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Grenfell Investigation into Potential Land Contamination Impacts

Technical Note 16: Preliminary Risk Assessment

Royal Borough of Kensington and Chelsea

Project number: 60595731

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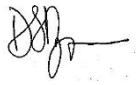			
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Revision History

Revision	Revision date	Details	Authorized	Name	Position
Original	16 July 2019	Prelim Draft for discussion		Liz Philp	Technical Director
Revision 1	21 August 2019	Revision after client comments		Liz Philp	Technical Director
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1. Introduction

This technical note sets out the Preliminary Risk Assessment (PRA) for the Stage 1 investigation of potential land contamination impacts resulting from the Grenfell Tower fire on 14 June 2017. The format and content of the PRA is based on the final specification for the Stage 1 investigation (AECOM, 2019a) and draws on technical information presented in separate technical notes (TNs) that have been prepared by AECOM to address specific aspects of the assessment. These key information sources are summarised in Table TN16-01 below. Those TNs that do not directly provide informative input to the PRA have been greyed out in the table below.

Table TN16-01. Technical Notes

Number	Title
1	Finalised specification
2	Protocol for evidence reviews
3	Protocol for initial soil sampling exercises
4	Fire chemistry and identification of COPC
5	Fate of debris – deposition, spread, clean-up
6	Atmospheric dispersion and deposition of finer particles
7	COPC fate & transport in the environment
8	COPC toxicity
9	Published data on national and regional urban background soil concentrations
10	Local baseline data on soil concentrations of COPC
11	*Technical Note removed but numbering preserved to avoid referencing issues*
12	Spatial mapping of historic and current land uses
13	Potential source contributions to urban soil pollution
14	Collated community information
15	Factual data from initial exploratory sampling and pilot study
16	Preliminary risk assessment
17	Part 2A risk assessment for pilot study
18	Stage2/3 design

1.1 Legislative Context

The Part 2A regime provides a means of identifying and remediating land that poses a significant risk to health or the environment and focuses on the risks caused by land contamination to human health and defined receptors including controlled waters, buildings and other forms of property, and certain specified ecosystems. Under Section 78A (2) of the Environmental Protection Act 1990 (as amended), contaminated land is defined as:

> *"any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that.…*
>
> *significant harm is being caused or there is a significant possibility of such harm being caused; or*
>
> *significant pollution of controlled waters is being caused, or there is a significant possibility of significant pollution of controlled waters being caused."*

The 2012 Part 2A Statutory guidance defines significant harm and sets out how to establish whether the land under investigation is causing such harm to human health (or whether it is causing a significant possibility of significant harm (SPOSH) – ranked according to four categories), non-human receptors including ecological and property receptors. Similarly, the guidance defines significant pollution of controlled waters and sets out how to establish whether the land is causing such pollution (or whether it is causing a significant possibility of significant pollution (SPOSP), again ranked according to 4 categories). Set procedures are specified for regulators to follow in deciding if land is not contaminated land and for determining land as contaminated land, including defining the extent, sub-divisions, requirements for notification and recording.

Further detail in relation to Part 2A of the EPA, the 2012 Statutory Guidance, and the process of risk assessment within the Part 2A regime is provided in Appendix A of the Environment Agency "Analysis and Interpretation Methodology for the Soil Investigation at Grenfell Tower (v8_2)".

2. Objectives

The objectives of the PRA are to:

- Summarise the environmental setting of Grenfell Tower and its surrounding area.
- Interpret factual information presented in TNs to identify sources, pathways and receptors that could combine as contaminant linkages (CLs).
- Qualitatively evaluate CLs to decide whether there is a reasonable possibility of a significant contaminant linkage (SCL).
- Identify those CLs that would require more detailed investigation under Statutory guidance (the potential SCLs).

3. Scope of Work

The scope of work presented in this technical note, which is designed to achieve the objectives stated in Section 2 above, includes:

- A review of geological, hydrogeological, hydrological and sensitive land use information to define the environmental setting of the Tower and its surroundings.
- A review of historic land uses and regulatory records to define the historical and current contaminative potential of the Tower area and surrounding land.
- The identification of sources and contaminants, receptors, and exposure pathways using the site setting information and information presented in the Technical Notes listed in Table TN16-01.

