LONDON FIRE BRIGADE

OFFICIAL
29 April 2022
CRMP

Assessment of Risk

Assessment summary

The Fire and Rescue National Framework for England 2018 places a duty on all Fire and Rescue Services to "*identify and assess the full range of foreseeable fire and rescue related risks their areas face*". The London Fire Commissioner's (LFC) Assessment of Risk (AoR) is the Brigade's response to that requirement. It sets out all foreseeable risks which the LFB might be expected to respond to and assesses their risk based on a combination of their likelihood and consequence.

This process of identifying and assessing all foreseeable risks is used to enable the Brigade to make decisions in relation to how it "*puts in place arrangements to prevent and mitigate these risks",* which is also a requirement of the National Framework. These actions are documented in the Brigade's Assessment of Risk Response (AoRR), which maps all identified and assessed risks from the AoR to the capabilities required to deliver LFB's prevention, protection, and response services.

The AoRR identifies the programmes, projects, and initiatives, in the Target Operating Model (TOM) which have the greatest impact on risk reduction and increase the Brigade's ability to mitigate all foreseeable fire and rescue related risks.

When considered together these three documents, the AoR, AoRR and TOM, combine to inform the Brigade's integrated approach to risk management. The LFC's Community Risk Management Plan is the Brigade's integrated risk management plan and demonstrates how the Brigade will mitigate risk and improve public safety in London over the life of the plan. The AoR, AoRR and TOM all support this plan by setting out in greater detail the actions that the LFC will take to prevent fire and other emergencies and mitigate risk in London.

London Fire Brigade's (LFB or "Brigade") Assessment of Risk (AoR) is designed to help increase the understanding of how risk from fire and non-fire emergencies in London has changed over time and how the different elements combine to give a London-wide picture of risk.

The AoR is not the only process LFB uses to determine and provide its services, but it does give a high- level overview which can be used to understand the basic concepts of fire cover and the steps that LFB is taking to make people safe. The AoR is reviewed annually, or as significant new data becomes available. This enables the Brigade to adapt its operations to London's changing environment. The Brigade's approach to assessing risk is founded on risk management principles and the definitions set out in the National Fire Chiefs Council's 'Definition of Risk Project'.

In this Assessment of Risk, risk is defined as a combination of the likelihood and consequences of hazardous events. This allows the risk of incidents that may have happened only rarely, or never, to be assessed alongside risks that are common. This next section outlines the Brigade's understanding of risk and its approach to assessing risk in London.

This AoR has identified several high-risk areas relevant for London which will inform the development of the next Community Risk Management Plan (CRMP). The Brigade attends a wide range of emergencies that result in casualties and fatalities. These often occur in buildings but often occur in other locations as well. The highest identified fire risks are generally where most people live, and the highest risk property types are:

- Fires in the home
- Fires in care homes and specialised housing
- Fires in large entertainment, public and commercial buildings
- Fires in landfill, wasteland and on rural land (urban/rural interface)

- Non-fire incidents involving road vehicles, trains, or water

The UK Government and the London Resilience Forum (a partnership of organisations with responsibility for emergency preparedness in London) each produce a risk register of worst-case risks. This is updated annually and is used by them to prepare their response should these risks occur. This risk assessment uses a broader definition of risk and includes impacts on human welfare, behaviour, economic, infrastructure, environment, and security. The major extraordinary risks on these registers which the Brigade must prepare for are:

- Urban flooding
- Terror related incidents
- Pandemic influenza
- Severe Drought
- Major Fires

Finally, the Brigade has identified emerging risks that may arise and risks that could change over the term of the CRMP which may require the Brigade to adapt the services it provides to meet London's changing needs, wants and expectations, the highest likelihood risks are listed below:

- Changing built environment,
- Sustainability and climate change
- Security and resilience
- Population change

Overall, fire still presents a broad risk to the public, especially if control measures which are intended to prevent or reduce harm are not in place/fail and/or when the wider impacts of fire and non-fire incident on society are considered.

Summary of highest rated risks

Consequence						
	5		**Extraordinary risks** • Nuclear attack unenclosed urban area **Fire involving** • landfill or wasteland ***Non-fire incidents involving*** ▪ outdoor water and boats	**Extraordinary risks** • Conventional attack on chemicals infrastructure • Biological attack – unenclosed urban area **Fire involving** ▪ rural land (urban rural interface)* ***Non-fire incidents involving*** ▪ trains and transport buildings (including London Underground)	**Extraordinary risks** • Influenza type pandemic **Fire involving** • purpose-built flats **Non-fire incidents involving** ▪ road vehicles and urban infrastructure	
	4			**Extraordinary risks** • Chemical attack – enclosed urban area • Radiological attack – unenclosed urban area • Surface water flooding • Fluvial flooding • Severe drought • Severe space weather **Fire involving** • converted flats or HMOs • care homes and specialised living	**Fire involving** • houses and bungalows	**Extraordinary risks** • Marauding terrorist attack
	3					
	2					
	1					
		1	2	3	4	5
		Likelihood				

Extraordinary risk likelihood rating	**Fire/non-fire incident risk likelihood rating**	**Emerging risks**
probability of occurring within London within next 12 months	*likely frequency of incidents occurring within London*	• Changing built environment
1. Less than 0.2% chance of occurring	1. Between one a year and once a week	• Sustainability and climate change
2. Between 0.2% and 1%	2. Between one a week and one a day	• Security and resilience
3. Between 1% and 5%	3. Between one and five a day	• Population change
4. Between 5% and 25%	4. Between five and twenty a day	• Societal health and well-being
5. More than 25%	5. Twenty or more a day	

Combined map showing neighbourhood densities and high/very high incident occurrences

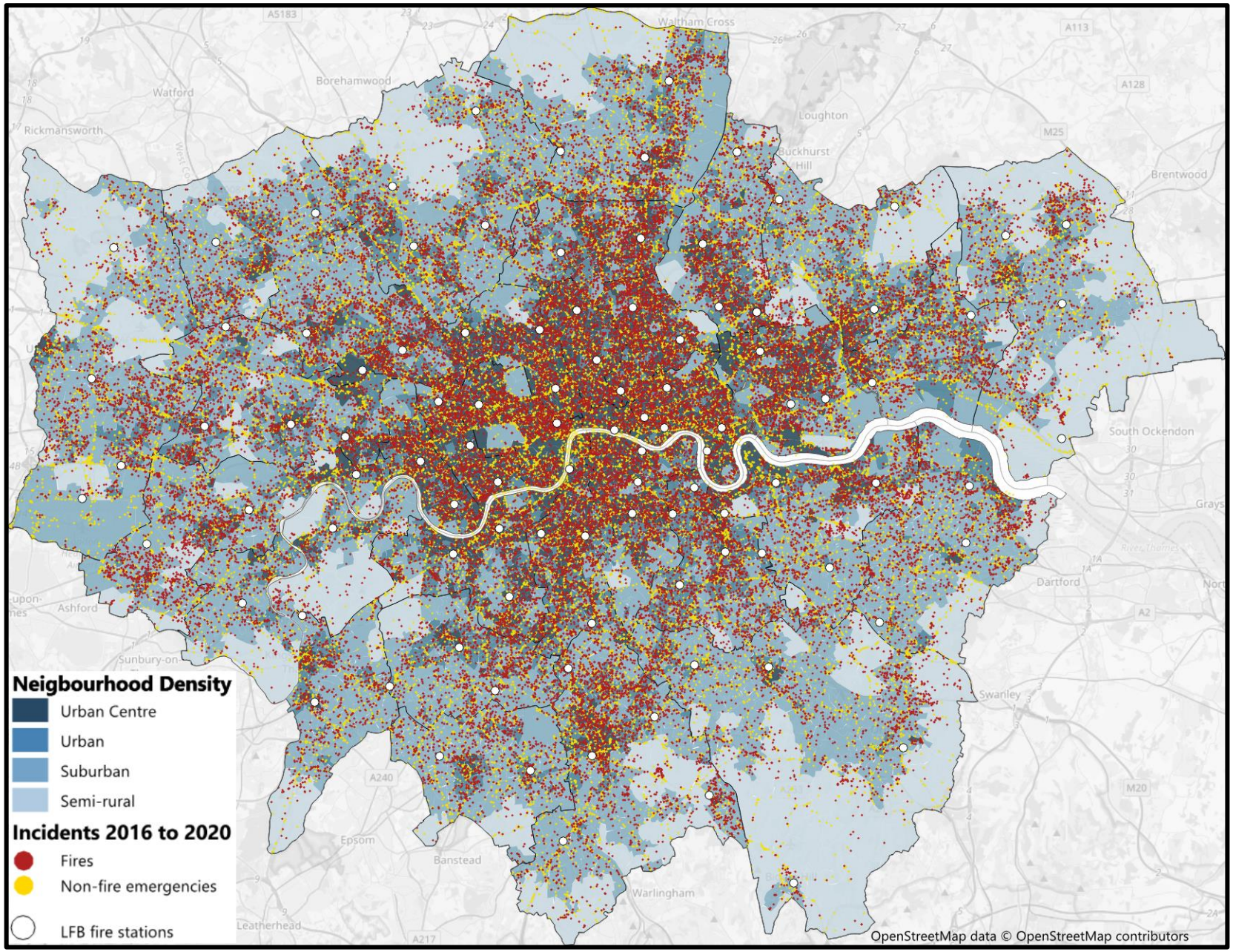


Table of contents

Our layered approach to assessing risk

Our Assessment of Risk looks at all foreseeable risks, both fire and non-fire, for which the London Fire Brigade may be expected to put in place appropriate controls. It identifies and assesses the risk which LFB must put in place arrangements to prevent and mitigate these risks. These arrangements are detailed in the Assessment of Risk Response. Together along with the Target Operating Model these documents support the development of the Community Risk Management Plan (CRMP).

In doing so, it is mindful of the statutory requirements that are put on fire and rescue services by the following legislation:

- Fire and Rescue Services Act 2004,
- The Regulatory Reform (Fire Safety) Order 2005,
- The Fire and Rescue Services (Emergencies) (England) Order 2007,
- Fire and Rescue Service National Framework for England (2018),
- Equalities Act 2010,
- Civil Contingencies Act 2004,
- Human Rights Act 1998.

To do this the Brigade is taking a layered approach to understanding risks in London (see figure 1.) putting our communities at the centre of the assessment. This enables the Brigade to consider all risks independently of each other and take a fully integrated assessment of risk and the factors that influence vulnerability. It considers risk through several sources, including our internal reviews of each fire that results in a fatality.

Our Community Risk Management Plan will set out how we intend to help London reduce, manage, and respond to these risks.

Risks relating to people and communities

This layer takes a people-centred view of concerns in London which aims to identify the risks that Londoners are most concerned about in relation to fire and rescue service incidents. These concerns reflect what Londoners, and those who commute into or visit London, have told us. The scale of some of these perceived risks may not match the reality that each risk poses, however it is important that the Brigade understands both the scale of actual risk and the perception of risk held by the public to allow it to engage in the most appropriate way to make people safer and feel safe in London.

The Brigade aims to eliminate or reduce these risks by understanding how people use and live in their spaces. We have used our last five years of data on fatalities and injuries arising from fire and non-fire incidents to understand peoples' vulnerability to becoming a casualty of an incident we may attend. This allows us to identify those people who are most vulnerable to fire and non-fire incidents.

Risks relating to property and places

This is a data-led risk assessment for individual life risks in different property types or locations that the Brigade attends, and which give rise to the highest number of casualties or fatalities per incident or put the most strain on our resources. This allows the Brigade to know which property types are the locations for most life-risk incidents and which property types have the potential for the greatest wider impacts and consequences.

Risks relating to national risks and extraordinary scenarios

This is a subjective risk assessment for the extraordinary or "worst-case" scenarios based on the London and national risk registers. These worst-case risks are assessed against a broad range of impacts: human welfare, behavioural impact, economic, infrastructure, environmental and security and are made up of three categories: accidents, threats, and natural hazards. This gives the Brigade a wider partner perspective on risks faced in London and England.

Emerging and future risk scenarios

This layer seeks to identify foreseeable risks which the Brigade may need to adapt to over the next three to five years and allows for longer term planning to be undertaken. These risks have been informed by work undertaken by the Centre for London (as published in their 2020 report "*London at a crossroads*") and by their ongoing work on "*London Futures: Building a new vision for London to 2050 and beyond*".

The first three layers of this risk assessment, when considered independently of each other, give an integrated assessment of all foreseeable risks across London in terms of who is at most risk, the places where people are at most risk and the broader risks associated with fire and rescue service incidents which give rise to wider community impacts. By including the fourth layer of future risk scenarios LFB can identify if there are any emerging trends or gaps which may need additional or new capacity or capability in future.

Neighbourhood density zones

Our all-risk aggregated approach to understanding risk in London has been to create a 'neighbourhood' view of London as we believe when taking an all risk approach most risks are correlated to the areas of London that have the most people and/or the most infrastructure (buildings) and as such, where more people work or visit. Our neighbourhood density zones highlight the areas of London where the combined densities of people and buildings are the greatest. Appendix 1 contains maps showing the geographical illustration using available data of each concern across London.

The neighbourhood density map shows the population and building density across London. We have divided this into four zones. Those with the highest population and building density (more than 15,000 people per sq. km) are shown in red, those with above average population and building density (between 9,000 and 15,000 people per sq. km) are shown in amber, those with below average population and building density (between 2,000 and 9,000 people per sq. km) are shown in grey and the lowest population and building density (below 2,000 people per km) are shown in green.

