Committee(s):	Date(s):
Summit Group Audit and Risk Management Committee	9th December 2013 28th January 2014
Subject: Strategic Risk 5: Flooding in the City	**Public**
Report of: Director of the Built Environment	**For information**

Summary

This report explains the risk assessment for strategic risk SR5: Flooding in the City. Parts of the City are at risk from river flooding and surface water flooding which would cause disruption to City activities. There could also be the potential for reputational damage for the City Corporation arising from poor preparation or inadequate response. Both sources of flooding would be low likelihood but higher impact events. There is a need to reduce the risk where practical and cost effective, and to improve resistance and resilience measures to reduce its impact.

The risk of River Thames flooding is mitigated by the Thames Barrier and river walls that currently protect against a 1 in 1,000 year flood surge. The risk of localised surface water flooding following intense rainstorms in London has a greater probability. However, major engineering solutions will not be cost-effective against surface water flood risks in the City. Therefore the mitigating actions will focus on the use of sustainable drainage systems to slow rainfall runoff to some extent and a range of physical and behavioural changes to increase resistance and resilience to its impact.

Mitigating controls have reduced the risk likelihood from gross risk 2 (unlikely) to net risk 1 (rare). The resultant entry on the Risk Register for Strategic Risk 5 is a net risk of 1 (rare) for likelihood and 3 (moderate) for impact.

The risk has not changed materially since last year due to effective mitigation measures including:-

- Environment Agency completed its Thames Estuary 2100 Plan that includes provision to raise the river walls by 2035
- City Corporation commissioned and submitted updated surface water flood risk maps for inclusion in Environment Agency maps
- Appointment of a Flood Resilience officer to investigate and promote flood resistance and resilience for existing buildings
- Preparation of a draft Local Flood Risk Management Strategy.

Recommendations

Members are recommended to note this report.

Main Report

Background

1. The City Corporation has a range of statutory duties with regard to flood risk in its roles as Planning Authority, Lead Local Flood Authority and as a Category 1 Responder under the Civil Contingencies Act. In accordance with the Flood and Water Management Act 2010 the City Corporation has prepared a Strategic Flood Risk Assessment 2012 to enable it to understand better the flood risks facing the City and to inform the Flood Risk Management Plans and the citywide Flood Risk Management Strategy which the City Corporation is required to prepare by 2015.

The Nature of the Risk

2. Flood risk in the City has two main sources: - river flooding and surface water flooding.

River Flooding

3. There is a relatively low risk of river flooding affecting part of the City which is south of Thames Street near the River Thames (see Appendix 1: River Zone Flood Map). The City's position on a hill above the River Thames provides it with greater natural protection from river flooding compared with some low-lying neighbouring boroughs. The relatively low risk from River Thames fluvial and tidal flooding is confined to the low-lying area south of Thames Street, the Temples and the adjacent streets south of Tudor Street.

4. River flooding would occur if there were an intense storm combined with a tidal surge up the Thames Estuary which could not be contained by the existing river defences including the Thames Barrier and river walls. Environment Agency modelling suggests this would be a rare event as existing flood defences give protection against a 1 in 1,000 year flood surge (0.1% annual probability). Although a relatively small part of the City would be flooded directly by such a surge there would be wider consequences as much of central London would be flooded as it is low-lying and the public transport network and other infrastructure could be badly affected.

Surface Water Flooding

5. Surface water flooding arises when there is an intense storm generating heavy or prolonged rainfall runoff that cannot be managed by existing drainage systems. This leads to local surface water runoff being unable to enter the drainage system or coming up from existing drains and manhole covers. London's combined sewer and surface water drainage system can make such flooding particularly unpleasant.