- Qualitative discussion and prioritisation of contaminant linkages (CLs) in accordance with the expectations of the Part 2A Statutory guidance and based on the EA/PHE methodology (EA, PHE, 2019) including consideration of the following:
  - Chemical analysis results as described in TN15 (e.g. percentage of non-detects, measured soil concentrations, and any spatial patterns consistent with fire emissions);
  - Generic screening criteria (GSC) identified in TN8 and TN17, and including equivalent in-house values for comparison with measured concentrations from the exploratory sampling (TN15);
  - 'Normal' levels of COPC in soils (identified in TN9) for comparison with measured concentrations from the exploratory sampling (TN15); and
  - Evidence gaps and other factors (qualitative degree of epistemic uncertainty).
- Identification and presentation of CLs requiring further investigation and assessment as part of the likely Stage 2 investigation.

4. Site Setting

In this section, Grenfell Tower and the area within the current security cordon are referred to as 'the Site'. The extent of the security cordon at the time that this report was prepared is shown in Figure TN03-01 and Figure TN03-02j in Technical Note 3.

The site setting is described below in order to provide information for the development of the conceptual site model (CSM), which informs the identification and evaluation of CLs. The CSM and CL evaluation is presented in Section 5.

4.1 Site location and description

Grenfell Tower is located off Station Walk in the Notting Hill area of London, approximately 145m from Latimer Road Tube Station (grid reference: 523910, 180960).

The area surrounding the Site is a densely populated predominantly residential urban area with a mixture of terraced residential housing and blocks of flats of various heights and ages.

Typical commercial and amenity facilities exist in the area including grassed public open spaces, parks, shops, community centres, schools, and leisure/sports centres. The large Westfield shopping complex is located approximately 600m south-west of the Site.

The Hammersmith and City London Underground line runs roughly southwest/northeast 75m to the northwest of the Site, with the nearest station (Latimer Road) located approximately 125m southwest of the Tower.

4.2 Current and historic land uses

The Envirocheck Report 209140267 (Landmark Information Group, 2019b) commissioned by AECOM contains a large number of contemporary trade directories and points of interest. Those within 250m of the Site have been reviewed and include the following land uses which could be potential sources of contamination surrounding the Tower: garage services, furniture manufacturers, fabric and clothes manufacturers, pharmaceutical manufacturers and petrol /fuel stations.

AECOM's Technical Note 10/12 (AECOM, 2019b) contains further information with regards to historical land uses with the vicinity of the Site. The Site was shown as open land from 1867 to 1895 when residential properties are shown on Blechynden Street. The Site was cleared in the early 1970's and Grenfell Tower was built between 1972 and 1975. In the early nineteenth century, prior to the earliest historical mapping available during the production of this report, the area around Notting Hill was famed for its potteries and piggeries, both of which are considered to be potential sources of land contamination caused by the brick kilns and slum conditions in the area. Several historical potentially contaminative land uses including; railway land, brickfields, ironworks, breweries, dye works, printing works, engineering works, cleaning works, motor repair works, joiners, electricity substations and

metal works have been identified within a 1km radius of the Site over the years. The historic review was based on a historic Ordnance Survey mapping report (Landmark Information Group, 2019a) which is reproduced in Appendix TN-C of technical note TN10/12. A wide range of chemicals of potential concern (COPC) may be associated with these historic land uses and these COPC are summarised in Table TN10/12-03 in TN10/12.

One area of potential infilled ground (non-water) has been identified from 1996 historical mapping at 118m south. This area may be linked to the brickworks that were present in this area during earlier mapping. Further areas of potentially infilled land were identified located between approximately 400m and 1.1km to the west of the Site. These areas of infilled land may also have been related to historic brickworks in these areas.

Technical Note TN10/12 (AECOM, 2019b) concludes that there are a number of areas surrounding Grenfell Tower associated with potentially contaminative former uses that could have resulted in soil contamination.

Typical COPC reported in many of the historic intrusive ground investigation reports reviewed as part of TN10/12 included: asbestos, metals, PAHs and TPH.

4.3 Geology

A geological sequence underlying the Site is summarised below and is derived from geological mapping and historical borehole logs provided in the BGS online Onshore Geoindex (British Geological Survey, 2019a) and information from the BGS Lexicon (British Geological Survey, 2019b).