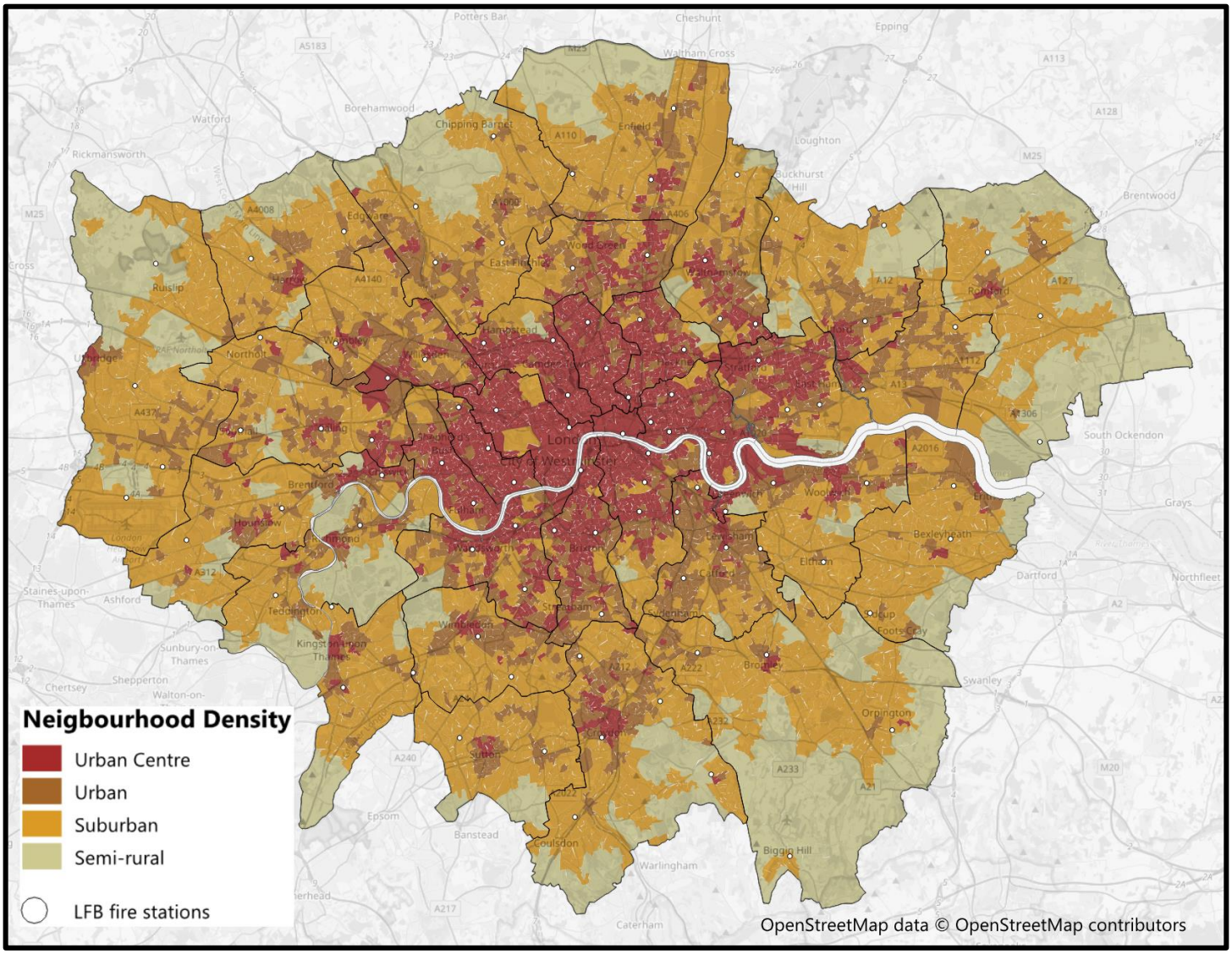


Figure 1. Neighbourhood density zones

Layer one: People and community led risks

This is the first layer of our risk assessment and is the central core around which the rest of the assessment sits. To understand people's vulnerabilities, we begin with their concerns. We have mapped where those concerns are located across London and analysed those concerns in relation to building and population density.

We then consider the different risk factors which influence people's vulnerabilities and how those risk factors make people more or less likely to need our services.

Concerns

The concerns identified below have been raised by Londoners, either through engagement or consultation. These risks are associated with public risk perception, mental health and wellbeing, economic loss, and loss of infrastructure. This year, following our analysis and feedback from our consultation, we have added some new concerns. The list of concerns has been put into two categories, people, and place, and are listed below. We have provided maps showing the location of some of these concerns at Appendix 1.

Concerns related to people

Concern	Description	Illustrative incident types	Representative data (LFB and NFCC Definition of Risk ONS, Census, MCHLG, OS EPC, IMD, MPS, Acorn data)
Population • Density • Change • Transient • Commuters	A concern that increases and changes in size of population can increase risk	• Fires in purpose-built flats • Fires in houses and bungalows • Fires in converted flats and HMOs • Persons under trains • Road traffic collisions	• Population density • Population change • Registered employment locations by LSOA • Dependent children living in household • One or less rooms than required
Physical vulnerability • Older people • Health and disability • Younger people • Mental health	A concern that certain physical characteristics increase an individual's risk	• Fires in purpose-built flats • Fires in houses and bungalows • Fires in converted flats and HMOs • Fires in care homes and specialised living	• Population density 65+ • Population density 5-18 • Health deprivation and disability ranking • Individual in very bad health • Crime ranking
Social vulnerability • Employment • Deprivation • Deprivation change • Crime • Homelessness • Low trust levels in uniformed services	A concern that certain socio-economic factors increase an individual's risk	• Fires in purpose-built flats • Fires in houses and bungalows • Fires in converted flats and HMOs	• Unemployment • IMD ranking • IMD ranking change • Density of crime • Living environment ranking • Income ranking • Unemployed

• Communication/language difficulties • Overcrowding • Illegal activity • Poor fire education • Cultural differences • Homelessness. • Illegal immigration			• Main language not English • Acorn data
Behavioural vulnerability • Terrorism • Hoarders • Smoking • Taking prescription drugs • Using illegal drugs • Drinking Alcohol • Hoax callers • Using candles	A concern that certain behaviours increase an individual's risk	• Fires in purpose-built flats • Fires in houses and bungalows • Fires in converted flats and HMOs • Fires in care homes and specialised living	• Density of crime • Crime ranking • Health deprivation and disability ranking • Individual in very bad health • Living environment ranking • Acorn data

Concerns related to places

Concern	Description	Illustrative incident types	Representative data
Building type/location • Density of buildings • Volume of high-rise buildings • Low Traffic Neighbourhoods • Difficult access	A concern that buildings which are near other or located near traffic reduction schemes, may present more risk	• Fires in high-rise buildings • Fires in purpose-built flats • Fires in houses and bungalows • Fires in converted flats and HMOs	• Flats and HMOs • Sheltered housing • Building density data • Density of buildings over 18m • Council tax band A or B • Detached house
Building occupancy/use • Hospitals • Care homes • Schools and colleges • Entertainment and cultural venues • Restaurants and takeaways • Garages, sheds, and garden annexes • Airports • Tunnels • Railway stations • Underground network • Industrial buildings • Heritage buildings	A concern that a building's use and familiarity of the occupants can increase its risk	• Fires in non-residential buildings • Fires in garages and sheds • Persons under trains	• Heritage building density • Industrial land density
Building management / ownership	A concern that poor management	• Fires in non-residential buildings	• Unemployment • IMD ranking

• Poor escape routes • Poor fire safety management • Poor energy performance • Social • Rented (poor landlords) • Leasehold	practices or types of ownership are correlated to increased risk to the occupiers	• Fires in purpose-built flats • Fires in houses and bungalows • Fires in converted flats and HMOs • Fires in care homes and specialised living	• IMD ranking change • Socially rented • Owner occupied
Building age / construction / configuration • Wooden framed buildings • Modern methods of construction • Cladding • Buildings undergoing renovation • Construction sites • Basement living • Homes and business that use gas • Tent or caravan living	A concern that certain types of construction and configuration can present higher risks	• Fires in buildings under construction, refurbishment or with certain construction types • Buildings which are susceptible to flooding (surface, pluvial and tidal)	• ACM cladding building density • Built pre-1982 • EPC rating F or G
Open space • Derelict buildings • Accumulated rubbish • Landfill sites • Open land • Open water • Underground water sources • Road junctions • Places where large crowds gather	A concern that areas which contain certain physical can present higher risk to neighbourhoods especially if they are remote from fire and rescue service resources	• Secondary fires • Rescues from open water • Areas prone to flooding	• Inland and tidal water density • Green space density

The table below illustrates the proportion of concerns which fall into each neighbourhood risk zone outlined earlier. It shows that the largest proportion of concerns are in London's most densely populated areas with the highest concentrations of infrastructure. The table shows that 73 per cent of London's most deprived areas and 83 per cent with the highest health and disability inequality are in just 30 per cent of London's area.

The same goes for the built environment with 87 per cent of London's high-rise buildings and 59 per cent of historical buildings located in its urban centres which make up just 14 per cent of London's area.

However, when it comes to vulnerabilities to fire these are much more evenly distributed with 46 per cent of people over the age of 65 living in suburban areas and 49 per cent living in urban areas.

London does have large areas of lower population and building density levels. These are home to just 3 per cent of its population but cover 24 per cent of the land area. These do contain some risks though, such as open water and rural land.

Overall, risks are more concentrated in areas of more dense population and buildings, however vulnerabilities to fire are more evenly distributed throughout London's diverse neighbourhoods and communities.

In the table and in the maps at Appendix 1, there is reference to LSOAs. These are Lower Super Output Areas which are small geographic areas used for the publication of the census. Across England, LSOAs have an average population of 1,500 people or about 650 households.

Neighbourhood concern	Urban Centre	Urban	Suburban	Semi-rural
Area covered (SqKm)	14%	16%	47%	24%
Population	35%	25%	37%	3%
Volume of buildings	41%	22%	33%	4%
Volume of buildings over 18m	87%	7%	6%	0%
Employees	65%	14%	19%	2%
Over 65's	26%	23%	46%	5%
Students (5-18)	32%	26%	39%	3%
Most deprived LSOA's	48%	25%	26%	2%
Changes in deprivation	42%	24%	31%	3%
Most health and disability inequality	58%	25%	16%	1%
Number of listed buildings (GI, II, II*)	59%	14%	20%	7%
Police recorded arson and criminal damage	39%	26%	32%	3%
Area of open water	17%	9%	33%	41%
Area of open land	4%	6%	53%	36%
Area of Industrial land	13%	33%	50%	5%

Table 1. Showing the percentage of area covered by each risk zone in relation to the percentage of concerns within each risk zone.,

Vulnerabilities

Evidence shows us that some people are more likely to have a fire, and some are more likely to become a casualty if they have a fire. Understanding what increases someone's vulnerability to fire enables the Brigade to target its services where they can best reduce risk.

Fatalities and risk factors

In the last five years, there were 1,191 fatalities from incidents we attended. From these incidents fire was responsible for the death of 259 people, of which 197 were from accidental fires in the home. A further 4,693 people were injured at fire incidents during this same period, of which 2,767 were considered serious and required hospital treatment. Over the same five-year period there were 932 fatalities and 13,652 casualties at the non-fire incidents we attended.

Our data shows that the two most important risk factors which contribute to someone becoming a fatality in a fire are if they smoke or have conditions more often associated with older people, such as visual, cognitive, or physical impairments. The last five years of data shows that 35 per cent of fatalities from fire were smokers and 65 per cent of fatalities from fire were over 65. Although the differential has reduced over time, men are still 16 per cent more likely than women to die from a fire. Additionally, proportionate to the size of population, there are more fire deaths in inner London than outer London (46 per cent of fire deaths compared to 40 per cent of population in inner London and 54 per cent of fire deaths compared to 59 per cent of population in outer London). This is likely to be related to increased risk factors such as the higher levels of deprivation in inner London compared to outer London outlined in the maps in appendix 1.

Individuals who are most at risk from fire, are those who:

- carry out high-risk fire behaviours
- are less able to react to a fire/alarm, and/or
- are less able to escape from a fire

Real life examples of risk factors include but are not limited to (Detailed analysis of fires attended by fire and rescue services, England, April 2019 to March 2020).

- Age,
- Mental health issues,
- Alcohol use,
- Drug use,
- Smoking,
- Poor housekeeping,
- Limited mobility,
- Living alone and low income.

These insights correlate with the National Fire Chief's Council's (NFCC's) work through the Definition of Risk project on the likelihood and consequence of dwelling fires. Based on their analysis of national definition of risk in dwelling fires, the following can be summarised (NFCC and Operational Research in Health (ORH), 2021, Definition of Risk – Likelihood and Consequence of Dwelling Fires).

- The rates of fire in socially rented properties are nearly triple owner-occupied properties and double the rates of privately rented properties.
- Socially rented flats are more than four times as likely to have a fire than a privately owned detached house. Conversely, a socially rented house is twice as likely to have a fire than a privately owned flat.
- On a national basis the rates of fires in sheltered housing or HMOs are significantly higher than other property types.
- Rates of fires in flats are more than double the rates in detached properties.
- Properties built after 1996 are much less likely to have a fire than those built before 1983 and generally rates of fire increase with age up to a point around 1900.
- Houses and bungalows with higher energy ratings are less likely to have fires than those with a lower energy rating. However, this is not true for flats.
- Dwelling fires in older properties are likely to have higher consequence than in newer properties.
- Dwelling fires in flats are much more likely to have a higher consequence on life but lower consequence on the property than for other property types.
- Dwelling fires caused by smoking have double the consequence score compared to other causes of fire.
- Fires caused by matches, candles and other naked flames are more likely to have a higher consequence.
- Cooking appliances are the most common cause of fire but have a low consequence score.
- Causes of fire that result in a high property consequence include naked flames, industrial equipment and spread from secondary fire.

LFB are currently working with ORH to integrate the Definition of Risk's approach into its integrated understanding of risk for dwelling fires, alongside the neighbourhood density zones approach for all risks. This understanding of risk will continue to be refined on an annual basis as more products are released as part of the NFCC Definition of Risk project and help the Brigade target those who are most vulnerable to fires in the home.

Layer two: Property and place led risks

This is the second independent layer of our risk assessment. It sets out the risk of fire and non-fire events against where they happen. In this layer we consider those incidents that are foreseeable as they occur sufficiently often to be considered "normal requirements". Normal requirements is a term used in the Fire and Rescue Services Act 2004 to describe the level of "personnel, services and equipment" that should be provided for firefighting and road traffic accidents. Less frequently occurring everts which would cause significant harm or damage are considered in the 'extraordinary risks' layer.

We have analysed the last five years' worth of our incident data and compared the rate of incidents, given their nature and location and the rate of casualties from these incidents.

We have displayed this information on a risk matrix below. This shows where we attend the most fire or non-fire incidents, and which give rise to the highest number of injuries and fatalities. We have also provided more information on the highest risks for both fire and non-fire events in Appendix 2. The following table sets out the likelihood scores we use in the risk matrix:

Likelihood

Score	Descriptor
1	Between once a year and once a week
2	Between one a week and one a day
3	Between one and five a day
4	Between five and twenty a day
5	Twenty or more a day

To rate the consequence of each incident, we have used our data to assess the 'life consequence' of an incident and the 'wider consequences' of an incident separately. We have then taken the higher of these two scores to determine the consequence score for the incident.