6. London's drainage system could not cope with a very intense rainstorm over central and north London with a return period of 1in 100 to 1 in 200 years (1% to 0.5% annual probability). The sewer capacity would not be sufficient to convey City runoff, the upstream runoff from Camden and Islington to the north and the runoff from Hammersmith, Kensington and Westminster to the west. Surface water flooding could occur in some low lying places up to 2 metres in depth depending on the intensity of the rainstorm. It is also thought that some shallower surface water flooding could occur with a 1 in 30 year storm (3.3% annual probability).

7. The Fleet Valley (including Farringdon Street) and Paul's Walk near the River Thames are vulnerable to surface water flooding in such circumstances because they are low lying land where rainfall runoff water would gather. The Thames riverside areas would be vulnerable because surface water gathering there would become trapped behind the river defence walls (see Appendix 1: Surface Water Flooding Hotspots).

8. Parts of the electricity network in the Farringdon area could be vulnerable to surface water flooding. UK Power Networks is investigating how the network could be sustained in the event of localised flooding. It is seeking permission to build extra resilience into the network to protect against localised flooding events as part of its Business Plan submitted in accordance with the electricity price control review process.

Mitigating Controls

River Flooding

9. The main mitigation controls for river flooding are the Thames Barrier and river wall defences which give good protection against a 1 in 1,000 year flood surge (0.1% annual probability). However such flood surges will become stronger and more likely due to climate change and the Environment Agency has estimated in its Thames Estuary 2100 Plan that flood defences along the riverside may need to be raised by up to 1 metre during the period 2035-2069 in order to maintain existing levels of protection.

10. The potential impact of river flooding is being reduced by using planning policies in the City's Local Plan to ensure that riverside buildings have been designed with flood risk in mind and do not place vulnerable uses in the ground and basement levels which are at risk. Potential impact is also being reduced by proactive investigation and promotion of flood resistance and resilience measures by the Flood Resilience officer.

Surface Water Flooding

11. Surface water flood mitigation measures are normally a combination of engineering works to increase drainage system capacity, sustainable drainage systems such as 'green' roofs or walls to provide extra storage and slow down rainfall runoff, and policy measures to ensure that existing and new buildings are built and occupied with the flood risk resistance and resilience in mind.

12. The City Corporation updated its Strategic Flood Risk Assessment (SFRA) in 2012 to provide a better understanding of local flood risk and impact. Improved rainwater flows modelling in the updated SFRA led to a reduction in the extent of the City thought to be vulnerable to surface water flooding. However the City is a small part of a much wider rainfall catchment area and so solutions need to be applied strategically in other parts of the Fleet Valley and elsewhere. Hence City Corporation officers have been active members of the Central London (North) Flood Risk Partnership as part of a collaborative approach.

13. A feasibility study has examined the cost and benefits of significant engineering works in the City to increase drainage system storage and flow capacity. That study concluded that such works would not be cost-effective in the City but similar measures might be in other parts of the London.

14. Policy commitments in the City's Local Plan to encourage green roofs and other sustainable drainage measures in the City should slow storm water runoff slightly but such measures also need to be applied much more widely across London to have a significant effect. Camden forms part of the Fleet River catchment area and Camden is proposing such measures in its Flood Risk Management Strategy.

15. Some risk will remain and so planning policy and contingency planning measures are needed to reduce its impact. Planning policies require relevant planning applications to be accompanied by flood risk assessments, to demonstrate the site is suitable for the intended use and encourage flood-resistant building designs. Contingency planning initiatives will ensure that relevant occupiers are aware of the risk and the need for contingency plans to improve their resilience to flooding.

Further Action

16. River flood risk is currently minimised by the Thames Barrier and river walls but this situation will need to be monitored by the Environment Agency so that the projected effects of climate change are allowed for and the existing level of protection is maintained in the long term. The Environment Agency's Thames Estuary 2100 Plan will form the basis of this long term planning.

