London Borough of Newham

Local Flood Risk Management Strategy

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Local Flood Risk Management Strategy for the London Borough of Newham

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1	March 2015	Draft
2	April 2015	Draft for internal consultation
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4	August 2015	Draft reviewed against EA and TW comments
5	September 2015	Final Draft updated with planning control and emergency planning pending items.

All changes to this document will be tracked and recorded by the LLFA management team.

It will be reviewed on an annual basis. However new risk assessment, lessons identified from incidents or exercises, restructuring of organisations or changes in key personnel will also prompt updates to the plan.

Local Flood Risk Management Strategy for the London Borough of Newham

1 Introduction

1.1.1 The London Borough of Newham Local Flood Risk Management Strategy is an important tool to help understand and manage flood risk within the borough.

1.1.2 It is not possible to prevent all flooding, but there are actions that can be taken to manage the risks and reduce the impacts that they may have on communities.

1.1.3 The Government has given local authorities new powers to manage local flood risk in a more coordinated way. As a Lead Local Flood Authority (LLFA) Newham Council's remit includes flood risk from surface water runoff, groundwater and small rivers, streams and ditches (ordinary watercourses).

1.1.4 This document is Newham's response to the challenge of managing flooding from these sources in the borough. The development of the Local Flood Risk Management Strategy has sought to balance the needs of our community, the economy and the environment.

1.2 Legislative Context

1.2.1 The Flood and Water Management Act 2010 (FWMA) requires LLFAs such as Newham to develop and apply a Local Flood Risk Management Strategy (LFRMS) that:

- Specifies the roles/management functions of the different authorities that have responsibilities for managing flood risk in Newham;
- Describes how Newham is working with partners to reduce flood risk;
- Provides an overall assessment of local flood risk;
- Sets out the objectives for managing local flood risk;
- Outlines measures/actions to be taken to meet those objectives and how and when these measures/actions are expected to be implemented;
- Sets out the costs and benefits of the measures, and how they are to be paid for; and
- Describes how the strategy contributes to the achievement of wider environmental objectives.

1.2.2 The Flood Risk Regulations 2009 (FRR) came into force on 10 December 2009. They transpose the EU Floods Directive into UK law. The key provisions of the Regulations, as they pertain to LLFAs are

the responsibility for local flood risk and the requirement to assess flood risk and prepare management plans.

1.2.3 Further information regarding the legislative context to flood risk management is provided in Appendix 1.

1.3 Local Partnerships

1.3.1 Newham Council works with several partners to reduce the risk and impact of flooding across the borough. This strategy sets out the responsibilities of such risk management authorities so it is clear how we will work together and so that local residents and businesses know what to expect of the different organisations involved.

1.3.2 Newham's partners and a summary of their responsibilities are:

- **The Environment Agency -** has a strategic overview of all sources of flooding and coastal erosion (as defined in the FWMA). It is also responsible for flood and coastal erosion risk management activities on main rivers and the coast, regulating reservoir safety, and working in partnership with the Met Office to provide flood forecasts and warnings. It must also look for opportunities to maintain and improve the environment for people and wildlife while carrying out all of its duties.
- **Thames Water Utilities -** is responsible for managing the risks of flooding from sewer systems: surface water, foul or combined, providing drainage from buildings and drained surfaces.
- **Neighbouring London Boroughs of Enfield, Tower Hamlets, Haringey, Hackney and Waltham Forest –** we are working together with our neighbours through the Drain London Forum (Group 4) to share knowledge and agree, where possible, a common approach to local flood risk management. Our group meets regularly with Thames Water and the Environment Agency (EA) to discuss group wide issues and share best practice. The London Legacy Development Corporation is also included in this group as it is the local planning authority for the Olympic Park area, which includes part of Newham.
- **Other adjoining boroughs -** LB Redbridge is not within Group 4 of the Drain London Forum so we will consult with Redbridge on matters of common interest which may have cross-borough effects. Whilst formally Newham adjoins boroughs south of the River Thames, it is considered unlikely that there will be cross boundary issues for flooding from ordinary watercourses and surface water.
- **Emergency Services -** responsible for minimising the impact of extreme flood events and responding to emergency situations.

- **Newham Emergency Planning –** responsible for setting up systems under the Civil Contingencies Act to deal with emergencies in Newham.
- **Newham Highways Team** – Responsible for highways under the control of the council, including managing incidents of flooding on the highway and contractors hired to undertake drainage cleansing activities.
- **Newham Planning Team** - Implements the Council policy on flood risk assessment for new developments. Publishes and updates the Strategic Flood Risk Assessment.
- **Transport for London (TFL)** – Responsible for the trunk roads within the Borough of Newham, not under responsibility of Newham Council.
- **Developers -** have a responsibility to minimise flood risk in new developments and their impact on the surrounding areas, through the design and layout of their schemes and incorporation of sustainable drainage (SuDS) techniques.

1.3.3 Although not a 'Risk Management Authority' as defined by the FWMA, the **Greater London Authority (GLA)** plays a co-ordination role for all 33 London Boroughs. They co-ordinate Drain London work to help manage and reduce surface water flood risk in London by improving available knowledge of the surface water drainage system and identifying areas at the greatest risk of flooding. Through this role, they also demonstrate some of the ways to reduce the risk.

1.3.4 **Local residents and businesses** also have a key role to play in managing flood risk. People and properties in any known areas of flood risk should be prepared for flood incidents, and any landowners whose properties adjoin watercourses have a responsibility to ensure the unobstructed flow of water. In addition, it is essential that local residents and businesses report any incidents of flooding of property, open spaces and roads. This all helps to build up knowledge of patterns of flooding, which can then help with future risk management.

2 Summary of Local Flood Risk

2.1 Definition of Flood Risk

2.1.1 Flood risk is the combination of the likelihood of the flood happening (probability) and the potential damage flooding will cause (consequence).

2.1.2 A risk can only be realised if there is a means (pathway) of connecting the source of the flood with the people, property and land that may be affected (receptors). Source, pathway and receptor must all be present for there to be a risk.

2.1.3 Assessing risk in quantifiable / financial terms assists in prioritising where available funding should be directed, as well as supports applications for additional external funding.

2.1.4 The consequences of flooding can be quantified relating to, for example, the damage to property or disruption to transport, however some consequences can be far reaching and not always easy to assign a value to, particularly the social impacts of displacement, loss and fear of repeat events.

2.2 Sources of Flooding

2.2.1 The most significant sources of flooding to Newham are main rivers and excess rainfall / surface water.

2.2.2 River flooding occurs when a river cannot cope with the amount of water draining into it from the surrounding land and its channel capacity is exceeded. Tidal flooding, in the case of tidal reaches of rivers, occurs during high tides and storm surges.

2.2.3 Newham is bounded by the River Lea and River Roding, to the west and east respectively. These two main rivers discharge into the tidally dominated River Thames, which forms the southern boundary of the borough.

2.2.4 Surface water flooding occurs when intense rainfall generates runoff that is not able to be managed by the drainage system, leading to ponding and overland flows. The combination of extensive man-made surfaces and structures, underlying geology, low-lying topography and primarily pumped drainage systems, means that the borough is susceptible to surface water flooding.

2.2.5 Further sources of flooding include sewers, groundwater, ordinary watercourses and 'artificial sources', such as reservoirs and canals; Table 1 below describes the sources of flooding in Newham and the relevant risk management authority (RMA).

2.2.6 A wide range of water management and flood defence systems are required to manage flooding. These defences include all aspects of the drainage network from simple road gullies to large assets such as the Thames and Barking Barriers, locks, culverts and sluices.

Table 1 – Flood Sources applicable to Newham

Flood Sources	Definition	RMA
Main Rivers	Flooding caused by overtopping of banks or defences, main rivers are defined by the Environment Agency and are capable of causing significant flooding	Environment Agency
Tidal	Flooding from the sea or tidal rivers	Environment Agency
Groundwater	Water rising from the ground where permeable rock formations exist	Newham Council
Ordinary Watercourses	Flooding caused by rivers, streams or ditches that are not classed as main rivers	Newham Council
Surface Water Runoff	Water that is not able to be managed by the drainage system, because it has been overwhelmed, leads to ponding and overland flows	Newham Council
Sewers	Water flows out of sewers due to blockages or lack of capacity/exceeding capacity (in case of extreme weather events)	Thames Water
Reservoirs	Reservoir dam failure leads to sudden inundation of downstream areas	Environment Agency
Canals	Flooding caused by overtopping or breach of canal banks or defences.	Canal and River Trust
Docks	Flooding caused by failure / overtopping of the dock gates, during tidal flood events, and overtopping of the dock walls	Environment Agency

2.2.7 Although these flood types are managed separately, it is important to note that they are all inter-related – surface water drains into sewers, sewers and ordinary watercourses flow into main rivers, rivers flow in and out of reservoirs, and so on. Therefore, management of the overall system must account for these various interactions.

2.3 Understanding of Flooding

2.3.1 The Environment Agency provides flooding information for main river, tidal, groundwater and reservoir sources. Hydraulically modelled flooding information for Newham's main rivers is provided by the Environment Agency and local flood mapping is available from the EA website:

https://www.gov.uk/prepare-for-a-flood/find-out-if-youre-at-risk

2.3.2 Hydraulic modelling of the main rivers is periodically updated by the Environment Agency, in line with best practice and to take appropriate account of the future impact of climate change.

2.3.3 In 2013 the Environment Agency, working with LLFAs, produced and published the updated Flood Map for Surface Water (uFMfSW). This currently represents the best publicly available information for surface water flood risk and local flood risk mapping is available from the EA website.

2.3.4 Newham Council has published several reports in recent years that provide information regarding flood risk, these include:

- Strategic Flood Risk Assessment (SFRA)
- Preliminary Flood Risk Assessment (PFRA)
- Surface Water Management Plan (SWMP)

2.3.5 The SFRA looks at flood risk across the borough and provides a tool to inform the policies and site allocations in our planning documents (for example the Newham Local Plan Core Strategy) to ensure future developments are sited and designed to minimise future flood risk.

2.3.6 The SFRA is available from the Newham Council website:

http://www.newham.gov.uk/Pages/ServiceChild/Planning-policy-documents.aspx

2.3.7 The PFRA is a high level study, required by the Flood Risk Regulations, covering all types of flooding in the borough and includes a summary of historic significant floods and information on future flood risk based on Environment Agency data.

2.3.8 The PFRA is available from Newham Council website:

http://www.newham.gov.uk/Pages/Services/Flooding.aspx

2.3.9 The SWMP identifies Local Flood Risk Hazard Zones (LFRZs) and Critical Drainage Areas (CDAs), and outlines the preferred surface water management strategy for the borough, based on surface water flood modelling developed specifically for this purpose.

2.3.10 The SWMP is available from the Newham Council website:

http://www.newham.gov.uk/Pages/Services/Flooding.aspx

2.3.11 The PFRA and SWMP were delivered under Tier 2 of the Drain London Project; however, the surface water flood model developed for the PFRA and SWMP has now been superseded by the Environment Agency's uFMfSW.

2.3.12 In 2013 a Tier 3 Drain London Project was commissioned to undertake more detailed integrated hydraulic modelling (to include the below ground drainage network) to enhance the understanding of, and identify solutions to, flooding in key areas identified in the SFRA and SWMP and in areas where historic flooding has occurred.

2.3.13 The surface water flood risk integrated modelling was undertaken for three study areas, encompassing a number of the SWMP CDAs. In addition to identifying and reviewing potential solutions to flooding, the Tier 3 study also seeks to evaluate the EA's uFMfSW mapping and provide updated flood mapping where required.

2.3.14 The understanding of local flood risk in the borough is therefore evolving and deepening as a result of the ongoing efforts of Newham Council and our flood risk management partners.

2.4 Watercourses, Assets and Defences

2.4.1 The London Borough of Newham is bounded on three sides by main rivers, as shown in Figure 1.

2.4.2 The River Thames, River Lea and River Roding are main rivers, and a number of other smaller rivers, such as the Aldersbrook, have also been classified by the Environment Agency as main rivers.

2.4.3 There are a number of small ordinary watercourse channels discharging into the River Roding, along the eastern side of the borough.

2.4.4 The Royal Docks are classified as an ordinary watercourse and protected against tidal flooding by the dock gates, which fall under the responsibility of the EA.

2.4.5 The borough includes the Thames Barrier, which provides tidal flood protection to the upstream catchment.

2.4.6 The River Thames and the lower reaches of the both the River Lea and the River Roding are tidally dominated.

2.4.7 The lower tidal reach of the River Roding is called Barking Creek and extends from the River Thames upstream to the Barking Barrage. The Barking Creek Tidal Barrier is located at the confluence with the River Thames and provides tidal flood protection to the River Roding and adjacent low-lying areas.