To calculate life consequence, we have calculated a consequence scale by dividing the number of fires or non-fire incidents by the number of fire injuries or casualties. By using this scale, we can identify incidents which are relatively rare but produce a high number of casualties in relation to the number of incidents. The following table sets out the life consequence scores we have used:

Life Consequence scores

Score	Life consequence
1	One casualty occurs per 100 or more incidents
2	One casualty occurs per 25 - 100 incidents
3	One casualty occurs per 10 - 25 incidents or a fatality occurs in 300 or more incidents
4	One casualty occurs per 5 – 10 incidents or a fatality occurs per 100 – 300 incidents
5	One casualty occurs per 5 or fewer incidents or a fatality occurs per 100 or fewer incidents

To calculate wider consequence, we have used the extent of the Brigade's response to an incident over the whole incident life cycle. By this we mean the total number of fire appliances used over the full duration of the incident including the response and post-response phases (a large incident will be attended by multiple crews from all over London throughout the incident's life-cycle due to the various tasks required to resolve an incident and to maintain the health and safety of operational crews). This figure gives reasonable representation for the size of the overall size an incident and the likely wider impacts to the local area. This measure also serves as a proxy for the wider impacts that an incident may have, such as wider human welfare

impacts, behaviour changes, economic impacts, environmental impacts, and impacts on essential services. The table below sets out the scores we have used:

Wider Impact Consequence scores

Score	Wider impact consequence
1	One or more incidents of this type have needed over 4 pumps in the last five years
2	One or more incidents of this type have needed over 40 pumps in last five years
3	One or more incidents of this type have needed over 60 pumps in last five years
4	One or more incidents of this type have needed over 80 pumps in last five years
5	One or more incidents of this type have needed over 100 pumps in last five years

It should be noted that incidents which relate to statutory duties are listed in normal font and non-statutory risks are in italics.

***** Indicates risks which have been rated higher based on wider impacts

Appendix 2. of this paper gives a detailed breakdown of each very high and high risk and recent examples of when they have occurred in London.

Fire and Non-fire incidents risk matrix

Consequence						
	5	**Fire involving** • warehouses and bulk storage* • manufacturing and processing plants*	**Fire involving** • landfill or wasteland* ***Non-fire incidents involving*** ▪ outdoor water and boats	**Fire involving** ▪ rural land (urban rural interface)* ***Non-fire incidents involving*** ▪ trains and transport buildings (including London Underground)	**Fire involving** • purpose-built flats* **Non-fire incidents involving** ▪ road vehicles and urban infrastructure	
	4	**Fire involving** • aircraft • static caravans, boats, houseboats, or towing caravans ***Non-fire incidents involving*** ▪ camping tent, shelter, or marquee ▪ static caravans, houseboats, or towing caravans ▪ other residential property	**Fire involving** • offices and call centres* • short stay accommodation* • retail outlets* • food and drink outlets*	**Fire involving** • converted flats or HMOs • care homes and specialised living	**Fire involving** • houses and bungalows	
	3	**Fire involving** • trains • camping tents, shelters, or marquees • places of worship • communal living • entertainment and cultural venues*	**Fire involving** • hospitals and medical care facilities • other non-residential property • public administration, utilities, and amenities	**Fire involving** • private garages and sheds		
	2	**Fire involving** • barbeques ***Non-fire incidents involving*** • barbeques	**Fire involving** • sports and leisure facilities • education sites • urban furnishings ***Non-fire incidents involving*** ▪ carparks and transport ▪ places of worship ▪ other residential property ▪ urban furnishings • vegetation by infrastructure network • other non-residential property	***Non-fire incidents involving*** ▪ converted flats and HMOs ▪ short stay accommodation ▪ non-residential property ▪ public administration, utilities, and amenities ▪ hospitals and medical care ▪ care and specialised living ▪ retail outlets ▪ food and drink outlets ▪ rural land	**Fire involving** • road vehicles ***Non-fire incidents involving*** • houses and bungalows	***Non-fire incidents involving*** ▪ purpose-built flats
	1	**Fire involving** • animals and agriculture • outdoor water • carpark and transport ***Non-fire incidents involving*** ▪ animals and agriculture ▪ refuse, rubbish, or recycling	**Fire involving** • farms, agriculture • transport buildings • vegetation by infrastructure network ***Non-fire incidents involving*** ▪ education sites ▪ aircraft ▪ private garage or sheds ▪ farming and agriculture ▪ sports and leisure facilities ▪ communal living ▪ warehouses and bulk storage ▪ manufacturing and processing plants ▪ entertainment and cultural venues	**Fire involving** • urban infrastructure ***Non-fire incidents involving*** ▪ offices and call centres ▪ landfill and wasteland	**Fire involving** • refuse, rubbish, or recycling	
		1	**2**	**3**	**4**	**5**
		Likelihood				

Layer three: National and partner led risks

This is the third layer of our risk assessment. The reasonable worst-case risk matrix is a subjective risk assessment based on the London and National Risk Registers and is put together by the London Resilience Partnership. This, together with the risk assessment of "normal" risk in layer two, allows us to address the requirement in the Fire and Rescue National Framework to assess all foreseeable fire and rescue related risks that could affect its communities. It also satisfies the Fire and Rescue Service (Emergencies) (England) Order 2007 which places some specific duties on the Fire and Rescue service in relation to:

- removing chemical, biological, or radio-active contaminants from people in the event of an emergency involving the release or potential release of such contaminants; and prevent or limit serious harm to the environment.
- an emergency involving the collapse of a building or other structure, or
- involves a train, tram, or aircraft, and is likely to require a fire and rescue services to use its resources beyond the scope of its day-to-day operations.
- and be able to use these resources outside the services boundary when requested.

The National Risk Register is produced by Government and the London Risk Register is produced by the London Resilience Forum (LRF). In both cases, they take a subjective approach based on professional judgement of subject matter experts from all London's partner agencies, to assess the reasonable worst-case scenario for each risk identified. This is because the consequences of risk can vary enormously; a train crash could result in the death and injury of many people but could also result in only a small number of minor injuries. There is very little data available to inform these risk assessments because of the rarity of these events.

The ratings for the fire-related risks on the London Risk Register are based on our recommendations. In producing this risk assessment, we have reviewed the ratings that we have provided to the LRF and are considering revisions to some of our recommended ratings. For the purposes of this risk assessment, we have used the original risk ratings agreed by the LRF but have used professional judgement to identify those which are considered high-risk for LFB.

Below the risk matrix, we have included two further tables. The first highlights the major risks from the matrix and provides examples of real incidents. The second highlights the significant risks from the matrix and again, provides examples of real incidents. Professional judgement has been used to delineate between these two categories.

Risk ratings

These risk ratings are taken directly from the London Risk Register.

Likelihood

Score	Likelihood Descriptor	Probability of the Reasonable Worst-case Scenario occurring within a 12-month period
1	Low	Less than 0.2% chance of occurring
2	Medium Low	Between 0.2% and 1%
3	Medium	Between 1% and 5%
4	Medium High	Between 5% and 25%
5	High	More than 25%

Consequence

Impact Category	Explanation
Human Welfare	Includes numbers of fatalities and casualties resulting from the reasonable worst- case scenario, needs for mass evacuation, and short and long-term accommodation.
Behavioural Impacts	Psychological impacts of the risk, including how people's perception and behaviour might change because of the risk.
Economic	An approximate net economic cost, including both direct (e.g., loss of goods, buildings, infrastructure) and indirect (e.g., loss of business, increased demand for public services) costs.
Essential Services	How the reasonable worst-case scenario might impact the emergency services, critical infrastructure, transport, education and other service and infrastructure providers.
Environment	Encompassing long-term impact of contamination or pollution of land, water or air with harmful biological / chemical / radioactive matter or oil, flooding, or disruption or destruction of plant or animal life.
Security	Includes impacts to law enforcement and intelligence services, and disruptions to criminal justice and border security.

Appendix 3. of this paper gives a detailed breakdown of each major and significant risk and examples of when they have occurred in London, the UK or in other countries.

Extraordinary scenario risk matrix

Consequence						
	5		• Nuclear attack unenclosed urban area • Severe drought	• Conventional attack on chemicals infrastructure • Malicious Attack on nuclear infrastructure • Biological attack – unenclosed urban area	• Influenza type pandemic	
	4	• Aviation crash • Fire or explosion at a fuel distribution site • Explosion at a high-pressure gas pipeline • Fire and explosion at onshore fuel pipeline • Reservoir/Dam collapse • Radiation release from overseas	• Major entertainment, public or commercial building fire • Complex built environments • High consequence dangerous goods • Malicious aviation incident • Malicious maritime incident • Gas supply infrastructure • Attack on UK electricity infrastructure	• Chemical attack – enclosed urban area • Radiological attack – unenclosed urban area • Surface water flooding • Fluvial flooding • Severe space weather • Conventional attack on Government • Malicious attack with building collapse		• Marauding terrorist attack
	3	• Building collapse • Evacuation of passenger ship • Bridge collapse • Water supply infrastructure • Large toxic chemical release • Fire and Explosion at onshore fuel pipeline • Mishandling of radioactive material	• Industrial explosion and major fire • Fuel supply contamination • Attack on UK gas infrastructure • Localised industrial accident involving small toxic chemical release	• Attack with building collapse • Chemical attack unenclosed urban area • Chemical attack on water infrastructure • Attack on civil nuclear • Tidal flooding • Ground water flooding • Malicious rail network incident	• Major residential high-rise fire • Major fire (other) • Person Borne IED • Heatwave • Accidental release of biological substance	• Public disorder • Cyber Attack
	2	• Accidental release of biological pathogen • Maritime pollution	• Local Accident on motorways/ major trunk roads	• Wildfires • Railway accident • Major care home or specialised living fire • Localised industrial accident involving small toxic release • Anthrax letters • Storms and gales • Land movement • Small aircraft incident		• Major landfill or wasteland fire • Industrial action by firefighters
	1	• Earthquake • Radiation from stolen goods				
		1	2	3	4	5
		Likelihood				

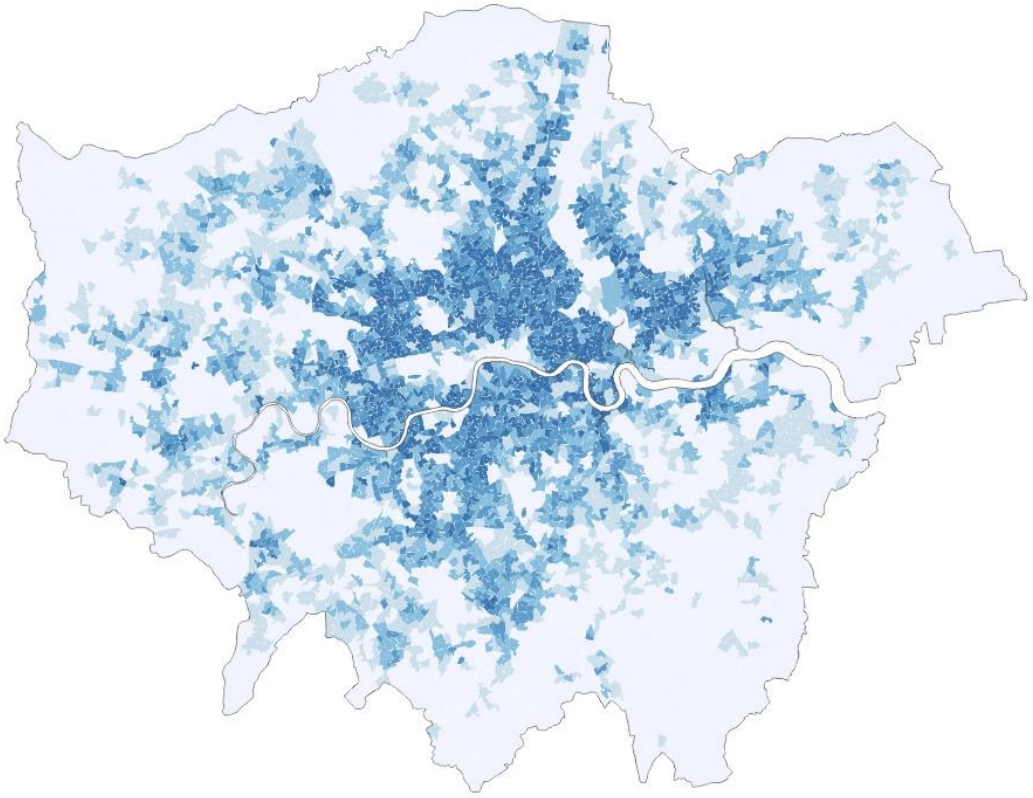
Layer four: Emerging and future led risks

This is the fourth layer of our risk assessment, which looks at emerging and future risks to London. These risks have been informed by work undertaken by the Centre for London (as published in their 2020 report "*London at a crossroads*") and by their ongoing work on "*London Futures: Building a new vision for London to 2050 and beyond*". The likelihood has been rated using responses from our public consultation. However, there is insufficient historical data for us to assess the potential impact at this point.