17. Surface water flood risk will remain despite measures to improve drainage capacity and reduce risk. Therefore the focus will in future be on resistance and resilience measures for those areas, buildings and occupiers that are at risk. Planning policies will ensure that buildings have been designed with flood risk in mind and they do not place vulnerable uses in the ground and basement levels which are at risk. Contingency planning initiatives will continue to ensure that relevant occupiers are aware of the risk and the need for contingency plans to improve resilience.

18. The Government is proposing to introduce a new Sustainable Drainage Systems approval process from April 2014, applicable to certain new developments, to ensure that they address surface water drainage issues at the design stage. The City Corporation will implement this national initiative for developments in the City

but detailed proposals have not yet been published by the Government and so the practical implications for the City are not yet clear.

19. In 2013 the City Corporation commissioned and submitted Flood Risk and Flood Hazard maps to the Environment Agency in accordance with its obligations under the Flood Risk Regulations 2009. It is using this information and that derived from the Strategic Flood Risk Assessment 2012 to produce Flood Risk Management Plans for vulnerable areas by 2015 accompanied by a citywide Local Flood Risk Management Strategy.

20. Initial work on the City's Local Flood Risk Management Strategy has generated the following draft objectives:

    - To provide up to date information regarding the level of flood risk within the City taking account of emerging climate change impacts

    - To reduce the vulnerability and cost to City businesses, residents and visitors of flood risk

    - To respond effectively in the event of flooding providing emergency assistance to those in need

    - To assist in recovery enabling the City residents and businesses to resume normal activities promptly

    - To engage with other flood risk management authorities taking action to reduce flood risk through partnership working within and beyond the City's boundaries

21. It is expected that the City's draft Local Flood Risk Management Strategy will be considered by Members in Spring 2014, to be followed by public consultation and finalisation later in the year.

Conclusion

22. The City of London is at relatively low risk of river, groundwater and coastal flooding due to its location on a hill and the high standard of its river defences. Parts of the City are at greater risk from surface water flooding if the drainage system is overloaded by heavy or prolonged rainfall. The City Corporation is fully aware of the need to address these risks and has taken steps to understand them better, and to implement policies in collaboration with others in London to mitigate the risks and reduce their potential impact.

Appendices

- Appendix 1: Strategic Flood Risk Assessment 2012: River Flood Zone Map & Surface Water Flooding Hotspots Map
- Appendix 2: Extract from Draft Local Flood Risk Management Strategy 2013 in preparation
- Appendix 3: Strategic Risk Register – Risk SR5 Flooding in the City