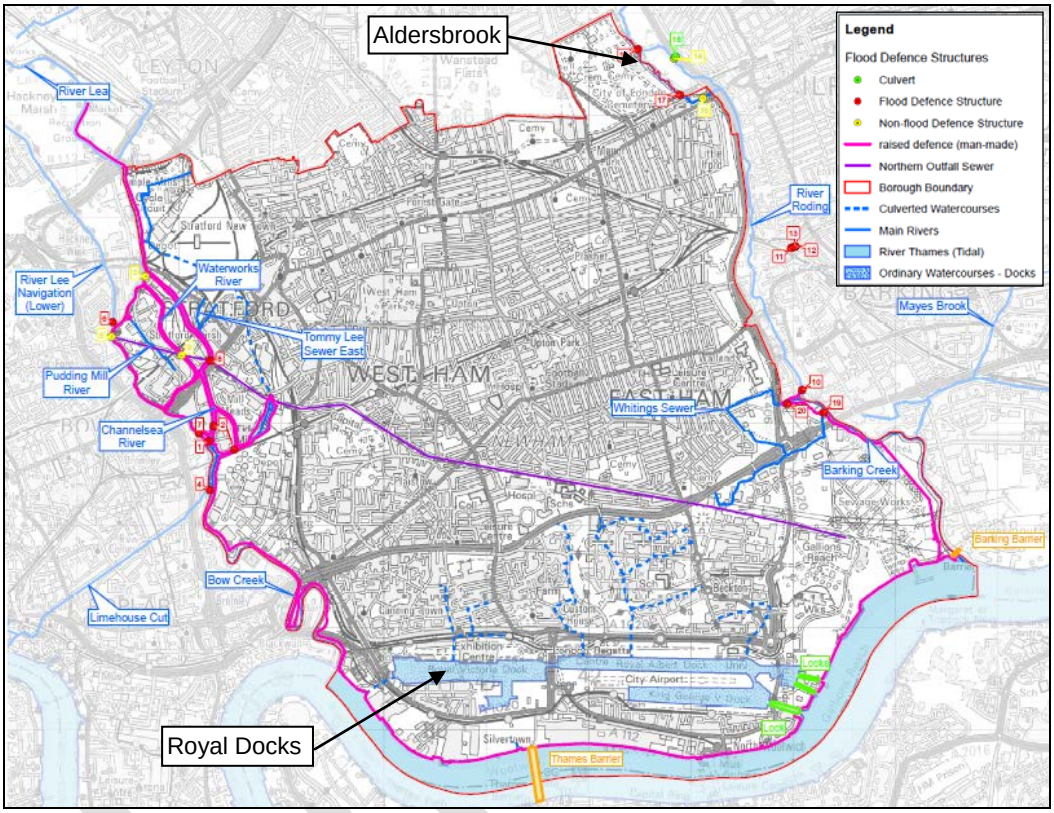

Figure 1 Newham Watercourses, Assets and Defences (Source: Figure 3.1 Newham SFRA, Assets and Defences)

2.4.8 The tidal reach of the River Lea (also known as Bow Creek) extends upstream to the Bow Lock link to the River Lee Navigation, and the Prescott Lock link to the Prescott Channel / River Lea at Three Mills.

2.4.9 The lower reaches of several of the watercourses in the borough are canalised and managed by the Canal and River Trust. This network of waterways (known as the Bow Back Rivers) connects the River Lea to the River Thames, draining to Bow Creek which is the final, tidally dominated, reach of the Lea.

2.4.10 All of these watercourses have been subject to engineering works, historically for the purpose of facilitating navigation and water supply,

and in more recent times for flood risk management and restoration, in association with the Olympic Park legacy.

2.4.11 The Thames Barrier and associated tidal defence walls, embankments and gates on the River Thames and River Lee provides Newham with a statutory level of tidal flood protection of 1 in 1000 (0.1% chance in any year).

2.4.12 However, there is a residual risk of flooding from breaches of the tidal defences caused by human interference or through defence failure. The Environment Agency has undertaken Breach Modelling (2015) which maps the residual risk of a breach or overtopping of the flood defences at certain locations along the river.

2.4.13 The Thames Estuary 2100 project (TE2100), led by the Environment Agency, developed a comprehensive action plan to manage future flood risk for the Tidal Thames for the next 100 years.

https://www.gov.uk/government/publications/thames-estuary-2100-te2100

2.4.14 The plan includes improvements to the existing Thames defences within the borough. There are implications for local councils and LLFAs regarding future surface water and combined discharges and for riverside development as a result of predicted rising water levels and the need to increase tidal defence heights.

2.4.15 In terms of Surface water assets relevant to flooding it is noteworthy that the western half of the borough drainage infrastructure consists almost exclusively of a combined sewerage -water system which relies on a number of pumping stations to function. The combined effluent draining the western part of the borough is transferred via the Northern Outfall Sewer to the South Eastern boundary of Newham to the Beckton Sewer Treatments Works before being discharged to the Thames.

2.4.16 Pumping Stations such as Abbey Mills are nodal to the process and accordingly represent major assets in terms of flood risk management as their failure could give rise to major impact in term of sewer and surface water flooding.

2.4.17 Other Newham major surface water flood management asset is the West Ham flood Alleviation scheme, a project completed by Thames Water in 2010 to reduce the risk of sewer flooding in Newham areas particularly prone to this occurrences due to limited capacity of the local combined sewer system infrastructure. The project targets to protect 800 homes from sewer flooding.

2.4.18 The West Ham Flood Alleviation Scheme consists of a main tunnel of 2800 mm with storage capacity running from a new built Abbey Mills Pumping Station (Effluent thereby pumped to the Northern Outfall

Sewer) linking drainage networks in Stratford, West Ham and Forest Gate.

2.4.19 The main tunnel is supplemented by additional 1200 mm micro-tunnels branching out to connect the existing combined sewer network so providing alleviations in case of surcharge of the system, by carrying away excess rainwater and sewage during storms, preventing flows backing up into streets and properties.

2.5 Flooding from Local Sources – Surface Water

Description of Source

2.5.1 Surface water flooding usually occurs during very intense rainfall which causes water to flow over the surface of the ground and create deep pools or puddles of water in low lying areas.

2.5.2 This type of flooding is most common in urban areas where water is unable to enter the ground because of tarmac or other impermeable surfaces. Flooding is intensified where existing surface features block natural overland flow paths, such as the raised Northern Outfall Sewer embankment and elevated main roads.

2.5.3 Surface water flooding can also be exacerbated when the soil is saturated and natural drainage channels or artificial drainage systems have insufficient capacity to cope with the intense rainfall.

History of Surface Water Flooding within Newham

2.5.4 Many of the past incidents of surface water flooding in the borough have been small scale incidents due to this lack of capacity in the existing drainage network in certain areas (inherent problem with an old drainage infrastructure not always at pace with rate of development of the concerned area and using a combined sewer system) or however where capacity was exceeded during extreme weather event, or blocked gullies preventing them from fulfilling their purpose effectively, combined with the natural topography of the area.

2.5.5 Historically, few incidents of surface water flooding have been recorded to have affected Newham. This is not to say that no such incidents have occurred or that there is no future flood risk to the borough from surface water.

2.5.6 A surface water flooding issue is known along Arragon Road, Upton Park, where highway flooding has caused in internal property flooding.

2.5.7 In September 2014 heavy rainfall caused disruption across Newham with flash flooding blocking roads in Forest Gate and Stratford and affecting rail services due to flooding on the line at Manor Park, as shown in Figure 2.

Figure 2 Photographs of flooding at Manor Park Station (19/09/2014)

2.5.8 Residents and businesses along Green Street and Upton Park were particularly affected, with instances of internal property flooding, as shown in Figure 3.

Figure 3 Photograph of flooding along Green Street (19/09/2014)

2.5.9 An investigation into the September 2014 flood event is being undertaken by Newham, with an initial assessment of local recorded rainfall showing the extreme rainfall to have lasted for between 1 and 2 hours and to have been between a 1 in 50 and 1 in 100 event.

2.5.10 Newham has collected anecdotal and photographic records of individual flooding incidents and collated them within the Council's combined GIS database of recorded flooding.

2.5.11 Newham has found that that there has been an ongoing history of drainage problems along Green Street. These incidents have historically been under-reported by residents, as have incidents where reactive highway drainage maintenance has been required.

2.5.12 The investigation has led to an enhanced programme of CCTV surveys and cleaning of gullies and highway drainage connections to sewers, specifically for the areas affected by flooding as well as selected CDAs identified by the SWMP.

2.5.13 The Environment Agency's uFMfSW, shown in Figure 4, currently represents the most up-to-date publicly available information for surface water flood risk for the borough.

2.5.14 The EA maps used a direct rainfall modelling approach, assuming 70% runoff coefficients for urban areas and runoff variation based on nationally mapped soil types for permeable surfaces in rural areas. In urban areas, underground drainage systems were not explicitly modelled, however a default loss rate of 12mm/hr was applied to rainfall to represent sewers. This approach isn't, however, able to account for the performance of flood alleviation schemes or where the discharge from sewers is artificially influenced, such as tide locked outfalls and pumped drainage systems.

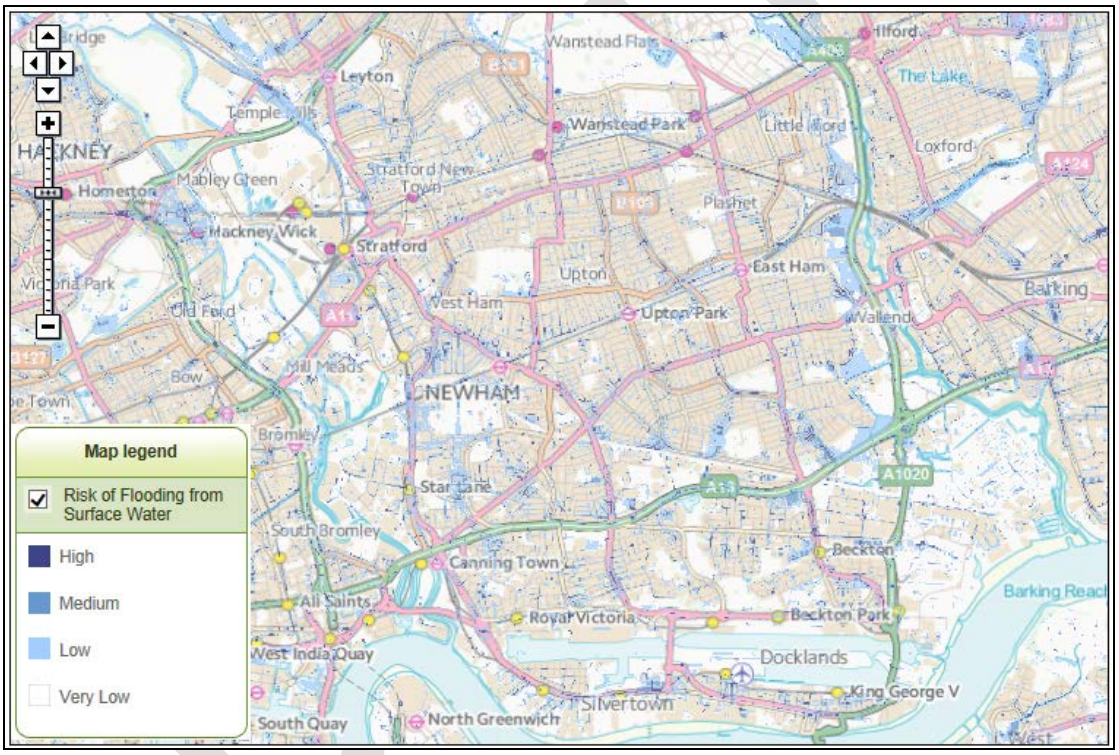

Figure 4 Risk of Flooding from Surface Water (Source: Environment Agency Online Map)

2.5.15 Although the surface water flood risk modelling and mapping undertaken to inform the SWMP has now been superseded by the uFMfSW, the areas identified by the SWMP as CDAs show good correlation with the uFMfSW and therefore remain unchanged. The locations of the CDAs are shown in Figure 5 and full details can be viewed in the SWMP.

2.5.16 The 13 CDAs identified generally fall within the following categories:

- **Topographical low lying areas:** Underpasses, subways and lowered roads beneath railway lines are more susceptible to surface water flooding;
- **Railway cuttings:** stretches of railway track in cuttings are susceptible to surface water flooding and, if flooded, will impact on services;
- **Embankments:** discrete surface water flooding locations along the upstream side of the raised rail or Northern Outfall Sewer embankments;
- **Sewer flood risk areas:** where extensive and deep surface water flooding is likely to be the influence of sewer flooding mechanisms alongside pluvial and groundwater sources.