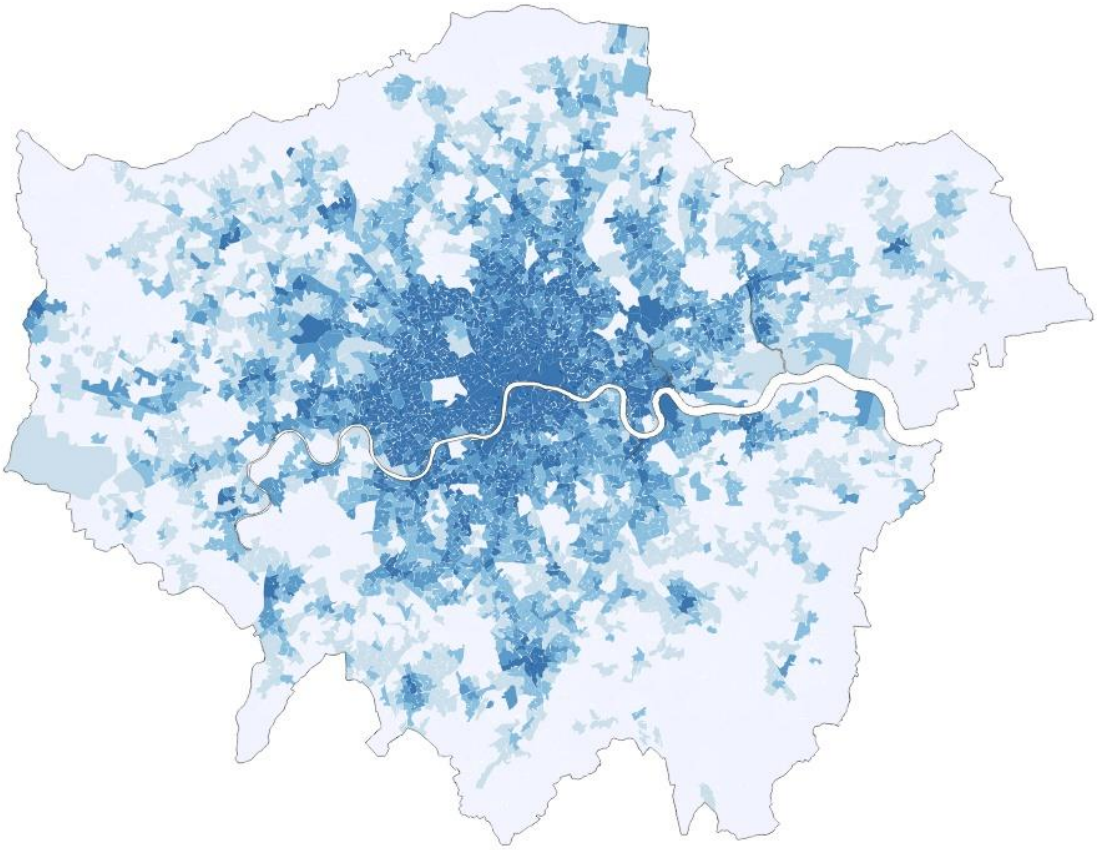
Likelihood	Risk	Outcome description
Very high	Changing built environment	Adapting the built environment whilst raising design and management standards resulting in continued issues with legacy building stock and modern methods of construction. Changes to the use of premises due to Covid-19 or other societal issues resulting in poorly adapted buildings resulting in potential for increased fire spread. The move to online retail could mean declining town centres and spaces especially in outer London resulting in the loss of retail space. Future of offices meaning that buildings which only presented a day-time life risk may be converted into residential property bringing an increased night-time life risk. Uncertainty about the future of central London meaning that property may change use. Increased use of low traffic zones meaning main transport routes may be more congested, though this will not affect LFB's pan-London response times it may impact attendance times for specific incidents in the vicinity to low traffic zones.
High	Health and well-being	Long term Covid-19 health impacts (direct and indirect) leading to greater mental health issues, poor mobility, and reliance on prescription drugs. Growing health issues, inequalities between those with private health care and those that rely on state provision. High level of obesity and inactivity increasing mobility issues. Unaffordable and overstretched care provision meaning fewer people are getting the help they require to enable them to live independently. Poorly trained and poorly regulated care providers, meaning lack of identification and reporting of risks.
High	Equalities and social inclusion	In-work poverty leading to higher levels of deprivation. Economic inequalities creating greater disparity between rich and poor within the same areas. Overcrowding of housing due to lack of social housing. Racism and associated movements leading to social unrest and public disorder. Greater proportions of fuel poverty are likely to occur in areas of higher poverty.
Very high	Sustainability and climate change	A significant increase in the frequency of events or their impact, along with the possibility of new extreme weather events. Warming climate giving rise to more extreme weather events and hot dry summers like 2018, flooding of 2021 and the 2013 St Jude's day gales and storms. These incidents all put significant strain on the Brigade's resources, and it is therefore foreseeable that if the scale and intensity of these extreme weather events increase with climate change the Brigade's capacity to deal with these incidents whilst maintaining normal business may be exceeded in the future. Other emerging risks which are associated with climate change include changing fuels for road vehicles, alternate power supplies for domestic and commercial premises.
Very high	Security and resilience	Continued risk of terrorism and the need to be able to respond with other emergency responders in a coordinated way mean that the Brigade will need to continue to delivery its high treat capability and enhance its response considering the recommendations made by the Manchester Arena Inquiry.
Very high	Population change	Most scenarios predict a continuation of the current trend for population growth, with some estimating population increases of up to 15 million people by 2050. This would be at a rate of 200,000 people a year, which is four times the current rate of population increase. However, at the other extreme there are predictions

		of population decrease. Additionally, the elderly population of London is predicted to increase in proportion as people live longer, with an increase of 1.3 million people over the age of 50 by 2050 or an increase of 45,000 a year. This could bring an increase in risk factors associated with an aging population and in particular an increase in people with dementia meaning more high-risk individuals.

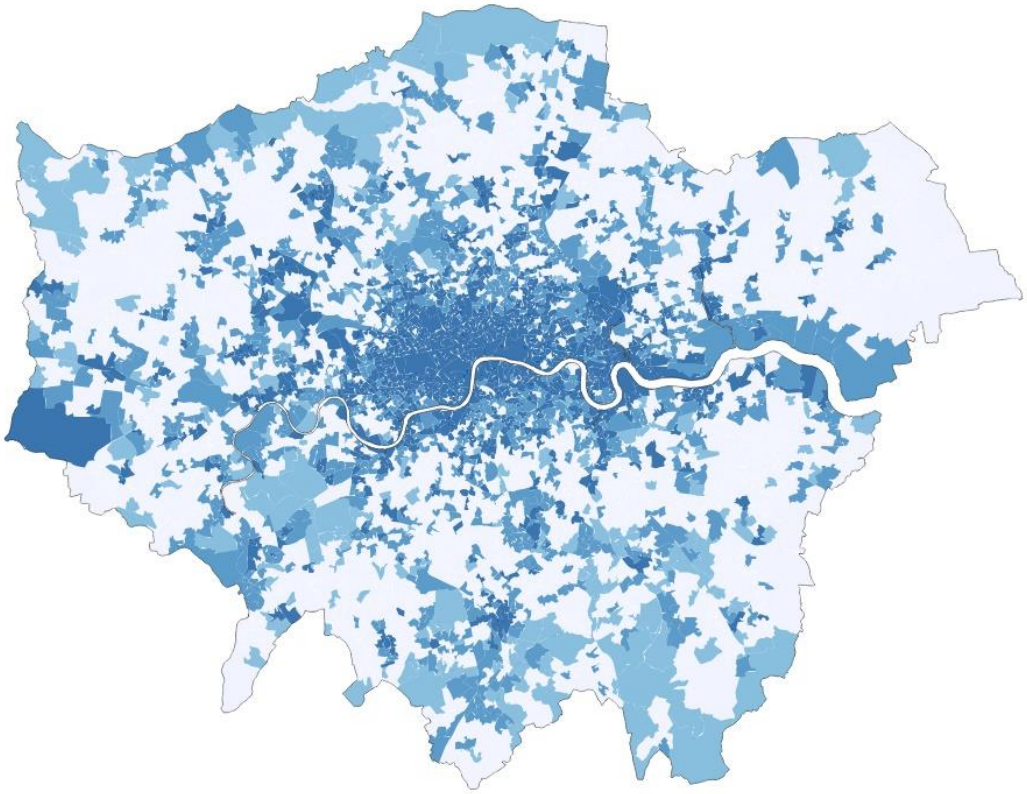
Appendix 1: Mapped Concerns



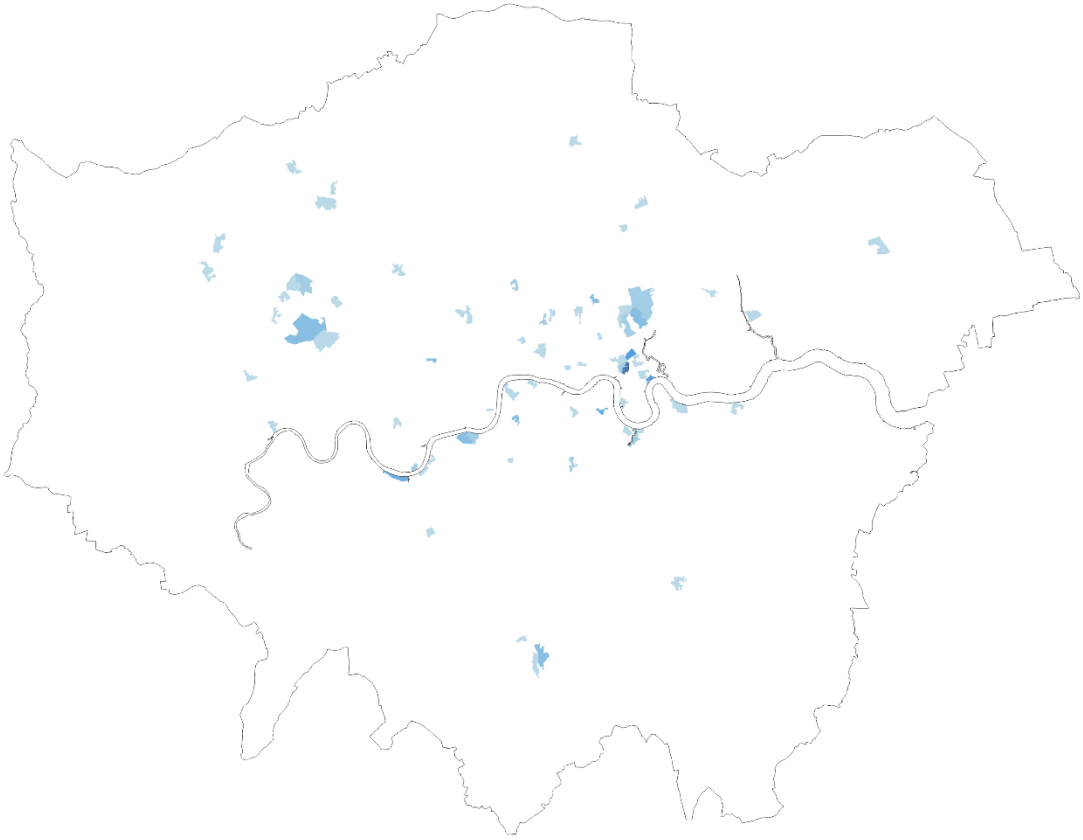
Map 1 Ranking population density (2019) by LSOA (Dark high – light low)



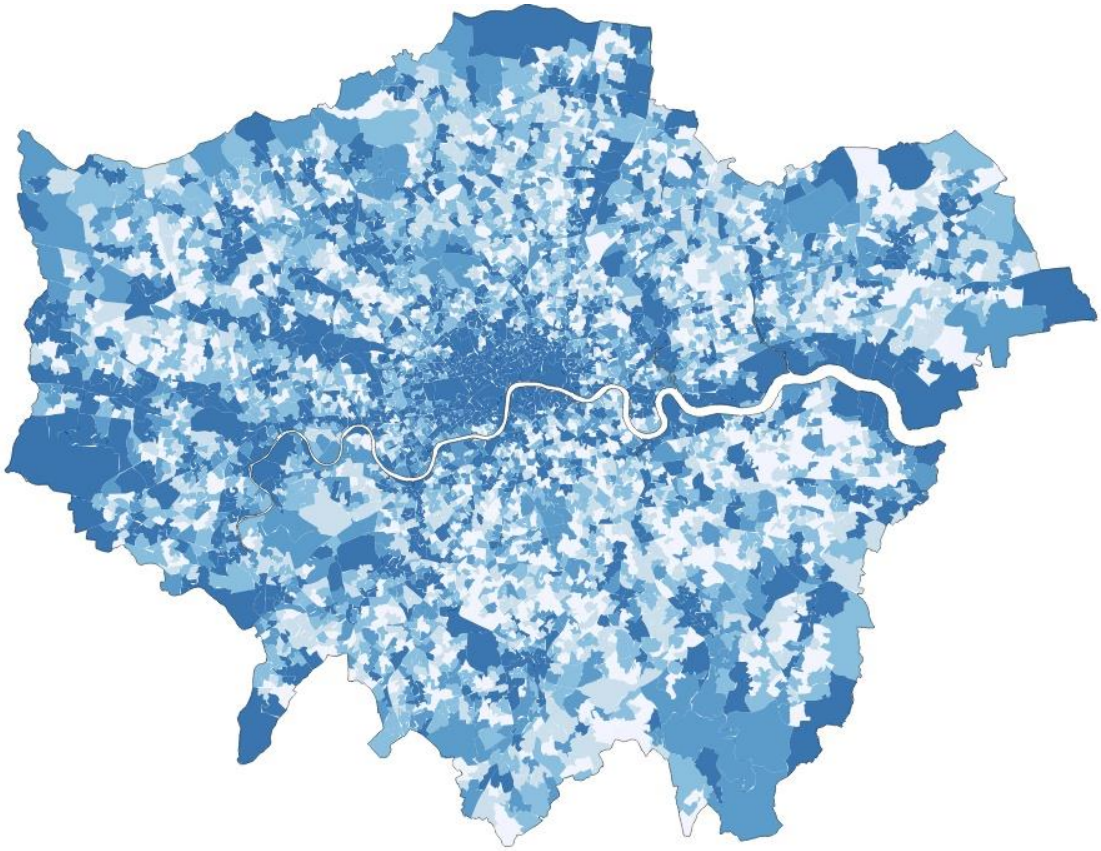
Map 2 Ranking of all building density by LSOA (Dark high – light low)



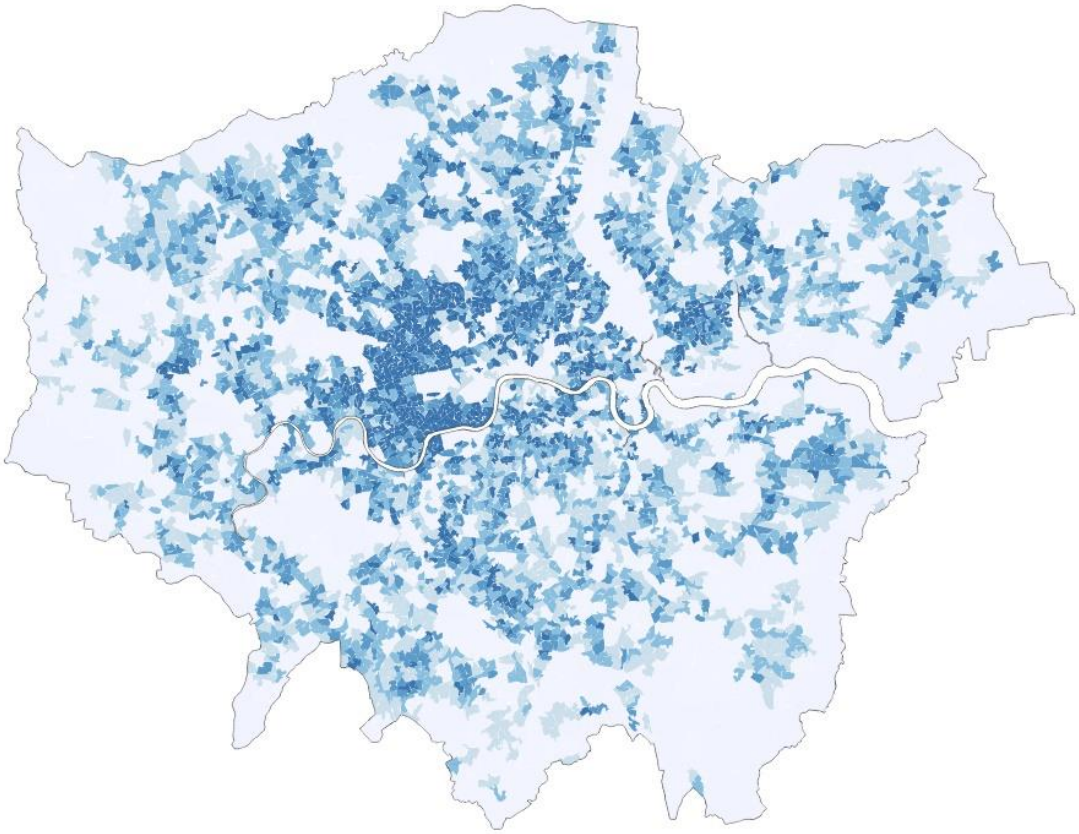
Map 3 Ranking density of buildings over 18m by LSOA (dark high – light low)