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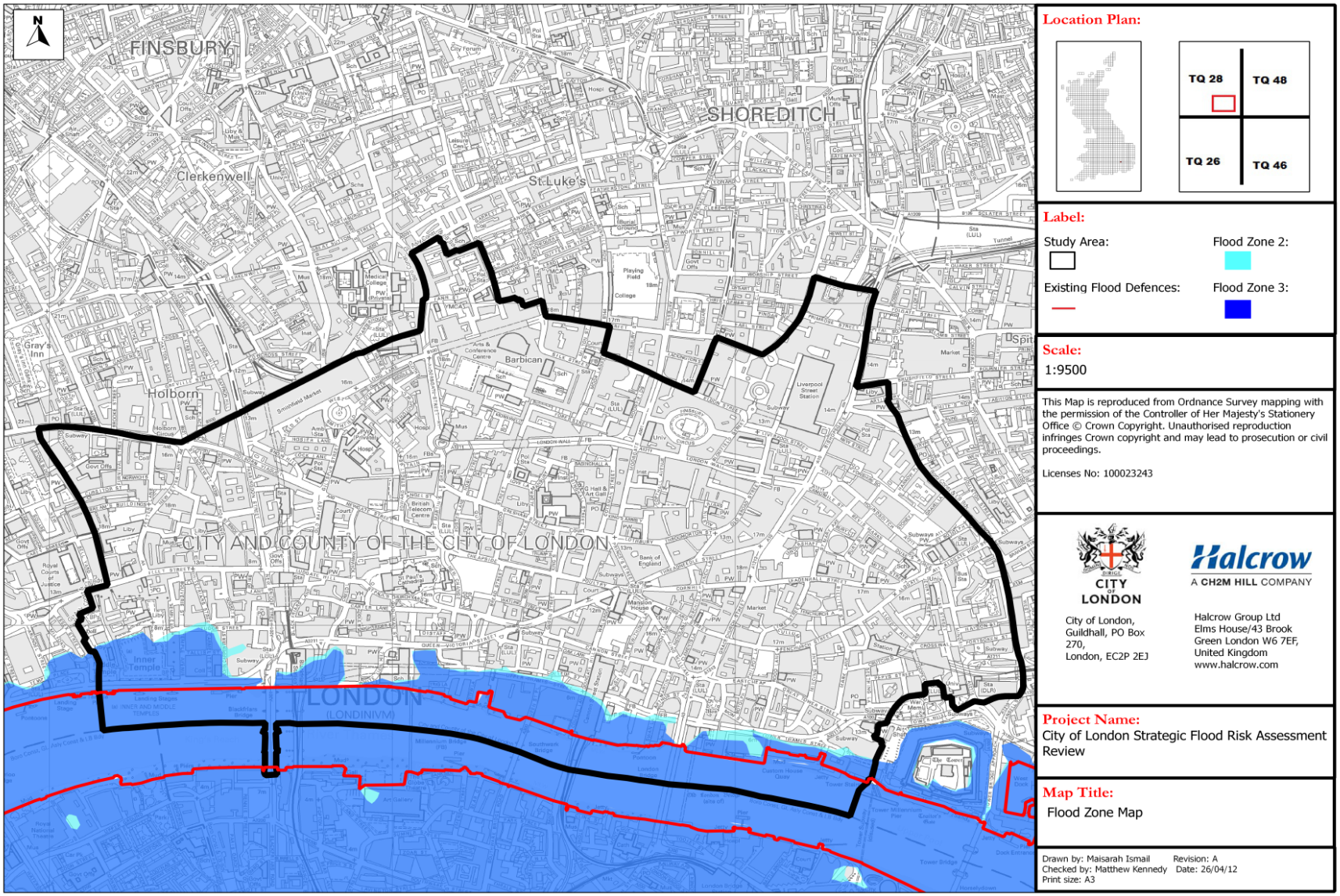