- **Made Ground.** Typically described as topsoil and brick rubble. One borehole describes the made ground as brick rubble clay. This extends to depths of between 0.60m bgl and 1.22m bgl.
- **Langley silt member.** This horizon is present in all of the consulted historic boreholes at thicknesses around 4.0m to 5.0m. The Langley Silt Member comprises silts and clays, described as grey and brown in colour in the historic borehole logs
- **Kempton Park Gravel.** This horizon is indicated to be present beneath the Langley Silt Member in all but one of the historical BGS borehole records reviewed. The Kempton Park Gravel comprises sand and gravel, locally with lenses of silt, clay or peat. The historical boreholes describe it as medium dense sandy course, medium and fine gravel, with one of the boreholes indicating the presences of a stiff brown clay beneath a thin gravel layer, which may be a localised lens of clay. The historical borehole records indicate the Kempton Park Gravel to be 0.64m to 2.32m in thickness at the Site.
- **London Clay.** The London Clay is indicated to underlie the superficial deposits. The London clay is described as poorly laminated, blue-grey or grey-brown, slightly calcareous, very silty clay, clay, with some layers of sandy clay. All the reviewed historical BGS boreholes terminated within the London Clay at between 9.14m and 18.69m bgl. The historic boreholes detail this stratum to be stiff grey silty clay.

Surrounding the Site, the Langley Silt and underlying gravel are absent to the north and east of the Tower beyond a distance of approximately 50m, with the London Clay bedrock immediately underlying this area. The Langley Silt extends to the west and south of the Site. To the south, the Langley Silt disappears approximately 1km from the Tower, with the surface geology beyond this distance recorded as the Secondary-A Kempton Park Gravel Member. Secondary-A gravel superficial deposits extent from this point to the River Thames further south.

The presence of variable thickness and composition of made ground in the area is likely to result in variable concentrations of constituents (including some of the COPC) in the surface soils and shallow soils. Where surface soils are influenced by the underlying geology (as opposed to be entirely anthropogenic or imported materials) then the typical background constituent concentrations may differ depending on whether the Langley Silt or the London Clay is the surface geology. This split is broadly characterised as Langley Silt immediately underlying the Tower (to an approximate radius of 50m) and to the south and west of the Tower, with the London Clay being the surface geology to the north and east of the Tower beyond a distance of approximately 50m.

Table TN16-02. Geology

Geological Unit	Stratum	General Description	Depth Range Strata Encountered (mbgl)	Thickness Range (m)	Comments
Made Ground	Cover layers and fill	Topsoils with brick rubble fill, or brick rubble clay	0-1.22	0-1.22	Variable thickness and composition indicate variable nature of the surface soils and shallow soils that might have been affected by deposition of effluents from the fire. Pre-fire constituent concentrations are therefore likely to be spatially variable.
Superficial Deposits	Langley Silt Member	Firm grey/ brown clay	5.18-6.40	Between 4.0 – 5.0	The Langley Silt overlies the Kempton Park Gravel in all areas close to and within approximately 1km of the Tower, providing low permeability protection to the underlying gravel.
	Kempton Park Gravel	Medium dense sandy coarse, medium and fine gravel. Stiff brown clay	5.79-7.47	Between 0 – 2.32.	Not indicated in the northernmost historical borehole, becoming thicker to the south with a clay lens in the southernmost borehole.
London Clay	Clay	Stiff grey clay	Base of boreholes 9.14-18.69	Estimated up to 150m	London Clay indicated to be a maximum thickness of 150m by the BGS Lexicon.

4.4 Hydrogeology

Unproductive strata are indicated to underlie the site within the Langley Sit Member and the London Clay. The gravel layer of the Kempton Park Gravel which underlies the Langley Silt beneath Grenfell Tower is likely to be designated as a Secondary 'A' aquifer similar to the nearby gravel members where they outcrop at surface further south, however is likely to be afforded protection from surface contamination by the lower permeability Langley Silt that overlies it within a distance of 1km from the Tower.

The site is not within a groundwater Source Protection Zone, and there are none within 500m of the site. The nearest reported groundwater abstraction is located 676m to northwest of the Tower and is associated with a heat pump borehole at Imperial College West (Block C). The permit start date is noted as 26th June 2016; however, no further details in relation to the abstracted aquifer or the permitted abstraction rate were provided.

4.5 Hydrology

There are no surface water features on site, the nearest surface water feature is recorded to be 242m southwest of the site, but this has not been designated and not identified by any other documentary evidence reviewed by AECOM and its existence is uncertain. A small watercourse is indicated to be present at 680m northwest, this appears to be a small drain along the side of a railway line and is likely to be fed by surface water drainage and have no continuity with groundwater. The nearest significant water feature is the Grand Union Canal located approximately 1.4km north of the site.

In addition, the River Thames located approximately 2.9km to the south southwest and there are lakes in Kensington Gardens and Hyde Park located approximately 2.3km to the east southeast.