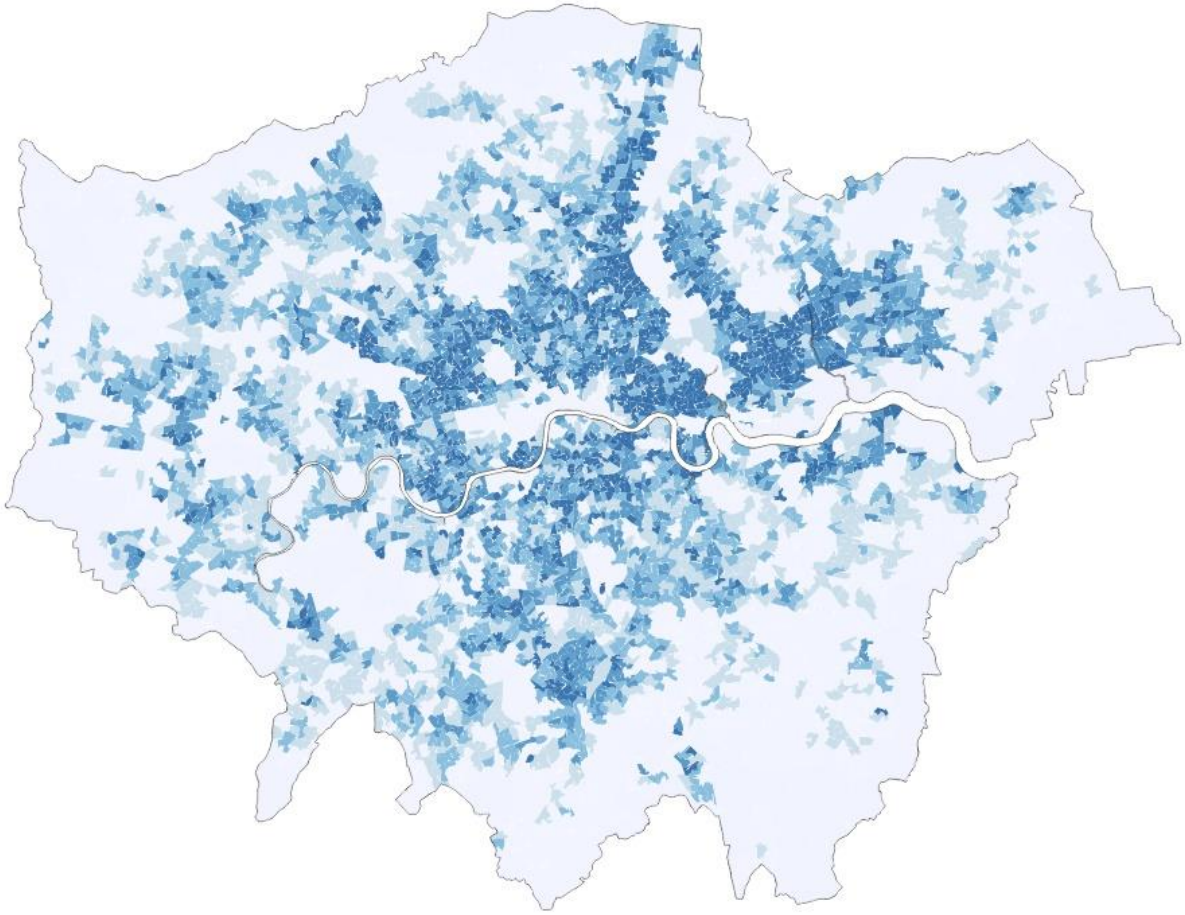
Map 3a Residential high-rise with ACM cladding risks (dark more – light fewer)



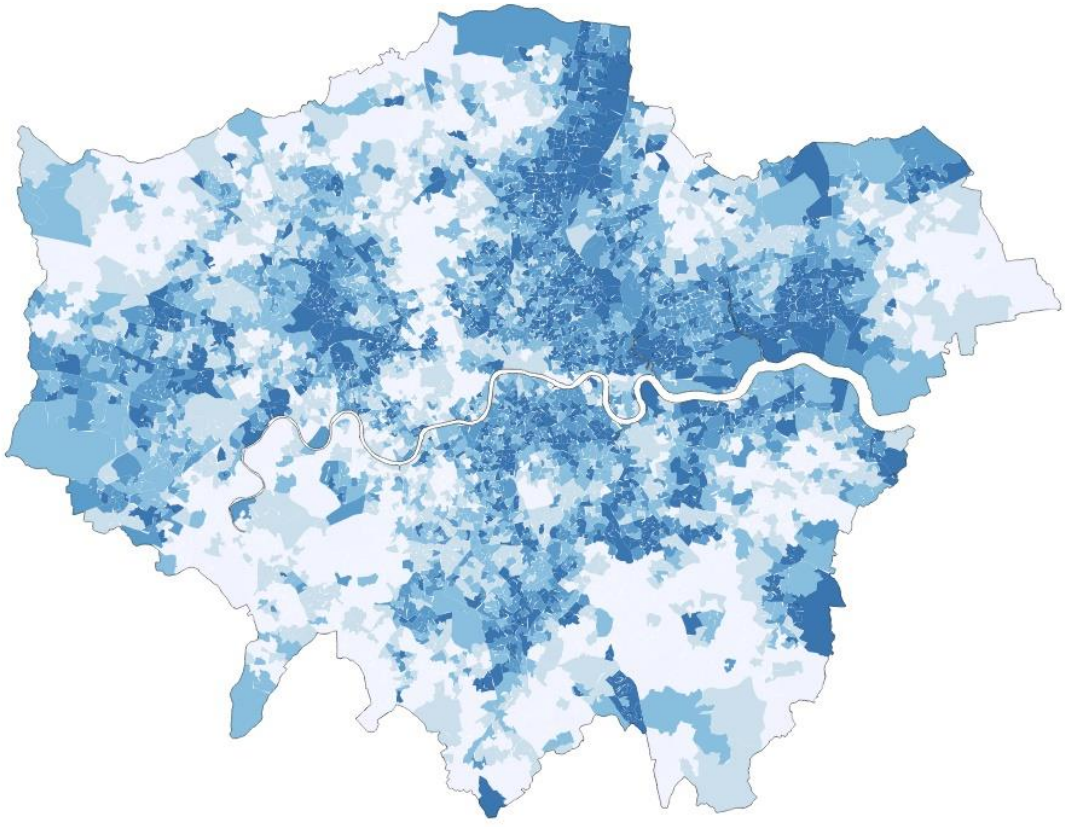
Map 4 Ranking of registered employment locations by LSOA (Dark high – light low)



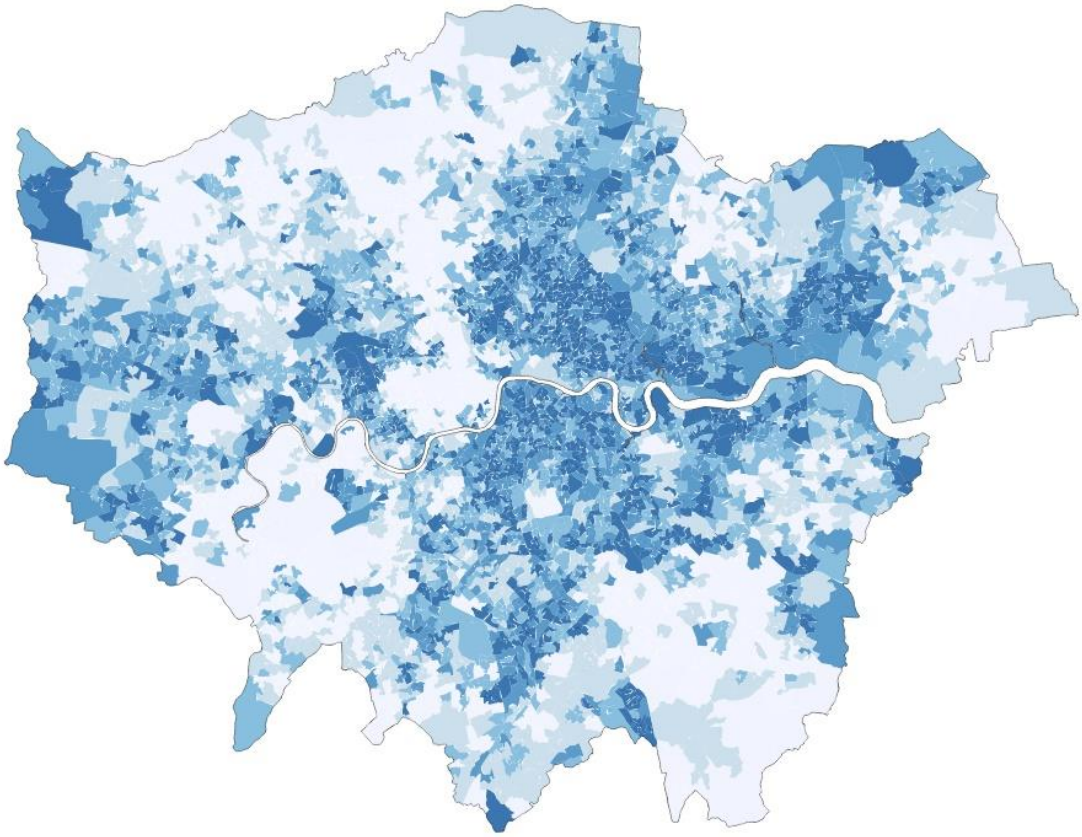
Map 5 Ranking population density Age 65+ (2019) by LSOA (Dark high – light low)



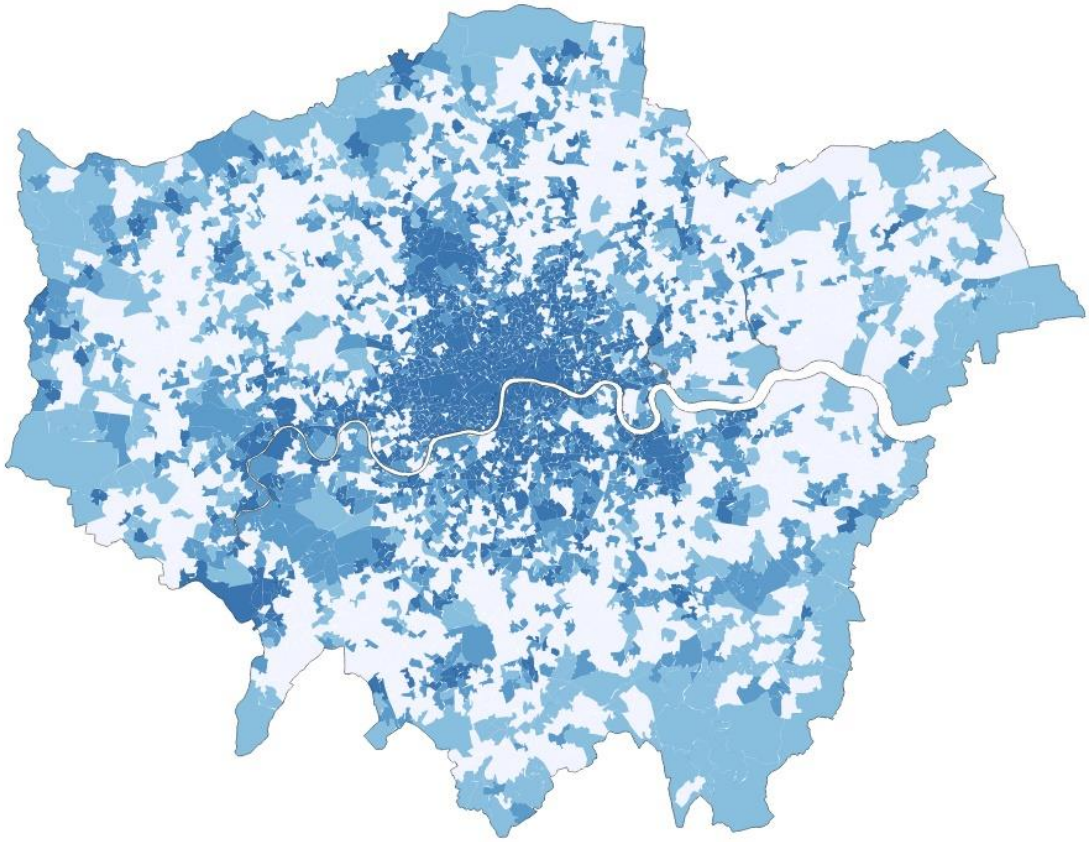
Map 6 Ranking population density Age 5-18yrs (2019) by LSOA (Dark high – light low)