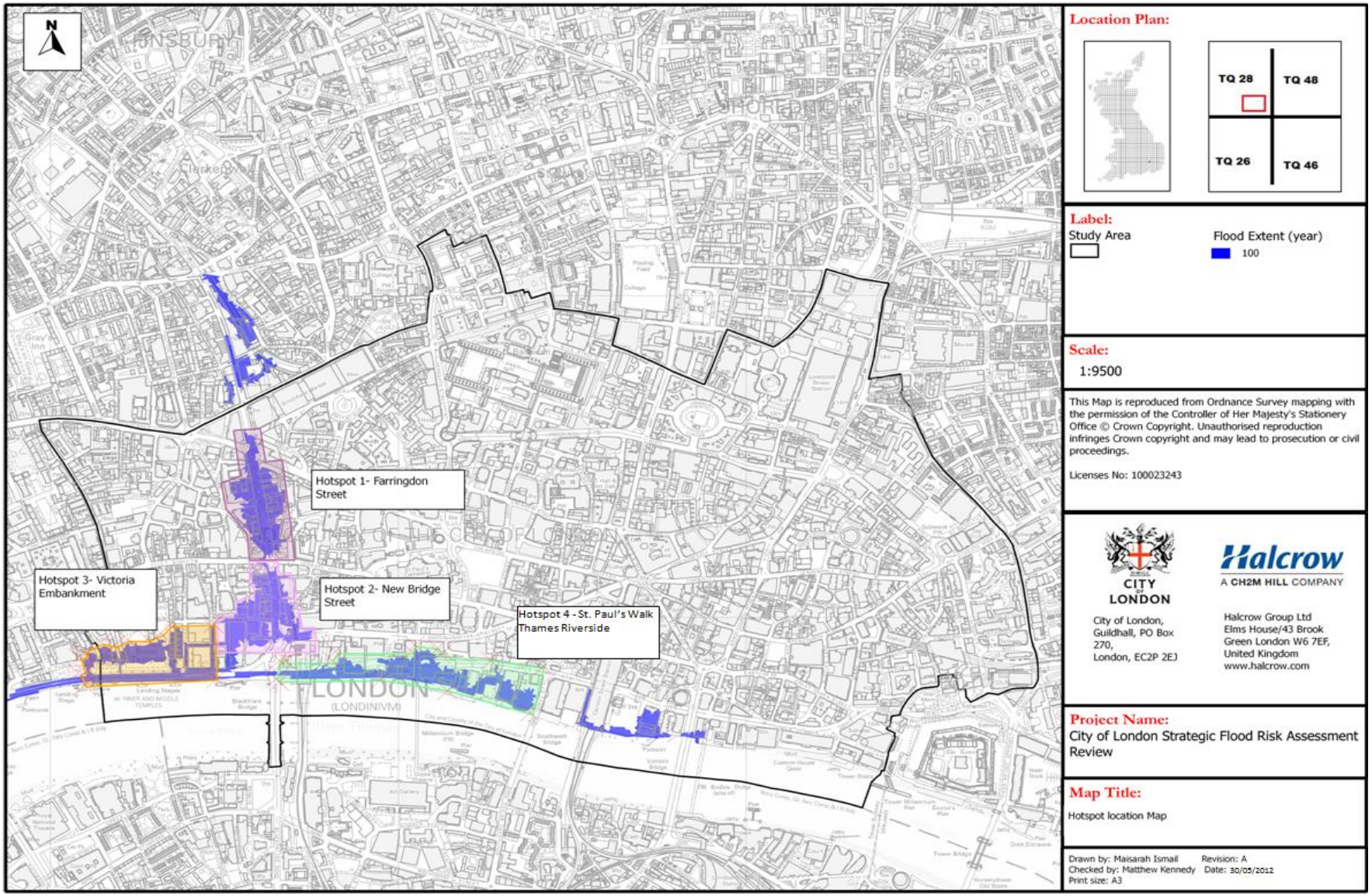
Appendix 1: Strategic Flood Risk Assessment 2012 River Flood Zone Map