The site is not within a flood zone but provided site sensitivity maps indicate that the site is at a high risk from flooding from surface water.

4.6 Stability Hazards

The on-Site ground stability hazards have been identified in the Envirocheck Report 209140267 (Landmark Information Group, 2019b) as very low to negligible. At a distance of 11m from the Site boundary the Envirocheck map shows a change in stability hazard, with the potential for shrinking or swelling clay ground identified as moderate. This is expected to be associated with a change in the mapped geology in this area.

4.7 Mining and Mineral Extraction

No coal mining or non-coal mining activity hazard has been identified in this area from the Envirocheck Report 209140267 (Landmark Information Group, 2019b).

4.7.1 BGS Recorded Mineral Sites

Ten BGS recorded Mineral sites are recorded between 76m and 467m south-east of the Site (Landmark Information Group, 2019b). These are associated with the former Notting Hill Brick Field and Potteries Field Clay PitAll of which were former opencast working, all now recorded to have ceased.

To the west and south-west of the Site, a further 19 mineral sites are recorded at distances of between 494m and 995m from the Site. These sites were associated with the former Eynham (Farm), Woodlane Farm and Norham Brick Fields, and the Cowley Brick Works.

4.8 Radon

Envirocheck Report 209140267 (Landmark Information Group, 2019b), commissioned by AECOM indicates the Site is located in an area where less than 1% of residential properties may be affected by radon.

4.9 Environmentally Sensitive Sites

There are no sensitive land uses identified within 1km of the site from the Envirocheck Report 209140267 (Landmark Information Group, 2019b), commissioned by AECOM.

4.10 Regulated Activities

4.10.1 Licensed Waste Management Facilities

There are no active landfill Sites, waste treatment, transfer or disposal Sites within 500m of the study Site (Landmark Information Group, 2019b).

4.10.2 Pollution Prevention and Control

Based on the Envirocheck report (Landmark Information Group, 2019b), there are no active Integrated Pollution Prevention and Controls (IPPC) within 250m of the site, the nearest IPPC is 487m west which denotes a surrendered permit for organic chemicals and oxygen containing compounds eg: alcohols. A Local Authority Pollution Prevention and Control is recorded 248m southwest associated with the respraying of road vehicles, it is noted that this site is now closed, another nearby permit listed at the same address is for coatings manufacturing, this application is withdrawn. There are no other Local Authority Pollution Prevention and Controls within 250m of the site.

4.10.3 Registered Radioactive Substances

No registered radioactive substances are recorded within 500m of the site. There is one record of a radioactive substance at 949m north, the status of this record indicates authorisation has been revoked or candled.

4.10.4 Hazardous Substances (COMAH) Facilities

Envirocheck Report 209140267 (Landmark Information Group, 2019b), indicated no records of COMAH facilities within 1km of the Site.

4.11 Spillages, accidents, emergency responses

Envirocheck Report 209140267 (Landmark Information Group, 2019b), commissioned by AECOM indicate no records of spillages accidents or emergency responses within 1km of the Site.

4.12 Regulatory Actions

No land determined as contaminated under Section 78R of the Environmental Protection Act 1990 has been identified within 1km of the Site based on the information provided in Envirocheck Report 209140267 (Landmark Information Group, 2019b).

Information provided to AECOM by RBKC indicates that there is not any land that has been determined as Contaminated Land within RBKC's boundary that lies within 500m of the Tower.

5. Conceptual Site Model

5.1 Introduction

The Conceptual Site Model (CSM) identifies the current source-pathway-receptor potential Contaminant Linkages (CLs) based on information about the Site's history, its environmental setting, evidence from previous ground investigations and the findings of the preceding parts of the Stage 1 investigation, including the exploratory sampling (TN15), identification of background concentrations (TN9), and identification of generic screening criteria (TN8). In this section the CSM covers the Tower itself, as well as the surrounding area that could potentially have been affected by the fire. It is intended to provide the basis for designing the quantitative stages of risk assessment, which evaluates each potential CL further to allow an assessment of the linkage significance with respect to the regulatory tests of "suitability for use" and "unacceptable risk". The development of this CSM has been undertaken in general accordance with section 2.2 of CLR 11 (Environment Agency, 2004).

The term 'potentially significant' has been used throughout Section 5 to describe CLs, or individual elements of CLs, that are considered to result in a reasonable possibility of a significant contaminant linkage (SCL). In accordance with the Statutory Guidance for Part 2A of the EPA 1990 (DEFRA, 2012), an SCL is defined as contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land.