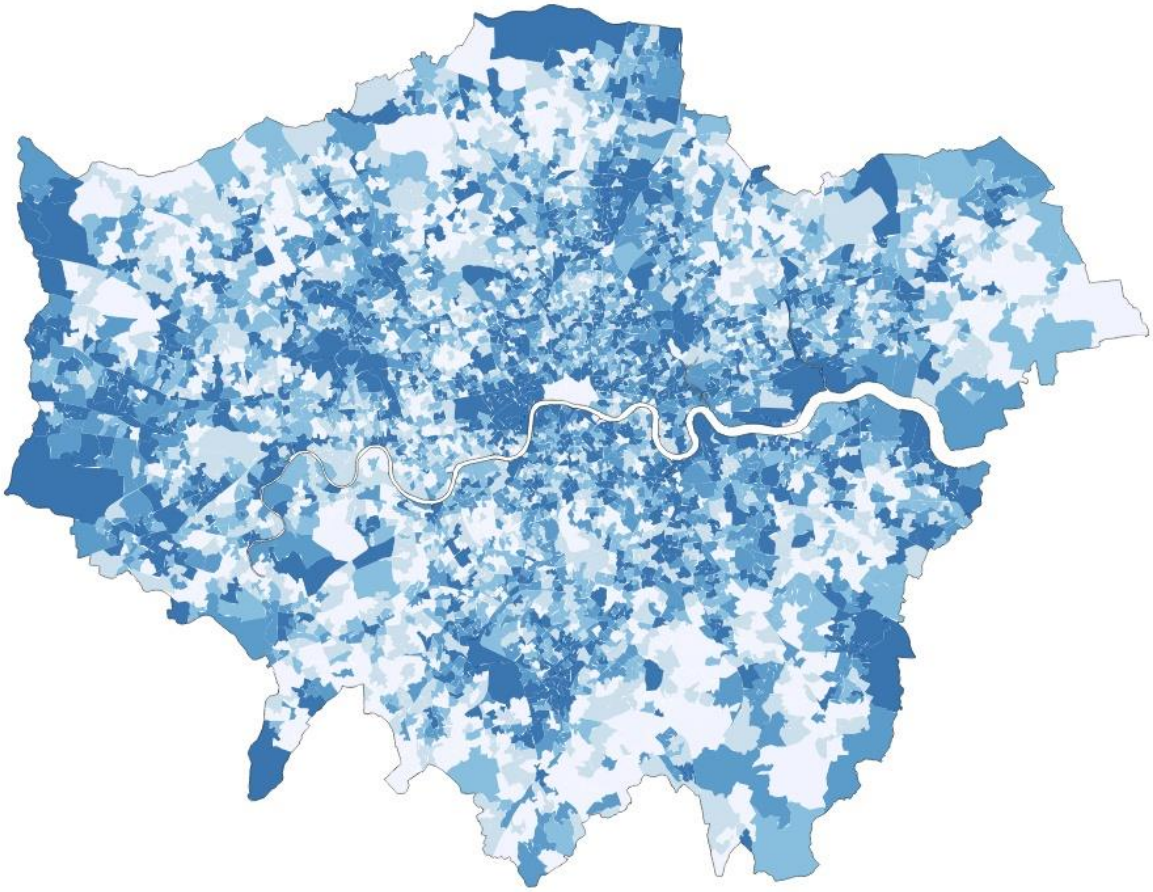
Map 7 Ranking of IMD 2019 by LSOA (dark high – light low)



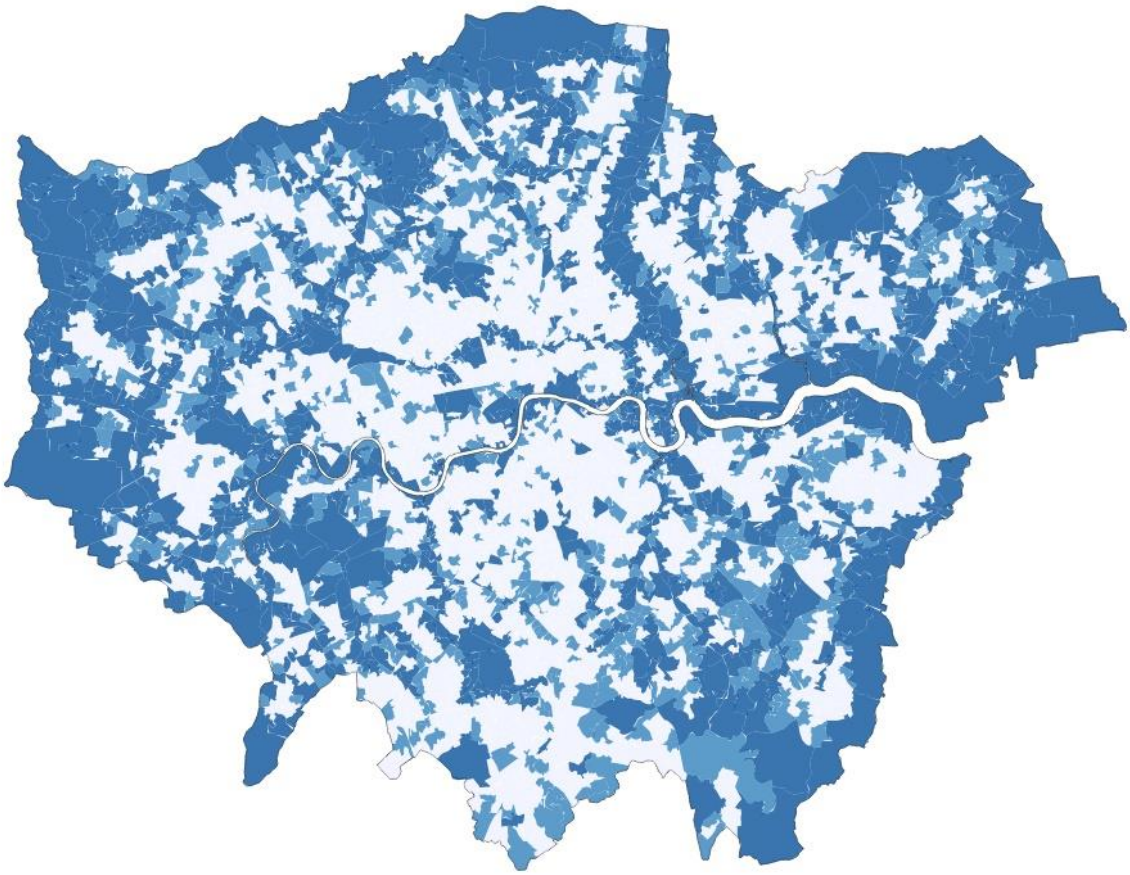
Map 8. Ranking IMD Health deprivation and disability by LSOA (Dark high – light low)



Map 9 Ranking of heritage site density (Grade I, II and II*) by LSOA (Dark high – light low)

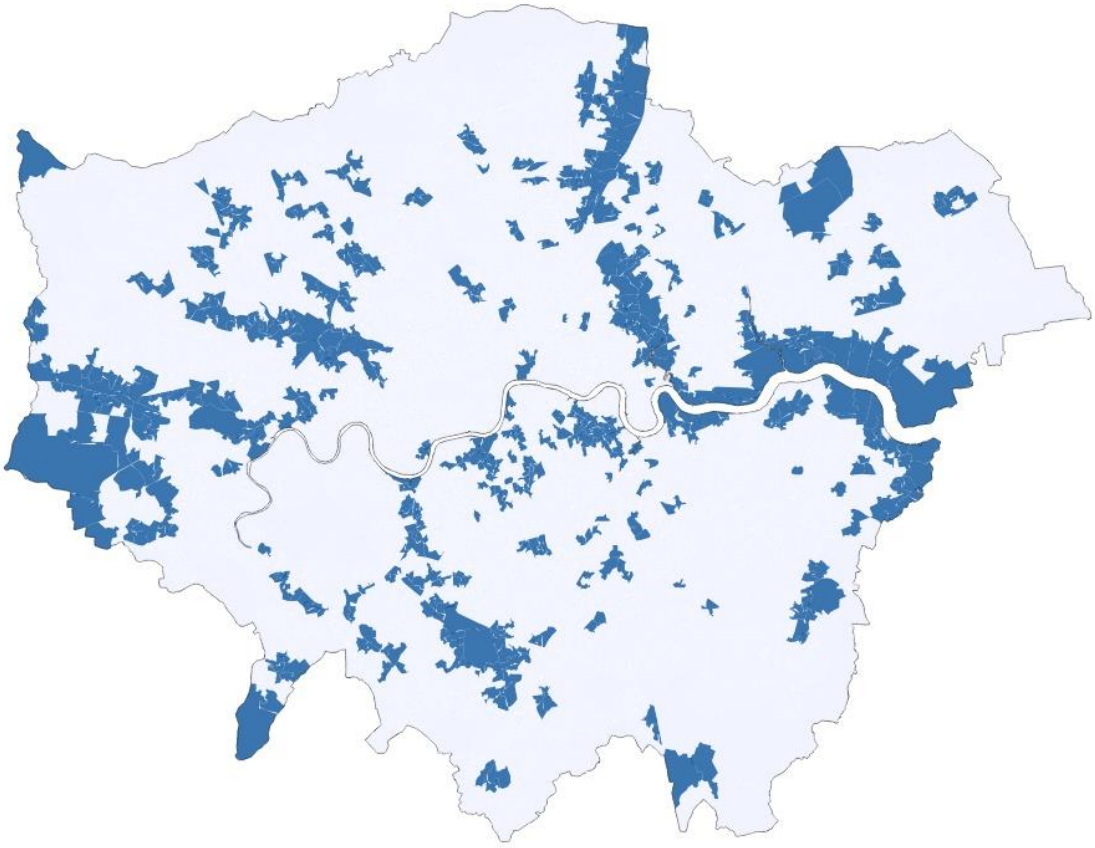


Map 10 Ranking of MPS density of crime (Anti-social behaviour, damage, and arson) by LSOA (Dark high – light low)



Map 11 Ranking of inland and tidal water density by LSOA (Dark high – light low)

Map 12 Ranking of green space density by LSOA (Dark high – light low)



Map 13 Industrial site locations (Dark high -light low)

Appendix 2: Major risks from property or places

Major individual life risks from fires

Rating	Risk	Likelihood	Life Consequence	Outcome description	Examples of significant incidents in last five years
Very High	Fires in purpose-built flats	4	5	LFB responded to an average of 2,637 fires in purpose-built flats a year over the past five years or roughly seven a day. This resulted in an average of 378 fire injuries a year at a rate of one injury every seven incidents attended or with an average of one fatality for every 300 incidents attended. The most likely location in a purpose built flat for a fire to start which results in a fatality is the living room or bedroom. There are over 8500 high-rise buildings in London with over 550 buildings of over 20 floors planned of which over 50 will be greater than 100m in height. In June 2021 there were over 850 high-rise buildings and over 1,000 buildings in total in London with a temporary suspension of 'stay put' where an interim simultaneous evacuation strategy has been put in place which have an increased risk of fire spread outside the flat of origin to other properties within the same building.	• Chartham Court - 2016 – 10 pump fire in a 16-floor residential block of flats, 3 people injured, 60 people evacuated, internal fire spread from ground to 3rd floor and external fire spread from ground to 9th floor. • Shepherd's Court – 2016 – 20 pump fire with fire spread to five floors, 50 people evacuated from 18 floor residential high-rise block. A total of 32 appliances were required to resolve the incident. • Grenfell Tower, Major Incident – 2017 – 72 people died because of a fire which started on the 4th floor and spread to the 23rd floor, 40 pumps, requiring 319 pumps to resolve over the course of the incident. • Worcester Park – 2019 – 20 pump fire in a residential block of flats of four floors. 23 flats were destroyed, and 150 people evacuated because of a fire which spread outside of its compartment of origin, requiring 142 pumps to resolve over the course of the incident. • Barking Riverside – 2019 – 20 flats destroyed because of a fire which spread outside of its compartment of origin, requiring 36 pumps to resolve over the course of the incidents. • The Cube Bolton – 2019 – 221 people evacuated because of a fire which spread outside of its compartment of origin. • New Providence Wharf, Major Incident – 2021 – 20 pump fire, 35 people rescued, 22 in fire escape hoods and a full evacuation of

					the building. This incident required 46 pumps to resolve over the course of the incident.
Very High	Fires in houses and bungalows	4	4	LFB responded to an average of 1,942 fires in houses or bungalows a year over the past five years or roughly five a day. This resulted in an average of 267 fire related injuries a year or one injury for every seven incidents attended or one fatality for every 300 incidents attended. The most likely location in a house or bungalow for a fire to start which results in a fatality is the living room or bedroom.	• Antrim Grove – 2016 – 10 pump persons reported fire requiring a total of 51 pumps over a period of 10 hours.
Very High	Fires in care homes and specialised living	3	4	LFB responded to an average of 368 fires in care homes and supported living a year over the past five years or roughly one a day. This resulted in an average of 48 fire injuries a year or one injury for every eight incidents attended by LFB or one fatality for every 300 incidents attended. The most likely location in a care home or supported living for a fire to start which results in a fatality is the living room or bedroom. This risk also has possible broader impacts including fire spread outside the flat of origin to other properties within the same building. One emerging risk is the lack of care works and staff in such premises, leading increased challenges with evacuation strategies.	• Chingford care home fire - 2018 – one person died at a 10-pump fire in a care home for people with learning difficulties. In total 24 appliances were used to resolve the incident.

Very High	Fires in converted flats and HMOs	3	4	LFB responded to an average of 947 fires in converted flats and HMOs a year over the past five years or roughly three a day or one fatality for every 300 incidents attended. This resulted in an average of 139 fire related injuries or one injury for every seven incidents attended. The most likely location in a converted flat or HMO for a fire to start which results in a fatality is the living room or bedroom. This risk also has possible broader impacts including fire spread outside the flat of origin to other properties within the same building.	• Daleham Garden, Camden – 2017 – 8 pump, persons reported fire, 1 person died, 20 people evacuated requiring alternative accommodation requiring a total of 27 pumps to resolve over the course of the incident.
High	Fires in garages and sheds	4	3	LFB responds to an average of 1454 fires in private garages or sheds a year a year or roughly four a day which resulted in an average of 14 fire injuries a year or one every 100 incidents attended.	• None

Major risks from fires with wider consequence

Rating	Risk	Likelihood	Wider Consequence	Outcome description	Examples of significant incidents in last five years
Very High	Fires on rural land (urban rural interface)	3	5	LFB responds to an average of 1,480 fires on rural land a year which resulted in one fatality in the last five years. Though most of these incidents are low level and dealt with by one or two fire engines they can require on rare occasions require significant resource commitment with a maximum of 209 pumps required over the whole incident life cycle at a single incident in the last five years. These incidents have the potential to cause significant environmental damage.	• Wanstead flats, Redbridge – 2018 – 40 pump grass fire in the urban/rural interface meaning that the fire had a significant impact on public safety. It required a total of 209 pumps to resolve over the course of the incident. Involving 100 hectares of rural grass land. Depending on their duration grass fires can cause localised increases in air pollution whilst active.