Appendix 1: Strategic Flood Risk Assessment 2012 Surface Water Flooding Hotspots



Appendix 2: Extract from the Draft Local Risk Management Strategy in preparation

City of London Corporation

Draft Local Flood Risk Management Strategy

2014 - 2020

Dec 2013

CITY OF LONDON

Contents

Section 1: Introduction

The City is at relatively low risk of flooding with specific areas at risk from river flooding and surface water/ sewer flooding (Fig 1). However the consequences of flooding in these restricted parts of the City could be very high in terms of loss of business and reputational damage and inconvenience to occupants.

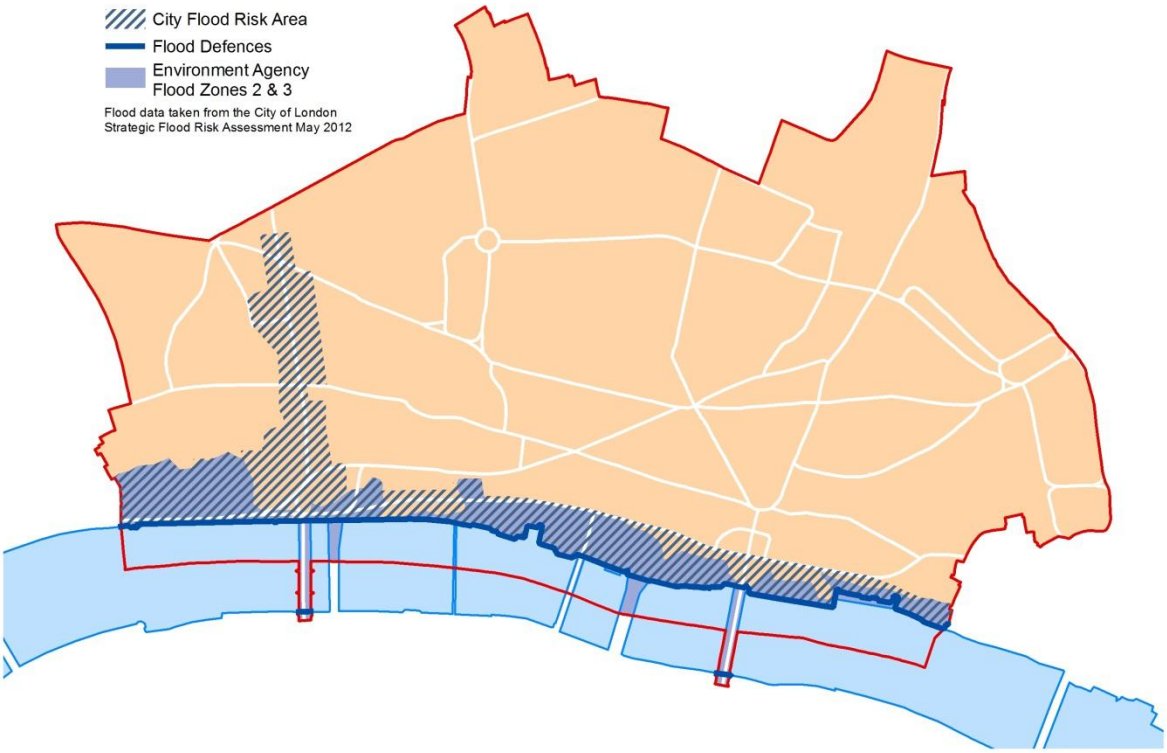


Figure 1: Flood Risk in the City of London

The City's flood risks must be considered strategically since flood risks are associated with river catchments which extend well beyond the City's boundaries. Changing weather patterns as a result of climate change will also influence the City's future probability of flooding with more intense rainfall events creating conditions where flash flooding and overloading of the sewer network could become more frequent. Sea level rise will increase the risk of flooding from the tidal Thames in future decades. As a consequence past experience of flooding is not necessarily an accurate predictor of future flood risk.

The City is protected from River flooding by the Thames Barrier and by local flood defences along the riverside. The Thames Estuary 2011 Plan (TE2100 plan) identifies the wider actions which are needed to protect London from future flooding some of which will need to be implemented within the City. Surface water/ sewer flooding is a risk along Farringdon Street and the Thames riverside as a result of rainwater catchments as far afield as Hammersmith to the west and Hampstead to the north of the City. It is impossible to completely eliminate the possibility of flooding occurring therefore an important element of flood preparedness is the implementation of measures to provide resistance, preventing flood waters entering properties and flood resilience enabling rapid recovery in the event of flooding. Emergency planning provides the assurance that in the event of flooding procedures are in place to respond effectively.

This strategy identifies the approach the City Corporation is taking to the flood risks that affect the City, the actions that are underway or planned to reduce these risks and the processes by which this strategy will be kept up to date.

The Flood and Water Management Act 2010 assigns various responsibilities to Lead Local Flood Authorities including the requirement to develop, maintain apply and monitor a strategy for local flood risk management in its area. The City Corporation, as unitary authority for the Square Mile is the Lead Local Flood Authority for the City.

This strategy covers flood risk affecting the City's geographic area; it does not include flood risks on City owned or managed land beyond the City's boundaries.

