BARNET
LONDON BOROUGH

Local Flood Risk Management Strategy 2023 – 2029

Flooding in Mill Hill November 2022, Image Credit: Barnet Council

Revision History

Version	Date	Description	Prepared	Approved	LLFA Sign Off
1.0	05/11/2022	First Draft for Client	MMC	MM	RS
2.0	03/02/2023	Second Draft for Client	MMC	MM	RS
3.0	21/04/2023	For Public Consultation	MMC	MM	RS
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Executive Summary

The Barnet Local Flood Risk Management Strategy (LFRMS) is a key statutory, strategic document, which replaces the first LFRMS published by Barnet Council (the Council) in 2017. It explains how local flood risk will be managed within the London Borough of Barnet (Barnet) for the next six years. The LFRMS sets out Barnet's key strategic flood risk management objectives and presents an updated Action Plan 2023-2029 which the Council proposes to adopt to make its communities more resilient to flooding and the impacts of climate change. It also summarises the past, current, and predicted future flood risks in Barnet, the responsible Risk Management Authorities (RMAs) for managing flood risk, advice for residents and developers, and a summary of Barnet's completed and pipeline flood risk schemes.

Barnet's local information, in addition to current legal requirements and policies such as the National Flood and Coastal Erosion Risk Management Strategy (NFCERMS), are used to propose four Strategic Objectives. The LFRMS is accompanied by an *Appendix A1* – Action Plan (2023-29) which establishes tasks to achieve each Strategic Objective.

A: FLOOD RESILIENCE

Take action to reduce flood risk and avoid economic damages, while delivering wider environmental and social benefits

B: ENGAGEMENT & EDUCATION

Engage and educate local residents and businesses to empower them to understand and reduce their own risk of flooding

C: PARTNERSHIP WORKING

Establish and maintain collaborative partnerships with internal and external stakeholders to facilitate effective information-sharing and maximise joint working opportunities

D: DEVELOPMENT & PLANNING

Steer development away from flood risk areas to protect these areas and ensure future development is sustainable in the context of climate change

The LFRMS Action Plan (2023-29) sets out comprehensive actions to achieve the above Strategic Objectives. The key measures include the Council's commitment to fund dedicated resources to deliver the Strategy, providing efficient responses to flood incidents and emergency recovery, maintaining a robust flood incident log and flood risk asset register and increasing internal and external stakeholder engagement for collaborative flood risk management and achieving long-term resilience.

Barnet is at risk of flooding from a variety of sources including surface water, main rivers, ordinary watercourses, groundwater, sewer flooding, and artificial sources such as reservoirs. The spatial risk of each of these sources of flooding in Barnet can be viewed in the Online Mapping Tool. There are several different organisations which contribute to the management of flood risk in Barnet, these are

known as RMAs. The Council as Lead Local Flood Authority (LLFA) is responsible for managing the flood risk from ordinary watercourses, surface water and groundwater sources. All the remaining flood risks are managed either by the Council as the Highways Authority, the Environment Agency (EA), Thames Water Utilities Limited (TWUL) or Transport for London (TfL). Due to the shared responsibility of flood risk management, collaboration between RMAs is essential.

Since the LFRMS and its Action Plan have been developed to be in use for the next six years, it is crucial that climate change and its associated uncertainties are appropriately taken into account. The LFRMS proposes measures that ensure that Barnet becomes more resilient and sustainable, by adopting an adaptive approach. It is key that the Council continues to acknowledge and understand the latest findings on climate change predictions in order to best manage flood risk in the local area. Barnet Council have been undertaking various flood mitigation works, from which the LFRMS will build upon. The LFRMS proposes to use sustainable flood risk management practices such as Sustainable Drainage Systems (SuDS), Natural Flood Management (NFM) and Property Flood Resilience (PFR), and to look for opportunities to implement such practices.

All the stakeholders involved in this LFRMS were invited to contribute to a public consultation process during Spring 2023. This was to ensure that the LFRMS has considered a broad range of interests within the local community. Primary stakeholders, local community groups and individuals have been consulted before the Council's adoption and publication of the LFRMS. Feedback from the public consultation has been used to inform any changes to the LFRMS and its accompanying Action Plan. To ensure that the LFRMS stays relevant and that the actions progress as they should, a monitoring and reviewing plan has been produced to keep track of the progress made to meet the Strategic Objectives.

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Figures and Tables

Acronyms and Abbreviations

Abbreviation	Definition
Barnet	London Borough of Barnet
BCP	Brent Catchment Partnership
CCA	Civil Contingencies Act, 2004
CDA	Critical Drainage Area
Defra	Department for Environment, Food & Rural Affairs
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
FAS	Flood Alleviation Scheme
FCERM	Flood and Coastal Erosion Risk Management
FRMP	Flood Risk Management Plan
FRR	Flood Risk Regulations, 2009
FSA	Flood Storage Area
FWMA	Flood and Water Management Act, 2010
GLA	Greater London Authority
IPCC	Intergovernmental Panel on Climate Change
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LoDEG	London Drainage Engineers Group
LPA	Local Planning Authority
LSSPS	London Strategic SuDS Pilot Study
MAFP	Multi Agency Flood Plan
NFCERMS	National Flood and Coastal Erosion Risk Management Strategy
NFF	National Flood Forum
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
OBC	Outline Business Case
PFR	Property Flood Resilience
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RMA	Risk Management Authority
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan, 2011
TfL	Transport for London
The Council	Barnet Council
TRFCC	Thames Regional Flood and Coastal Committee
TWUL	Thames Water Utilities Limited
WLSFRA	West London Strategic Flood Risk Assessment

1. Introduction

1.1 What is a Local Flood Risk Management Strategy?

A Local Flood Risk Management Strategy (LFRMS) is a key statutory and strategic document, which explains how local flood risk will be managed within a given area. In this instance, the London Borough of Barnet (Barnet)'s LFRMS will explain how Barnet Council (the Council) Lead Local Flood Authority (LLFA) will manage flood risk within its administrative boundary. This is based on the 'local flood risks' identified in Barnet, which is inclusive of surface water, ordinary watercourses, and groundwater flooding sources. This LFRMS complements other flood risk plans and policies in Barnet and is supported by outputs from other strategic documents. In conjunction with the LFRMS, a detailed Action Plan has been produced (*Appendix A1)*, listing actions that the LLFA will take to manage Barnet's flood risk between 2023-2029.

Barnet's LFRMS is comprised of the following Sections:

1. ***Introduction***
2. ***Roles and Responsibilities***
3. ***Local Flood Risk***
4. ***Advice for Residents***
5. ***Advice for Developers***
6. ***What the Council Have Done to Manage Flood Risk***
7. ***What the Council is Planning to do to Manage Flood Risk***
8. ***Summary***

1.2 Why do we need a LFRMS?

1.2.1 Legislation and policy

The Flood and Water Management Act 2010 (FWMA) sets out the responsibilities and duties which governing bodies must deliver in managing flood risk. Under this legislation, the Council are designated as the LLFA for Barnet. The LLFA is responsible for managing 'local flood risks' (see *Section 3*) in Barnet and have a statutory duty to develop and update their LFRMS. As part of Barnet's previous LFRMS (2017), the LFRMS should be updated approximately every six years as a minimum or following major changes among other strategic documents or legislation.

LLFAs must also ensure that their LFRMSs are consistent with the Environment Agency (EA)'s 2020 National Flood and Coastal Erosion Risk Management Strategy (NFCERMS) for England.

The NFCERMS sets out the nations approach to managing flood risk and coastal erosion until 2100 and sets out three long-term ambitions to help drive the country towards this vision:

1. Climate resilient places
2. Today's growth and infrastructure resilient in tomorrow's climate
3. A nation ready to respond and adapt to flooding and coastal change

The LLFA must also ensure that their LFRMS reflects the aspirations and priorities of other partners who have flood risk functions under the FWMA and the NFCERMS.

1.2.2 Recent flooding in Barnet

In 2021, Barnet was subject to Borough-wide flooding due to two extreme rainfall events on the 12th and 25th of July. A Borough-wide Section 19 is being undertaken to investigate the flooding, with particular focus on the north-east of Barnet, which was most significantly impacted. Additionally, Thames Water Utilities Limited (TWUL) have published their London Flood Review, which investigates the mechanisms and contributory factors that led to the flooding, and provides an overview of the lessons learnt and recommendations to improve London's sewerage and drainage systems for the future.

Climate change is expected to cause more frequent extreme weather events, such as those experienced in July 2021. Whilst these more severe floods cannot be entirely prevented, they must be better managed at a national and local scale. Therefore, Barnet requires an informed and forward-thinking strategy to establish its flood risk management approach for the next six years.

1.3 How is this Strategy being prepared?

The LFRMS drafting process includes multiple stakeholder workshops, during which a variety of Risk Management Authorities (RMAs) and Council departments have an opportunity to contribute their ideas and comments on the delivery of this next six-year strategy.

The LFRMS went through a public consultation process during an eight-week period in Spring 2023. This provided an opportunity for members of the public and other stakeholders to feed into the development of Barnet's LFRMS. Feedback from the public consultation has been incorporated into the revised final versions of the LFRMS and its associated documents, which are expected to be published on the Council's website during Summer 2023.

1.4 Additional assessments

There is a further requirement for the impact of the LFRMS to be assessed in line with environmental legislation. This has been achieved by undertaking Strategic Environmental Assessment (SEA) and Habitats Regulations Assessment (HRA) scoping reports.

1.4.1 SEA scoping report

The purpose of the SEA is to assess whether the proposed LFRMS Strategic Objectives and actions will pose any significant impacts to the local environment. An SEA is required under the European SEA Directive 2011, which establishes five stages of assessment.

Stage A: Setting the context and objectives, establishing the baseline and deciding on the scope
Stage B: Developing and refining options and assessing effects
Stage C: Preparing the environmental report
Stage D: Consulting on the draft strategy and the SEA report
Stage E: Monitoring the significant effects of implementing the strategy

Appendix A2 presents the SEA scoping report, which encompasses Stage A and determines whether progression onto later stages is required.

1.4.2 HRA scoping report

The purpose of the HRA is to determine if the proposed LFRMS Strategic Objectives or actions will pose any risks or implications to habitats within protected sites. This is required under the Conservation of Habitats and Species Regulations 2017, which establishes the three tasks of a full HRA.

Task 1: **Screening.** To check if the strategy, plan or proposal is likely to have a significant effect on the conservation objectives of a European Site.
Task 2: **Appropriate Assessment.** To assess the significant effects of the proposal in more detail and identify ways to avoid or minimise any effects.
Task 3: **Derogation.** To consider if proposals that would have adverse effects on a European Site qualify for exemption.

Appendix A3 – Habitats Regulations Assessment presents the HRA scoping report, which encompasses Task 1 and determines whether progression onto later stages is required.

1.5 The LFRMS Strategic Objectives

This LFRMS will revolve around a set of four Strategic Objectives that will shape the actions of the LLFA for the next six-year period. These actions are set out in *Appendix A1*. This reflects a refreshed approach from the previous strategy, wherein ten local objectives were developed in line with the former NFCERMS 2011.

The four Strategic Objectives align with the latest guidance and targets set by the NFCERMS 2020 and reflect the overarching flood risk management aims of Barnet.

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Engage and educate local residents and businesses to empower them to understand and reduce their own risk of flooding

C: PARTNERSHIP WORKING

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Steer development away from the flood risk area to protect these areas and ensure future development is sustainable in the context of climate change

Figure 1-1 Barnet's LFRMS Strategic Objectives

2. Roles and Responsibilities

2.1 How is flood risk management shared between authorities?

Several organisations contribute to the management of flood risk in Barnet, these are known as RMAs. They vary from government organisations to private companies, and each have their own duties to perform before, during and after a flooding incident.

RMAs with flood risk management functions within Barnet are summarised throughout the remainder of this Section. *Table 2-1* lists each RMA against the type of flood risk that they manage, whilst *Table 2-2* sets out the RMA drainage management responsibilities. As Barnet is located upstream of the Thames Tidal limit, it is not considered at risk of tidal flooding.

