment Agency Flood Zone 2
- Site Boundary

Notes

1. Environment Agency Flood Zone 3: Land assessed, ignoring the presence of flood defences, as having a 1% or greater annual probability of fluvial flooding or a 0.5% or greater annual probability of tidal flooding.
2. Environment Agency Flood Zone 2: Land assessed, ignoring the presence of flood defences, as having between a 1% and 0.1% annual probability of fluvial flooding or between a 0.5% and 0.1% annual probability of tidal flooding in any year.

London Borough of Hillingdon

HILLINGDON LONDON

Preliminary Flood Risk Assessment

Scale at A3	Date	Drawn by	Approved by
1:40,000	06/04/2011	R.MOORE	P.HLINOVSKY

Summary Map of Past Floods - Main River / Fluvial / Tidal Incidents

Consultants
CAPITA SYMONDS
Flood Risk Management
Capita Symonds
Level Seven,
52 Grosvenor Gardens,
Belgravia,
London
SW1W 0AU

Drain London Programme Board Members

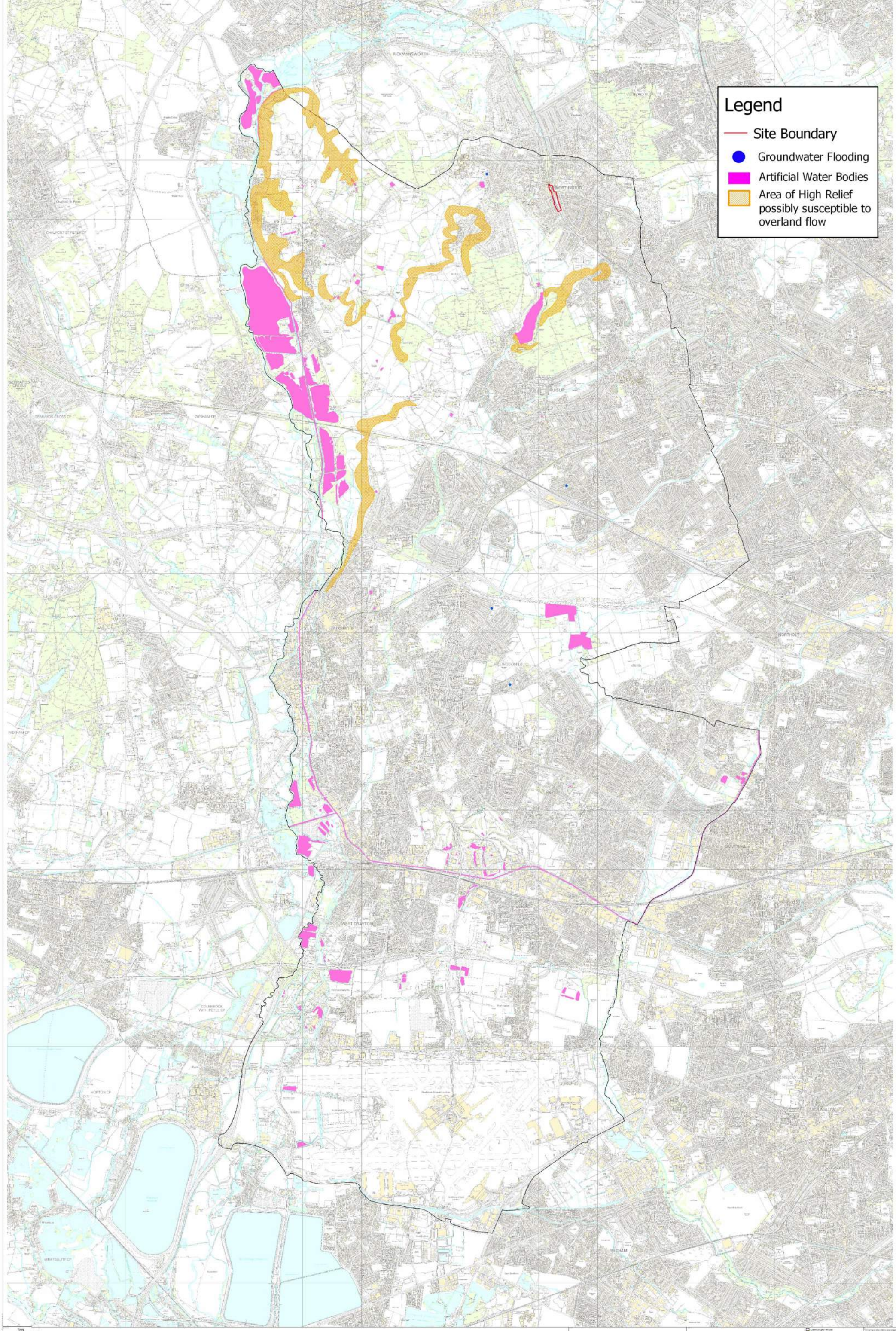
Environment Agency · Thames Water · LONDON COUNCILS · GREATERLONDONAUTHORITY