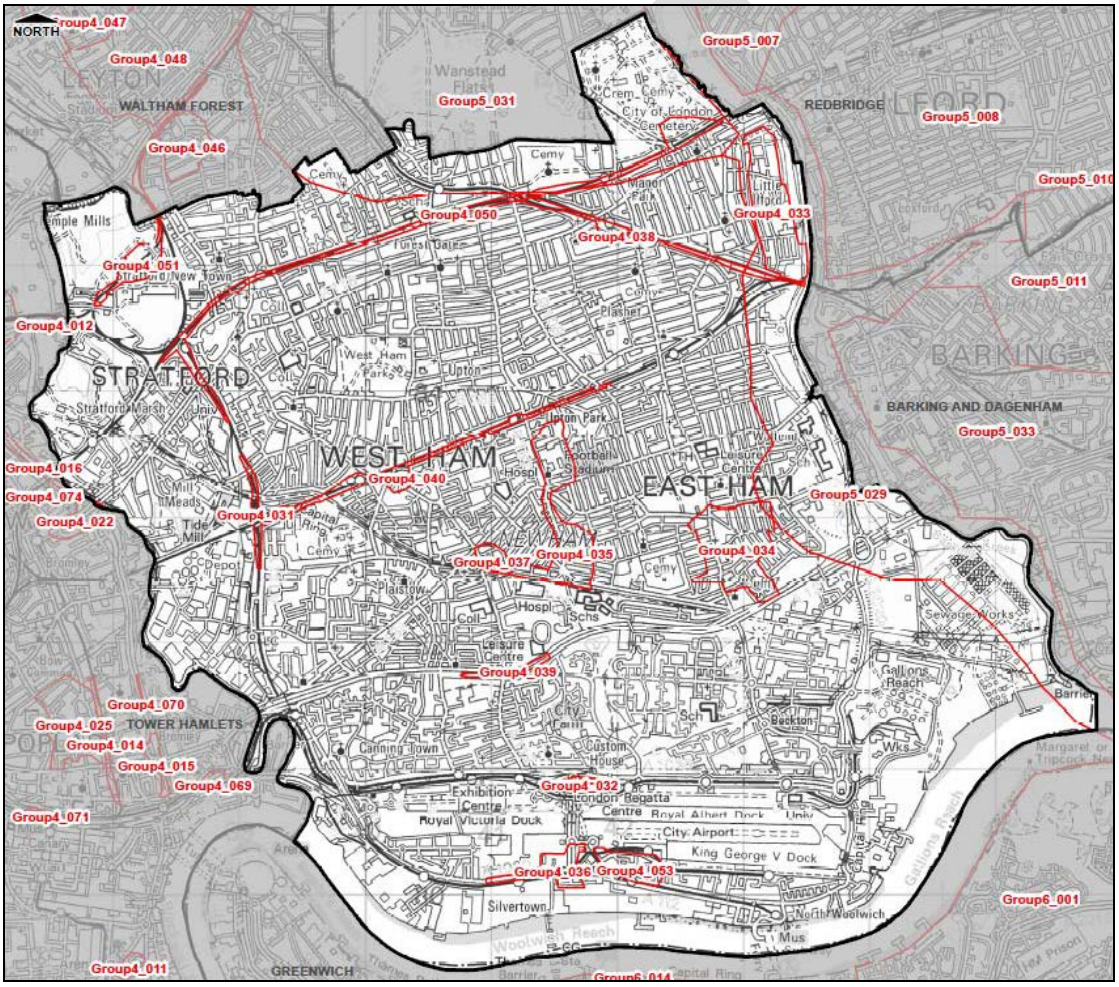

Figure 5 Critical Drainage Areas in Newham

2.5.17 The CDAs were defined by the SWMP using a reported 'cautious approach', based on the surface water flood modelling undertaken by the SWMP, and broad catchment areas were defined. However, the classification does not indicate that every property within the boundary of a CDA is at a significant risk of flooding.

2.5.18 For each of the CDAs, the SWMP identified and reviewed preferred options for managing flooding and reducing flood risk. It was concluded that priority should be assigned to addressing surface water flooding risk in those areas that:

- Experience regular or significant surface water / groundwater / sewer flooding;
- Contain basement properties;
- Contain critical infrastructure; and / or
- Through the pluvial modelling undertaken, are predicted to face significant surface water flood depths (>0.5m) and hazard (high flow velocities and depth) for the 1 in 100 year rainfall event.

2.5.19 An action plan was developed for Newham that identifies:

- LLFA common actions required to satisfy the FWMA and FRR requirements;
- Future studies and consultations for investigation and confirming the level of flood risk within the borough;
- Who is responsible for delivery of each action, along with who might provide support;
- When actions should be undertaken, reviewed and updated;
- Linkages between actions;
- An estimation of costs for investigations and optioneering works – including possible sources of funding – for the CDAs within the borough.

2.5.20 The integrated hydraulic modelling, undertaken as part of the Tier 3 Drain London Project, enhanced the understanding and identification of potential solutions to flooding in key areas identified in the SFRA and SWMP and in areas where historic flooding has occurred.

2.5.21 The surface water flood risk integrated modelling was completed for three study areas, encompassing a number of the SWMP CDAs as well as areas of historic flooding.

- **Little Ilford:** CDA 033 (Little Ilford), CDA 038 (Woodgrange Station and railway) and Manor Park Station (CDA 050) which experienced surface water flooding in 2014.
- **Newham Central:** CDA 034 (Hameway), CDA 035 (Humberstone Rd), CDA 037 (Kent and Surrey Streets) and Arragon Road, which has historically experienced surface water flooding.
- **Silvertown:** CDA 036 (North Woolwich Road Roundabout) and CDA 053 (Wythes Road and Drew Road).

2.5.22 In addition to identify and reviewing potential solutions to flooding the Tier 3 Drain London Study also evaluated the EA's uFMfSW mapping and identified where updated flood mapping should be provided to the Environment Agency to update the uFMfSW.

2.5.23 The impact of climate change has been accounted for in the surface water flood risk integrated modelling undertaken by the Council, by modelling of the 1 in 100 event plus a 30% future increase in peak rainfall intensity.

2.6 Flooding from Local Sources – Groundwater

Description of Source

2.6.1 Groundwater flooding occurs as a result of a rising water table from the underlying rocks (usually permeable and forming an aquifer) or from water flowing from abnormal springs. This tends to occur after long periods of sustained heavy rainfall and can be random in both location and time of flooding, often lasting longer than a river or surface water flood. High groundwater levels may not always lead to widespread groundwater flooding, but have the potential to exacerbate the risk of:

- Surface water flooding by saturating the soil and reducing the amount of rainfall the ground can accept,
- River flooding by increasing the base flow in rivers, and
- Sewer flooding through the interaction between groundwater and underground sewer networks.

Groundwater flooding is rarely a threat to life but is potentially damaging to property and infrastructure.

History of Groundwater Flooding within Newham

2.6.2 There are several records of groundwater flooding in the borough (2003, 2004, 2006, 2009, and 2010) affecting areas in East Ham, Forest Gate, Plashet, Upton Park, Manor Park and Plaistow. The SFRA shows that data provided by the Environment Agency indicated a total of ten incidents of groundwater flooding were reported to have occurred within Newham between January 2003 and June 2006 (See Figure 6).

2.6.3 The SFRA also states that the records of historic flooding available from Thames Water do not contain any flooding incidents related to groundwater. The lack of historic records, however, does not prove that there have been no other incidents of groundwater flooding in Newham, only that any such events have not been recorded by Thames Water or have not been attributed to groundwater.

Flood Risk Information

2.6.4 The causes of groundwater flooding are generally understood. However, groundwater flooding is dependent on local variations in topography, geology and soils. It is difficult to predict the actual location, timing and extent of groundwater flooding without comprehensive datasets.

2.6.5 There is a lack of reliable measured datasets to undertake groundwater flood frequency analysis and, even with datasets, this analysis is complicated due to the non-independence of groundwater

level data. Studies therefore tend to analyse historic flooding which means that it is difficult to assign a level of certainty.

2.6.6 As part of the Newham SFRA spatial datasets defining soils, geology and topography were assessed to assign borough wide groundwater flood risk, as illustrated in Figure 6, with the majority of the borough defined as at Medium risk.

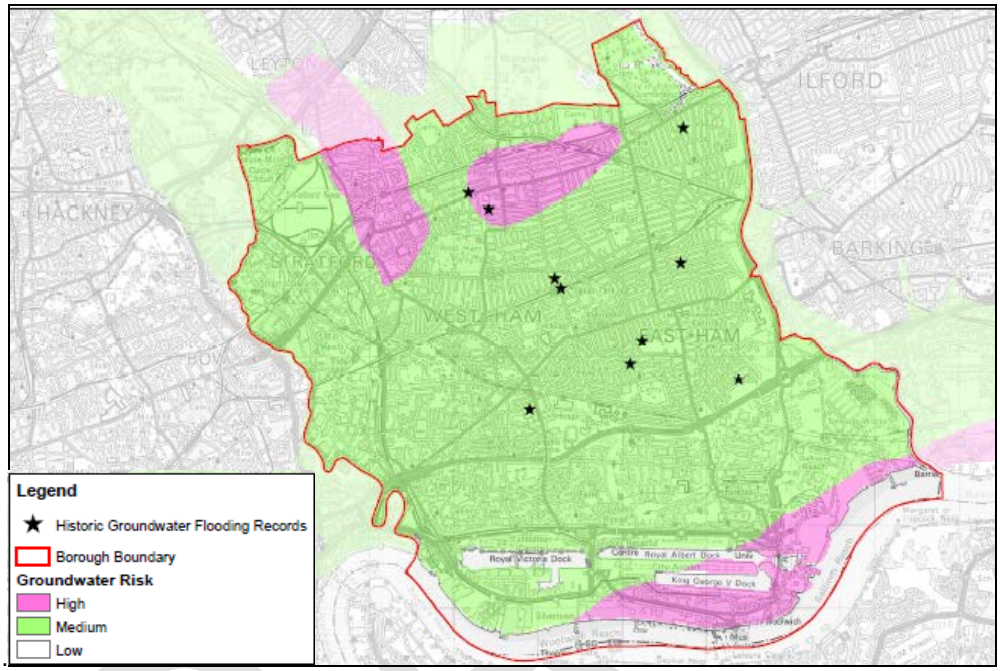

Figure 6 Potential Groundwater Flood Risk and Historic Groundwater Flooding Records [Source: Newham SFRA Figure 7.1]

2.6.7 The impact of climate change on groundwater levels is highly uncertain. More winter rainfall may increase the frequency of groundwater flooding incidents, but drier summers and lower recharge of aquifers may counteract this.

2.7 Flooding from Local Sources – Ordinary Watercourses

Description of Source

2.7.1 Ordinary watercourses include every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows, above ground or culverted, which is not designated as a main river.

2.7.2 There are a number of short reach ordinary watercourses that discharge into River Roding, along the eastern side of the borough.

2.7.3 The Royal Docks, located in the south of the borough, are classified as an ordinary watercourse but managed by the Royal Docks Management Authority. The dock gates themselves form part of the Thames Defences and are thus fall under the responsibility of the EA.

History of Ordinary Watercourse Flooding within Newham

2.7.4 The historic fluvial and tidal flooding map from the SFRA is shown in Figure 7 (within Section 2.8). The location of the recorded flooding during the 1987 event is a low-lying area drained by ordinary watercourse channels to the River Roding (Barking Creek).

2.7.5 The source of the worst case flooding of the ordinary watercourse is considered to be from the main rivers, rather than from the contributing catchment of the ordinary watercourse itself, due to their short reaches and drainage of the low-lying catchment areas of the main rivers.

2.7.6 No other historical information of flooding from ordinary watercourses in the borough is known.

Flood Risk Information

2.7.7 Fluvial and tidal flood modelling for the main rivers are considered to provide the requisite flood risk information for the ordinary watercourse ditches connecting to the River Roding.

2.8 Flooding from Other Sources – Main Rivers

Description of Source

2.8.1 Main river flooding of Newham occurs from:

- Fluvial flooding from prolonged or intense rainfall in the upstream catchments of the River Thames, River Lea and/or River Roding,
- Tidal flooding from a tidal surge, or
- A combination of both.

A description of the three main rivers is provided in Section 2.4.

History of Main River Flooding within Newham

2.8.2 The greatest recorded flood event on the River Lea and River Roding (since records began) is the March 1947 Thames flood. The floods were caused by snowmelt followed by rainfall and were unique in their volume and persistence, affecting areas in the west of Newham, principally around Stratford but also the area of Silvertown.

2.8.3 The extent of fluvial and tidal flooding recorded to have affected Newham is shown in Figure 7.

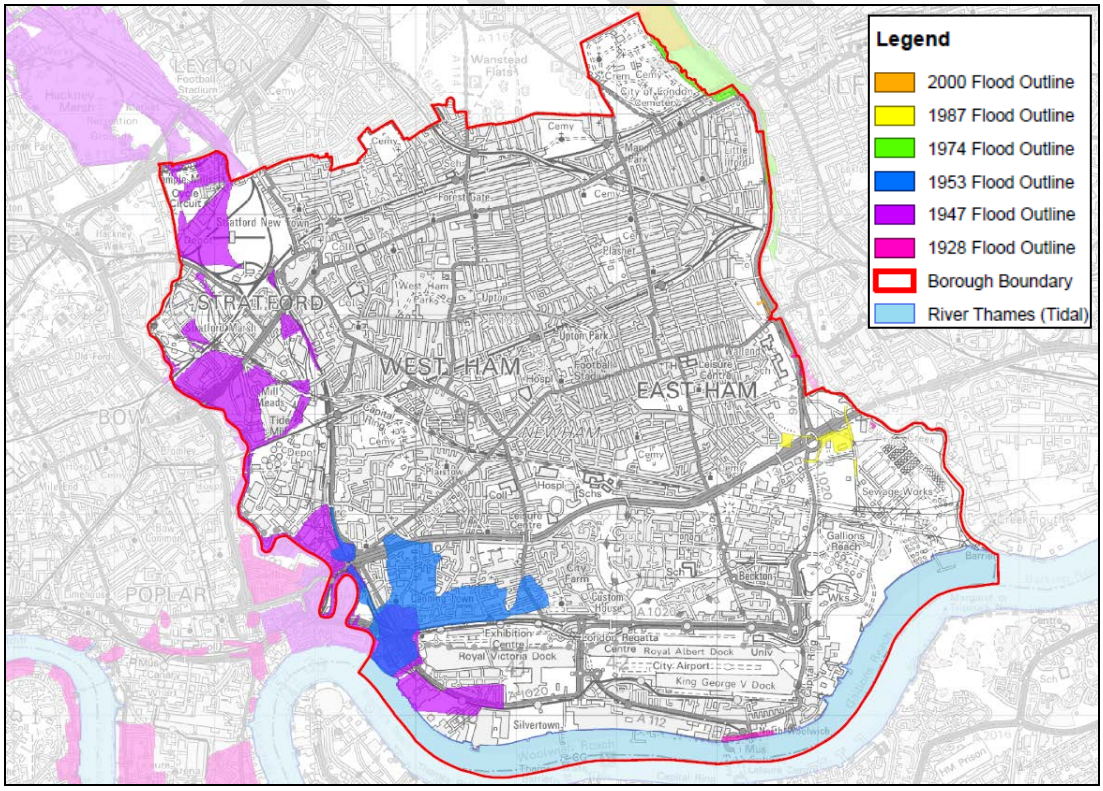

Figure 7 Historic Fluvial and Tidal Flooding [Source: Newham SFRA Figure 1.4]

2.8.4 Since the 1947 floods, a number of flood defences and structures have been installed to help prevent the flooding of London. These have included the flood defence walls along the rivers, works to the Lower Lea, the Barking Creek Tidal Barrier and the Thames Barrier.