Table 2-1 The flood risk responsibilities

Flood Risk Responsibility	Risk Management Authority (RMA)		
	Barnet Council	EA	TWUL
River flooding from main rivers [1]		✓	
Ordinary watercourses	✓		
Flooding from public sewers			✓
Groundwater flooding	✓		
Reservoir flooding		✓	
Surface water flooding	✓		

[1] Main rivers are usually larger rivers and streams, designated as such, and shown on the Main River Map. The Environment Agency carries out maintenance, improvement or construction work on main rivers to manage flood risk. Other rivers are called 'ordinary watercourses'. LLFAs carry out flood risk management work on ordinary watercourses (Defra, 2017).

Table 2-2 Drainage responsibilities

Drainage Responsibility	Risk Management Authority (RMA)		
	Barnet Council	TfL	National Highways
Highway drainage and asset management of major A-roads		✓	
Highway drainage and asset management of motorways			✓
Highway drainage and asset management of other public roads	✓		

2.1.1 The Council

The Council are appointed as the LLFA under the FWMA and are one of the principal RMAs for the management of local flood risk within Barnet. The LLFA has following duties under Flood and Water Management Act 2010:

- To prepare and maintain a LFRMS, consulting with local organisations and the public.
- To undertake works to manage local flood risk in their authority area, including from ordinary watercourses (non-main rivers), surface water and groundwater, as illustrated in the Online Mapping Tool.
- To maintain an Asset Register, which is a record of physical features that have a significant effect on flooding in the area.
- To undertake 'Section 19' flooding investigations when a significant flooding incident has occurred. The threshold criteria for when the Barnet's LLFA will conduct a Section 19 is presented in *Figure 2-1.*
- To regulate and maintain the proper flow of ordinary watercourses, including issuing consents and enforcing obligations on physical structures.
- To provide technical advice to the Local Planning Authority (LPA) as a statutory consultee on surface water drainage proposals for major developments, in line with the Town and Country Planning Order (Development Management Procedure) (England) Order 2015.
- To assist the Council in its lead role in emergency planning and recovery after a flood event.

For more information on how to report flooding please go to *Section 4*, or check the Flood and Water Management page on the Council Website

Section 19 Flood Investigation Criteria

- When four or more properties on a street, or within adjacent streets, suffer internal flooding from a single flood event.
- When a single property floods on repeated occasions (at least three times) within two years from its initial reported flood.
- When a part of the highway floods, making it impassable and leading to road closures on repeated occasions within three years.
- When there is flooding of any critical infrastructure, which includes:
  - Water and power stations
  - Red routes
  - Police and fire stations
  - Schools or care homes
  - Railway lines
  - Electricity substations
  - Hospitals

Figure 2-1 The threshold criteria for when a flood investigation will take place in Barnet

The LLFA also have further responsibilities under the Flood Risk Regulations 2009 (FRR):

- To determine whether there is a significant flood risk in the Borough and identify which parts of the Borough are affected by the risk ('flood risk areas'). These flood risk areas should be detailed within Preliminary Flood Risk Assessments (PFRAs).
- To prepare a Flood Hazard Map and a Flood Risk Map in relation to each relevant flood risk area.
- To co-operate with other relevant authorities exercising their function under the FRR.
- To prepare a Flood Risk Management Plan (FRMP) in relation to each flood risk area.

The Cycle 2 FRMP sets out eight objectives which Barnet are committed to achieving by 2027. These have been included in the *Appendix A1* – Action Plan of this Strategy and are listed below:

- By 2027, London Borough of Barnet will organise varied community events to improve relations with communities and active resident groups.
- By 2027, London Borough of Barnet will carry out a strategic assessment to map the strategic flood storage areas for Barnet.
- By 2027, London Borough of Barnet will undertake option appraisal studies for at least top 6 priority Critical Drainage Areas (subject to funding) to deliver detailed option appraisal.
- By 2027, London Borough of Barnet will develop business cases to deliver at least 2 Critical Drainage Area schemes on ground (subject to funding).
- By 2027, London Borough of Barnet will establish and improve relations with key stakeholders to work together to develop at least one project at one of the key infrastructure flooding hotspots (subject to funding).
- By 2027, London Borough of Barnet will aim to reduce flood risk in new developments by reviewing and improving the current lead local flood authority planning application review process and produce Barnet-specific Sustainable Urban Drainage Systems guidance.

- By 2027, London Borough of Barnet will review and improve the existing process of emergency preparedness, responding to flooding incidents and post-flood recovery to develop and share a case study in the Greater London, Thames Flood Risk Area.
- By 2027, London Borough of Barnet will investigate potential locations, appraise nature-based solution options within Critical Drainage Area assessments (or explore other opportunities) to deliver at least one nature-based solution scheme.

2.1.2 The Environment Agency

The Environment Agency (EA) is the national flood risk authority for England.

Under the FWMA, the EA provide strategic overview of all sources of flooding and coastal erosion. In particular, the EA assume regulatory control of some large watercourses, which they have categorised as main rivers. Barnet's main rivers are defined by the EA Statutory Main River Map and set out in *Section 3*.

The EA's other responsibilities include:

- Delivering flood risk warnings in partnership with the Met Office.
- Producing flood risk maps and data.
- Managing the construction and maintenance of flood defences on main rivers.
- Managing large flood defence schemes near to or within main rivers.
- Consenting and enforcement of works near to or within main rivers.
- Producing guidance on FRMPs.
- Producing a NFCERMS and deliver its actions.
- Cooperate with RMAs and exchange information.
- Supporting other flood risk RMAs by providing resources and allocating government funding for schemes.

2.1.3 Thames Water

Thames Water Utilities Limited (TWUL) is the water and sewerage provider for Barnet and they have the responsibility to manage the risk of flooding in relation to water supplies and sewerage facilities under the Water Industry Act (1991). Under this Act, Section 106 denotes the right for developments to communicate with (connect to) public sewers following TWUL consent. TWUL must also manage the flood risks posed from their infrastructure if it were to fail and ensure that public sewers are well maintained and in working condition.

TWUL should also advise the LLFA on any works being carried out and collaborate with other RMAs. This involves inviting the LLFA to consult on their key documents, such as their Drainage and Wastewater Management Plan (DWMP) consultation, which took place in September 2022. The DWMPs are new long-term plans which will ensure a resilient and sustainable wastewater service for the next twenty-five years and beyond – more information can be found in *Section 6.3.1*.

Most of Barnet's drinking water is provided by Affinity Water. Whilst not an RMA under the FWMA, there is a risk of flooding if an Affinity Water asset were to leak. Flooding from such a source lies outside of the remit of both the FWMA and LLFAs. Therefore, any suspected leaks should be reported on their website.

2.1.4 Transport for London

Transport for London (TfL) holds the responsibility for managing the public transport network for London. Under the Highways Act (1980), TfL also has a duty to maintain highway drainage and roadside ditches along the TfL red routes. This is usually done in collaboration with National Highways, because the red routes form part of the England Strategic Road Network, and the Highways department within the Council.

Red routes within Barnet consist of three major A-Roads which are managed by TfL:

- **A1** (Barnet Way, Barnet By-Pass, Watford Way, Great North Way, and Falloden Way)
- **A41** (Edgware Way, Watford Way, Hendon Way, and the Brent Cross Flyover)
- **A406** (North Circular Road)

2.1.5 National Highways

National Highways are responsible for highway drainage and asset management of motorways. They manage flood risks by continually updating their standards for road design to align with the effects of climate change; for example, providing larger drains to cope with increased rainfall. National Highways also identify areas at greatest risk of flooding through their Drainage Data Management System, to prioritise the drainage system upgrades which may be required.

In the Climate change and the strategic road network report, National Highways have identified Natural Flood Management (NFM) as an opportunity to reduce flood risk to their highways. Through a collaborative approach with other RMAs, flood risk can be reduced whilst also bringing wider environmental benefits. Whilst this is limited to a series of pilot projects in North-Western England thus far, there may be scope to extend this to London. More information regarding NFM can be found in *Section 5.2*.

2.1.6 Category One responders

A Category One responder has a duty to act when a major flooding incident is declared. Under the Civil Contingencies Act 2004 (CCA), along with the Council and the EA, the Emergency Services (Police, Fire and Rescue, Ambulance Services) have been assigned as Category One responders who will be involved in managing and delivering the response.

To comply with the statutory duties of the CCA and recommended actions of the Pitt Review (2008), the Council has prepared a Multi-Agency Flood Plan (MAFP). This plan reflects the known risks of flooding within Barnet and provides an outline of response, management and roles and responsibilities of Category One responders. Depending on the circumstances of the incident, such as the cause of flooding, other organisations may also become involved.

2.1.7 Landowners

Private landowners are responsible for taking the necessary measures to protect their own land and property from flooding. However, they must ensure that any measures taken do not inflict a greater negative impact on the surrounding property or land by increasing their flood risk. A ‘lower’ landowner must accept natural runoff from a ‘higher’ landowner. Therefore, one landowner must not cause interference to the natural runoff which could detrimentally affect another owner. ‘Natural’ runoff does not include water from gutter downpipes.

A riparian owner is the person (or people) with watercourses on, next to or beneath their property boundary. Riparian owners have the responsibility for maintenance of their stretch of watercourses and have a responsibility to ensure that any structures on their land that are linked to neighbouring watercourses are clear of debris, so that natural flow can be maintained. Natural right of drainage is allowed, however landowners must not artificially channel water in a way which will affect neighbouring properties. If a landowner has flood defences, these must also be maintained appropriately.

Further guidance on how to manage a watercourse on your property can be found on the Council Website and the Government Website.

3. Local Flood Risk

3.1 What are the flood risks in Barnet?

Barnet is vulnerable to a variety of sources of flooding, which include:

- Flooding from surface water
- Flooding from main rivers
- Flooding from ordinary watercourses
- Flooding from groundwater
- Flooding from sewers
- Flooding from artificial sources

The relevant authorities responsible for managing and mitigating each of these sources of flooding are outlined in *Table 2-1.*

These flooding sources can interact with each other to create complex mechanisms in certain areas. Descriptions of each flood risk and how they can affect infrastructure and property in Barnet are summarised throughout *Section 3.1*. Further detailed information can be found in the Barnet Surface Water Management Plan 2011 (SWMP).

3.1.1 Flooding from surface water

Surface water flooding occurs when water cannot drain away quickly enough into the ground, watercourses, or surface water sewers, which results in pooling on, or flows over the surface of, the ground as 'runoff'. This type of flooding is common during or following periods of high intensity rainfall. Barnet's risk of surface water flooding can be viewed on the Online Mapping Tool.

In urban areas, impermeable surfaces have replaced the natural, permeable surfaces known as 'greenfield'. This prevents water from soaking into the ground or slowly flowing overland to watercourses and low-lying areas. Manmade structures such as roads or railway lines can often form barriers to the natural flow of surface water or create artificial low-lying areas that are prone to flooding. Where surface water sewers are blocked or overwhelmed by the volume of water, this can also increase the likelihood of surface water flooding.

As part of the Barnet SWMP, thirty-three Critical Drainage Areas (CDAs) were identified within Barnet, which are areas considered at the highest risk of surface water flooding. A CDA can be defined as an area that has critical drainage problems and can cover wide urban and rural areas and further information can be found within Section 2.4 of Barnet's previous LFRMS, which refers to the prioritisation of risk areas.

The risk of surface water flooding in Barnet is largely determined by topography. The areas at greatest risk of surface water flooding are within Barnet's low-lying areas, which are located along the western border within the Silk Stream catchment, along the north-eastern border within the Pymmes Brook catchment, and within the River Brent catchment, which dissects Barnet from the north-east to the south-west.

There are a significant number of properties at risk from surface water flooding in Barnet in a 1 in 30-year rainfall event, 4,458 in total, as of the EA's 2014 Surface Water modelling. This number increases exponentially for 1 in 100-year and 1 in 1000-year rainfall events as shown below in

Table 3-1. Most of these properties are residential (about 80%), while approximately 7% of these at-risk properties are commercial.