5.2 Potential Sources

The source of potential contamination being investigated is the Grenfell Tower fire of 14 June 2017. Since Part 2A of the EPA deals with contamination associated with materials in, on or under the 'land', the mechanism for assessment is based on the collated evidence indicating that effluents from the fire were deposited on the land during, and in the immediate aftermath of, the fire. In addition, rare ongoing deposition of fire debris may be occurring as fragments currently trapped on flat rooftops or in guttering etc. are occasionally dislodged to ground level. The collated evidence describing the deposition of fire effluents on the land is included in the following AECOM Technical Notes (TNs):

- TN5: Fate of debris – deposition, spread, clean-up (AECOM, 2019c).
- TN6: Atmospheric dispersion and deposition of finer particles (AECOM, 2019d).
- TN14: Collated community information (AECOM, 2019f).

The predominant sources of potential contaminants include dust, ash and debris deposited from the smoke plume, larger pieces debris emitted from the fire and deposited more locally to the Tower relatively independently of the smoke plume behaviour, and firewater from the firefighting effort that flowed to surface water drains, infiltrated to ground in the immediate vicinity of the Tower, and was pumped from the basement to the Thames Water sewer.

The following source observations are considered to be relevant based on the information presented in TN5, TN6, TN9 (AECOM, 2019e) and TN14:

- Heavy debris including glass and metal fell in the immediate vicinity of the Tower to a distance of approximately 20m.
- Charred low-density debris was reportedly found in the surroundings of the Tower to a distance of approximately 300m regardless of direction from the Tower.
- Beyond a distance of approximately 300m, debris was reportedly found in the north-west direction from the Tower, with debris reported as far as Little Wormwood Scrubs
- The higher rates of smoke particle deposition are predicted to be in a zone to the northwest of the Tower approximately 0.5km wide and within 1km of the Tower, and in a much larger zone that extends northwest approximately 2 km from the Tower and approximately 2.5km wide.
- The highest zone of smoke particle deposition modelled is an oval area between approximately 3km and 5km to the northwest of the Tower where deposition is modelled to be 100 times higher than that in the 0.5km wide zone identified in the bullet point above that is within 1km of the Tower.

- Ash in air and a strong odour was reported at Longstone Avenue Allotments at the time of the fire, 3.7km to the north west of the Tower.
- The laboratory analysis of the firewater in the Tower basement carried out prior to its discharge to Thames Water sewer identified a number of SVOCs and metals at concentrations above method detection limits. It is expected that other firewater, potentially containing similar compounds, would have infiltrated to ground in the immediate vicinity of the Tower at the time of the firefighting operation.

Given the atmospheric deposition of dust, ash, and debris onto the ground surface, it is expected that potential sources will primarily be located in areas of exposed soil, grass, vegetation and permeable surfaces where dust and debris fragments may have been washed through to the underlying soil. Rare ongoing addition to the potential soil source may be occurring as trapped pieces of debris on roofs, gutters etc. are dislodged and land on open areas. Dust, ash and debris falling on other hard paving such as tarmac and concrete is likely to have been washed into drains or washed/blown onto adjacent soft ground.

Since the deposition of the dust, ash and debris, disturbance of the ground surface is likely to have occurred in some areas including mixing to greater depth during gardening and other soil excavation activities and removal of contaminants where soils or surface cover has been changed or replaced.

5.2.1 Chemicals of Potential Concern (COPC)

The COPC that could to be associated with fire effluents deposited on the land were identified in AECOM's TN4: Fire chemistry and identification of COPC (AECOM, 2019g).

The list of COPC identified in TN04 (AECOM, 2019g) was used to inform the design of the exploratory and pilot study sampling work. The sampling design is described in TN03 (AECOM, 2019e), with the results of the sampling presented in TN15 (AECOM, 2019h).

Table TN16-03 below lists the COPC identified in TN4 (AECOM, 2019g) and states the number of samples (maximum of 71) from the exploratory sampling in which each COPC was reported at a concentration above its laboratory method detection limit. This does not necessarily mean that a detected COPC is of concern, just that it may be relevant to consider it further as part of the PRA process.