2.8.5 The last significant event to have affected Newham since the completion of the Thames Barrier in 1982 is the 1987 event which caused flooding in the vicinity of the A13 / A406 Junction from the tidal reach of the River Roding.

Flood Risk Information

2.8.6 The combined tidal and fluvial flood risk for Newham from main rivers - including the presence of flood defences - is shown in Figure 8, the Environment Agency's 'Risk of flooding from Rivers and Sea' online flood map.

2.8.7 Flood Zones designated by the EA, based on the risk of fluvial and tidal flooding, are provided by the Environment Agency (as shown in Figure 9). Flood Zones are generated ignoring the presence of all flood defences; therefore the areas benefiting from flood defences are also shown.

2.8.8 Flood Zones are published by the EA as Flood Maps For Planning (Fig. 9 example) are used to inform and influence decisions on what types of new development can be located where.

2.8.9 Whilst existing flood defences provide a high standard of protection, in the event of a failure or breach in the defences the impact of flooding from a main river would potentially be very severe.

2.8.10 Hydraulic modelling of main rivers includes assessing the potential impact of climate change. This is typically achieved by increasing peak fluvial flows by 20% and calculating potential sea level rise for the proposed design horizon, typically 100 years. The Environment Agency maps display present day flood risk.

2.8.11 The SFRA includes flood mapping for Newham showing the actual and residual risk of fluvial and tidal flooding from main rivers.

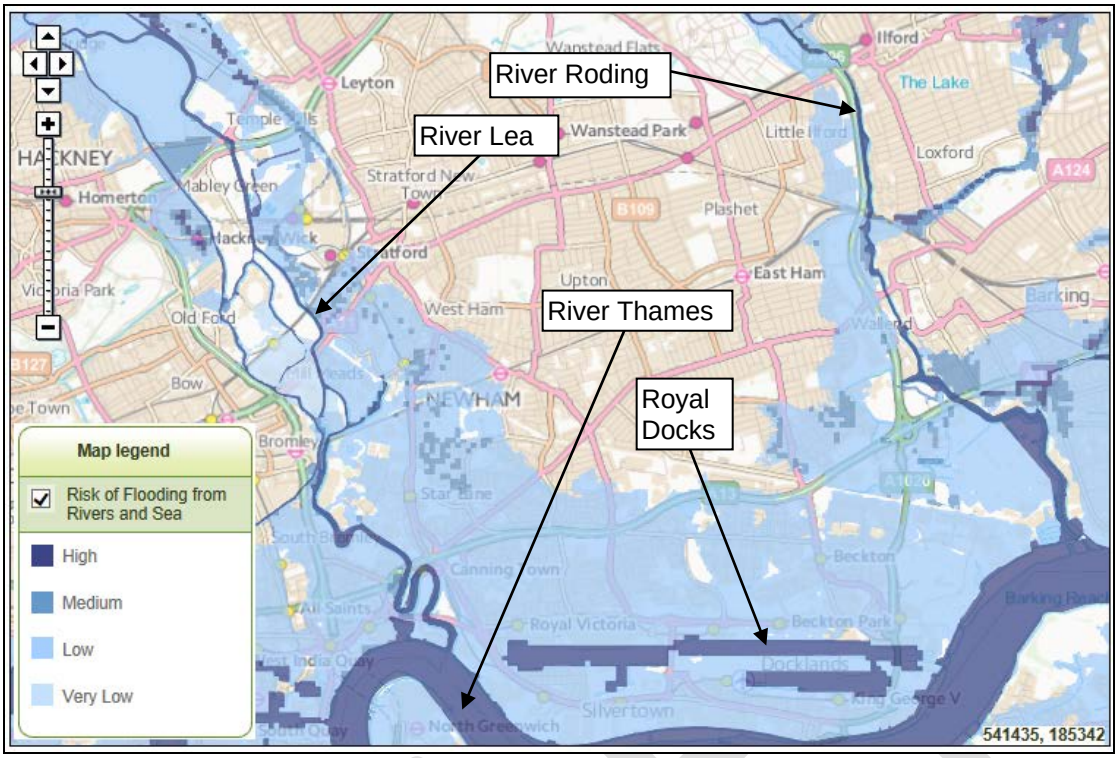

Figure 8 **Risk of Flooding from Rivers and Sea (Source: Environment Agency Online Map)**

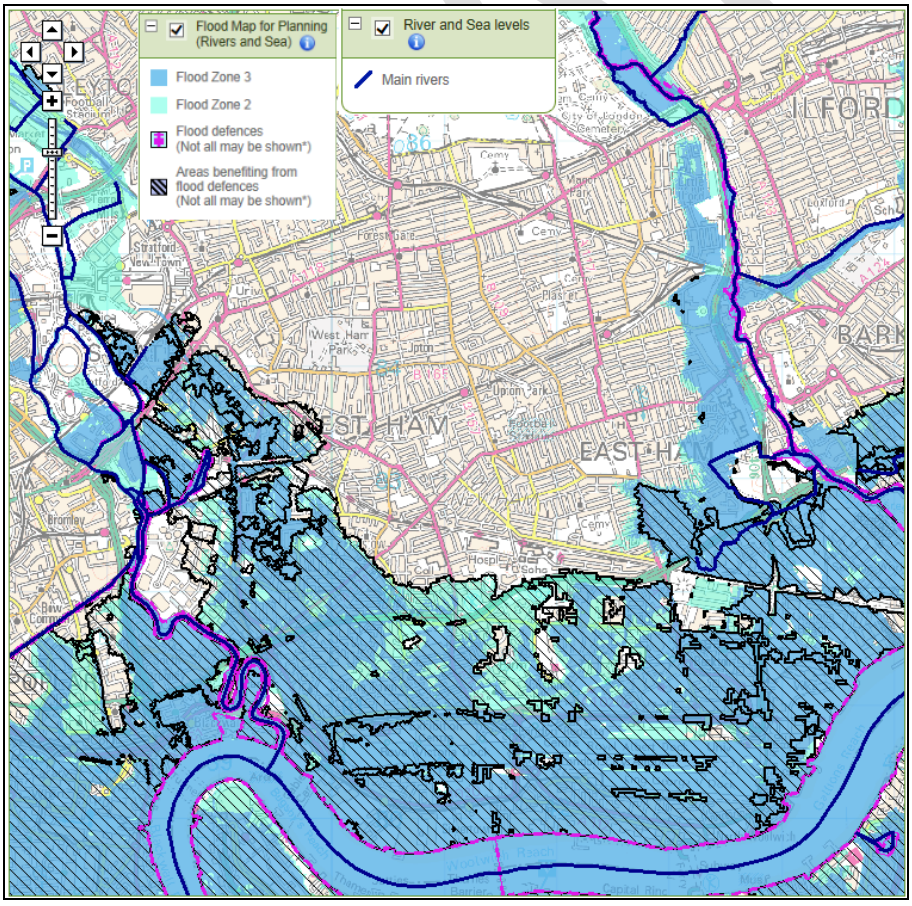

Figure 9 **Flood Map for Planning (Source: Environment Agency Online Map)**

2.9 Flooding from Other Sources – Sewers

Description of Source

2.9.1 Sewer flooding typically occurs during heavy rainfall due to a number of combined or individual reasons, namely:

- The amount or intensity of rainfall exceeds the capacity of the system,
- The sewer system is blocked or has failed, and/or
- High water levels in the receiving watercourses cause water to back up the system and overflow.

2.9.2 Sewer flooding and surface water flooding are linked and, barring the case of a blockage or failure, cannot typically be separated for urban areas such as Newham.

2.9.3 Modern sewers are typically designed to accommodate a 1 in 30 year rainfall event, older sewers however normally don't offer near that standard of protections. Highway sewers might only be designed for 1 in 1 or 1 in 2 storm event. Where such limitations and variability are considered it follows that occasionally rainfall can be so heavy (in either rate or total volume) to overwhelms the local sewer system. When this happens, water can overflow from manholes and gullies and flood properties, gardens and transport infrastructure. In the case of combined drainage systems, the overflowing water can be contaminated with sewage. This is also the case for foul sewers, where misconnections and ingress of surface water during heavy rainfall can result in their surcharging.

2.9.4 The drainage of Newham is split approximately in half, with the western half of the borough served by combined drainage and the eastern half served by separate foul sewer and surface water systems. However, the Thames Water sewer plans show that some areas of the separated sewers make use of combined manholes, where it is not known if the foul and surface water are able to mix during flood or surcharged sewer conditions.

2.9.5 The sewer systems serving the borough are almost all reliant upon pumping stations, both foul and surface water. This local configuration warrant that all major pumping stations in the borough should be inscribed in the Asset Registry.

History of Sewer Flooding within Newham

2.9.6 Sewer flooding incidents have been recorded in Stratford, Upton and West Ham, as shown in the Thames Water DG5 Register (Figure 10).

2.9.7 The DG5 Register is a database held by Thame Water of reported incident of sewer flooding causing internal flooding of properties

caused by a rainfall event with a return period of less than or equal to one in ten years.

2.9.8 Thames Water commitments include improvements to the public sewer network in Newham to reduce the risk of sewer flooding, informed by investigations. They have an ongoing responsibly to keep the sewers running freely.

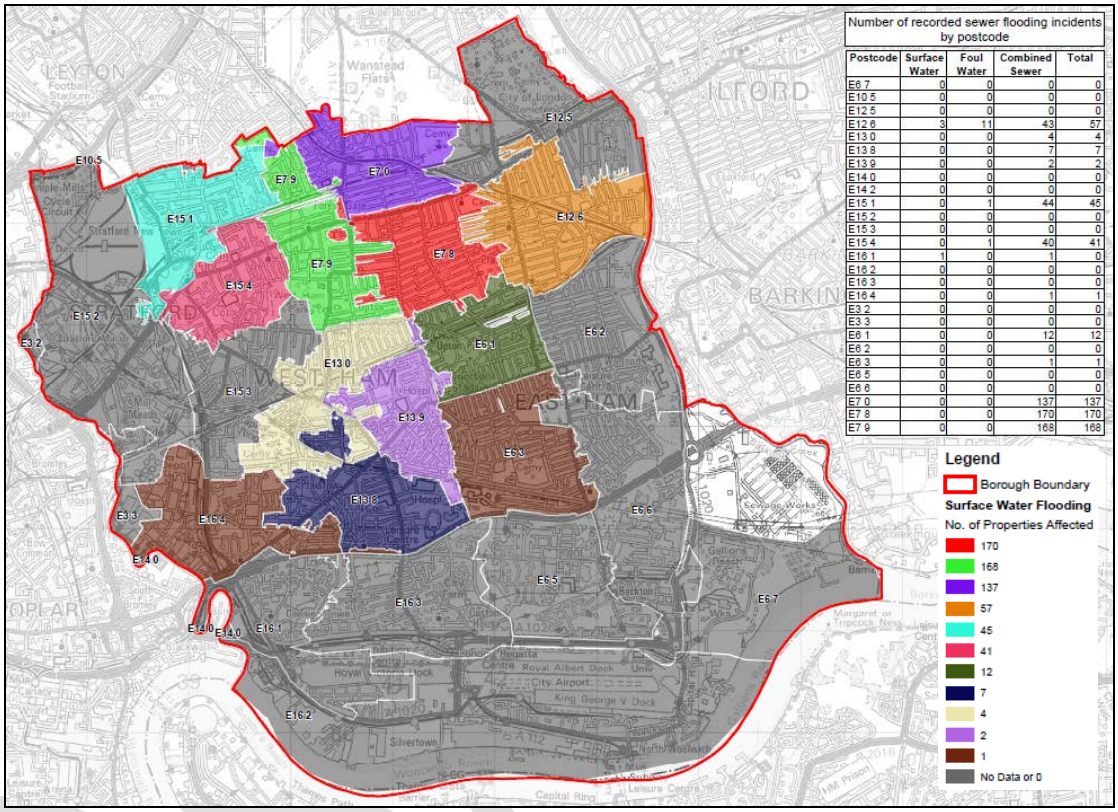

Figure 10 Thames Water Recorded Surface Water Flooding Incidents [Source: Newham SFRA Figure 6.1]

Flood Risk Information

2.9.9 Thames Water is known to have undertaken hydraulic modelling of the drainage networks serving the borough, however it does not publish flood risk maps. The only information that it publishes is the instances of flooding that it recorded in their DG5 register (shown in Figure 10).