Recurrence Intervals

1 in 30-year event means there is a **3.3%** chance of flooding in any given year (a 1 in 30 chance each year)

1 in 100-year event = **1%** chance each year

1 in 1000-year event = **0.1%** chance each year

More information on flood risk can be found on the governments flood risk and coastal guidance

Table 3-1 Number of properties at risk of flooding from surface water (EA 2014 Surface Water modelling)

	Residential	Commercial	Other	Total
1 in 30-year rainfall event	3,591	348	519	**4,458**
1 in 100-year rainfall event	8,259	707	1,093	**10,059**
1 in 1000-year rainfall event	22,891	1,650	2,715	**27,256**

3.1.2 Flooding from rivers

Fluvial flooding occurs when the volume of water in a river channel exceeds the channel's capacity because of intense rainfall. This can cause the watercourse to overflow or overtop its banks and produce flooding. The term 'fluvial flooding' is used to refer to flooding from main rivers, which are defined and designated by the EA. Main rivers are typically larger rivers or streams and their locations can be seen on the EA's Statutory Main River Map. Barnet's main rivers and ordinary watercourses are mapped on the Online Mapping Tool. On this page, you can also view the risk of fluvial flooding.

Although fluvial flood risk in Barnet is limited to areas located adjacent to the Borough's main rivers and ordinary watercourses, the lower-lying areas around the Silk Stream and Deans Brook in the west of the Borough are at the greatest risk of experiencing fluvial flooding.

There are three primary main rivers in Barnet which are outlined below:

The River Brent - Notable tributaries include the Dollis Brook (has its own tributaries including Folly Brook and Hendon Cemetery Drain), Mutton Brook and the Silk Stream (at the confluence with the Brent reservoir).

Figure 3-1 The Dollis Brook, a tributary of the River Brent
Image Credit: Barnet Council

Silk Stream - Notable tributaries include the Edgware Brook (starts in the London Borough of Harrow and enters through Barnet's western boundary), Edgwarebury Brook, the Deans Brook, and the Burnt Oak Brook.

Figure 3-2 The Silk Stream (Left) and The Burnt Oak Brook at Watling Park, a tributary of the Silk Stream (Right)
Image Credit: Barnet Council

Pymmes Brook – Notable tributaries include Shirebourne Brook, Monken Meads Brook and Bounds Green Brook (upstream section also known as Strawberry Vale Brook).

The EA have established three flood risk zones, which are categorised based on the percentage chance of flooding from rivers or the sea in any given year. The probability of flooding within each of the flood risk zones is shown below in *Table 3-2*.[2]

Table 3-2 EA's Fluvial / Tidal Flood Risk Zones

Zone	Return Period	Probability of flooding in any given year (% chance)
1	1 in 1000-year	Less than 0.1%
2	Between 1 in 100-year and 1 in 1000-year	Between 0.1 – 1%
3a	1 in 100-year (rivers) or 1 in 200-year (sea)	1% (rivers) or 0.5% (sea)
3b	1 in 30-year	3.3% (significant risk)

The Council as LPA has a responsibility to prevent development in Flood Zone 3 to protect high risk areas from flooding. Flood Zone 3 is split into 3a and 3b, with each Zone having different implications for planning and development management. Flood Zone 3a restricts any 'highly vulnerable' developments, while only considering developments which have submitted Sequential and Exception Tests. Flood Zone 3b refers to undeveloped Functional Floodplain and should be protected – no development is permitted unless it is a 'water-compatible' development or 'essential infrastructure'. Flood Zone 3b is further defined in Table 1 of the NPPG.

3.1.3 Flooding from ordinary watercourses

Ordinary watercourses refer to all rivers, streams, ditches, drains, cuts, dykes, sluices, sewers (other than public sewers) and passages that convey water, above ground or culverted, that are not designated as main rivers by the EA. The ordinary watercourses in Barnet can be found on the Online Mapping Tool.

The key ordinary watercourses in Barnet are:

- Folly Brook
- Decoy Brook
- Clitterhouse Stream
- Blacketts Brook
- Shirebourne Brook

[2] Planning Practice Guidance (PPG) was updated in 2022 to change Flood Zone 3b from a 1 in 20-year to 1 in 30-year return period. The mapping of Flood Zone 3b will be updated on the online tool and in the West London SFRA once the new dataset becomes available from the EA.

Figure 3-3 Blacketts Brook at Friary Park, a tributary of the Pymmes Brook
Image Credit: Barnet Council

The flooding mechanisms of ordinary watercourses are similar to that of fluvial flooding; they occur when the volume of water in the feature exceeds its capacity. However, it is considered that the flooding from ordinary watercourses is a combination of surface water and sewer flooding, as these smaller conveyance passages often receive the majority of their flow from inside the urban area and are heavily influenced by the interactions between runoff from highway drainage and sewer assets.

The LLFA are responsible for consenting works that propose changes to ordinary watercourses or alter or obstruct the flow in the watercourse under Section 23 of Land Drainage Act 1991. **If you are planning to carry out any works within 5m of an ordinary watercourse, it is strongly advised to first contact the Council via fwm@barnet.gov.uk to find out if you require consent.**

Culverting can exacerbate the risk of flooding and increase the maintenance requirements for a watercourse. It also destroys wildlife habitats. Hence, the Council discourage culverting and only considers it if alternative options have been explored and there is no reasonably practical solution. More information about culverts and ordinary watercourse management can be found on the Council Website.

3.1.4 Flooding from groundwater

Groundwater flooding results from a rise in groundwater levels sufficient for the water table to breach the ground surface, commonly following prolonged periods of sustained high rainfall. This type of flooding tends to be drawn out over longer periods, developing over weeks or months and can take longer to subside, depending on the underlying geology and the surface topography. Groundwater flooding is known to occur in areas underlain by aquifers (a layer of below-ground rock that holds groundwater) or sub-surface permeable strata.

Like much of Greater London, the geology of Barnet is overlain by a thick layer of London Clay, which resides above a chalk aquifer. The depth of the Clay varies across Barnet, which in turn influences the

susceptibility of areas to groundwater flooding. Whilst the majority of Barnet is protected by a thicker layer of London Clay, such as within its northern and west-central areas. There are some lower lying areas with a thinner layer of London Clay, such as along the Dollis Brook, Pymmes Brook, River Brent and Silk Stream. These areas have increased potential of elevated groundwater. Additionally, in Finchley, Hendon and north Hampstead there is a permeable chalk-sand and gravel outcrop which lies close to the surface. This outcrop area may also be susceptible to groundwater. The British Geological Survey have an online map which shows the underlying geology of Barnet and Great Britain as a whole.

Areas susceptible to groundwater flooding, and areas with increased potential for elevated groundwater within Barnet are available to view on the Online Mapping Tool.

Areas susceptible to groundwater flooding are depicted on a 1km^2 grid, as detailed in the 2018 West London Strategic Flood Risk Assessment (WLSFRA). Although there are no 1km^2 areas situated wholly within Barnet where groundwater flood risk is marked as orange, some of these more susceptible areas are located partially within Barnet, namely around Brent reservoir (Welsh Harp) and parts of New Southgate on Barnet's eastern border with the London Borough of Enfield. Approximately half of these 1km^2 areas across Barnet are marked as yellow and therefore may be susceptible to groundwater emerging across <25% of their area, with these being located primarily around Barnet's lower-lying areas close to the River Brent, Pymmes Brook, and the Silk Stream. Conversely, the other half of 1km^2 areas across Barnet are categorised as being not susceptible to groundwater flooding.

3.1.5 Flooding from sewers

Sewer flooding is usually a localised and short-term type of flooding which typically occurs during heavy rainfall if:

- The volume of rainfall entering the sewer network exceeds the capacity of the drainage system
- The sewer system becomes blocked by debris or sediment
- The sewer system surcharges due to high water levels in receiving watercourses
- The sewer system surcharges due to the ingress of groundwater, either through the fabric of the sewer or due to inundation above the surface

Flooding from all public sewers, which include surface water, foul and combined sewers, is the responsibility of TWUL as the sewerage undertaker. The majority of Barnet is served by separate surface water and foul sewers, although some areas are served by combined sewers. These areas include New Barnet, Hadley, East Barnet, Atlas Road, Brent Cross Interchange, Princes Park Avenue and Highfield Road.

TWUL have produced an Event Duration Monitoring Map for Combined Sewer Overflows which provides near real-time information about storm overflow activity from Combined Sewers.

The Online Mapping Tool used data from TWUL, to present the internal and external sewer flooding incident records across Barnet that have been reported to TWUL from 1946 to 2023. The north-western area of Barnet around Edgware has recorded the greatest total number of sewer flooding incidents. There are also other pockets of more affected areas around the southern parts of Chipping Barnet in the Borough's north, East Barnet in the borough's east, and Hendon and West Hendon in the Borough's south-west.

3.1.6 Flooding from artificial sources

Other sources of flooding include any waterbodies which have not been covered under any of the aforementioned categories. These would typically include canals, lakes, and reservoirs. Barnet are working in collaboration with the City of London over the management of specific waterbodies.

There are four reservoirs located within Barnet:

- Arkley reservoir is a subterranean reservoir which runs alongside Rowley Green Lane is managed by Affinity Water Ltd
- Bury Farm Flood Storage Area (FSA) is a statutory reservoir located on the Edgwarebury Brook and is managed by the EA
- Edgwarebury FSA is a non-statutory reservoir a short distance downstream of the Bury Farm FSA which is also managed by the EA
- Stoney Wood FSA is a reservoir which is managed by the EA

Additionally, the Brent reservoir is shared between the north-eastern border of the London Borough of Brent, and the south-western most border of Barnet, at the confluence of the River Brent and the Silk Stream. The 598,000m² Brent reservoir is owned and maintained by the Canal and River Trust and feeds the Paddington Arm of the Grand Union Canal.

The sudden failure of a dam could potentially have catastrophic consequences to properties in the vicinity, due to a surge in water being released into the catchment. The EA's reservoir inundation mapping shows the maximum flood extent from large reservoirs (which hold over 25,000m^3 of water) in the unlikely event of a breach. The Online Mapping Tool shows the extent of flooding in Barnet for two different reservoir failure scenarios.

- A 'dry-day' scenario indicates the predicted flood extent if reservoir failure occurred during normal river levels.
- A 'wet-day' scenario indicates the predicted flood extent of reservoir failure if a river is already experiencing an extreme natural flood.

The dry-day reservoir flood risk extent is largely constrained to Barnet's western border, where Bury Farm reservoir and Stoney Wood reservoir are located. These two reservoir outline flood extents follow the Edgwarebury Brook and Deans Brook respectively, before both joining the Silk Stream south of Edgware. Their flood extents then follow the Silk Stream down to its confluence with the River Brent at the Brent reservoir in the south-western corner of Barnet. Other notable outline reservoir flood extents in Barnet include that of Bishops Wood reservoir in the south-east, Arkley reservoir in the north, and Cockfosters reservoir in the north-east, although Arkley reservoir is the only of these three reservoirs that is located within Barnet's boundaries.

The wet-day flood extents across Barnet are shown for Brent reservoir, Bury Farm reservoir and Stoney Wood reservoir. These flood extents follow the same routes as their dry-day scenarios but cover a greater area, particularly in the flatter low-lying areas through Burnt Oak, Colindale, and West Hendon. Wet-day flood extents are not available for the remainder of Barnet.

The enforcement of the Reservoirs Act (1975) is the responsibility of the EA. However, the maintenance and regular inspection of the reservoirs is the responsibility of the owners. It is the responsibility of the site owners to have an onsite plan; however, they are not required to share these plans with the Council.

3.2 Flooding history within Barnet

The Online Mapping Tool displays ninety-three flooding hotspot locations in Barnet at which flooding has reoccurred between 2011 and 2020. Most of these flooding incidents were a result of surface water flooding, on forty occasions, or caused by sewer flooding, on twenty-five occasions. These incidents were mostly sporadic across Barnet, although there was a concentration of incidents in Chipping Barnet and East Barnet in the north-east of Barnet. The Tool also includes the EA's Historic Flood Map (2018) dataset, which displays all areas of land that fall within the maximum extent of recorded flood outlines from rivers and groundwater springs between 1946 and 2018. Further detailed information on more historic surface water flooding incidents can be found in the SWMP.

Seventeen incidents reported to the LLFA were a result of fluvial flooding, nine from main rivers, and eight from ordinary watercourses. There was a single incident resulting from groundwater. The Silk Stream contributed to four of the main river incidents, while there were also incidents from the Dollis Brook, Mutton Brook and Pymmes Brook. The ordinary watercourses that are prone to frequent flooding are the Blacketts Brook in Friary Park, the Shirebourne Brook near Burnside Close, the Clitterhouse Brook near West Heath Road and the Vale and Decoy Brook. Other ordinary watercourse incidents were sporadic but concentrated in the northern and southern parts of Barnet, while two incidents were from the Burnt Oak Brook (also known as Watling ditch) near to Mill Hill, west-centre of Barnet. The location of the groundwater flooding incident was not confirmed.