Table TN16-03. Exploratory and Pilot Study Sampling COPC Detections

Category	Specific compounds or elements	Number of Detections above laboratory method detection limit (MDL)*
Metals		
	Lead	71
	Aluminium	67
Polycyclic Aromatic Hydrocarbons		
	USEPA priority 16 PAH	71
	7,12-dimethylbenzo(a)anthracene	0
Dioxins, Furans and dioxin-like PCBs		
	Poly-chlorinated dibenzodioxins (PCDD)	67
	Poly-chlorinated dibenzofurans (PCDF)	67
	Poly-brominated dibenzodioxins (PBDD)	67
	Poly-brominated dibenzofurans (PBDF)	67
	Mixed halogenated dibenzodioxins (PXDD)	n/a

Category	Specific compounds or elements	Number of Detections above laboratory method detection limit (MDL)*
	Mixed halogenated dibenzofurans (PXDF)	n/a
	'WHO-12' Dioxin-like PCBs	67
Non-dioxin-like PCBs	Dutch-7	12
Isocyanates		
	Isocyanic acid	0
	Methyl isocyanate	0
	Ethyl isocyanate	0
	Propyl isocyanate	0
	Phenyl isocyanate	0
	Hexamethylene di-isocyanate	0
	Toluene-2,4-diisocyanate	0
	Toluene-2,6-diisocyanate	0
	Methylene-bis-(phenylisocyanate)	1**
	Isophorone diisocyanate	0
Volatile Organic Compounds		
	Benzene	1
Organophosphorus Compounds		
	2-Propanol, 1-chloro-,2,2',2"-phosphate (TCIPP, previously known as TCPP)	0
	Phosphoric acid, triphenyl ester (TPHP)	n/a
	Ethanol, 2-butoxy-,1,1',1"-phosphate (TBOEP, previously known as TBEP)	n/a
	Phosphoric acid, triethyl ester (TEP)	n/a
	Phosphoric acid tris(methylphenyl) ester (TMPP, previously known as TCP)	n/a
	Tris(2-ethylhexyl) phosphate (TEHP)	5
Cyanides		
	Free cyanide	1***
	Total cyanide	31
	Thiocyanate	43
Brominated Fire Retardants		
	Polybrominated biphenyls (PBBs)	0
	Tetrabromobisphenol A	0
	Polybrominated diphenyl ethers (PBDEs)	0
	Polybrominated diphenyl ethanes	n/a
	Hexabromocyclododecane	0
Fibres		

Category	Specific compounds or elements	Number of Detections above laboratory method detection limit (MDL)*
	Asbestos	21
	Synthetic Vitreous Fibres	21

**a COPC being present at a concentration above the MDL does not imply any level of risk, just that the chemical was able to be detected by the laboratory instrumentation.*

***detected in 1 of 4 duplicate sample analyses at a concentration 1.5 times above the MDL therefore significant uncertainty with reliability of the detection*

****detected in 1 of 4 duplicate sample analyses at a concentration 1.2 times above the MDL therefore significant uncertainty with reliability of the detection*

n/a data not available as laboratory analytical services could not be found for these compounds

In addition, a number of potential contaminants not thought to be directly related to the fire were identified as part of wider analytical suites used for the exploratory sampling. These included:

- Metals other than lead and aluminium, including As, Ba, B, Cd, Cr, Cu, Ni, Se, V, Zn.
- VOCs other than benzene, including chloromethane, chloroethane, dichloromethane, toluene, ethylbenzene, xylenes, 4-isopropytoluene and five VOC TICs. With the exception of chloromethane, these compounds were reported above the laboratory MDL in a small proportion of samples that would not be considered indicative of a widespread source across the area.
- SVOCs, including phenolic compounds, PAHs (and related compounds) not speciated in the 'priority 16 compounds' suite, phthalates, 1,2-dichlorobenzene and hexachlorobenzene. With the exception of bis(2-ethylhexylphthalate) (DEHP), 2-methylnaphthalene, carbazole and dibenzofuran, these compounds were reported above the laboratory MDL in a small proportion of samples that would not be considered indicative of a widespread source across the area. Of these compounds, DEHP is commonly found in urban areas as it is a common additive to plastic products from which it can be leached. 2-methylnaphthalene, carbazole and dibenzofuran are commonly encountered alongside PAH compounds and can be assessed within the same COPC grouping.
- A relatively large number of SVOC TICs were identified, with the large majority of those identified being alkylated PAH compounds and other hydrocarbon type compounds likely to be associated with similar source materials as the PAHs.