Section 2: Flood Risk Strategy requirements

The Flood and Water Management Act 2010 specifies LLFA's duties with regard to Flood Risk Strategies and outlines the elements that must be included in a Flood Risk Strategy. Table 1 shows these requirements and where each one is covered in the City of London Local Flood Risk Management Strategy.

Table 1: Flood Risk Strategy Requirements

The Flood and Water Management Act 2010 section 9 (4) requires that the strategy must specify:	Where it is covered in this strategy
(a) the risk management authorities in the authority's area,	Appendix 2
(b) the flood and coastal erosion risk management functions that may be exercised by those authorities in relation to the area,	Appendix 2
(c) the objectives for managing local flood risk (including any objectives included in the authority's flood risk management plan prepared in accordance with the Flood Risk Regulations 2009),	Chapter 4
(d) the measures proposed to achieve those objectives,	Chapter 4 and Chapter 5
(e) how and when the measures are expected to be implemented,	Chapter 5
(f) the costs and benefits of those measures, and how they are to be paid for,	Chapter 5
(g) the assessment of local flood risk for the purpose of the strategy,	Chapter 3
(h) how and when the strategy is to be reviewed, and	Chapter 6
(i) how the strategy contributes to the achievement of wider environmental objectives.	Chapter 7

Appendix 3: Risk Supporting Statement SR5: Flooding in the City — Risk Owner: Director of the Built Environment

Risk	City Corporation fails to adequately address the impact of a major flood in part of the City in relation to businesses, roads, transportation, etc. **Links to: Strategic Aim SA2 and Key Policy Priority KPP3**	**Gross Risk**	A
		Likelihood	**Impact**
		2	4
Detail	There are three elements to this risk; river flooding, surface water flooding and an inadequate response to flooding. While river flooding is unlikely, a significant area south of Thames Street would be affected by it, compounded by the fact that flood water would remain trapped behind the river defences. Surface water/sewer flooding is a more likely scenario, with London's drainage system lacking the capacity to accommodate prolonged intense rainfall. Responsibility for the sewer network lies with Thames Water not the City, although the City has overall responsibility for co-ordination of flood risk as a Lead Local Flood Authority. Strategic Flood Risk Assessment Review 2012 has confirmed that surface water flooding would be restricted to relatively few, small areas in the Fleet Valley and the Thames Riverside, with most of the City not directly affected.		

Issues	**Controls**
River Flooding **rare** (1) impact **major** (4)	Main defence provided by Environment Agency through Thames Barrier and river wall defences, proven reliability over the past 30 years. Latest research shows that the Barrier will remain effective until at least 2035 and could be adapted to last much longer. **(Environment Agency and riparian owners)**
Surface water flooding **rare** (1) impact **moderate** (3)	Partnership working with pan-London bodies, surrounding boroughs, Thames Water and Environment Agency to reduce the risk and resist its effects. Planning controls constrain building design and uses in higher risk areas. Further modelling work has been undertaken to define vulnerable areas and investigate mitigation, resistance and resilience measures in those areas. Impact is localised to specific parts of the City. **(Policy & Performance Director)**
Inadequate response to flooding **unlikely** (2) impact **moderate** (3)	Contingency plan in place. City Corporation has responsibilities under the Civil Contingencies Act. Further work planned as part of the City's Flood Risk Strategy. **(Head of Resilience & Community Safety)**

Summary		
While it is not possible for the City alone to reduce significantly the risk of flooding, it is possible to minimise the impact of such incidents through planning policy to avoid critical or vulnerable uses in higher risk areas, to increase runoff storage capacity through sustainable drainage measures, and through robust contingency planning. The City has responsibilities under the Flood Risk Regulations 2009 and Flood and Water Management Act 2010, culminating in a flood risk management plan for areas which are at significant risk of flooding, to be in place by June 2015.	**Net Risk**	G
	Likelihood	**Impact**
	1	3
	Control Evaluation	
	A	