Other notable flooding hotspots are Mill Hill Broadway, the A41 underpass (Brent Cross), Bunn's Lane under the railway bridge and the junction of Barnet Lane and Stirling Way at Stirling Corner roundabout on the northern border of Barnet, which is shared with the Borough of Hertsmere. This section of highway is on the TfL red route and thus managed by TfL.

Following further recent flooding events such as the major events in July 2021, the Council will be conducting a Section 19 investigation to be published in late 2023.

3.3 Climate change and flood risk

What is climate change and how are we causing it? – Climate change is the long-term variation in the planet's temperature and weather patterns. Whilst it can be a natural process, we are currently experiencing a rapid change in global climate, which is due in part to greenhouse gases emitted by human activities.

How is the climate changing? – In their Sixth Assessment Report published in 2021, the Intergovernmental Panel on Climate Change (IPCC) highlight the fact that climate change is already affecting weather extremes across the globe. For example, more intense heatwaves and heavy rainfall have increased in frequency since the 1950s.

How will climate change in Barnet? – In the UK, the Met Office produces UK Climate Change Projections, which are predictions on how the climate in the UK may change over the twenty-first century. These predictions include *"an increased chance of warmer, wetter winters and hotter, drier summers along with an increase in the frequency and intensity of extremes"*, in line with international predictions.

How does climate change impact flooding? – Climate change is expected to increase the risk of flooding in the future, with areas historically at low risk of flooding becoming more vulnerable.

Seasonal surface water flooding is predicted to increase, with the type of flooding experienced in July 2021 expected to become more common.

What are the Council doing about this? – The Council recognise that we need fast and effective climate actions to protect properties and infrastructure from the increased flood risk due to climate change. Issues such as land use change, groundwater abstraction, and ecological concerns are also being impacted by climate change and must be considered when developing flood risk plans.

Barnet's LFRMS and Appendices take the above factors into account and aim to mitigate their implications of flood risk in Barnet. It is important for the Council to recognise that areas within Barnet will become more vulnerable as a consequence of climate change, hence the necessity of an Action Plan that takes this into account.

In May 2022, the Council declared a climate and biodiversity emergency, with a vision to become net zero carbon in Barnet by 2042, and for the Council by 2030. Barnet's Sustainability Strategy sets out the approach to achieve this, and a public consultation of this strategy was held between February and March 2022. The FRMP also sets out a series of objectives for Barnet to achieve by 2027, which are in line with the ambitions of the NFCERMS, such as to deliver nature-based solutions in the context of climate change. These objectives are listed in *Section 2.1.1*.

4. Advice for Residents

While Barnet's LLFA can contribute flood risk mitigation through delivering Flood Alleviation Schemes (FASs, see *Section 6.1*) that will improve the resilience of the Borough, everyone has an important role to play in sustainable flood risk management. Flood risk cannot be entirely managed by RMAs or developers; property owners must make effective and informed decisions to help improve the resilience within an area. Thus, it is essential that residents understand the following information and guidance contained within *Section 4* of this Strategy.

Key Advice for Residents:

You can contribute to more effective flood risk management by:

- Incorporating permeable paving within your driveways.
- Installing water butts to reuse rainwater.
- Implementing planters to disconnect rainwater downpipes.
- Preserving your front and/or back gardens.
- Never fly tipping local watercourses.
- Effective management of personal litter.
- Understanding your duties if you are a riparian owner.
- Taking appropriate consents for undertaking any works within 5m of an ordinary watercourse.
- Checking that your plumbing connections are right to ensure you are not contributing to pollution of Barnet's watercourses.
- Volunteer to be a flood warden and help your community.
- Develop a personal flood plan and know what to do to keep yourselves and your most important possessions safe during a flood. Further detailed in *Figure 4-2.*
- Develop a community flood plan with your community to better prepare for and recover from flooding. You can use the following template.

4.1 How to check your flood risk

It is advised that residents check their short-term and long-term flood risk using these links to the EA's online tool. For properties which are located within a Flood Zone, it is highly recommended that the property owner and/or resident should register for Flood Alerts, which is a free service provided by the EA. Further information about checking your flood risk can be found on the council webpage, including a link to sign up for the Met Office free email alert service which provides warnings ahead of severe weather events.

4.2 How to reduce your flood risk

Whilst it is not possible to prevent flooding entirely, there are ways in which you can improve your resistance and resilience to flooding. The remainder of *Section 4.2* sets out ways in which you can lower the risk of water entering your home or business and minimise its impact if it does enter your property.

4.2.1 Property Flood Resilience measures

The National Flood Forum (NFF) have set out two main approaches to property-level protection:

Resilience

- **Reducing the impact** of flooding, should water get inside your property. The aim is to ensure that damage is minimised and that you can get back into your home or business as quickly as possible.

Resistance

- **Reducing the risk** of water getting into your property. These measures can allow for time to move possessions from ground level and get people to a place of safety if a flood is expected.

A 'Six Step process to Flood Protection' is set out on the NFF's Protecting your property page, which details how to reduce flood risk most effectively and respond if there is a flood.

Additionally, a Property Protection Advisor is a free National Flood Forum tool which raises awareness of the options available and provides an initial estimate of the costs of resistance measures for different types of properties. The Blue Pages also have many examples of the types of products and services available. Some examples of Property Flood Resilience (PFR) measures are shown below in *Figure 4-1.* The EA also have a blog where you can investigate ways to make your house more flood resilient.

It is important to note that the Property Protection Advisor is only a guide and it is strongly advised to seek expert advice from an independent flood risk assessor

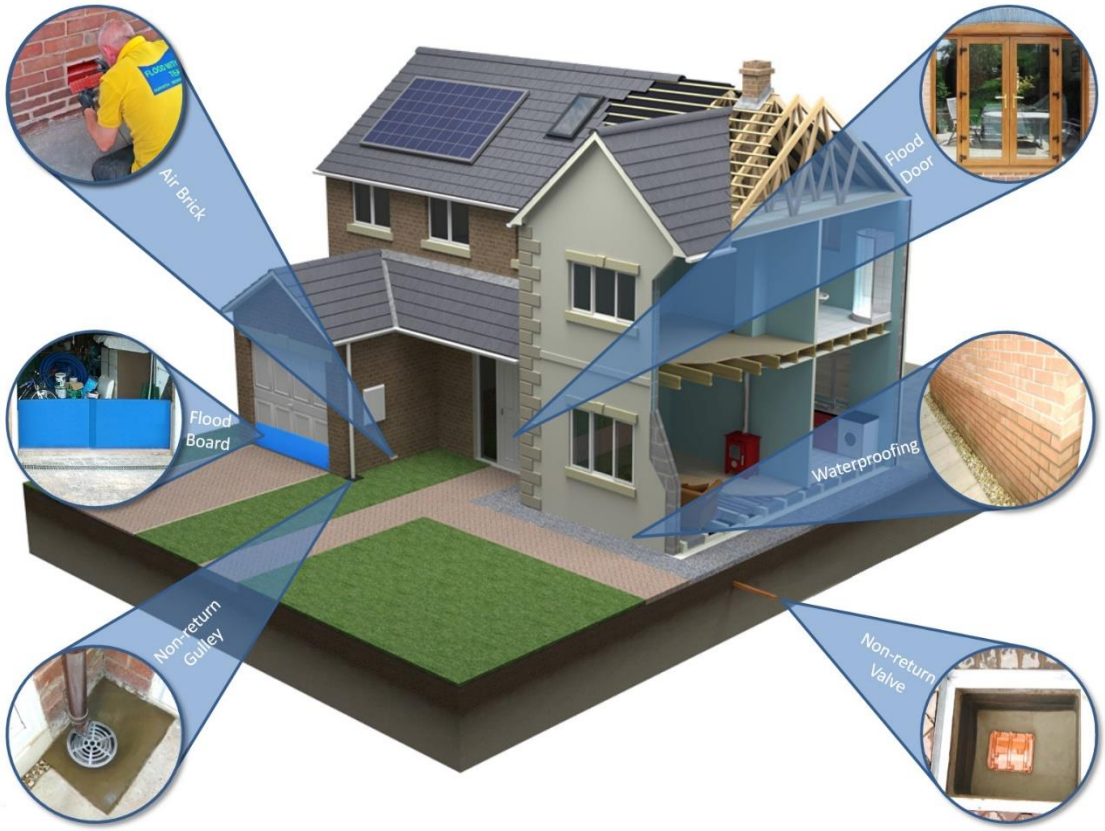

Figure 4-1 Whitehouse Construction 'Mainstreaming PFR'
Image Credit: CIWEM (Chartered Institution of Water and Environment Management)

4.2.2 Sustainable Drainage Systems

Property owners can take many approaches to reduce surface water flood risk to their properties, such as by disconnecting their downpipes, preserving their natural back gardens or introducing Sustainable Drainage Systems (SuDS). SuDS are effective at slowing and attenuating surface water which greatly reduces the risk of surface water sewer systems becoming overwhelmed which can lead to flooding. By paving their driveways with permeable material, the hardstanding surface area is significantly reduced which minimises surface water runoff. Property owners can also install SuDS Planters and water butts to attenuate and harvest rainwater on their property. An array of SuDS options for both property owners and developers is presented in *Table 5-1*, while additional information about SuDS is also available on the Susdrain website.

4.2.3 Riparian ownership responsibilities

While SuDS can be effective at reducing flooding from surface water runoff, some individuals will be at risk from other types of flooding. Depending on the proximity of a property to a main river or an ordinary watercourse, an individual might find themselves at risk of flooding. *Section 2.1.7* sets out the appropriate measures which riparian owners should take to ensure that an ordinary watercourse on their land is not increasing flood risk to their own or neighbouring properties.

4.3 What to do before, during and after a flood

Before

- Find out if you are at flood risk using **EA's online tool**
- Sign up for the EA's free 24-hour **Floodline** Warnings Direct Service
- Read NFF advice
- Check your buildings and contents insurance policy to ensure that you are covered for flooding. It is also advised to take inventory and photographs of your valuables
- Move valuables to a safe place above the flood line
- Know how to turn off the water, gas, and electricity, ask your supplier for advice if you are not sure
- Prepare an **Emergency Flood Kit (also known as a grab bag)** and a **Personal Flood Plan. Examples of what you should include in your Emergency Flood Kit include: a first aid kit, torch, phone and charger, warm/waterproof clothing, essential medicine, and copies of essential documents such as insurance, utilities, and flood plan**

During

- Keep up to date with weather using the radio, TV, internet, or social media
- Check on and try to keep outside drains clear to let surface water escape
- Do not approach fast flowing or deep water
- Keep cuts clean and covered since floodwater may be contaminated
- Turn off gas, electricity, and water supply if safe to do so
- Move family and pets upstairs or to a high place with means of escape

After

- Only return to your property once officials have said it is safe to do so
- Do not turn electricity back on until it has been checked by a qualified person
- Have your gas or oil central heating checked by a qualified person
- Record photos of the flood height and contact insurance providers
- Report the flood to the appropriate authority as stated in *Figure 4-3*

Figure 4-2 What to do before, during and after flooding

4.4 How to report types of flooding

There are many different sources of flooding in Barnet, as outlined in *Local Flood* Risk; who you should report the incident to depends on the type of flooding. *Table 2-1* and *Table 2-2* outline who is responsible for each type of flooding. For how to report a flood to the various responsible authorities, see *Figure 4-3*.