2.9.10 The DG5 mapping is, however, incomplete, as it only records instances reported to Thames Water and does not include instances of highway flooding where properties may have been at risk but it was not reported.

2.9.11 The integrated surface water modelling recently completed by the Council includes representation of the sewers and pump stations within the hydraulic model, therefore is able to assess the likelihood of sewer flooding across the model study area.

2.9.12 The impact of climate change has been accounted for in the surface water flood risk integrated modelling undertaken by the Council, by modelling of the 1 in 100 year event plus 30% increase in peak rainfall intensity.

2.10 Flooding from Other Sources – Artificial Sources

Description of Source

2.10.1 Artificial sources include any water bodies not covered under other categories and typically include canals, lakes and reservoirs.

2.10.2 There are no additional artificial sources located in Newham that have not already been considered under other categories, with the Limehouse Cut / Lee Navigation and Royal Docks covered under Main River and Ordinary Watercourse categories.

2.10.3 The flooding from artificial sources is, however, not restricted to individual boroughs and Newham lies downstream of a number of reservoirs: King George V and William Girling reservoirs in Enfield, and the Basin and Perch Pond reservoirs in Wanstead.

History of Reservoir Flooding within Newham

2.10.4 There are no known records of recorded incidents of flooding from artificial sources within Newham.

Flood Risk Information

2.10.5 The Environment Agency's 'Risk of flooding from Reservoirs' online flood map for Newham is shown in Figure 11. The shading on the map shows the area that could be flooded if the upstream large reservoirs were to fail and release the water it holds.

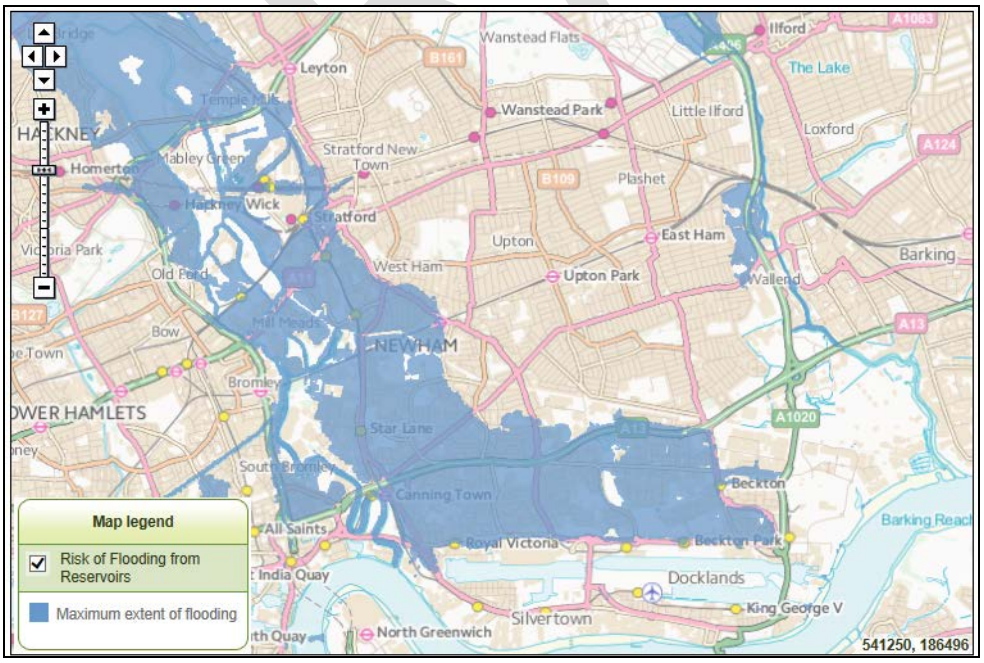

Figure 11 Risk of Flooding from Reservoirs (Source: Environment Agency Online Map)

2.11 Objectives and Actions for Managing Local Flood Risk

2.11.1 Based on the current understanding of flooding in the borough, the LFRMS has been prepared with the overarching aim of minimising the impact of flood risk on our residents and businesses.

2.11.2 To succeed in this aim Newham have identified 7 key objectives and the associated actions/measures that are consider necessary to deliver each objective. The objectives are set out below, with actions and details presented in Sections 2.13 to 2.19. All future flood risk management actions will consider social, economic and environmental outcomes.

2.12 Local Flood Risk Management Strategy Objectives

1	**Maintain and enhance understanding of flood risk in the borough**
2	**Maintain and improve flood risk management assets and infrastructure**
3	**Work with planners and developers to ensure that flood risk is appropriately managed by new development**
4	**Reduce the likelihood and impact of flooding within the borough**
5	**Raise public awareness of flooding issues and promote community level action**
6	**Respond effectively in the event of a flooding emergency**
7	**Adopt and maintain a partnership approach to flood risk management**

2.12.1 It is considered that these actions are consistent with, and further support the objectives of, the National Flood and Coastal Erosion Risk Management Strategy (EA, 2011):

https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england

2.12.2 Table 2 overleaf provides a summary of the National Strategy objectives and how these are addressed within the objectives of Newham's LFRMS.

Table 2 – LFRMS Objectives and National Strategy Objectives

National Strategy Objective	Link with LFRMS Objectives
Understanding the risks of flooding and coastal erosion, working together to put in place long-term plans to manage these risks and making sure that other plans take account of them	1, 5, 7
Avoiding inappropriate development in areas of flood and coastal erosion risk and being careful to manage land elsewhere to avoid increasing risks	3
Building, maintaining and improving flood and coastal erosion management infrastructure and systems to reduce the likelihood of harm to people and damage to the economy, environment and society	2, 3, 4, 5
Increasing public awareness of the risk that remains and engaging with people at risk to encourage them to take action to manage the risks that they face and to make their property more resilient	1, 5, 6
Improving the detection, forecasting and issue of warnings of flooding, planning for and coordinating a rapid response to flood emergencies and promoting faster recovery from flooding	1, 6

2.13 OBJECTIVE 1: Maintain and enhance understanding of flood risk in the borough of Newham

Provide up to date information regarding the level of flood risk within the borough of Newham taking account of emerging climate change impacts, improve understanding and awareness of flood risk

Flood Modelling

2.13.1 As presented in Section 2.5, the Environment Agency's uFMfSW currently represents the best available information on surface water flood risk for the borough.

2.13.2 The uFMfSW is based on a higher resolution surface water modelling approach than developed for the SWMP. Both modelling approaches are, however, unable to assess the performance of the existing below ground sewer systems serving the borough and unable to assess the potential benefit of proposed options to reduce flooding.

2.13.3 Consequently, Newham, in collaboration with the Drain London Project, has initiated a series of detailed modelling studies looking at high-risk areas that explicitly model the interactions between above and below ground drainage systems including main rivers, ordinary watercourses, combined, surface water and foul sewers, surface and foul water pumping stations and overland flow.

2.13.4 Where the results of these studies improve the understanding of surface water flood risk, the results will be provided to the Environment Agency to update future versions of the uFMfSW.

Flood Incidents

2.13.5 It is vital to collect and record detailed information when flood incidents, such as the September 2014 event, occur. This enhances the understanding of flood risk and can be used to validate and improve models, as well as providing first-hand evidence of flooding.

2.13.6 The public must be encouraged to increase the reporting of incidents of surface water / highway / property flooding to Newham. It is also vital to maximise the recording of flooding incidents within the Council, by ensuring that unscheduled highway gulley maintenance (e.g. unblocking gullies / pipe connections) due to reported flooding is recorded.

2.13.7 Newham will ensure that the incident information gathered and recorded by the Council is also recorded, where appropriate, on FloodStation, which is described in more detail in Section 2.14 (Objective 2: Asset Register).

Strategic Flood Risk Assessment

2.13.8 Newham published the SFRA in 2010, it provides information relating to flood risk from all sources across the borough. As the information relating to surface water flooding has been improved it is recommended that the SFRA be updated with respect to surface water flood risk as soon as the updates to the uFMfSW have been implemented. The SFRA should also be updated with respect to the other sources of flooding, such as main rivers, if new modelling is available.

Actions

- Improve understanding of flood risk in Newham by carrying out detailed modelling studies in high-risk areas
- Work with partners to ensure national datasets such as the uFMfSW are updated with the results of these local studies
- Record flood incidents in a consistent manner
- Provide up to date information regarding the level of flood risk within Newham taking account of emerging climate change impacts by publishing flood risk data on the Council website where appropriate
- Review the SFRA with respect to surface water flood risk

2.14 OBJECTIVE 2: Maintain and improve flood risk management assets and infrastructure

Ensure continued serviceability of existing flood risk management assets by carrying out regular inspections and maintenance as required following best practice principles

Maintenance Responsibilities

2.14.1 Maintenance of flood risk management assets is the responsibility of the asset owner (or 'riparian' owner). This includes the flood defences along watercourses.

2.14.2 The 'main river' designation of watercourses gives the Environment Agency powers to undertake maintenance, carry out improvement works, operate structures, etc. but not the duty to do so. Maintenance and operation remains the responsibility of the owner. Newham Council, as the LLFA, is responsible for ensuring that riparian owners carry out their duties in those case concerning ordinary watercourses.

2.14.3 The Environment Agency is responsible for the maintenance of its flood defence assets within the borough, including the Thames Barrier and Barking Barrier.

2.14.4 Newham Council is responsible for the maintenance of the gullies and connections to the Thames Water sewers or outfalls for almost all of the highway network. Transport for London is, however, responsible for the trunk roads in the borough.

2.14.5 Thames Water is responsible for the maintenance of the sewers (combined, foul and surface water) serving the borough, including the pumping stations. Most of the CDAs identified by the SWMP are reliant upon the pumping stations to manage the likelihood of flooding.

Ordinary Watercourse Consents

2.14.6 Where a landowner wishes to carry out modifications to an ordinary watercourse that will have an impact on the flow of water, the owner must obtain consent from Newham Council.

Routine and Reactive Maintenance

2.14.7 Routine maintenance includes day-to-day activities such as cleaning highway gullies and removing litter and other detritus from the streets and is the responsibility of the Council. These actions help to ensure that important features of the drainage network such as gullies, pipes and grilles are less likely to become blocked and thereby lead to flooding.

2.14.8 Reactive maintenance involves responding to incidents where some degree of flooding has already occurred. This is often due to blockages caused by litter, fallen trees or collapsed pipes affecting the functionality of the drainage system. Newham's contractors carry out unscheduled cleaning when blockages or other issues are reported.

Asset Register

2.14.9 The FWMA requires LLFAs to establish and maintain a register of 'significant flood risk management assets' including information on ownership and condition.

2.14.10 London Drainage Engineers Group (LoDEG) members helped to develop new web-based software for this purpose known as FloodStation. This system allows LLFAs to record information about assets; it also has a function for recording flood incidents.

2.14.11 Recording details of flood incidents and linking these to specific assets where relevant, as well as monitoring the condition of significant flood assets, enable London Boroughs to manage risks and prioritise resources effectively, reducing risks to communities, property and infrastructure.

2.14.12 It is up to individual LLFAs to define what a 'significant' flood risk management asset is.

2.14.13 Newham Council considers any asset that has the potential to cause flooding through individual failure to be significant. Therefore large assets such as culverted watercourses, raised flood defences, flood storage areas, underground tanks and pumping stations are considered to be significant whereas individual highway gullies are not.

2.14.14 Newham LLFA in their initial assessment of potential flood risk management assets took the view to include in their register only those structures either in council ownership or with immediate relevance to surface waters flooding and excluded other major assets under others' responsibility (e.g. Pumping Stations with Thames Water) or concerning other type of flood risk (e.g. River, tidal).

2.14.15 The Council will review the classification of assets in its register and consider inclusion of other structures as their relevance to local flood risk will be clarified by additional studies. It is anticipated that Thames Water major pumping stations, on which the borough sewer-drainage system generally relies upon, should be included in Newham Assets Register.

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Inspections

2.14.16 Newham Council will carry out regular inspections of all significant flood risk management assets, whether public or privately owned, for which it, as the LLFA, is responsible for ensuring are maintained.

2.14.17 Main river assets and reservoirs already have established inspection regimes that are overseen by the Environment Agency.