FIGURE A-2.1

Filepath: L:\Environment\towic\CS\34913_DrainLondon_Tier2\Group1\ARC\mxds\PFRA\GP1_Hillingdon_FigA-2.1_PreTdIncidents.mxd

Figure 5—5: Groundwater Flooding Instances Recorded in LBH[16]

[16] London Borough of Hillingdon, November 2008; 'Strategic Flood Risk Assessment'



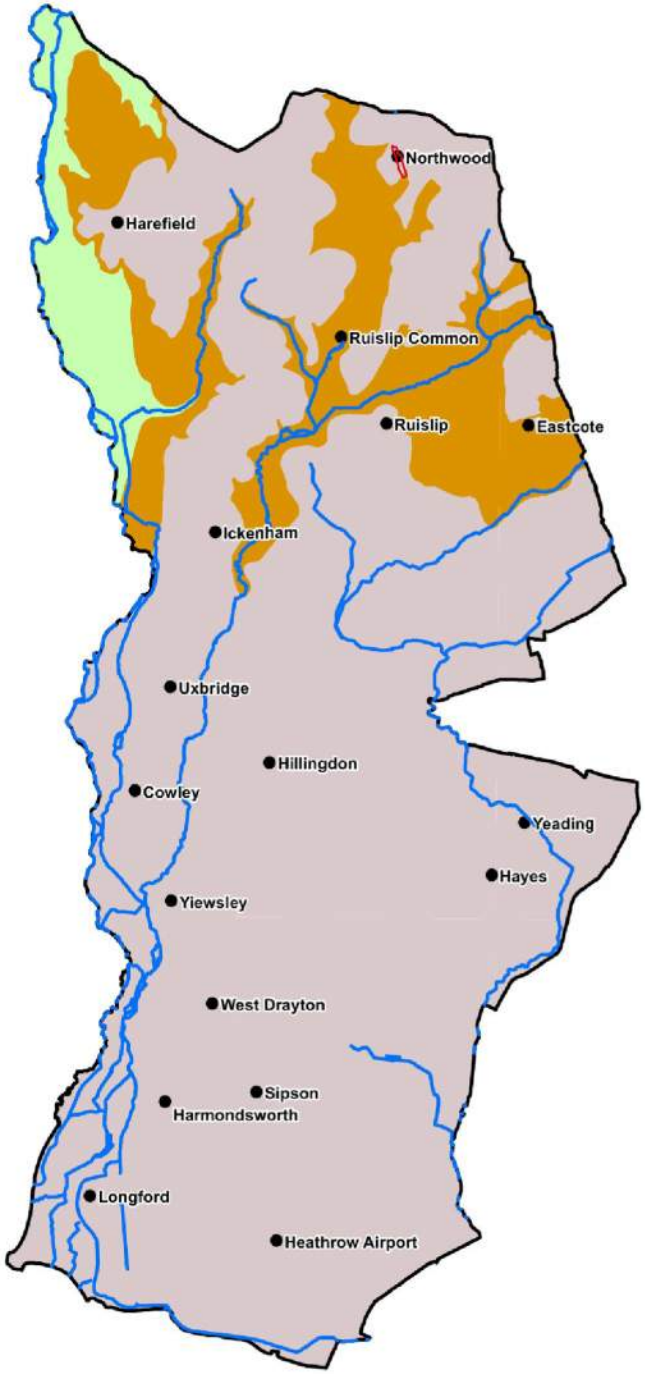
FINAL

LONDON BOROUGH OF HILLINGDON SFRA

OTHER SOURCES OF FLOOD RISK

FIGURE 6

Figure 5—6: Geology in the LBH



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

NOTES

- London Borough of Hillingdon
- Towns
- Main Watercourses

Solid Geology

- London Clay
- Lambeth Group
- Upper Chalk Formation
- Site Boundary

Revision Details	By / Check	Date	Suffix

Drawing Status: FINAL

Job Title: LONDON BOROUGH OF HILLINGDON SFRA

Drawing Title: SOLID GEOLOGY

Scale at A3: 1:75,000

Drawn	Approved
TD	HR

Stage 1 check	Stage 2 check	Originated	Date

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Drawing Number: **FIGURE 8**

Rev:

N

Plot Date: 12th November 2007
Filepath: K:\D_Hillingdon_SFRA\Arc\GIS\MXD\Final Figures\Figure 8 Solid Geology.mxd

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