HOW TO REPORT A FLOOD

For blocked public sewers and public sewer flooding	**Thames Water Utilities Limited** 0800 316 9800 (24-hour service) If the lines are busy, you can use the links below: TWUL blockage reporting tool Sewer flooding questionnaire
For groundwater and surface water flooding and flooding from ordinary watercourses	**Barnet Lead Local Flood Authority** 020 8359 3555 (Monday-Thursday 9am-5.15pm, Friday 9am-5pm) 020 8359 2000 (out of office hours) highwayscorrespondence@barnet.gov.uk
For flooding from main rivers	**Environment Agency** 0345 988 1188 (Floodline Telephone 24-hour service) 0800 80 70 60 (EA Incident Hotline 24-hour service
For blocked private drains and flooding caused by private drains	**Property/Landowner** You are responsible for private sewers and drains within your property boundaries
For blocked drains and/or gullies on roads adopted by the Council	**Barnet Highways** 020 8359 3555 (Monday-Thursday 9am-5.15pm, Friday 9am-5pm) 020 8359 2000 (out of office hours) highwayscorrespondence@barnet.gov.uk

Figure 4-3 How to report a flood

5. Advice for Developers

The latest flooding advice and best practice is underpinned by the NFCERMS, which the EA published in 2020. The NFCERMS, which is further outlined in *Section 1.2*, sets out the long-term vision for a nation ready for, and resilient to, flooding and coastal change – today, tomorrow and to the year 2100.

Adaptation – the measures taken on in the long term for people and places to adjust to the reality of flooding being likely instead of mitigating the risk of flooding through resilience enhancing measures.

Resilience – the capacity of people and places to plan for, better protect, respond to, and recover from flooding and coastal change.

The NFCERMS has three long-term ambitions which are climate resilient places, today's growth, and infrastructure resilient in tomorrow's climate, and a nation ready to respond and adapt to flooding and coastal change. A sustainable approach to flood risk management requires a combination of resilience measures and adaptive approaches. The NFCERMS definitions of adaptation and resilience can be seen in the box on the right.

The NFCERMS proposes to follow the 'build back better' approach, which focusses on improving the resilience of properties and infrastructure for future flood occurrences. This will be done by making the best land use and development choices to protect people and places who are responding to and recovering from flooding, while adapting to climate change.

This adaptation is essential because the risk of flooding is perpetually changing. The NFCERMS proposes 'adaptive pathways' to enable RMAs and local areas to better adapt to expected changes in climate that exacerbate flood risks.

Therefore, it is critical that individuals, businesses, land managers and infrastructure providers within wider communities all contribute towards adapting to climate change and flooding.

5.1 Sustainable Drainage Systems

SuDS aim to manage rainwater close to source through various means, to 'Slow the Flow' before surface water enters watercourses or sewer systems. In addition to their primary aim, to reduce flood risk, their natural designs also contribute to sustainable development by improving water quality and enhancing biodiversity and amenity.

SuDS can improve water quality through helping to remove pollution from runoff. This will contribute to meeting the EU Water Framework Directive (2000) targets of achieving a 'good' ecological status in all main rivers which were identified in the Thames River Basin Management Plan, by 2027. There are three primary main rivers identified in this plan in Barnet, and their ecological statuses are set out in the EA's Catchment Data Explorer:

- **The Pymmes Brook** is heavily modified and has moderate ecological status (2019)
- **The Dollis Brook and Upper Brent** is heavily modified and has moderate ecological status (2019)
- **Silk Stream and Edgware Brook** is heavily modified and has moderate ecological status (2019)

The **Welsh Harp Water Body** also includes the Brent reservoir and is artificial with moderate ecological status.

As stated in the Sustainable Design and Construction Supplementary Planning Document , one of the primary reasons for not meeting the 'good' ecological status is the poor management of urban runoff, which can be mitigated through the appropriate use of SuDS.

Some examples of ways in which SuDS manage surface water are shown below in *Table 5-1*, and more information on SuDS can be found on the Susdrain website.

Following the expected enactment of Schedule 3 of the FWMA in 2024, the incorporation of SuDS into new developments will become mandatory in England. Schedule 3 is further detailed in *Section 5.3.1*, while further information can be found on the government website.

Table 5-1 Types of SuDS with examples, including who should typically look to install them

Type of Surface Water management	Photo example	Some examples of SuDS	Developer	Property Owner
Rainwater Harvesting (capturing and storing rainwater for later use)	 Photo of a rainwater harvesting tank Image Credit: Susdrain	**Water Butts**	✓	✓
		Blue Roofs	✓	
Infiltration (seepage into the soil)	 Photo of an infiltration trench Image Credit: Susdrain	**Soakaways**	✓	✓
		Infiltration trenches	✓	
Attenuation (capturing and withholding rainwater or		**Raingardens**	✓	✓
		Green roofs	✓	✓

Type of Surface Water management	Photo example	Some examples of SuDS	Developer	Property Owner
surface water for gradual release)	 Photo of a green roof Image Credit: Susdrain	**Retention ponds**	✓	
		Permeable paving	✓	✓
Conveyance (transporting surface water away from hardstanding areas)	 Photo of a swale Image Credit: Susdrain	**Swales**	✓	
		Channels	✓	
Improving Water Quality	 Photo of a filter strip Image Credit: Susdrain	**Filter strips**	✓	
		Filter drains	✓	

5.2 Natural Flood Management

Effective flood risk management can bring other benefits to Barnet, by improving biodiversity, urban greening and creating carbon sinks that can all contribute to mitigating the greenhouse effect, which induces global warming and climate change. Natural Flood Management (NFM) approaches and the appropriate inclusion of SuDS when planning new developments are effective ways to mitigate flooding in a sustainable way.

NFM is a method of managing excess water in a way which simulates natural processes, helping to protect and restore the natural environment. NFM aims to reduce the peak flood flow by holding back or delaying water from moving through a system quickly in the event of excessive rainfall, which in turn increases the time available to prepare for flooding. NFM is often a more natural approach than SuDS, sourcing more natural materials instead of manmade features.

Figure 5-1 Volunteers removing scrub from riverbanks of the Burnt Oak Brook with Thames21
Image Credit: Barnet Council

Figure 5-2 Riverbanks of the Burnt Oak Brook after concrete removal
Image Credit: Unblocking the Burnt Oak Brook Project Report, Thames21

There are four mechanisms of NFM which are:

1. **Increasing flood storage:** Designing temporary storage areas for surface water runoff during a flood event which are then gradually released overtime. An example of this would be reconnecting functional floodplains and creating storage ponds.
2. **Increasing catchment and channel roughness:** Increasing roughness helps to strengthen the resistance to water flows on the surface and in channels to 'slow the flow'. An example of this would be by increasing planting and restoring river meanders, where possible.
3. **Increasing losses:** Increasing the amount of water infiltrating into the ground or that is lost to the atmosphere via evapotranspiration. An example of this would be reducing soil compaction or implementing infiltration SuDS.
4. **De-synchronising peak flows from tributaries:** Slowing the flow of water in one tributary compared to another can reduce the peak flows coinciding at a main river downstream and reduce flooding.

One way in which Barnet is managing to 'Slow the Flow' is through the Barnet Tree policy. Barnet have pledged to plant 900 trees per year for the next five years as of 2019 and as such were awarded the 2019 London Borough Tree Award. Tree planting increases the interception of rainfall to delay the development of runoff and ponding on the surface. It also brings about environmental benefits, such as improving biodiversity and air quality and reducing the urban heat island effect, which occurs when urban areas replace natural land cover with dense concentrations of pavement and other surfaces that retain heat.

Another way which Barnet is promoting NFM is through leading the Action for Silk Stream project in collaboration with the London Borough of Harrow, and with involvement from Thames21, TWUL, EA, and Greater London Authority (GLA) among many others. The project will explore opportunities to restore stretches of the river and create new areas of natural drainage and wetlands to increase flood resilience among other environmental benefits such as improving water quality, boosting amenity and providing new habitats for wildlife. Further information regarding the Action for Silk Stream project can be found in *Section 6.1.1.*

5.3 Planning policy and planning applications

The National Planning Policy Framework (NPPF) states that "inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk". A site-specific flood risk assessment (FRA) analyses flood risk from all sources at a given location and should be provided for all development in Flood Zones 2 and 3 in line with the NPPF. Sequential testing aims to steer new development to areas with the lowest risk of flooding; it is required for all developments in Barnet.

The Planning Practice Guidance (PPG) defines Flood Zone 3b as the functional floodplain comprising land where water from rivers or the sea has to flow or be stored in times of flood. The actions under Strategic Objective D of this LFRMS are centred around steering development away from Flood Zones 2 and 3, in line with the NPPF and PPG. The actions under Strategic Objective D are set out in *Appendix A1 – Action Plan*.

5.3.1 The LLFA's role

The LLFA has a statutory duty to review major planning applications, providing comments on the surface water drainage elements of the proposed development/scheme. Major applications are any developments which include ten or more dwellings, have a site area of 5,000m^2 or greater, or have a proposed internal floorspace of 1000m^2 or greater. The LLFA also assess whether appropriate measures have been proposed to manage any surface water flood risks present. While the EA will assess whether the risks from main rivers, tidal and reservoir flooding sources have been sufficiently mitigated for the development. Where flood risk-related planning policy is being achieved the LLFA can recommend approval to the LPA, often with the use of planning conditions.

For major applications the LLFA will ensure that:

- An FRA has been provided, if the site is located within a CDA.
- The drainage hierarchy set out in the London Plan 2021 is being adhered to and that sustainable features are being included. There is a preference for larger scale sites (> 1 Hectare) to opt for open SuDS features.
- Proposed runoff rates aim to achieve greenfield rates.
- Calculations are provided for greenfield, existing and proposed runoff rates for return periods of 1 in 1-yr, 1 in 30-yr and 1 in 100-yr rainfall events and that an appropriate climate change allowance has been applied, as per EA guidance.
- The required attenuation storage volume to achieve the proposed runoff rate(s) and the proposed attenuation storage volume for the site are both supported by calculations.
- Sufficient maintenance tasks and frequencies have been stated and that a maintenance owner has been named for the proposed features.

The LLFA is not a statutory consultee for minor applications and is therefore not required to undertake a review of these applications or provide any comments. Minor applications are dealt with on a case-by-case basis and may be reviewed at the planning officers' discretion where flood risk is a concern. However, minor developments are still required to achieve the same planning policies and incorporate sustainable drainage techniques. It should also be noted that if there are plans to do works within 5m of an ordinary watercourse a land drainage consent is required in addition to the Planning Application. Further information about consenting works to ordinary watercourses can be found in *Section 3.1.3.*

Defra have announced that Schedule 3 of the FWMA is expected to be enacted in 2024. Schedule 3 sets out a framework for the rollout of drainage systems, a SuDS Approving Body (SAB), and national standards on design, construction, operation, and maintenance. It will also make the right to connect surface water runoff to public sewers conditional upon a drainage system being approved before any construction work can commence. This Section will be updated following the enactment of Schedule 3.

5.3.2 The Developer's role

The developer is expected to meet the necessary policy requirements on SuDS, these policies include:

- National Planning Policy Framework (Paragraph 159-169)
- London Plan (Policies SI 12 and SI 13)
- Barnet's Local Plan (Policy ECC02A Water Management Policy)
- Non-Statutory Technical Standards for SuDS

More information about these policies can be found in the Planning and Policy Framework section of the WLSFRA.

The LLFA has also produced a Sustainable Drainage Proforma, which is required to be submitted along with any planning applications.

As per the SuDS Proforma, typically the LLFA would expect the Drainage Strategy to include the following but not limited to:

- A fully labelled SuDS network diagram showing, pipes and manholes, SuDS features with reference numbers etc.
- SuDS design input data and results to support the design.
- Infiltration site investigation results showing that infiltration systems are feasible method of discharge for this site, if SuDS infiltration method is proposed.
- Appropriate design rainfall i.e. Flood Estimation Handbook (FEH) design rainfall 2013.
- Assessment of the proposed drainage system during the 30-year design rainfall according to Design and Construction Guidance, March 2020.
- Assessment of the attenuation storage volumes to cope with the 100-year rainfall event plus climate change.
- Evidence of TWUL agreement for discharge to their system (in principle/ consent to discharge) if the proposal includes connecting to a sewer system.
- Details of overland flood flow routes in the event of system exceedance or failure, with demonstration that such flows can be appropriately managed on site without increasing the flood risk to occupants or neighbouring properties.
- SuDS operation and maintenance plan.
- SuDS detailed design drawings.
- SuDS construction phasing.