5.2.2 Summary of Sources

Of the COPC listed in Table TN16-04, there is no evidence for the presence of isocyanates or brominated flame retardants (BFRs) that could reasonably allow them to be considered further as a potential source in the context of Part 2A. In the case of isocyanates, this is consistent with the expectation from the review of fate and transport that, even if they were initially present in fire effluents at the time, they are unlikely to have persisted in the environment to the time of the exploratory sampling. Various BFR compounds are likely to have more variable fate in the environment, with PBBs likely to be relatively long-lived. However, BFRs work by decomposing on heating and therefore would have undergone some degree of degradation during the fire. It is therefore reasonable to consider that the lack of BFRs in the exploratory samples at detectable concentrations is compatible with the conceptual deposition scenario and there is not a reasonable possibility that CLs with BFRs as a source could be significant.

The presence of benzene in a single sample, and TEHP in five samples, also suggests very limited potential for further consideration as a COPC in the context of Part 2A that would have been associated with the fire. However, these compounds have been retained as COPC at this stage given the potential to act as sources in at least one sampled area, and the evidence provided in TN4 (AECOM, 2019g) for these compounds to be constituents of fire effluents and / or present in environmental media following fires.

Many of the detected metals, including aluminium and lead, are natural constituents of soils and at this stage it is unclear whether their presence could be related to effects of the fire. Other than lead and aluminium, there is no evidence to suggest that the metals described above would be from the fire, and therefore only lead and aluminium (of the metals discussed) have been considered further as a potential source for the PRA.

PAHs, including related SVOC compounds, are considered to be potential COPC given their identification in all samples. This is also true for dioxins, furans and dioxin-like PCBs, which as a group were detected in all samples. Most of these compounds are present as background constituents in urban soils (AECOM, 2019e) (AECOM, 2019b) and at this stage it is uncertain whether the detections identified in the exploratory sampling (AECOM, 2019h) are representative of background levels only, or have some additional component from the fire effluent source.

Other COPC that appear to be potential sources for consideration in the PRA include a small number of VOCs, cyanides, non-dioxin-like PCBs, asbestos and synthetic vitreous fibres. These groups of contaminants were not identified in all areas but remain potential COPC within the areas that they have been reported by the exploratory sampling. Of the VOCs identified in exploratory samples, only benzene is considered to be of sufficient concern as a potential fire effluent for further detailed evaluation in the PRA. Similar to the discussion above for PAHs and dioxins, furans and dioxin-like PCBs, these additional COPC have some reported background presence in urban soils and at this stage it is uncertain whether the detections identified in the exploratory sampling are representative of background levels only, or have some additional component from the fire effluent source.

The final groups of COPC considered in the PRA have been defined as follows:

- S1 – Metals, specifically lead and aluminium.
- S2 – PAHs and related SVOC compounds.
- S3 - dioxins, furans and dioxin-like PCBs.
- S4 – non-dioxin-like PCBs.
- S5 – VOCs (benzene).
- S6 – Organophosphorous compounds (mainly TEHP).
- S7 – Cyanides.
- S8 – Fibres.

5.3 Potential Receptors

The potentially relevant receptors are split into four main groups (human health, controlled waters, property, and ecological) in accordance with the Statutory Guidance (DEFRA, 2012). Further receptor type breakdowns within these groups are summarised below, with each individual receptor type allocated an ‘R’ code for subsequent ease of discussion.

5.3.1 Human Health

- Residents (R1)
  - This group includes residents living in properties with private gardens where cultivation of produce is a possibility, those living in properties with no private outdoor space without any possibility of growing produce, those with raised bed plots in community kitchen gardens, and those with larger typical allotment plots.
- Visitors (R2)
  - This group includes visitors to the area either to visit local residents, use local parks and leisure services, or use commercial services (e.g. shops).
- Commercial workers (R3)
  - This group includes workers in local businesses or other services (e.g. schools) that are not resident in the local area.
- Maintenance workers (R4)

  - This group includes workers that are not resident in the local area but who work in the area carrying out regular maintenance jobs that involve more disturbance of the soil/ground (such as tending park areas) than workers in a commercial business such as a shop.

5.3.2 Property

- Pets (R5).
- Homegrown produce (R6).
- Buildings (R7).

5.3.3 Controlled Waters

- Groundwater in Kempton Park Gravel (Secondary-A aquifer) (R8).
- Surface waters: (R9)
  - River Thames located approximately 2.9km to the south southwest.
  - The Grand Union Canal located approximately 1.4km to the north.
  - Lakes in Kensington Gardens and Hyde Park located approximately 2.3km to the east southeast.

5.3.4 Ecological Receptors

The closest protected areas are a number of designated Local Nature Reserves on Wormwood Scrubs, with the nearest located approximately 1.1km to the northwest of the Tower.