2.14.18 Where private assets are found to require repairs or improvements the owner will be informed of their responsibilities. If maintenance is not carried out enforcement action will be considered and carried out as a last resort

Actions

- Review and issue ordinary watercourse consents, and ensure the works are carried out in accordance with requirements
- Carry out routine and reactive maintenance of highway drainage
- Review, improve and maintain the flood risk management asset register
- Carry out planned maintenance of Council owned assets
- Ensure that privately owned, non-main river assets are adequately maintained, through the use of enforcement action where necessary

2.15 OBJECTIVE 3: Ensure new developments minimise the risk of flooding

Ensure new development is safe from flooding, does not increase flood risk elsewhere and, through the re-development of previously developed land, reduces overall flood risk

Planning Policy

2.15.1 The application of planning policy and development management are fundamental in managing flood risk within the borough, by ensuring that new developments are not at risk of flooding and do not exacerbate flood risk elsewhere by increasing surface water runoff from hard-standing areas or reducing catchment flood storage. This is achieved by implementing the policies and recommendations made in the SFRA and the SWMP.

2.15.2 These policies are in line with the National Planning Policy Framework (NPPF), Planning Practice Guidance - Flood Risk and Coastal Change (PPG-FRCC) and London Plan, and have been encapsulated in the Development Management Document, which forms part of the Council's Local Plan.

National Planning Policy Framework (NPPF):

https://www.gov.uk/government/publications/national-planning-policy-framework--2

Planning Practice Guidance - Flood Risk and Coastal Change (PPG-FRCC):
http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/

London Plan:

https://www.london.gov.uk/priorities/planning/london-plan

https://www.london.gov.uk/sites/default/files/Sustainable%20Design%20%26%20Construction%20SPG.pdf

Local Plan for the London Borough of Newham:

http://www.newham.gov.uk/Pages/Services/Local-plan.aspx

2.15.3 The Environment Agency's 'Flood Map for Planning' (as presented in Section 2.8) provides designated Flood Zones which are used to inform and influence decisions on what types of new development can be located where, as well as to dictate what assessments (in terms of flood risk) are required to support planning applications.

2.15.4 In accordance with national planning policy, a sequential, risk-based approach must be taken by Newham for the allocation of development sites. The Sequential Test, using Flood Zones as refined by the SFRA, steers new development to areas with the lowest probability of flooding.

Safe Development

2.15.5 To be classified as safe, the developer of any proposed development in or near flood risk areas must provide evidence to show that the development would be safe and that any residual flood risk can be overcome to the satisfaction of Newham Council's planners, taking account of any advice from the Environment Agency and the LLFA.

2.15.6 The developer must submit a site-specific Flood Risk Assessment that demonstrates that the site will be safe and that people will not be exposed to hazardous flooding from any source. The requirements of a site-specific flood risk assessment are detailed here:

http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/site-specific-flood-risk-assessment/

2.15.7 To be classed as safe, any development in or near flood risk areas must:

- Provide a dry access route above the 1 in 100 plus climate change fluvial / 1 in 200 plus climate change tidal flood water level or, where appropriate modelled data exists, an access route within the low hazard area of the floodplain (as defined by the Environment Agency's Flood Risk Assessment Guidance for New Development R&D Technical Report FD2320) to and from any residential development should be provided;
- Finished floor levels should be set at least 300mm above the 1 in 100 plus change fluvial / 1 in 200 plus climate change tidal flood water level;
- Not increase flood risk elsewhere by showing that there will be no net loss of flood storage and that overland flow routes will not be obstructed;
- For surface water flooding, a 100mm freeboard, instead of 300mm applicable to fluvial flooding, should be considered.

2.15.8 These documents also contain policies that avoid locating vulnerable uses, such as basement dwellings or essential infrastructure, in areas that are at risk of flooding.

Sustainable Drainage

2.15.9 New developments, particularly the re-development of brownfield sites, provide opportunities to reduce overall flood risk, principally through the use of Sustainable Drainage Systems (SuDS) and allowing space for flood storage and overland flows. It is widely recognised that sustainable forms of flood alleviation, such as providing more space for rivers to flow and flood naturally, are preferable to outdated techniques that rely on hard defences such as concrete walls and channels.

2.15.10 SuDS include measures such as green roofs, permeable paving and rainwater harvesting that mimic natural drainage systems by increasing storage and infiltration and slowing down the rate of runoff. This reduces the rate and volume of surface water runoff and therefore the risk of flooding further downstream

2.15.11 Well-designed SuDS can be more economic and robust than conventional drainage systems. In addition, SuDS offer a wide range of ancillary benefits including improved water quality, increased tolerance of droughts, enhanced amenity and opportunity to create biodiversity habitat features. SuDs accordingly represent a tool of climate change impacts mitigation.

2.15.12 Newham's Core Strategy presumes that all development contributes to minimising the risk of flooding in Newham. All development proposals are expected accordingly to maximise permeable surfaces (including green roof), adopting a presumption against hard-standing on domestic gardens and public open space.

2.15.13 Newham SWMP (Policy 1) requires that all developments across the borough (excluding minor house extensions) which relate to a net increase in impermeable area are to include at least one 'at source' SuDS measure (e.g. waterbutt, rainwater harvesting tank, bio-retention planter box etc.). This is to assist in reducing the peak volume of runoff discharging from the site.

LLFA as Statutory Consultee

2.15.14 In recognition of the benefits of SuDS, the FWMA (2010) introduced the requirement for all new developments to include SuDS features. This legislation designated LLFAs such as Newham as SuDS Approving Bodies (SABs) with responsibilities for approving all new SuDS and adopting them where they serve more than one property.

2.15.15 The government, however, in 2014, issued a new consultation on an alternative proposal to make LLFAs a statutory consultee on planning

applications for surface water management to include SuDS requirement.

2.15.16 The government revised approach expects local planning policies and decisions on planning applications relating to major development (developments of 10 dwellings/ 0.1 ha or more and equivalent non-residential or mixed development) to ensure that SuDS for the management of run-off are put in place, unless demonstrated to be inappropriate

2.15.17 The LLFA under the new arrangement, which came into force on 6th April 2015, does not directly approve sustainable drainage schemes as an independent authority or is required to adopt them, but similarly to the Environmental Agency, advises as statutory consultee the Local Planning Authority on surface water management scheme for new major development proposals.

LLFA Criteria of Assessment

2.15.18 Newham LLFA's statutory advice on the suitability of surface water management scheme proposals will have regard to national and local policies as well LLFA's own determination of local flood risk, coherently with the objectives of the Local Flood Risk Management Strategy.

2.15.19 Newham LLFA expects surface water management schemes of major development proposals to respond in full to the requirements set by relevant national and local policies.

2.15.20 Major developments, by nature of their larger footprint and capability in term of resources, are in a privileged position to ensure that their proposals contribute positively to the quality of the local environment and that a proportionate reduction in flood risk is achieved. Newham LLFA expects major developments to recognise this opportunity and aim from the onset at achieving best standards.

Major Development SuDS Standards

2.15.21 Newham LLFA in forming its judgement on the suitability of a drainage scheme of major developments will consider whether the proposal sufficiently demonstrates, in the context of the application, best endeavour to maximise SUDS and achieve greenfield runoff rate, unless demonstrably unfeasible and /or disproportionate

2.15.22 The LLFA will adopt a presumption against proposals that arbitrarily pre-empt SUDS feasibility or aim from the onset at minimum standards. SuDS solutions applied as an afterthought, a bolt-on feature, will not be deemed meeting minimum standards.

2.15.23 The London Plan Supplementary Planning Guidance on Sustainable Design and Construction is adopted by Newham LLFA as primary reference in matter of sustainable drainage standards for major development proposals. Specific requirements, complementing the London Plan, and applicable to development in Newham, are summarised below in reference to relevant local policies

2.15.24 The London Bough of Newham, Policy SC3, Objective 3, requires SuDS to be incorporated in all major developments, in conjunction with Policy SC1, the London Plan and PPS25 (Now superseded by the NPPF).

2.15.25 Newham (in line with the London Plan Guidance and UKCIP guidance) requires that 'brownfield' redevelopments greater than 0.1 hectare to reduce post development runoff rates for events up to and including the 1 in 100 year return period event with an allowance for climate change to not more than 3 times the calculated greenfield runoff rate for the site (calculated in accordance with IoH124).

2.15.26 The only exceptions to the above, for which discharge rates greater than 3 times the calculated greenfield runoff rate could be considered, are where a pumped discharge would be required to meet the above standard, or where surface water drainage is to tidal waters and therefore would be able to discharge at unrestricted rates - provided unacceptable scour would not result.

2.15.27 In cases such as the above, where a discharge rate of not more than 3 times the calculated greenfield rate could not be achieved, Newham SWMP (Policy 2) provides that 'brownfield' major redevelopments are required to reduce post development runoff rates for events up to and including the 1 in 100 year return period event with an allowance for climate change (in line with London Plan and UKCIP guidance) to a minimum of 50% of the existing site conditions.

2.15.28 New development in Critical Drainage Areas (CDAs) and Flood Risk Zones (FRZs) as identified by Newham SWMP will attract special consideration in terms of drainage strategy in response to associated higher flood risk.

2.15.29 Developments in CDAs will be expected to adopt flood risk mitigation measures - including SuDS solutions where feasible – as deemed by the Local Planning Authority adequate and sufficient in the specific context to satisfy both onsite and offsite flood risk management requirements while contributing to reduce flood risk in the critical drainage area catchment. Assessment of proposals as satisfactory will be mediated by criteria of proportionality.

2.15.30 Newham SWMP (Policy 3) states that developments located in Critical Drainage Areas (CDAs) and greater than 0.5 hectare are required to reduce runoff to that of a predevelopment Greenfield runoff rate (calculated in accordance with IoH124) for events up to and including

the 1 in 100 year return period event with an allowance for climate change (in line with the London Plan Guidance and UKCIP guidance). It is recommended that a SuDS management train is used to achieve this reduction.

Additional SUDS standards

2.15.31 To manage the pollutant loads generated from development proposals subject to SUDS requirements, Newham SWMP (Policy 4) advises that Best Management Practices (BMP) are required to be demonstrated for all development applications within the LB of Newham. For major developments the following load-reduction targets must be achieved when assessing the post-developed sites SuDS treatment train (comparison of unmitigated developed scenario versus developed mitigated scenario):

- 80% reduction in Total Suspended Sediment (TSS);

- 45% reduction in Total Nitrogen (TN);

- 60% reduction in Total Phosphorus (TP); and

- 90% reduction in litter (sized 5mm or greater).

Actions

- Apply the National Planning Policy Framework 'Flood Risk & Coastal Change' section of the Planning Practice Guidance and the local flood risk policies for Newham
- Require use of sustainable drainage techniques for all new development in accordance with local and national policies
- Provide the statutory consultee response on planning applications for surface water management.
- Develop and publish Newham SuDS Guide

2.16 OBJECTIVE 4: Reduce the likelihood and impact of flooding within the borough

Improve protection against flooding for all properties where possible, identify areas where flood protection is sub-standard and implement flood alleviation schemes where opportunities exist

Local Flood Defence Improvements

2.16.1 Encourage strategic approach to improving local flood defences, through identification of flood risk and working with developers, planners, Environment Agency and other RMA to reduce flood risk within the borough.

2.16.2 Newham Council will work with the Environment Agency and asset owners, using LLFA and planning powers, to ensure that the flood defence improvements required by the TE2100 strategy are achieved.

Retrofitting Sustainable Drainage

2.16.3 To maximise the benefits of sustainable drainage in existing communities it is essential to identify and implement opportunities to retrofit SuDS. There are many situations where such measures can be carried out cost effectively, for example:

- Regeneration projects – projects to enhance public spaces create opportunities to improve drainage by implementing multi-functional measures such as rain gardens and permeable paving
- Footway schemes – works on the footway often provide opportunities to implement SuDS, for example by converting conventional highway verges and planted areas, which are usually raised, to rain gardens which are shallow, depressed areas of vegetation that can accept, store and drain rainwater runoff; opportunities to install permeable paving should also be exploited both on footways and carriageways, however such schemes can be limited by existing constraints such as buried services and the cost implications of full re-construction
- Traffic calming schemes – works that involve restricting traffic in some way to promote safety measures can often be combined with SuDS implementation at minimal additional cost
- Car parks – most car parks can be easily converted to store shallow depths of flood water during extreme flood events without significantly affecting their serviceability; for example creating a 100mm high kerb or bund around a fairly flat car park whilst leaving the conventional drainage system intact can store relatively large volumes of water at low cost; such schemes can

be enhanced further by replacing the conventional drainage systems with additional SuDS features

- Refurbishment of large estates – large sites such as hospitals, schools, business and industrial areas routinely carry out refurbishment and renewal works; such schemes create SuDS opportunities which should be explored

Natural Flood Management

2.16.4 Natural flood management refers to the alteration, restoration or use of landscaped features to slow runoff rates and reduce flood risk downstream.

2.16.5 The highly urbanised character of the borough does not lend itself to the implementation of such measures; however, where possible, existing parks and grassed fields will be assessed for the likelihood of retaining rainfall runoff or overland flow.

Surface Water Drainage Improvements

2.16.6 The SWMP identified a number of preferred options for CDAs, where below ground surface water drainage improvement was suggested.

2.16.7 The integrated surface water flood risk integrated modelling undertaken by the Council (under Drain London Tier 3) reviewed the SWMP preferred options and made recommendations or provided alternate options for reducing surface water flood risk. The options identified included:

- Improving gulley drainage to sewers
- New surface water pipe connections from areas of flooding to adjacent pipe networks.
- Additional surface water pumping stations.
- Providing surface or below ground storage required along the railway lines.