6. What the Council Have Done to Manage Flood Risk

6.1 Flood Alleviation Schemes and Drainage Works

Barnet are currently progressing multiple FASs as part of their existing programme of works. A FAS can be defined as a project that aims to reduce the severity of flood risk within a given area. *Sections 6.1.1* to *6.1.6* detail Barnet's current FASs, including programme timescales, why the schemes were chosen and the schemes' benefits. The Council applied for significant external funding; for example, the Council was successful in securing £6m for Action for Silk Stream project (funded by Defra) to enable large-scale flood risk management schemes in the Borough and has included at least ten projects in the national Flood and Coastal Erosion Risk Management (FCERM) programme. Any project in the FCERM programme has three key stages, these are:

- Initial Assessments
- Detailed Option Assessment
- Business Case

The Business Case will need to be approved by the EA and if stakeholders agree, the scheme can go through to Detailed Design and Construction.

In addition, the Council has allocated £6m of its Capital Infrastructure Levy funding for various drainage improvement schemes in the Borough, including installation of smart sensors to be able to produce warning systems when flooding is expected.

6.1.1 Action for Silk Stream project (2021-2027)

Barnet and the London Borough of Harrow are working in partnership to deliver holistic catchment-wide NFM measures and SuDS interventions within the Silk Stream catchment (*Figure 6-1*) over a six-year period (2021-2027). These solutions will provide multiple benefits, demonstrate innovation and keep community at the heart of Barnet. £6m has been secured via the government's Flood and Coastal Resilience Innovation funding. The project is innovative because it involves conducting a large, multi-site, catchment wide NFM project in an urban area and for its use of thermosensors. More information can be found here. The vision of the project is to help tackle the effects of climate change by making space for water, reducing flooding and improving water quality in the Silk Stream catchment for the benefit of communities and the environment.

Figure 6-1 The Silk Stream catchment
Image Credit: Barnet and Harrow Council

The project aims to build multiple, nature-based, sustainable projects to reduce river and surface water flooding within the Silk Stream catchment area, while helping to mitigate the impact of climate change. Delivery of these schemes will provide wider benefits to local communities in and downstream of Barnet, including residents, visitors and businesses. For example, the schemes will improve water quality by removing pollutants from the surface water before it enters watercourses or sewer networks. Providing more open green spaces for the community will also enhance biodiversity, enable habitat generation and add amenity, while educating locals about sustainable flood risk management.

Feasibility studies for the Action for Silk Stream were completed in April 2022 and Outline Business Cases (OBCs) were approved by the EA in August 2022. A priority list of options for the identified projects has been prepared and four projects have been identified to move forward with detailed design in 2023/24. These four project locations within Barnet are:

- Edgwarebury Park
- Stoneyfields Park
- Lyndhurst Park and the Meads
- Watling Park

In its first year, the project delivered extensive engagement by organising mini festivals at multiple locations within the catchment across Barnet and Harrow to spread awareness of the project and educate local communities. Targeted co-design workshops for the first two pilot sites Watling and Chandos Park were also delivered so as to engage with communities at an early stage of the design process.

If you have any questions regarding the Action for Silk Stream project, please email fwm@barnet.gov.uk.

6.1.2 Unblocking the Burnt Oak Brook project (2021-2022)

Early in 2021, Barnet secured funding for the Rivers and Wetlands Community Days programme, which is hosted periodically by the Wild Trout Trust and funded via TWUL's Community Investment Fund. The Council match funded it with further funding from the EA to expand the scope of works.

Unblocking the Burnt Oak Brook was delivered between 2021 and 2022 by Barnet in partnership with Thames21. Thames21 led the community engagement and organised informal, educational events for local Friends' groups in Watling Park, Burnt Oak.

The project delivered small-scale river restoration works to restore the river in the Burnt Oak Brook. The environmental outcomes of the project included a reduction in litter (*Figure 6-2*) and increased use and positive perception of the riverside spaces. Artificial concrete riverbanks were removed and naturalised (as illustrated in *Figure 6-3*) as part of this scheme and the community were engaged and trained in sustainable river management. More information can be found here.

Figure 6-2 Litter clearance volunteering as part of the Unblocking the Burnt Oak Brook Project
Image Credit: 'Unblocking the Burnt Oak Brook Project' Report, Thames21

Figure 6-3 Removal of concrete to naturalise the existing riverbed
Image Credit: 'Unblocking the Burnt Oak Brook Project' Report, Thames21

6.1.3 Muswell Hill FAS (2021-Ongoing) – Halliwick Recreation Ground SuDS scheme

The EA approved an OBC for the implementation of a SuDS detention basin in the north-eastern corner of Halliwick Recreation Ground. Detention basins are surface storage basins that intercept and store surface water following heavy rainfall. This project is being delivered as part of the Council's CDA program included in the national FCERM programme and is co funded by the Council, the EA and TWUL.

The new flood storage detention basin will attenuate surface water during heavy rainfall periods, thereby reducing the flood risk to nearby properties and highways. The scheme will also help tackle the impacts of climate change by providing flood mitigation alongside environmental improvements and amenity benefits for local residents. *Figure 6-4* illustrates a visualisation of the filled SuDS basin post-heavy rainfall.

The scheme will integrate landscaping features around the detention basin to enhance the amenity benefits of the scheme. The Council have worked closely with 'Friends of Halliwick Rec' and the local communities as the final designs were developed. The scheme is expected to be going in construction phase in Spring 2023.

Besides this primary scheme in Halliwick Recreation Ground, small scale localised SuDS features, including tree pits and rain gardens, have been proposed in the area.

Figure 6-4 Design visualisation of the proposed SuDS basin filled post heavy rainfall
Image Credit: Barnet Council

6.1.4 CDA pre-OBC projects (2019-2022)

Barnet identified thirty-three CDAs within their previous LFRMS (2017) based on the areas that were considered at greatest risk of flooding. These thirty-three CDAs are illustrated within the Online Mapping Tool. Barnet are currently progressing six individual CDA projects, which are included in the National FCERM programme. The Barnet CDA project locations are:

- Decoy Brook CDA
- Mill Hill Circus CDA
- Childs Hill CDA
- Friern Barnet CDA
- Longmore CDA
- Underhill CDA

A Detailed Option Assessment study is taking place for the Greenway, Burnt Oak after the flood investigation from the 2016 event.

The scheme locations were selected from the ten highest priority CDAs within Barnet's previous LFRMS and the aim of the projects is to deliver a combination of SuDS, hard engineering and NFM interventions where the flood risk is predicted to be greatest. Initial investigations for each CDA have been completed and the schemes began progressing detailed assessment when Barnet's Environment Committee Paper was approved in June 2019. As part of these schemes, local flood mechanisms were assessed and site visits were undertaken to identify a long list of locations where SuDS could be incorporated.

Once completed, the SuDS will alleviate flood risk to local properties and infrastructure while also providing wider benefits, such as connecting residents and visitors to the natural landscape.

6.1.5 Trash screen and trash pin improvements (2022)

In 2022, work was commissioned to improve several trash screens across Barnet. A trash screen is a type of fencing used to filter debris within a watercourse culvert (a structure that channels water underground).

Trash screen and trash pin improvements were required at the following locations:

1. Blacketts Brook (at Torrington Park Culvert in Friary Park) – trash screen
2. Folly Brook (at the Southover Culvert) – trash pin
3. Shirebourne Brook (at Burnside Close Culvert) – trash screen
4. The Vale – trash screen

These three locations were all identified as flooding hotspots in Barnet's SWMP (2011). Trash screen improvements have been carried out at Burnside Close (January 2022), Friary Park (in May 2022) and at Southover (December 2022). The previous trash screens at these locations did not provide access for the maintenance team during emergency works. The new trash screens have provided an access platform to contractors, thereby reducing the risk to health and safety for the site crew. Before and after photos for the trash screen improvement at Friary Park can be seen in Figure 6-5. The improvements have reduced local flooding by reducing the risk of blockages within the culverts.

Figure 6-5 Before and after photographs of the trash screen at Friary Park

Image Credit: Barnet Council

Figure 6-6 Trash pins at Southover
Image Credit: Barnet Council

6.1.6 Council Capital Infrastructure Levy funded drainage improvement projects (2022-2023)

In 2022, the Council allocated £6m of Capital Infrastructure Levy funding, to be used over the following five years to deliver extensive drainage improvement works across the Borough. These include:

- Installation of smart water level sensors and gully monitors at seventy-one locations in the Borough to generate warning systems of when flooding is expected
- Preparation of a SuDS strategy and highway SuDS opportunity mapping tool across the Borough
- CCTV survey of all Priority 1 long culverted watercourses (~6.8km)
- Enhanced gully cleansing and gully improvement works
- Drafting its own land drainage bye laws
- Trash screen survey works

Barnet has an extensive network of ageing drainage infrastructure assets including trash screens, gullies and gully connection pipes, where assets are not operating at original intended capacity or usage.

Improvement work to existing watercourses, gullies and sensors is planned for delivery by March 2023, during the six-year drainage programme. This will include enhanced cleansing of the highway gullies in areas at high risk of surface water flooding and gully maintenance and repair work. The improvement work will also comprise CCTV surveys of P1 (high priority) long culverted watercourses, which lie within the top ten priority CDAs. Gully and water level sensors are to be installed across approximately sixty-five selected vulnerable gullies and six watercourses respectively.

6.2 Strategic updates

6.2.1 WLSFRA (2018)

Under the NPPF, 2021 and Flood Risk and Coastal Change Planning Practice Guidance, 2014, Local Authorities are required to identify, plan for and manage flood risk through the WLSFRA process. The WLSFRA informs the types of development which may be permitted in flood risk zones, in addition to suitable mitigation methods, such as SuDS.

The West London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow commissioned the production of a joint 'West London' Strategic Flood Risk Assessment (SFRA). The combined area features several cross-boundary EA-designated main rivers, therefore a joint SFRA is beneficial for all Boroughs and encourages catchment-based approaches for flood risk management. The WLSFRA aims to provide the evidence base for ensuring development is steered away from areas identified most at risk from all sources of flood risk and to reduce the risk of flooding to residents and infrastructure. Policy recommendations stemming from the WLSFRA can be found here and the mapping that illustrates the flood risks can be found here, including a manual detailing how the maps can be used.

6.2.2 Barnet Level 2 SFRA (2021)

The Council completed its Level 2 SFRA in 2021 to build an evidence base for the draft Local Plan. Detailed assessments were undertaken for each flood source, planning considerations and potential mitigation measures were assessed for eighteen sites that required targeted assessment. The purpose of this assessment was to inform decision-making regarding which sites could be taken forward for development, thus informing the Local Plan. The Level 2 SFRA also provided spatial planning and site-specific recommendations to enable developers to produce appropriate flood risk mitigation actions for each of the assessed sites. As part of this project, strategic storage sites were identified Borough-wide, which can help to alleviate surface water flood risk. More information can be found in the Level 2 SFRA.

6.2.3 Previous LFRMS Action Plan (2017)

Barnet's previous LFRMS was published in 2017 and set out ten local objectives and associated measures that would be actioned within Barnet and by other RMAs to manage local flood risk issues identified and achieve those objectives. Within the proposed local objectives, there were thirty-four associated measures which specified how the relevant RMAs would manage local flood risk issues identified within the Borough.

Since the previous LFRMS (2017), Barnet have been progressing the proposed objectives and measures. For example, Barnet review planning applications for surface water implications to prevent risks of flooding in new developments (local objective 1) by encouraging the use of SuDS within new builds. The ongoing FAS (as discussed in *Section 6.1* of this LFRMS) contribute to promoting flood resistance and resilience (local objective 2) and this update of the LFRMS, including its Action Plan (*Appendix A1*), satisfies local objective 8.

6.3 Technical updates

6.3.1 Drainage and Wastewater Management Plan (2025-2030)

As of April 2025, DWMPs must be produced by water and sewerage companies and enable organisations to work together to improve drainage and environmental water quality. Barnet's water

service company is TWUL, which has recently created its first DWMP. The DWMP is a long-term plan that will ensure a sustainable, resilient wastewater service for the next twenty-five years and beyond, which is increasingly important in the context of climate change and urban development.

The TWUL DWMP has identified the wastewater catchments most at risk due to future pressures. The DWMP aims to protect the environment, look after the health of the rivers, limit the risk of flooding and generate wider benefits for the communities TWUL serves. TWUL's final DWMP was informed by a public consultation on their Draft Plan, which ran from June to September 2022. More information on the process and documents can be found here. To request more information specific to Barnet, please contact dwmp@thameswater.co.uk. Following severe flooding in July 2021, TWUL commissioned an Independent Review to investigate their response to the incidents, which was led by The Independent Expert Group. The DWMP is TWUL's commitment to local and regional flood risk management. TWUL are also involved at a strategic level to help Local Authorities develop SuDS schemes and are supporting with Barnet's existing FAS. Barnet are working in collaboration with TWUL, who provided funding towards the Muswell Hill CDA scheme that Barnet is progressing, as detailed in *Section 6.1.3*.