Very High	Fires on landfill and wasteland	2	5	LFB responds to an average of 105 fires in landfill and wasteland a year. These incidents can require significant resource commitment with a maximum 250 pumps over six days involved in a single incident in the last five years. These incidents have the potential to cause significant environmental damage.	• Launders Lane landfill site, Havering – 2019 – 10 pump fire requiring 250 pumps over 6 days. Though all fires result in significant amounts of smoke in the short term, the consequence of incidents in landfill sites which can burn intermittently for weeks, and months can impact on local air quality affecting public health and well-being in that area.
High	Fires in warehouses and bulk storage	1	5	LFB responds to an average of 37 fires in warehouses and bulk storage a year which resulted in one fatality in the last five years. Though these numbers are relatively low they can require significant resource commitment with a maximum of 202 pumps involved over 18 hours at a single incident in the last five years. These incidents have the potential to cause significant environmental damage.	• East Lane Business Park, Brent – 2017 – 20 pump fire requiring 202 pumps over 18 hours. • Aladdin Works, Ealing – 2018 – 20 pump fire requiring 198 pumps over 33 hours. • White Hart Lane, Haringey – 2017 – 25 pump fire requiring 198 pumps over 25 hours.
High	Fires in manufacturing and processing plants	1	5	LFB responds to an average of 115 fires in manufacturing and processing plants a year. These incidents can require significant resource commitment with a maximum 110 pumps required over the whole incident life cycle at a single incident in the last five years. These incidents have the potential to cause significant environmental damage. This risk includes fires in COMAH sites and major hazardous storage sites.	• Rustlins Ltd, Brent – 2018 – 15 pump fire requiring 110 pumps in total. • A&R Paper converters, Redbridge – 15 pump fire requiring 108 pumps in total
High	Fires in retail outlets	2	4	LFB responds to an average of 341 fires in retail outlets a year. These incidents can require significant resource commitment with a maximum 102 pumps involved over 10 hours at a single incident in the last five years. These incidents have the potential for fire spread to residential property with many mixed-use buildings in London.	• The Mall, Walthamstow – 2019 – 25 pump fire requiring 102 pumps over 10 hours to resolve.
High	Fires in short stay accommodation	2	4	LFB responds to an average of 117 fires in short stay accommodation a year or roughly two a week which resulted in 7 fire injuries a year or one every 17 incidents attended. These incidents can require significant resource commitment with a maximum 86 pumps over 17 hours involved at a single incident in the last five years.	• Mandarin Hotel, Westminster – 2018 – 20 pump fire requiring 58 pumps over 18 hours to resolve. • Harbour Hotel, Richmond – 2019 – 15 pump fire requiring 86 pumps over 17 hours, with 300 people evacuated.

High	Fires in offices and call centres	2	4	LFB responds to an average of 154 fires in offices and call centres a year or roughly three a week which resulted in 4 fire injuries a year or one every 36 incidents attended. These incidents can require significant resource commitment with a maximum 98 pumps over 12 hours involved at a single incident in the last five years.	• Chancery Lane, Westminster – 2020 – 25 pump fire on a Saturday requiring 98 pumps over 12 hours, with 39 people evacuated.
High	Fires in food and drink outlets	2	4	LFB responds to an average of 325 fires in food and drink outlets a year or roughly one a day which resulted in 26 fire injuries a year or one every 12 incidents attended. These incidents can require significant resource commitment with a maximum 82 pumps over 13 hours involved at a single incident in the last five years. There are additional concerns regarding life risks when residential accommodation is located above takeaways and restaurants.	• Tiroler Hut Restaurant, Westminster – 2019 – 15 pump fire in restaurant and residential property, requiring 82 pumps over 13 hours to resolve.

Major individual life risks from non-fire incidents

Rating	Risk	Likelihood	Life Consequence	Outcome description	Examples of significant incidents
Very High	Non-fire incidents involving road vehicles and urban infrastructure	4	5	LFB responded to an average of 5,546 non-fire incidents a year involving road vehicles over the last five years or 15 a day. This resulted in an average of 1,666 casualties a year resulting from these incidents, or one injury for every three incidents attended. The most common incident involving road vehicles or urban infrastructure is road traffic collisions and associated risks on roads.	• Orpington bus crash – 2019 – 2 pumps and 2 FRUs special service. Two buses in collision with a motor vehicle, one person killed and 14 injured.
Very High	Non-fire incidents involving trains and transport buildings	3	5	LFB responded to an average of 243 non-fire incidents involving trains a year over the last five years or one every day and half. This resulted in an average of 95 casualties a year, or one casualty every other incident attended. The most common high-risk incident type involving trains and transport buildings is likely to be persons under a train. The largest incident was the tram crash at Sandilands, where 7 people lost their lives and 50 people were injured.	• Sandilands, tram crash, Major Incident, Croydon – 2016 – 8 pumps, 4 FRUs, USAR modules, 7 persons died, 50 persons injured and removed to hospital, this incident required a total of 20 pumps to resolve.
Very High	Non-fire incidents involving outdoor water and boats	2	5	LFB responded to an average of 179 all incidents a year involving outdoor water over or boats over the last five years, or one every other day. This resulted in an average of 31 casualties a year resulting from these incidents, or one casualty for every five incidents attended. The most common high-risk incident type in or near outdoor water or boats is likely to be persons in the water in need of rescue.	• Princess Crescent, Hackney – 2019 – 12 pump, 6 FRUs, 1 HVP special service, burst watermain, 250 properties flooded to depth of 1 meter, 1 person rescued, 100 people displaced. • Pan-London surface water flooding, major incidents – 2021 - 68 and 63 pumps were deployed across London to deal with widespread flooding on 12th and 25th July 2021 which were both declared as a major incident. Several rescues were carried out by the Brigade from people in cars with several underground stations and hospitals flooding.

Other significant property risks with wider consequences

These are foreseeable risks which are not identified in the last five years of LFB data as being very high or high but are highlighted as part wider consultation and through the NFCC preliminary Higher Risk Occupancy Guidance and as such are considered appropriate to highlight as part of the LFB's Assessment of Risk.

Risk	Outcome description	Examples of recent significant incidents that have occurred in London or in other countries
Fires in major entertainment, heritage, or public buildings	LFB responds to an average of 34 fires a year in entertainment and cultural venues, 20 fires in places of worship and 33 fires in grade I and II* buildings a year and 303 fires within 15m of a listed building a year in London. In particular cases this can give rise to significant loss of heritage to London and the UK and potential significant economic loss, and media and political attention associated with the buildings.	• Cutty Sark Fire – 2007 – Large fire occurred on the Cutty Sark, almost destroying the historic ship. • Glasgow School of Art, Glasgow – 2014 – Large fire at the Glasgow School of Art. • Morden Mosque fire – 2015 – Large fire damaging 50% of ground floor of Europe's largest mosque. • Notre-Dame de Paris fire – 2019 – Major fire in a historical cathedral in Paris requiring over 400 firefighters to extinguish costing over €1 billion to restore.
Fires involving public administration, utilities, or amenities	LFB responds to an average of 165 fires involving public utilities, utilities, and amenities a year over the last five years or three a week. This resulted in an average of 10 fire related injuries a year, or one casualty every 17 incidents attended.	• Holborn tunnels fire – 2015 - A fire in electrical tunnels in the Holborn area closed the centre of London for 36 hours and resulted in 5,000 people being evacuated and costing the local economy over £40 million. Required specialist teams to extinguish.
Fires in major transport building	LFB responds to an average of 71 fires involving transport buildings a year over the last five years or just over one a week. This resulted in an average of 5 fire related injuries a year, or one casualty every 118 incidents attended.	• Kings Cross Underground fire – 1987 – 31 people killed and 100 injuries from a fire in an underground station. • Elephant and Castle fire – 2021 – 15 pump, FRUs 4 fire and explosion in railway tunnel under Elephant and Castle railway station resulting in six causalities and over 600 people evacuated.
Fires in hospitals and medical care facilities	LFB responds to an average of 92 fires involving hospitals and medical care facilities a year over the last five years or nearly two a week. This resulted in an average of 7 fire related injuries a year, or one casualty every 14 fires attended.	• Royal Marsden Hospital, Kensington and Chelsea – 2008 – 20 pump fire, 800 staff and 29 patients evacuated. • University College Hospital, Westminster – 2008 – 20 pump basement fire, 20 staff and 83 patients evacuated.

Fires on education sites	LFB responds to an average of 100 fires involving education sites a year over the last five years or one very two weeks. This resulted in an average of 3 fire related injuries a year, or one casualty for every 29 incidents attended.	• Thomas Fairchild School, Hoxton – 2009 – 20 pump fire at an East London primary school which was subsequently demolished and required a £9.3 million rebuild, with 300 pupils to be relocated to alternative schools.

Appendix 3. Major worst-case risks

Examples of major worst-case risks

Rating	Risk	Likelihood	Impact	Outcome description	Examples of significant incidents
Very High	Marauding terrorist attack or person borne IED	5	4	Marauding, simultaneous or near simultaneous marauding firearms attacks in a crowded urban area. Up to 200 fatalities (predominantly from gunshots but also from blast) and 650 casualties with gunshot, blast, and other injuries.	• July 7th London bombings – 2005 – 56 people killed and 784 injured when four bombers set off near simultaneous bombs in London. • November 13th Paris attacks – 2015 – 137 people killed and 416 injured in a multi sited terror attack in Paris. • Westminster Bridge attack – 2017 – 6 people killed, including the perpetrator, and 49 injured when a car was driven at speed at pedestrians on Westminster Bridge. • London Bridge attack – 2017 – 11 people killed, including the perpetrators, and 48 injured when a van was deliberately driven at pedestrians near London Bridge. • Parsons Green bomb – 2017 – 30 people injured when a bomb exploded on the District Line near Parsons Green station. • Fishmongers' hall attack – 2019 - 3 people killed, including the perpetrator, and 3 people injured in a stabbing attack.
Very High	Surface water, fluvial or tidal flooding	3	4	Surface water flooding in a large metropolitan area caused by a warm unstable atmosphere, most likely to occur in summer due to the warmer atmosphere having a greater water holding capacity, causes a pattern of convective rainfall events. Successive bands of frontal rainfall saturate river catchments (soil moisture deficit is at zero) and fill river channels to full capacity. High intensity heavy rainfall causes fluvial rivers in London (tributaries to the Thames) to exceed channel capacity. Flooding happens	• Floods in Southeast England – 2014 – Widespread flooding across the Southeast of England affecting Hampton and ground water flooding in Kenley requiring the rescue and evacuation of many residence. • Flooding in Belgium and Germany – 2021 – over 180 people killed in widespread surface water and pluvial flooding in Europe. Similar floods occurred in China and India within a week. • Pan-London surface water flooding – 2021 - 68 and 63 pumps were deployed across London to deal with widespread flooding on 12th and 25th July 2021. Several rescues were carried out by

				very quickly with little warning and time for evacuations.	the Brigade from people in cars and Pudding Land TFL station was flooded. A major incident was declared by LFB on 12th July.
Very High	Influenza type pandemic	4	5	A worldwide outbreak of influenza occurs when a novel flu virus emerges with sustained human-to-human transmission. Up to 50 per cent of the population may experience symptoms, which could lead to up to 750,000 fatalities in total in the UK. Absenteeism would be significant and could reach 20 per cent for 2-3 weeks at the height of the pandemic, either because people are personally ill or caring for someone who is ill, causing significant impact on business continuity.	• Covid-19 Global Pandemic – 2020/2021 – Worldwide pandemic which saw LFB respond alongside the London Ambulance Service and the Metropolitan Police Service to increase London's emergency health care capacity.
Very High	Conventional attack on chemicals infrastructure or biological attack – unenclosed urban area	3	5	Terrorist use of explosives causes a significant breach of one or more containment vessels at a major chemical installation. There could be up to 2,000 fatalities and 10,000 casualties, up to 10km from the site. Simultaneous aerosol releases of slurries of Bacillus anthracis spores (the causative agent of Anthrax) from five sites across London resulting in approximately one million people at >1% risk of infection from aerosolised particles.	• None
Very High	Chemical attack – enclosed urban area or radiological attack – unenclosed urban area	3	4	The dissemination of approximately 2kg of an improvised preparation of the volatile nerve agent sarin into a crowded enclosed or semi enclosed area, such as a sporting stadium, shopping centre or major transport hub. Radiological attack on an unenclosed crowded urban area, through an explosively released radiological dispersal device. There may be up to 30 fatalities and up to 85 casualties.	• None

Examples of significant worst-case risks

Rating	Risk	Likelihood	Impact	Outcome description	Examples of significant incidents
Very High	Major residential high-rise fire	4	3	A major fire in a building resulting in up to 140 fatalities and 300 casualties, significant damage to the building affected and disruption to local transport services for up to a week. This risk also includes a major fire in a very tall building, large buildings which have a footprint of over one hectare, buildings of national significance or in a building/location which forms or is related to part of the UK national infrastructure.	• Grenfell Tower – 2017 – 72 people died because of a fire which started on the 4th floor and spread to the 23rd floor
High	Major entertainment, public or commercial building fire	2	4	Major fire in a large public or commercial building such as a sports stadium, hotel, night club, tourist attraction, transport building, infrastructure, shopping centre, public administration building or office block resulting in up to 50 fatalities and 250 casualties. Potential for significant strain on NHS due to high number of burns victims with potential for overseas support. Potential for a significant number of international residences to be involved and widespread infrastructure and economic impacts costing hundreds of millions with incidents lasting over 12 hours. Risk of long-term mental health issues both from responders, survivors, and witnesses.	• Hampton Court Palace fire – 1986 – large fire at a Royal Palace in West London. • Kings Cross Underground fire – 1987 – 31 people killed and 100 injuries from a fire in an underground station. • Windsor Castle fire – 1992 – large fire at the Royal Palace destroyed 115 rooms and other priceless artifacts. • Buckingham Palace fire – 2002 – Fire in Buckingham Palace. • Glasgow School of Art, Glasgow – 2014 – Fire at the Glasgow School of Art. • Notre-Dame de Paris Cathedral fire – 2019 – Major fire in a cathedral in Paris costing over £500 million to restore
High	Public disorder	5	3	Large scale public disorder at site(s) in a single city, or in multiple cities, occurring concurrently over several days resulting multiple large fires across London.	• London riots – 2011 – London experienced its biggest time of civil unrest in recent history, resulting in multiple large fires across the city over a three-day period, with LFB having 97 frontline fire appliances committed to incidents across London at its height.
High	Complex built environments	2	4	Consequences of a major incident affecting large buildings or a complex-built environment. Incidents in these facilities/areas have the potential to trigger a	• London is a complex built environment, from London underground stations, to the largest shopping centre in Europe, home to six Premier league football clubs, the national football

				complex chain of events that lead to serious consequences for public safety.	and rugby stadiums, the world's most prestigious tennis tournament, the UK Parliament and Royal Family, the centre of the UK financial system, embassies and a number of world famous museums, art galleries, libraries, hotels, universities and theatres as well as three top tier COMAH (Control of Major Accident Hazards Regulations) sites, two international airports, two central London heliports and a military air base.
High	Large aircraft incident in proximity to airport	2	4	An aircraft incident within 1000m of the airport boundary during the take-off or landing phase. Aircraft are large commercial aircraft that can range in size from an Airbus A380 (550 people) to smaller commercial jets (50 people). Fatalities or serious injury may occur on the aircraft or within a localised area caused by the direct impact of the aircraft. There may also be local structural collapse, or road closers and HAZMAT material contamination. It will have a joint response from LFB and Airport FRS.	• Air France flight 4590 – 2000 – A Concord flight takes off from Paris Charles de Gaulle Airport crashing two minutes after take-off into a nearby hotel resulting in 113 deaths and 6 injuries.
High	Large hazardous materials incident or radioactive storage facility/transport accident	1	5	Large toxic chemical release caused by release of chlorine or several other chemicals. This incident arises from possible mechanical equipment/process failure or corrosion, and not necessarily involving fire or explosion. A road or rail tanker containing dangerous goods and/or "high consequence" dangerous goods are involved in an accident leading to fire and an explosion. Up to 200 fatalities and up to 500 people requiring medical treatment. The explosion will cause varying degrees of damage to property and infrastructure depending on their distance from the incident. This risk would result in a toxic plume/gas cloud which would be harmful to the population, resulting in evacuation	• Gas leak in Bhopal, India – 1984 - Thousands of people died from the effects of toxic gases which leaked from a chemical factory near the central Indian city of Bhopal. Methyl isocyanate gas (MIC) had escaped when a valve in the plant's underground storage tank broke under pressure. This caused a deadly cloud of lethal gas to float from the factory over Bhopal, with more than 20,000 people required hospital treatment
High	Attack with building collapse	3	3	A vehicle borne improvised explosive device with a 1000 kg TNT equivalent charge causes partial collapse of a building and primary and secondary fragmentation.	• Murrah Building, Oklahoma City – 1995 – Attack on the Oklahoma Federal Building killing 168 people and injuring 680 others. It damaged 324 building in Oklahoma City and caused $652 million worth of damage.