2.16.8 Before the commission or implementation of any of the options is considered full testing in an integrated hydraulic model is required.

Actions

- Encourage strategic approach to improving local flood defences
- Ensure that the main river flood defence improvements required by TE2100 are delivered, in collaboration with the Environment Agency and asset owners.
- Identify and implement opportunities to retrofit Sustainable Drainage Systems
- Promote the use of natural floodplain management, where appropriate.
- Review and undertake further assessment towards implementation of the preferred options for reducing surface water flooding
- Implement surface water options, in collaboration with partners

2.17 OBJECTIVE 5: Raise public awareness of flooding issues and promote community level action

Promote flood resistance and resilience measures to any properties at risk of flooding where an adequate standard of protection cannot otherwise be achieved; ensure that residents in flood risk areas are adequately prepared

Raise and Maintain Public Awareness

2.17.1 The SFRA for Newham should be able to provide communities and businesses with appropriate flood risk information. As stated in Section 2.13, it is recommended that the SFRA be updated to reflect the Environment Agency uFMfSW, SWMP and updated surface water modelling undertaken by the Council, as well as other updates to flood risk from other sources of flooding.

Preparedness

2.17.2 It is vital to recognise that even with a wide range of flood risk management assets in place, residual flood risk will still exist; this is due primarily to two factors:

- Exceedance events – extreme storms can occur that exceed the design standards of the flood defences or drainage infrastructure;
- Structural failure – flood defences have the potential to fail either through blockages or structural collapse, such failures are often associated with inadequate maintenance.

2.17.3 In the case of surface water flooding, the design standard for the 'no flooding' condition is less than the standard adopted for fluvial or tidal flood defence assets.

2.17.4 Consequently, in areas where significant actual or residual flood risk remains it is important that communities and businesses are adequately prepared.

2.17.5 Where specific communities are at significant residual risk of flooding the development of Community Flood Plans should be promoted, as well as the development and exercising of business continuity and emergency plans.

Flood Resistance and Resilience

2.17.6 Where residual flood risk remains and no other suitable flood risk reduction measures can be identified, individual property protection measures can be used as a last resort to minimise the potential consequences of flooding. Properties of all types can be modified to be flood resistant or flood resilient.

2.17.7 Flood resistance measures aim to prevent floodwaters from entering properties, while flood resilience measures allow water to enter properties but aim to reduce the damage caused when it does.

Planning Practice Guidance – Flood Resilience and Flood Resistance:

http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-resilience-and-flood-resistance/

2.17.8 Such measures are not ideal, however they can significantly reduce the costs and disruption caused by flooding.

2.17.9 The opportunity for adopting resistance or resilience measures is typically limited by the depth of flooding externally affecting the building, as shown in Table 3.

Table 3 - Considerations for resistance and resilience measures

	Design Depth of Water		
	Water depth up to 0.3m	**Water depth from 0.3m to 0.6m**	**Water depth above 0.6m**
Approach	Attempt to keep water out.	Attempt to keep water out, in full or in part, depending on structural assessment. If there are structural concerns, follow the approach to the right.	Allow water through property to avoid risk of structural damage.
Mitigation measures	Materials and constructions with low permeability	Materials with low permeability to at least 0.3m. Flood resilient materials and design access to all spaces to permit drying and cleaning.	Materials with low permeability to at least 0.3m. Accept water passage through building at higher water depths. Design to drain water away after flooding. Access to all spaces to permit drying and cleaning.

Actions

- Identify properties where an acceptable standard of protection cannot be achieved
- Promote Community Flood Plans and Business Continuity Plans where significant residual flood risk remains
- Promote individual property protection measures including flood resistance and resilience measures where significant residual flood risk remains

2.18

OBJECTIVE 6: Respond effectively in the event of a flooding emergency

Respond effectively in the event of flooding providing emergency assistance to those in need

Multi-Agency Flood Plan

2.18.1 Newham Council aims to take action before, during and after flooding in order to mitigate the effects of any extreme rainfall or fluvial flood events. The procedures to be followed are set out in detail in the Multi-Agency Flood Plan. This document has been prepared by Newham's Emergency Planning (Resilience and Emergency Team) in partnership with a number of external agencies including the Metropolitan Police, the London Fire Brigade and the Environment Agency. It includes a risk assessment for critical infrastructure across the borough, this ensures that the risks are well understood and can be managed accordingly.

2.18.2 The plan is currently under external review with the Environmental Agency; Newham Emergency Planning has provided the LLFA with a advanced draft copy of the plan and knowledge of its provisions accordingly shared and understood. However as it is not yet published a link to the document cannot be provided at this stage. Its publication expected as imminent a link reference will be added to next review of this document.

2.18.3 Detailed guidance on the development of a multi-agency flood plan can be found here:

https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england

Communications

2.18.4 There are a number of ways flood warnings are communicated to residents and businesses. The Environment Agency offers a Floodline Warnings Direct service for homes and businesses. Flood warning messages are sent out to numbers registered with this service, which includes tenants and landlords.

2.18.5 Environment Agency Flood Alerts and Warnings are, however, only issued for fluvial and tidal flooding, not surface water.

2.18.6 The Met Office in partnership with the Environment Agency through their Flood Forecasting Centre issue Flood Guidance Statements, which advise on surface water flood risk as a side effect of severe weather forecasted usually over large geographical area as subset of an overall UK wide assessment.

2.18.7 Newham LLFA receive regular email updates alerts highlighting likelihood of severe weather in their relevant area and possible magnitude of impact in term of surface water flooding

2.18.8 However, there is not for surface water a flooding warning service equivalent to fluvial and tidal in terms of confidence of where and when this might happen within a larger geographical area due to the overall unpredictability of the location of weather events as to their actual intensity and duration.

2.18.9 The LLFA share the flood statements with its borough partners, but in practical terms flooding is likely to already have occurred before the Council would be able to issue any warning. The Council highway and drainage team are likely to be the first to be aware of issues, with incoming calls to report highways flooding.

2.18.10 The Council also provides up to date information via its website and the local press to keep residents and businesses informed.

Emergency Flood Defence Measures

2.18.11 Newham Emergency Planning activates emergency services in response to triggers as identified in their Multi-Agency Flood Plan. Triggers are based on Flood Warning and Alert, in response to heavy rainfall events, or as informed by Central Government.

2.18.12 Specific procedures and level of activation are based on risk assessment of information received. Emergency response will vary accordingly, from monitoring the situation, instruct preparedness, up to escalating responses with full activation and coordination of emergency services.

2.18.13 In terms of basic flood emergency equipment that Newham Council can rely on is a limited provision of emergency pumps, which may be deployed by Newham's Highways Team in case; however Newham do not provide or maintain a stock of sandbags or other similar movable flood barriers.

2.18.14 Where properties or businesses are threatened by flooding, Newham will consider the level of assistance it is able to provide, complementing other partner agencies services in accordance with the Multi-Agency Flood Plan.

Operate Evacuation Centres

2.18.15 Evacuation centres would be opened by Newham's Emergency Planning, however the specific provision and operation of evacuation centres is not yet published.

Post Flooding Response

2.18.16 In the event of a local flooding incident, Newham Council will assist the community with the recovery, as well as undertake an investigation of the flooding.

2.18.17 The assessment will include a number of activities to qualify the event and its cause, such as: recorded event rainfall analysis, gulley inspections and maintenance, CCTV survey of the drains, review existing modelling, and commission new hydraulic modelling, etc.

2.18.18 The post flooding analysis will look to determine the cause of the flooding incident and if anything could be done to reduce the likelihood and impact of a similar event in the future.

2.18.19 In case of significant flooding incident the LLFA will carry out a formal Flood Incident Investigation, according to their duties under Section 19 of Part 3 of the Flood and Water Management Act 2010 and publish the report of the investigation.

2.18.20 Newham LLFA formally investigated the 24 September 2014 flood incidents in Newham and produced a section 19 report whose finding were shared with Newham flood risk partners, neighbouring LLFAs, the EA and Thames Water.

Actions

- Apply the emergency response measures described in the Multi-Agency Flood Plan
- Review the Multi-Agency Flood Plan with respect to surface water
- Encourage residents and businesses in flood risk areas to sign up to the Environment Agency's Floodline Warnings Direct service.
- Continue to improve network of remote flood monitoring equipment and CCTV cameras, make this information publicly available where possible
- Gather flooding information to allow post flooding incident assessments to be undertaken

2.19 OBJECTIVE 7: Adopt and maintain a partnership approach to flood risk management

Continue to work collaboratively with fellow risk management authorities to ensure flood risk management activities are coordinated across the borough and surrounding areas

2.19.1 Flooding does not respect local authority boundaries, it is therefore essential that LLFAs work in partnership across local authority boundaries (in particular the five surrounding boroughs) and with a range of agencies to create a comprehensive understanding of flood risk and determine a suitable plan of actions to manage that risk.

Drain London

2.19.2 Drain London has been working to establish ownership of London's drainage assets, assess their condition and secure a better understanding of the risk from surface water flooding, so that boroughs and the Greater London Authority (GLA) can manage and improve drainage assets and mitigate the risk from this type of flooding.

2.19.3 Newham officers attend regular meetings with neighbouring boroughs through the Drain London Forum to share best practice and ensure ongoing projects provide complimentary flood risk mitigation.

Flood Working Group

2.19.4 Within Newham, a Flood Working Group is to meet regularly to discuss ongoing activities and policy development. This provides an opportunity for officers from different departments that have responsibilities for flooding to share information and coordinate activities across the Council.

Environment Agency

2.19.5 The Environment Agency is able to provide support to Newham, through providing knowledge and funding for detailed assessments and delivery, from funding allocations that are administered by the EA.

2.19.6 Newham also works collaboratively with the Environment Agency to continuously assess flood risk using the latest available techniques and information, sharing data and resources where applicable, and contributing to flood risk plans and other documents.

Utility and Transport Providers

2.19.7 Thames Water is an important partner in the implementation of flood mitigation and resistance measures. Thames Water has a remit

through the utilities regulator OFWAT to reduce the number of properties affected by sewer flooding. OFWAT imposes strict criteria and will only fund projects where there is a history of internal sewer flooding of premises during 1 in 10 year rainfall events.

2.19.8 Other utility companies and transport providers, such as Transport for London, London Underground and Network Rail, need to be aware of the flood risks affecting their networks. Flood risk strategies provide an opportunity for engagement with these organisations.

Technical Bodies

2.19.9 London Drainage Engineering Group (LoDEG), Association of Thames Drainage Agencies (ATDA) and Construction Industry Research and Information Association (CIRIA) provide technical support and training related to flood risk and SuDS.

Emergency Services

2.19.10 In the event of an emergency, Newham will work together with other agencies including the emergency services and neighbouring local authorities to respond as set out within the Multi-Agency Flood Plan, provided by Community Resilience Team.

Actions

- Continue to actively engage in the Drain London Forum to contribute to a coordinated London-wide approach to flood risk management
- Continue to hold regular Flood Working Group meetings
- Work with the Environment Agency to deliver flood alleviation schemes, and improve knowledge and understanding of flood risk
- Work with Thames Water to identify opportunities for jointly funded projects where opportunities exist
- Provide utility and transport companies with the latest available information on flood risk so they can assess the potential impact on their infrastructure and build resistance and resilience to flooding where necessary, ensuring a prompt recovery following a flood incident

3 Actions to Reduce Local Flood Risk

3.1 Funding and Resources

3.1.1 As LLFA, Newham Council will take the lead role in implementing this LFRMS and coordinating activities with other risk management authorities to address flood risk across the borough.

3.1.2 From April 2015, following internal restructuring, LLFA will be the duty of Newham Council's Environmental Control Unit.

3.1.3 In order to deliver the London Borough of Newham LFRMS actions to fulfil the aims/objectives set out, Newham Council will seek to:

- Secure new sources of national funding where possible,
- Explore additional funding sources, and
- Manage existing maintenance budgets to deliver best value.

3.1.4 The funding levels available for each flood management scheme now relate directly to the number of homes protected, damage prevented, and other benefits such as the environmental or business benefits that will be delivered. Extra emphasis is also now given to protecting homes in deprived areas.

3.1.5 A range of available funding opportunities will be pursued to help reduce identified flood risk in the borough. In addition to local authority budgets for works on the highways drainage network and maintenance regimes, the strategy will also seek contributions from developers when planning applications are determined.

3.1.6 Some actions will require additional funding for staff resources, expert consultancy fees and direct project funding. A number of other external sources of funding and resources will be utilised where available:

- Funding can be obtained from Defra's Flood Defence Grant in Aid and the Thames Regional Flood and Coastal Committee's local levy, both administered by the Environment Agency, for local flood risk investigations and for implementation of flood alleviation schemes that deliver suitable reductions in flood risk;
- Thames Water can fund flood alleviation works on the sewer network where the appropriate criteria are fulfilled;
- Utility companies and property owners are responsible for site specific flood risk alleviation, resistance and resilience of their premises;
- Developers are required to ensure that flood risks are addressed and to implement SuDS as part of new developments.

3.1.7 The level of flood risk varies across the borough and as such any works would be proportionate to the level of risk. They would also consider their impact on the local environment to ensure that, where possible, flood management measures go beyond being merely functional, and secure wider environmental enhancements such as to water quality, landscape and biodiversity, in order to meet the objectives of the Water Framework Directive and National Flood and Coastal Erosion Risk Management Strategy.