6.3.2 New National Modelling (2022-2024)

The EA develop and host national flood risk modelling which detail existing assets and hydrology across England. Recently, the EA have started to update this to provide New National Modelling. The EA have engaged Local Authorities across the country to review and add additional information, helping to fulfil one of their core principles ('use existing local modelling as much as possible').

6.4 Partnership working

6.4.1 North-west London Strategic Partnership

The Greater London Authority's (GLA) Drain London project, 2010 grouped Local Authorities based on their proximity to promote partner-working and sharing best practice guidance. Barnet have been grouped with five other Boroughs: Brent, Ealing, Harrow, Hillingdon and Hounslow – together they form the North-west London Strategic Partnership. The group meet with other RMAs with flood risk functions on a quarterly basis, to collaborate on delivering their LLFA requirements from the FWMA and the FRR. The group includes an elected representative on the Thames Regional Flood and Coastal Committee (TRFCC).

6.4.2 Brent Catchment Partnership

The Brent Catchment Partnership (BCP) represents a group of organisations working together to make the streams, lakes, and canals of the River Brent catchment cleaner, more accessible and more attractive, to benefit local communities and wildlife. The BCP provides a platform where partners can share information and build knowledge about the shared aim to bring about sustainable water and river management. The members involved include the five London Boroughs (Barnet, Brent, Ealing, Harrow and Hounslow), in addition to other groups such as the Brent Rivers and Canals Society, EA, TWUL, Natural England, Thames21, Canal & River Trust, London Wildlife Trust and Zoological Society of London.

6.4.3 Thames Regional Flood and Coastal Committee

RFCCs were established by the EA under the FWMA. They bring together members appointed by Local Authorities and independent members with relevant experience for three purposes:

1. To create coherent plans to identify, communicate and manage flood risk across catchments.
2. To encourage efficient, targeted and risk-based investment in flood risk management that represents value for money and benefits local communities.
3. To provide a link between the EA, LLFAs and other RMAs with flood risk functions to deepen knowledge and share best practice.

Barnet is located within the Thames region and therefore has representation on the TRFCC. Barnet is partnered with the London Boroughs of Brent, Ealing, Harrow, Hillingdon and Hounslow similar to the partnering for the North-west London Partnership, detailed in *Section 6.4.1*. The TRFCC host sub-committee and main-committee meetings on a quarterly basis, which provide updates on the spending figures for local levy and facilitates discussion between partners who provide flood scheme updates where relevant.

6.4.4 London Drainage Engineers Group

The London Drainage Engineers Group (LoDEG) was formed in 2011 by the GLA following the enactment of the FWMA and the creation of the LLFA role for all London Boroughs. LoDEG's primary objectives are to:

- Facilitate partnership working between LLFAs and other RMAs with flood risk management functions (such as the EA, TWUL and the GLA)
- Develop tools to support London Boroughs to exercise their LLFA duties
- Formulate and provide advice to London Boroughs and London Technical Advisers Group
- Promote best practice and share knowledge and experience within the profession

Quarterly meetings are chaired by LoDEG, which include a series of external presentations on subjects of interests to the membership followed by RMA updates. Monthly newsletters are published by LoDEG. More information regarding the meetings and newsletters can be found here.

6.4.5 Barnet Internal Flood and Drainage Board and Barnet Flood Group

Barnet LLFA hosts an Internal Flood and Drainage Board, which meets monthly to review current and future scheme opportunities and organise stakeholder workshops on an ad hoc basis. Barnet LLFA are aiming to set up quarterly Flood Group meetings with other internal service delivery teams. The purpose of the Flood Group will be to introduce other departments within Barnet to the importance of effective flood risk management and the role of the LLFA within this. The LLFA will provide updates on their existing schemes and the forum will facilitate collaboration between internal teams on existing and upcoming planned projects. This will allow time and cost efficiencies through the LLFA proposing to include SuDS features into other ongoing schemes, which will benefit Barnet's overarching shared aims. Barnet LLFA will be responsible for logging and updating a list of attendees and for organising and chairing the meetings in future.

7. What the Council is Planning to do to Manage Flood Risk

7.1 New Action Plan

As part of this LFRMS update, a detailed Action Plan has been produced to outline the specific measures proposed to meet the Strategic Objectives (detailed in *Section 1.5* of this LFRMS) over the six-year period between 2023 and 2029. Some of the measures include the statutory duties of the LLFA and other partner RMAs. The LFRMS Action Plan (2023-2029) sets out comprehensive actions to achieve this Strategy's Strategic Objectives. The key measures include the Council's commitment to fund dedicated resources to deliver the Strategy, providing efficient responses to flood incidents and emergency recovery, maintaining a robust flood incident log and flood risk asset register and increasing internal and external stakeholder engagement for collaborative flood risk management and achieving long-term resilience.

Some of the objectives and measures from the previous LFRMS have been carried over into the current LFRMS. These include maintaining and updating the flood risk asset register and the investigation of all reported flooding incidents, in addition to continued collaboration and the promotion of flood resilience and resistance across Barnet.

The proposed actions align to the EA's NFCERMS, its associated 2021 Action Plan and 2022 Roadmap. Actions set out in Barnet's FRMP to be delivered by 2027 are included within the Action Plan. Despite each action being listed independently, the actions are not mutually exclusive and, in many cases, will benefit more than one of the proposed Strategic Objectives.

The Action Plan details the lead RMA responsible for the actions' delivery and lists partner RMAs supporting with the delivery of the actions. Each action has a given timescale (from 2022), which is categorised as follows:

- Short-term = 0-2 years
- Medium-term = 2-4 years
- Long-term = 4-6+ years
- Ongoing = Continual action

The Action Plan also specifies the status of each action as follows:

- Red = Action not started
- Amber = Action in progress
- Green = Action completed

The Action Plan includes measures that are themed around cultivating an awareness of flood risk management for both residents and businesses, while improving collaboration between strategic RMAs who have flood risk management functions. Similarly, the Action Plan measures are centred on increasing flood resilience by placing requirements on developers to steer development away from areas at high risk of flooding. There is a focus on the proactive seeking of funds and resource are in place for the maintenance of the Action Plan to ensure continuous undertaking of these measures.

The full Action Plan can be seen in *Appendix A1* – Action Plan of this document.

7.2 Current flood alleviation work

The Council will continue to deliver the FCERM and Community Infrastructure Levy funded programme, as discussed in *Section 6.1*.

7.2.1 Neighbouring Borough collaborations

The London Borough of Enfield are progressing work on a large-scale project in Arnos Park. The scheme will deliver river restoration and will potentially incorporate a flood alleviation element. Currently, the project is undergoing early stages of feasibility investigations and aims to restore approximately eight hundred metres of river, with potential for SuDS and NFM elements.

The scheme is just east of Barnet; therefore, there is potential to increase partner-working through Bounds Green and the Pymmes Brook, which flows through both the park and downstream east of Barnet. Enfield are currently awaiting confirmation from the EA regarding funding allocations. It is recommended that communication could improve through increasing engagement by scheduling regular meetings to create an active group around the Arnos Park scheme, where best practice guidance can be shared, such as updated modelling and more project-related interaction.

In 2017, the TRFCC approved the development of the London Strategic SuDS Pilot Study (LSSPS) to evaluate the benefits of small retrofit SuDS features dispersed across a catchment. The LSSPS supported the successful delivery of retrofit SuDS in Enfield (in addition to the London Boroughs of Camden and Hillingdon). This work may help support Barnet in the actions to reduce flood risk, improve partner-working and deliver SuDS.

In addition to the above, Barnet is progressing the existing flood alleviation schemes discussed in *Section 6.1*.

7.3 Strategic updates

7.3.1 Multi Agency Flood Plan and Council Flood Plan (2019)

In 2019, Barnet's Emergency Planning team created two Flood Plans, the MAFP and the Council Flood Plan, which are internal documents for use within the Council. The Flood Plans are updated every three years and therefore both are due an update shortly.

The current MAFP aims to provide a multi-agency response framework to mitigate the impact of flooding in Barnet. It provides guidance on a strategic multi-agency response to deliver the needs of those affected by a flood incident and specific objectives, such as providing effective management structures and ensuring that a safe system of work is employed throughout the response and recovery. The MAFP outlines the different types of flood risk and the triggers for flooding preparation and response, as well as tailoring this to vulnerable people and providing information on recovery.

The current Council Flood Plan details the Council's response to flooding in Barnet. It aims to clarify roles and responsibilities, confirm the initiation procedures and coordination arrangements in case of EA flood warnings and steers departments to national guidance on flooding.

7.4 Key stakeholders

7.4.1 Internal stakeholders

At an early stage in the project to develop this new LFRMS, an internal stakeholder workshop was carried out to introduce internal stakeholders (Barnet service delivery teams) to the aims and content of the LFRMS, Action Plan, SEA and HRA. In the first instance, internal stakeholders provided local policy information; they were later consulted on the documents at consultation phase in 2023 to ensure their continued cross-departmental collaboration to improve the Council's flood risk management processes. The internal stakeholders who were consulted include representatives from the Council teams indicated in *Figure 7-1*.

- LLFA
- Ecology
- Emergency Planning
- LPA
- Highways
- Asset Management
- Traffic and Transport
- Parks
- Regeneration and Neighbourhoods
- Growth and Housing
- Sustainability
- GIS and Data Management
- Environment/Biodiversity and Climate Change
- Climate Emergency Group
- Communications
- Consultation Management

Figure 7-1 List of internal stakeholders

7.4.2 External stakeholders

Similarly, an external stakeholder workshop was held in which the stakeholders provided useful insight for ongoing and future Barnet FASs. The external stakeholders provided information relating to current and future strategic work. During the public consultation phase in 2023, these stakeholders were consulted. The external stakeholders are listed in *Figure 7-2*.

- Environment Agency
- Thames Flood Advisors
- Thames Water
- London Borough of Brent
- London Borough of Camden
- City of London
- London Borough of Haringey
- London Borough of Harrow
- Hertsmere Borough
- Historic England
- Natural England

Figure 7-2 List of external stakeholders

7.5 How will these actions be funded?

Funding for FASs is targeted at locations that have the highest level of flood risk where there is greatest need for investment in flood alleviation. As a LLFA, Barnet is able to apply for Defra's FCERM Grant in Aid funding as well as Local Levy from the TRFCC. Both of these funding streams are awarded via the EA through the submission of a project proposal and funding request.

Barnet is also awarded funding through the national Department for Levelling Up, Housing and Communities' Revenue Support Grant. This funding stream is awarded to Local Authorities for wider works but is not ringfenced for the LLFA, who thereby may need to apply for a portion of this to be used for flood risk management workstreams.

Third party funding is typically required to progress most projects, as benefactors of schemes and therefore enables the delivery of flood risk management benefits across Barnet. As indicated in *Why do* we need a LFRMS?, the increase in climate change is expected to bring about more extreme flooding; therefore, the need to deliver FASs and seek third party funding for this purpose is also increasingly required. The Council is already extensively investigating third party funding, although continued commitment is required.

8. Summary

8.1 Summary of LFRMS

The LLFA for an area in England must develop, maintain, apply and monitor a strategy for local flood risk management in its area (a LFRMS). This LFRMS has set out Barnet LLFA's approach to managing local flood risk across the Borough over the next six years.

The Strategic Objectives are outlined in *Section 1*, which outlines the purpose of the LFRMS, why it is required and how it has been prepared. The clear definition of the RMAs with local flood risk management functions are detailed in *Section 2*, improving clarity and supporting improved collaboration. An assessment of all local flood risks has been made in *Section 3* which shows the different risks of flooding Barnet faces and Barnet-wide flood risk is mapped in the Online Mapping Tool to supplement this. The LFRMS also signposts guidance for residents on how they can reduce their flood risk, advising residents to invest in resistance and resilience measures and providing clear instructions on how to report flooding in *Section 4*, so that flood risk can be managed by the relevant RMAs. Sustainable flood risk management, including information on SuDS, NFM and how these are incorporated into national, regional and local planning policy is detailed in *Section 5*. Moreover, *Section 6* provides information on the multiple, current FASs and drainage works in Barnet as well as detailing key technical and strategic updates, such as information on the DWMP and various partner groups. *Section 7* lists planned future work and sets out how the proposed objectives and measures in the Action Plan detailed in *Appendix A1* are to be funded and which stakeholders will be consulted.