High	High consequence dangerous goods	2	4	A road or rail tanker containing dangerous goods and/or “high consequence” dangerous goods is involved in an accident leading to fire and an explosion. Up to 200 fatalities and up to 500 people requiring medical treatment. The explosion will cause varying degrees of damage to property and infrastructure depending on their distance from the incident. This risk would result in a toxic plume/gas cloud which would be harmful to the population, resulting in evacuation of the immediate area.	• None
High	Chemical attack unenclosed urban area or Chemical attack on water infrastructure	3	4	The explosive dissemination of approximately 10kg of an improvised preparation of the volatile nerve agent sarin (otherwise known as GB) into an unenclosed area such as a city centre shopping environment.	• Tokyo Sarin attack – 1995 – A sarin attack on the Tokyo subway network killing 13 people and injuring 5,500 people.

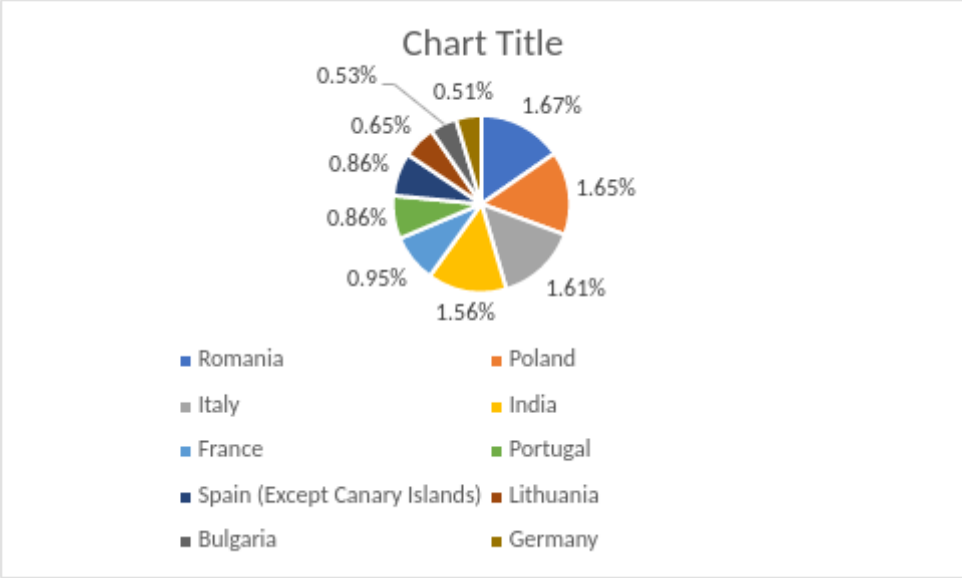
Appendix 4. Equalities impact assessment

Protected Characteristic	**Impact: positive, neutral, or adverse**	**Reason for the impact**	**What information have you used to come to this conclusion?**
Example: Age	***Adverse***	***Moving this service online will adversely affect older people, who are least likely to have access to a computer or smart phone and may not be able to use the new service.***	***GLA Datastore: X% of the London community are aged 70 or over. GLA data shows that only 10% of those over the age of 70 have regular access to a computer or smart phone.***
Age (younger, older, or age group)	NA	The AoR identifies that older people are more likely to have specific risk factors such as mobility issues, mental health issues, taking prescription drugs and living alone. The AoR identifies that that young people do not have any particular risk factors associated with them though some may live in lower quality accommodation, flats and live alone.	LFB data shows that older people are more likely to be victims of fire and rescue service incidents and are particularly vulnerable to fires, with 85 per cent of fatal fires involving someone over the age of 50 and 65 per cent of fatal fires involving someone over the age of 65. Figure 7. in appendix 1. shows that those aged over 65 are evenly distributed across London. Table 1. confirms this with 49 per cent of over 65s living in urban areas which make up 30 per cent of London's area and 46 per cent of over 65s living in suburban areas. London's population, the number of Londoners aged 65 or over is projected to increase by 86 per cent between 2019 and 2050, faster than younger age groups. Therefore, there will be a growing need for infrastructure that supports an ageing population, including accessible. London Data Store 2019: 12% of Londoners are 65+. 68% are 16-64 and 20% are 0-15. 45% of fires deaths are in the over 40 years bracket. (LFB FIRE FACTS Fire deaths in Greater London 2019). The LFB have profiled the next fire death victim as;

			"This is an older person aged 65 or over who lives alone. Where they live, or the type of property, does not matter. However, their home will be unsafe from the risks of fire and without adequate fire detection" (LFB FIRE FACTS - Fire deaths in greater London 2019)
Disability (physical, sensory, mental health, learning disability, long term illness, hidden)	NA	The AoR identifies that people with disability are more likely to have specific risk factors which increase their vulnerability to fire.	LFB's data shows that disability and poor mental health and mobility issues and taking prescription drugs increase your vulnerability to fire. Figure 4. in appendix 1. shows that disability is distributed across London with a great proportion in east London and the extreme west of London. Characteristics associated with disability are often found in older people who are found all over London and are proportional to the population density in each of the four neighbourhood impact zones. People with disability are also likely to be more economically deprived and as such have risk factors associated with deprivation. LFB's data shows that if you are poor, you are more likely to have a fire. There are several related reasons for this. Figure 3. shows that there are patches of deprivation across London with a bias towards the eastern side of London as well as some areas in Northwest London.
Gender reassignment (someone proposing to/undergoing/ undergone a transition from one gender to another)	NA	People going through these processes can come up against some negative views when engaging with Establishment organisations, therefore they may be reluctant to invite them into their homes, for fear of being judged.	There is no detailed data held by the Brigade in relation to gender reassignment and their vulnerability to incidents which the fire and rescue service would be expected to attend and therefore no assessment has been made. Research carried out in 2012 on the acceptability of gender identity questions in surveys provided an indicative estimate that 1 per cent of the UK population identify as trans. LGBT in Britain – Home and Communities' Report shows that: Half of Ethnically Diverse LGBT people (51 per cent) face discrimination within the LGBT community. More than a third of trans people (36 per cent), one in eight LGBT disabled people whose activities are 'limited a lot' (13 per cent), and one in five LGBT people of non-Christian faith (21 per cent) say they have experienced discrimination from within the community because of distinct parts of their identities.

			Only half of lesbian, gay and bi people (46 per cent) and trans people (47 per cent) feel able to be open about their sexual orientation and/or gender identity to their whole family. A third of bi people (32 per cent) say they cannot be open about their sexual orientation with anyone in their family.
Marriage / Civil Partnership (married as well as same-sex couples)	NA	The AoR shows that single older men are more likely to be victims of fires.	LFB's data shows that being in a marriage or civil partnership generally decreases your risk from fire. As such those people who live alone and especially older people who live alone often have more risk factors making them more vulnerable to fire.
Pregnancy and Maternity	NA	Mobility and prescription drugs	Though no LFB data specifically relates to pregnancy or maternity risk factors associated with pregnancy and maternity such as reduced mobility and prescription drugs are known to increase an individual's risk to fire. Some mobility risks are borne from the hormone, which relaxes ligaments. Movement of organs to accommodate a growing baby can result in pressure on nerves and hips which in turn result in issues with mobility. Additional risks presented in relation to the unborn child. Removing the assumption that only heterosexual people will be categorised within this characteristic
Race (including nationality, colour, national and/or ethnic origins)	NA	The AoR cannot find any data that clearly shows that there any strong correlations between race and an increased vulnerability to fire or other emergencies.	57 per cent of Londoners are white British, white Irish or other white ethnicity, with the remaining 43 per cent having a black, Asian or minority ethnicity (BAME). LFB's data shows that race does not have an impact on an individual's vulnerability to fire. The proportion of each category of race is relative to the size of that category's population in London. Though other risk factors such as economic deprivation and employment may be present in specific ethnic groups.

			The 2011 census show that 1 in 10 London residents had migrated to the UK within the previous 5 years. 78% of London's population is made up people from the United Kingdom. Therefore, up to 22% may not speak English as a second language if at all. Top 10 represented nationalities (Other than UK non-English speaking) in order in London and main dispersion areas: 1. Romania – Northwest and Northeast 2. Poland – Northwest and Southeast 3. Italy – All, particularly Westminster, Kensington & Chelsea, Hammersmith & Fulham 4. India – West and Northwest, Hounslow. Northeast – Redbridge 5. France – All 6. Portugal – Outer London, Brent, and Lambeth 7. Spain – All 8. Lithuania – Outer, Greenwich 9. Bulgaria – Haringey and Newham 10. Germany – All

			
Religion or Belief (people of any religion, or no religion, or people who follow a particular belief (not political)	NA	The AoR does not show any specific additional risks for any religion or belief.	It is known that the lighting of candles, which can be related to religious activity can increase someone's risk to fire. Additionally, large gatherings can increase someone's risk to certain incident types the likelihood of such incidents is relatively low. The risk matrix shows that incidents in places of worship occur on average about once a month and result in one casualty every 10-25 incidents. It is noted that some areas of London hold higher numbers of a particular religious group, for example Barnet has the highest Jewish community numbers and New Malden the highest Korean population. The views of each person are equally valued and that for proportion of views purposes it may be necessary to direct engagement in highest populated areas, this is not to suggest that the views are of lesser or more value. Nearly half of London's residents, 48 per cent, give their religion as Christian. Muslims account for 14 per cent and all other religions total 12 per cent. People stating no religion make up the remaining 26 per cent. The proportion of

			Londoners who are Muslims or who have no religion has increased in recent years, while the proportion who are Christian has declined.
Sex (men and women)	NA	We will ensure language is inclusive throughout the project and run workshops to avoid excluding any groups, including the use of unnecessarily gendered language. Positive action opportunities to be explored in the future to facilitate a more balanced workforce and encourage participation from said groups. Gender specific groups to be contacted through engagement to seek views and opinions.	LFB's data shows that men are 16 per cent more likely to be victims of fire than women with men making up 58 per cent of fire victims over the last 20 years. Men and women are relatively evenly distributed across London. In 2019, the GLA projects that 4.55 million Londoners are female and 4.55 million are male. Women face issues around gender-based violence and low pay. As most lone parents (90 per cent) are women, recent reforms to welfare that have affected lone parents have had a disproportionate impact on women. Women sharing other characteristics women often face additional challenges, such as higher gender pay gaps among older and BAME women. Young women report issues around financial pressures and mental health issues. Men face issues around lower educational attainment and are at higher risk of suicide and therefore may be more at risk to fire and other emergencies. Additionally, if men become single in later life, they may find it harder to care for themselves and more likely to undertake riskier behaviours.
Sexual Orientation (straight, bi, gay, and lesbian people)	NA	People who are part of the LGBT community can come up against some negative views when engaging with Establishment organisations, therefore they may be reluctant to invite then into their home, for fear of being judged	Two per cent of adult Londoners identify as gay or lesbian, higher than the UK rate of 1.3 per cent. A further 0.6 per cent identify as bisexual and 0.6 per cent as other sexual identities.15 A recent survey of the UK's LGBT population found that 40 per cent had experienced an incident such as verbal harassment or physical violence because they were LGBT, and that they had lower levels of life satisfaction than the general UK population. Only half of lesbian, gay and bi people (46 per cent) and trans people (47 per cent) feel able to be open about their sexual orientation and/or gender identity to their whole family. A third of bi people (32 per cent) say they cannot be open about their sexual orientation with anyone in their family. Goals for Reducing Straight Bias in Language:

			Reducing straight bias and increasing visibility of lesbians, gay men, and bisexual persons. Lesbians, gay men, and bisexual men and women often feel ignored by the general media, which take the straight orientation of their readers for granted. Unless an author is referring specifically to straight people, writing should be free of straight bias. Ways to increase the visibility of lesbians, gay men, and bisexual persons include the following: a. Using examples of lesbians, gay men, and bisexual persons when referring to activities (e.g., parenting, athletic ability) that are erroneously associated only with straight people by many readers. b. Referring to lesbians, gay men, and bisexual persons in situations other than sexual relationships. Historically, the term same-sex attraction has connoted sexual activity rather than a general way of relating and living. c. Omitting discussion of marital status unless legal marital relationships are the subject of the writing. Marital status per se is not a good indicator of cohabitation (married couples may be separated, unmarried couples may live together), sexual activity, or sexual orientation (a person who is married may be in a gay or lesbian relationship with a partner). Furthermore, describing people as either married or single renders lesbians, gay men, and bisexual persons as well as straight people in cohabiting relationships invisible. d. Referring to sexual and intimate emotional partners with both male and female terms (e.g., "the adolescent males were asked about the age at which they first had a male or female sexual partner"). e. Using sexual terminology that is relevant to lesbians and gay men as well as bisexual and straight people (e.g., "when did you first engage in sexual activity" rather than "when did you first have sexual intercourse"). f. Avoiding the assumption that pregnancy may result from sexual activity (e.g., "it is recommended that women attending the clinic who currently are engaging

			in sexual activity with men be given oral contraceptives," instead of "it is recommended that women who attend the clinic be given oral contraceptives").