3.1.8 In Newham, local flood risk management schemes will be categorised as follows:

- Schemes in response to reports of flooding incidents from residents and businesses.
- Ongoing programmes of drainage improvement and maintenance works e.g. gully cleaning.
- Possible larger long-term schemes with eligibility for national funding.
- Introduction of SuDs techniques such as swales, green roofs, storage ponds, water features and permeable paving within new developments through the planning process and inclusion within regeneration projects where public open space is available to include SuDs techniques.

3.2 Flood Risk Action Plan

OBJECTIVE 1: Maintain and enhance understanding of flood risk in the borough of Newham

Action	Who	When	Funding
Improve understanding of flood risk in Newham by carrying out detailed modeling studies in high-risk areas	Environmental Control Unit	2015 to 2017	LLFA Drain London FDGiA Local Levy
Work with partners to ensure national datasets such as the uFMfSW are updated with the results of these local studies	Environmental Control Unit Environment Agency	2015 to 2017	LLFA
Record flood incidents in a consistent manner	Environmental Control Unit Highway Services(report flood incidents)	Ongoing	LLFA
Provide up to date information regarding the level of flood risk within Newham taking account of emerging climate change impacts by publishing flood risk data on the Council website where appropriate	Environmental Control Unit	Ongoing	LLFA
Review the SFRA with respect to surface water flood risk	Planning Policy	2016	Planning

OBJECTIVE 2: Maintain and improve flood risk management assets and infrastructure

Action	Lead	Timescale	Funding
Review and issue ordinary watercourse consents, and ensure the works are carried out in accordance with requirements	Environmental Control Unit	Ongoing	LLFA
Carry out routine and reactive maintenance of highway drainage assets and land drainage features in parks	Highway Services/ Public Space and Landscape Design	Ongoing	Highways/ Public Space and Landscape Design
Maintain the flood risk management asset register	Environmental Control Unit	Ongoing	LLFA
Carry out planned maintenance of Council owned assets	Environmental Control Unit	Ongoing	Borough
Ensure that privately owned, non-main river assets are adequately maintained, through the use of enforcement action where necessary	Environmental Control Unit	Ongoing	LLFA

OBJECTIVE 3: Ensure new developments minimise the risk of flooding

Action	Lead	Timescale	Funding
Apply the National Planning Policy Framework 'Flood Risk & Coastal Change' section of the Planning Practice Guidance and the local flood risk policies for Newham	Planning Environmental Control Unit	Ongoing	Planning
Require use of sustainable drainage techniques for all major developments and new development in CDAs and high flood risk areas (subject to feasibility), in accordance with local and national policies.	Planning Environmental Control Unit	Ongoing	Planning and LLFA
Provide the statutory consultee response on planning applications for surface water management	Environmental Control Unit	From 6/4/2015 onwards	LLFA Planning
Develop and publish Newham SuDS Guide	Environmental Control Unit Planning	6 months	LLFA and Planning

OBJECTIVE 4: Reduce the likelihood and impact of flooding within the borough

Action	Lead	Timescale	Funding
Encourage strategic approach to improving local flood defences	Environmental Control Unit	Ongoing	LLFA FDGiA Local Levy
Ensure that the main river flood defence improvements required by TE2100 are delivered, in collaboration with the Environment Agency and asset owners.	EA Environmental Control Unit Planning	Ongoing	Others: Land / Asset owner, EA, etc.
Identify and implement opportunities to retrofit Sustainable Drainage Systems	Environmental Control Unit Planning	Ongoing	LLFA others
Promote the use of natural floodplain management in Newham, where appropriate.	Environmental Control Unit Parks Property Services	Ongoing	LLFA
Review and undertake further assessment towards implementation of the preferred options for reducing surface water flooding	Environmental Control Unit	2015 to 2018	LLFA FDGiA Local Levy
Implement surface water options, in collaboration with partners	Environmental Control Unit Planning	2016 onwards	FDGiA Local Levy Borough capital Thames Water

OBJECTIVE 5: Raise public awareness of flooding issues and promote community level action

Action	Lead	Timescale	Funding
Identify properties where an acceptable standard of protection cannot be achieved	Environmental Control Unit	2017	LLFA
Promote Community Flood Plans and Business Continuity Plans where significant residual flood risk remains?	Emergency Planning	Ongoing	Emergency Planning
Promote individual property protection measures including flood resistance and resilience measures where significant residual flood risk remains	Environmental Control Unit	Ongoing	LLFA

OBJECTIVE 6: Respond effectively in the event of a flooding emergency

Action	Lead	Timescale	Funding
Apply the emergency response measures described in the Multi-Agency Flood Plan	Emergency Planning	Ongoing	Emergency Planning
Review the Multi-Agency Flood Plan with respect to surface water	Emergency Planning Environmental Control Unit	2015	Emergency Planning
Encourage residents and businesses in flood risk areas to sign up to the Environment Agency's Floodline Warnings Direct service and/or Newham Council's CommunitySafe system	Emergency Planning	2015	Emergency Planning LLFA
Gather flooding information to allow post flooding incident assessments to be undertaken	Environmental Control Unit Highways	Ongoing	LLFA

OBJECTIVE 7: Adopt and maintain a partnership approach to flood risk management

Action	Lead	Timescale	Funding
Continue to actively engage in the Drain London Forum to contribute to a coordinated London-wide approach to flood risk management	Environmental Control Unit	Ongoing	LLFA
Reinstate and continue to hold regular Flood Working Group meetings	Environmental Control Unit	Ongoing	LLFA
Work with the Environment Agency to deliver flood alleviation schemes, and improve knowledge and understanding of flood risk	Environmental Control Unit	Ongoing	FDGiA Local Levy LLFA
Work with Thames Water to identify opportunities for jointly funded projects where opportunities exist	Environmental Control Unit	Ongoing	LLFA Thames Water
Provide utility and transport companies with the latest available information on flood risk so they can assess the potential impact on their infrastructure and build resistance and resilience to flooding where necessary, ensuring a prompt recovery following a flood incident	Environmental Control Unit	Ongoing	LLFA

Appendix 1 – Legislative Context

Flood and Water Management Act 2010

The Flood and Water Management Act 2010 aims to provide better, more comprehensive management of flood risk for people, homes and businesses. The Act defines the following bodies as 'risk management authorities':

- a Lead Local Flood Authority (LLFA)
- the Environment Agency
- a district council for an area for which there is no unitary authority
- an internal drainage board
- a water company
- a highway authority

Newham's roles and responsibilities, as a LLFA, contained within the Act include:

- development, maintenance, application and monitoring of a strategy for local flood risk management (LFRMS) in its strategic leadership of local risk management authorities.
- powers to request information from any person in connection with the authority's flood risk management functions
- a duty to investigate and publish reports on flooding incidents in its area (where appropriate or necessary) to identify which authorities have relevant flood risk management functions and what they have done or intend to do
- a duty to maintain a register of structures or features which have a significant effect on flood risk in their area, in the view of the lead local flood authority
- power to do works to manage flood risk from surface runoff or groundwater
- power to designate structures and features that could affect flooding and are considered to be significant when assessing local flood risk
- a role as a statutory consultee regarding approvals for SUDs schemes for major developments as defined by the London Plan.
- decision-making responsibility for whether works on ordinary watercourses by third parties that may affect water flow can take place

Newham, as the LLFA, is by the 6th April 2015 to become statutory consultee to planning for approval of SuDS schemes intended to apply to major development. This replaces the original legislation that would have designated the LLFA as SuDS Approving Bodies (SABs) with responsibilities for approving all new SuDS and adopting them where they serve more than one property.

In formulating the LFRMS, Newham must consult with the public and any risk management authority that would be affected. The Strategy must also be consistent with the National Flood and Coastal Erosion Risk Management Strategy for England. A summary of the Local Strategy must be published and may be accompanied by guidance on how the strategy should be applied in the area.

Flood Risk Regulations 2009

The Flood Risk Regulations 2009 came in to force on 10 December 2009. They transpose the EU Floods Directive into UK law. The key provisions of the Regulations are

- to give responsibility to the Environment Agency to prepare preliminary flood risk assessments, maps and plans - for floods from the sea, main river and reservoirs
- to give responsibility to lead local flood authorities to do the same for all other forms of flooding (excluding sewer flooding which is not caused by precipitation)
- Preliminary flood risk assessments (PFRAs) to be prepared by the Environment Agency and LLFAs. Newham has prepared and published its preliminary flood risk assessment as part of the 'Drain London' initiative co-ordinated by the Greater London Authority (GLA).
- flood hazard and risk maps to be prepared by the Environment Agency for identified areas of significant flood risk
- for Newham as a LLFA to prepare a flood risk management plan by December 2015

The flood risk assessments must be reviewed on a six-yearly basis and any changes in the assessment incorporated in the flood risk management plans.

Appendix 2 – Glossary and Abbreviations

Glossary

Term	Definition
Catchment Flood Management Plan	A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Critical Drainage Area	A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding during severe weather thereby affecting people, property or local infrastructure.
Culvert / culverted	A channel or pipe that carries water below the level of the ground.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
Flood Zone 1	Low Probability of Flooding. In accordance with the NPPF, land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.
Flood Zone 2	Medium Probability of Flooding. In accordance with the NPPF, land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1-0.1%), or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5-0.1%) in any year.
Flood Zone 3a	High Probability of Flooding. In accordance with the NPPF, land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of sea flooding (>0.5%) in any year.

Flood Zone 3b	Functional Floodplain. In accordance with the NPPF, land where water has to flow or be stored in times of flood.
Environment Agency	Environment regulator for England and Wales. Risk Management Authority responsible for management of flood risk from main rivers, tidal and coastal sources of flooding and Reservoirs.
Flood Defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Floodplain	Area adjacent to river, coast or estuary that is naturally susceptible to flooding.
Flood Resilience	Resistance strategies aimed at flood protection.
Flood Risk	The level of flood risk is the product of the frequency or likelihood of the fl
Flood Zone	The extent of how far flood waters are expected to reach.
River Flooding	Flooding by a river or a watercourse (also called fluvial flooding).
Groundwater	All water which is below the surface of the ground and in direct contact with the ground or subsoil.
Hydraulic Modelling	A computerised model of a watercourse and floodplain to simulate water flows in rivers too estimate water levels and flood extents.
Integrated Hydraulic Modelling	A hydraulic model that includes the below ground drainage network, to simulate the interaction between surface water and the drainage infrastructure
Land Drainage Act 1991	Sets out the statutory roles and responsibilities of key organisations such as Internal Drainage Boards, local authorities, the Environment Agency and riparian owners with jurisdiction over watercourses and land drainage infrastructure. Parts of the Act have been amended by the Flood and Water Management Act 2010.
Local Flood Risk	Defined in the Flood and Water Management Act 2010 as flooding from surface runoff, ordinary watercourses and groundwater.

Lead Local Flood Authority (LLFA)	The statutory body defined under the Flood Risk Regulations 2009 and Flood and Water Management Act 2010 responsible for the management of local flood risk, namely surface water runoff, groundwater and ordinary watercourses.
Local Planning Authority (LPA)	Body that is responsible for controlling planning and development through the planning system.
Main River	Watercourse defined on a 'Main River Map' designated by DEFRA. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities for main rivers only.
Mitigation Measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.
Multi-Agency Flood Plan (MAFP)	Plan outlining how responding parties under the Civil Contingencies Act and key voluntary response organisations will work together on an agreed coordinated response to severe flooding in the London Borough of Newham.
National Planning Policy Framework (NPPF)	National Planning Policy Framework (NPPF) for England, published by the Development for Communities and Local Government. This sets the government's planning policies for England and how these are expected to be applied.
Ordinary Watercourse	A watercourse that does not form part of a main river. This includes "all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows" according to the Land Drainage Act 1991.
Overland Flow	Flooding caused when intense rainfall exceeds the capacity of the drainage systems or when, during prolonged periods of wet weather, the soil is so saturated such that it cannot accept any more water.
Residual Flood Risk	The remaining flood risk after risk reduction measures have been taken into account.
Return Period	The average time period between rainfall or flood events with the same intensity and effect.

Riparian Owner	Anyone who owns land or property alongside a river or other watercourse. Responsibilities include maintaining river beds/banks and allowing flow of water to pass without obstruction.
Sewer Flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Standard of Protection	The flood event return period above which significant damage and possible failure of the flood defences could occur.
Sustainability	To preserve /maintain a state or process for future generations.
Sustainable Drainage System (SuDS)	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations meeting their own needs.
Tidal	Relating to the actions or processes caused by tides.
Tributary	
1 in 30 year event	An event, which has a 3.33% probability of occurring in any one year.
1 in 100 year event	An event, which has a 1% probability of occurring in any one year.

Abbreviations

EA	Environment Agency
FDGiA	Flood Defence Grant in Aid
FRR	Flood Risk Regulations 2009
FWMA	Flood and Water Management Act 2010
GLA	Greater London Authority
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
PFRA	Preliminary Flood Risk Assessment
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TE2100	Thames Estuary 2100 project
TFL	Transport for London
WFD	Water Framework Directive
uFMfSW	updated Flood Map for Surface Water