Due to growing populations, rising development demands and an increase in the frequency and severity of storms brought about by climate change, Barnet's need for a robust LFRMS has never been greater. This LFRMS works alongside the SWMP and other wider strategies such as those listed in *Appendix B1* – Legislation for making Barnet a greener, more flood resilient and more sustainable place to live, work and visit. Collaborating with other RMAs to target investment to increase resilience to flooding in areas that require it the most is a key aim of the LFRMS and is reflected in the Action Plan.

8.2 Next steps

The LLFA will maintain and update the Action Plan provided in *Appendix A1* – Action Plan, which will be monitored and reviewed in accordance with *Section 8.3*. This will enable the delivery of the measures proposed to achieve the Strategic Objectives, which are detailed in *Section 1.5*.

8.3 Monitoring and reviewing

In accordance with the FWMA, the LFRMS is required to be reviewed and updated every six years; therefore, the next update is scheduled for 2029. However, the LFRMS may be required to be updated if there are significant changes updating knowledge relating to flooding or flood modelling, or if there are significant changes to legislation.

The actions proposed in the Action Plan set out Barnet's approach to manage flood risk and achieve the Strategic Objectives detailed in *Section 1.5* over the next six-year period (2023-2029). The Action Plan will be reviewed at least every two years, including updating the status for each action. Each action will be reviewed individually at defined frequencies (either monthly, quarterly, half-yearly or

annually) according to the monitoring plan in the Action Plan. This monitoring plan will be an internal document and will enable Barnet LLFA to track progress against each action to ensure the actions are delivered according to the set timescales and achieve the Strategic Objectives.

Appendix A1 – Action Plan

LFRMS Action Plan, which will be uploaded onto Barnet's Council webpages.

Appendix A2 – Strategic Environmental Assessment

LFRMS SEA, which will be uploaded onto Barnet's Council webpages.

Appendix A3 – Habitats Regulations Assessment

LFRMS HRA, which will be uploaded onto Barnet's Council webpages.

Appendix B1 – Legislation

International	
EU Water Framework Directive (2000)	The EU Water Framework Directive (WFD), made it a requirement for Member States of the EU to improve and maintain the state of all waters, including surface waters and groundwater. All waters were to achieve a 'good' ecological status by 2015 or, at the latest, by 2027. The WFD requested that water management plans are developed using a river basin approach. The WFD was adopted into UK law in 2003 and has been retained in UK law post-Brexit.
EU Floods Directive (2007)	The EU Floods Directive dictated how Member States should approach the flood risk management of all types of floods. A three-stage process was introduced, with the cycle continuing every six years. The original requirements are as follows. By 2011, Member States had to have produced PFRAs to identify areas where watercourses and coast lines are potentially at risk of flooding. By 2015, mapping of flood risk areas showing the extent, assets and number or inhabitants at risk must have been carried out. By 2015, FRMPs for areas at high risk of flooding must have been produced, including measures to reduce flood risk. The EU Floods Directive was implemented in UK law through the FRR which is retained in UK law post-Brexit.
Intergovernmental Panel on Climate Change Report (2021)	The IPCC Sixth Assessment Report assessed the physical science basis of climate change. Headlines include predictions of +1.5°C temperature change in the next two decades and that climate change is presently affecting every populated region of the globe.
National	
Civil Contingencies Act (2004)	The CCA is a legislative framework for civil protection in the UK that established the roles and responsibilities on organisations that play a role in preparing for and responding to emergencies. Local Authorities are a Category 1 responder with duties that include putting in place emergency plans, sharing and co-operating with other local responders to enhance efficiency.
Pitt Review (2008)	Following the extreme flooding that took place in the summer of 2007, a comprehensive review lead by Sir Michael Pitt known as the Pitt Review was commissioned by the UK Government. The Pitt Review provided 92 recommendations to improve flood risk management in England, notably that County Councils, large metropolitan Boroughs, and Unitary Authorities should take lead on the management of flood risk. The Pitt Review recommendations were accepted by the Government and gave way to the FWMA.
Flood Risk Regulation (2009)	The FRR implemented the EU Floods Directive in England. Flood risk management, as set out by the framework, required the production of PFRAs, identification of flood risk areas, mapping of such areas and FRMPs.
Flood Water Management Act (2010)	The FWMA aimed to provide better, more sustainable management of flood risk and coastal erosion along with improving the sustainability of water

	resources. It defined structures and responsibilities for managing flood risk, notably with the introduction of LLFAs which impart the role of managing local flood risk to County Councils, large metropolitan Boroughs and Unitary Authorities. The EA was appointed to hold the strategic overview role of all sources of flooding, in addition to managing the flood risk from main rivers and the sea. The FWMA also placed a statutory duty on the EA to develop a NFCERMS for England.
UK 25 Year Environment Plan (2018)	The UK's 25 Year Environment Plan sets out the Government's plan to improve the environment within a generation. Key focuses of the plan include: (1) clean air, (2) clean and plentiful water, (3) thriving plants and wildlife, (4) reducing the risks of harm from environmental hazards, (5) using resources from nature more sustainably and efficiently, (6) enhancing beauty, heritage and engagement with the natural environment, (7) mitigating and adapting to climate change, (8) minimising waste, (9) managing exposure to chemicals and (10) enhancing biosecurity.
Flood and Coastal Erosion Risk Management Policy Statement (2020)	The Flood and Coastal Erosion Risk Management Policy Statement reflected the Government's long-term ambition to increase the resilience to flood and coastal erosion risk nationwide.
National Flood and Coastal Erosion Risk Management Strategy (2020)	The NFCERMS set out a framework for RMAs involved in managing flood risk to increase the nation's flood resilience. The publication of the NFCERMS was followed by an Action Plan aligned with the Strategy's long-term objectives.
Environment Act (2021)	The Environment Act is the UK's new framework of environmental protection since departing from the EU. It is intended to provide legal regulations on nature protection, water quality, clean air and other environmental protections. The Environment Act provides the Government with powers to set new binding targets, including for air quality, water, biodiversity, and waste reduction, and also establishes a new environmental watchdog – the Office for Environmental Protection.
National Planning Policy Framework (2021, revised)	NPPF, published by the Ministry of Housing, Communities & Local Government, set out the planning policies to deliver sustainable development. It provided guidance to Local Authorities on developing Local Plans in line with national planning policies.
Regional	
Thames Catchment Flood Management Plan (2009)	The Thames Catchment Flood Management Plan is a Plan which helped RMAs such as the EA to plan and agree the most effective ways to manage flood risk in the future. The Plan needs to consider all types of inland flooding from rivers, groundwater, surface water and tidal flooding but not directly from the sea (coastal flooding) which is instead covered by Shoreline Management Plans. The Plan also consider likely impacts of climate change, land use change/management and the need for future development.
Mayor of London's Climate Change Adaption Strategy (2011)	The Mayor of London's Climate Change Adaption Strategy set out the framework for improving the quality of life in London and for protecting the natural environment. It provided an Action Plan for making London more sustainable by using three 'pillars': retrofitting London, greening London, and cleaner air for London. The strategy presented the main climate change

	impacts on London on cross-sector issues including health, economy, and infrastructure. The strategy also provided a 'roadmap to resilience' outlining key actions, with lead and partner organisations.
Thames Estuary 2100 Flood Risk Management Plan (2023)	The Thames Estuary 2100 Plan was developed by the EA and provides strategic direction for managing flood risk in the Thames Estuary to the end of the century. The Thames Estuary 2100 Plan is an adaptive strategy and is reviewed on an interim basis every 5 years and on a full basis every 10 years. The Plan considers different long-term options for managing tidal flood risk depending on changes in factors which determine the level of flood risk, including sea level rise.
London Regional Flood Risk Appraisal (2018)	The London Regional Flood Risk Appraisal provided an overview of all sources of flooding in London and addressed both its probability and consequences. The London RFRA subsequently informed the London Plan and should inform local-level flood risk assessments and local plans.
London Sustainable Drainage Action Plan (2021)	The London Sustainable Drainage Action Plan addresses a specific need to promote the awareness, and the retrofitting, of sustainable drainage systems right across London. It contains a series of actions to make London's drainage system work in a more natural way with the main focus on the retrofitting of sustainable drainage to existing buildings, land and infrastructure. Sector-specific SuDS guidance has been developed as part of the London Sustainable Drainage Action Plan.
The London Plan (2021)	The London Plan is an overarching Strategic Development Strategy for London. Producing an SDS is a requirement of the London Mayor established under Greater London Authority legislation. The London Plan established an integrated economic, environmental, transport and social framework for the development of London for the next 20-25 years. London Boroughs' local plans need to align with the London Plan, and its policies guide decisions on planning applications by Councils and the Mayor.
Local	
Barnet's Local Plan (Core Strategy): Development Plan Document (2012) Barnet Draft Local Plan (Reg 19) 2021-2036	The Core Strategy (referred to as the Local Plan) was developed by the LPA to set out a framework for the future development of the area. It set out policy and guidance to plan and manage growth and to guide development across Barnet. It addressed needs and opportunities in relation to housing, the economy, community facilities and infrastructure. It also provided the basis for conserving and enhancing the natural and historic environment, mitigating and adapting to climate change and achieving well designed places. Barnet have produced a new Draft Local Plan in 2021 which is yet to be published. This will set out the local plan for Barnet for the next 15 years until 2036.
Barnet's Local Plan: Examination of Technical Paper on Biodiversity (2022)	Barnet's Technical Paper on Biodiversity sets out the way the new Barnet Local Plan will identify, map and safeguard the wildlife rich habitats across Barnet. The Paper also addresses how the Plan promotes the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species.

West London Strategic Flood Risk Assessment (2018)	The SFRA is an NPPF requirement to provide a strategic overview of all forms of flood risk within an area. It should assess the risk from all sources of flooding, the cumulative impact that development or changing land use would have on the risk of flooding and the effect of climate change on these risks. The SFRA should also identify opportunities to reduce the causes and impacts of flooding and any land likely to be needed for flood risk management features and structures. The SFRA provides guidance for the local plan, individual planning applications, future flood management, emergency planning and how to adapt to climate change. The WLSFRA was produced for the London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon, and Hounslow.
Barnet Level 2 SFRA (2021)	Metis Consultants produced Barnet's Level 2 SFRA in 2021 to build an evidence base for the Council's draft Local Plan. Detailed assessments were undertaken for each flood source, planning considerations and potential mitigation measures were assessed for eighteen sites that required targeted assessment. The purpose of this assessment was to inform decision-making regarding which sites could be taken forward for development, thus informing the Local Plan. More information can be found in the Level 2 SFRA.
Surface Water Management Plan (2011)	The SWMP is a document produced by LLFAs to outline the preferred surface water management strategy of an area. Barnet's SWMP was produced in 2011 and included flooding from sewers, drains, groundwater and runoff from land, small watercourses and ditches that could occur as a result of heavy rainfall.

Appendix B2 – Useful Links

Below is a list of useful links which have been referenced throughout the LFRMS.

Action for Silk Stream | Barnet Council

Barnet's Environment Committee Paper (2022)

Blue Pages

Defra - Property Protection Advisor

EA's Online Tool for checking flood risk

EA's Statutory Main River Map

Emergency Flood Kit

Flood and Water Management | Barnet Council

Formal Pre-Application Advice Service

Guidance on Managing a Watercourse on your Property – Barnet Council

Guidance on Managing a Watercourse on your Property - EA

Level 2 SFRA

London Flood Review

London Strategic SuDS Pilot Study (LSSPS)

Managing Culverts

National Flood Forum (NFF)

Online Mapping Tool

Personal Flood Plan

Protecting your Property - NFF

Rivers and Wetlands Community Days

Sign up for Flood Alerts

Susdrain

Sustainable Drainage Proforma

Thames21 Action for Silk Stream

The Town and Country Planning (Development Management Procedure) Order 2015

Unblocking the Burnt Oak Brook Project Report