The closest ecological sensitive sites that could constitute a relevant receptor in accordance with the Part 2A Statutory guidance (DEFRA, 2012) include:

- Brent Reservoir – a Site of Special Scientific Interest (SSSI) located approximately 6.3km to the north northwest of the Tower.
- Barn Elms Wetland Centre – a Site of Special Scientific Interest (SSSI) located approximately 3.8km to the south southwest of the Tower.

Although the Brent Reservoir is located in the approximate direction of the smoke plume, it is beyond the zone of most substantial particle deposition described in TN6 (AECOM, 2019d). As such it is not expected to have been significantly impacted by the fire and has not been considered in further detail as a receptor of concern.

The Barn Elms Wetland Centre is located to the south southwest of the Tower and is not expected to have been affected by particle deposition or debris. As such it has not been considered in further detail as a receptor of concern.

5.4 Potential Pathways

5.4.1 Human Health

Potential human health exposure pathways have been defined based on the land-uses and likely exposure scenarios in the vicinity of the Tower, and taking into account the primary guidance for human health risk assessment in the UK (Jeffries, 2009):

- Ingestion of soil and soil derived indoor dust (P1).
- Inhalation of soil-derived dust (indoor and outdoor) (P2i and P2o).
- Dermal contact with soil (P3).
- Dermal contact with soil derived dust (indoor) (P4).
- Consumption of produce and attached soil (P5).
- Inhalation of vapours (indoor and outdoor) (P6i and P6o).

5.4.2 Controlled Waters

The following potential controlled waters migration pathways are considered to exist taking into account the Site setting:

- Leaching of contaminants from surface soils (P7).
- Vertical migration in the unsaturated zone (P8).
- Lateral migration in the groundwater (P9).
- Run-off to surface water (P10).

5.4.3 Property

5.4.3.1 Pets

Potential exposure pathways for pets are considered to be the same as those for human health as described in Section 1.4.1. The consumption of homegrown produce pathway is considered to be a potential pathway for pets such as rabbits. These animals may be fed produce such as lettuce that is grown on the kitchen garden plots or allotments.

5.4.3.2 Homegrown Produce

Potential exposure pathways that could cause homegrown produce to be affected by the COPC in soil include:

- Deposition and absorption (P11).
- Root uptake (P12).
- Vapour uptake/permeation (P13).

5.4.3.3 Buildings

The exposure pathways that have the potential for COPC in soil to affect building structures

- Leaching and migration in unsaturated zone (P7 – P9) to sub-surface structure (e.g. foundations)
- Chemical Interaction with structural building materials causing corrosion, weakening or other effect that could cause structural failure, substantial damage or substantial interference with right of occupation (P14)[1].

5.5 Contaminant Linkages

Table TN16-04 to Table TN16-08 present the combinations of sources, pathways and receptors identified in Sections 5.2 to 5.4 that form contaminant linkages (CLs) based on the COPC detected in exploratory soil samples.

[1] Statutory guidance for Part 2A explicitly excludes buried services such as sewers, water pipes or electricity cables as receptors under the definition of property.

Table TN16-04. Contaminant Linkages for non and low volatility COPC affecting Human Health Receptors

Source	COPC	Pathway	Receptor
Dust, ash and debris deposited from the smoke plume Larger pieces debris emitted from the fire and deposited more locally to the Tower relatively independently of the smoke plume behaviour	S1 – metals S3 – Dioxins, furans and dioxin-like PCBs S4 – non-dioxin-like PCBs S6 – phosphate esters S7 – cyanides S8 – asbestos and SVF	P1 - Ingestion of soil and indoor dust	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers
		P2 - Inhalation of soil derived dust (indoor and outdoor)	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers
		P3 - Dermal contact with soil (outdoor)	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers
		P4 - Dermal contact with soil derived dust (indoor)	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area
		P5 - Consumption of produce and attached soil	R1 – Residents
		P6i - Inhalation of vapours (indoor)*	None
		P6o - Inhalation of vapours (outdoor)*	None

* Vapour pathways are greyed out as they are not relevant to non and low volatility chemicals

Further consideration of source and pathway validity for COPC groups can also be made, as follows:

COPC Group	Potential significance of source based on exploratory soil sample results	Pathway	Likelihood and potential significance of pathway being present
S1 – Metals (specifically lead and aluminium)	The concentrations of lead reported in the exploratory sampling were not clearly different to expected urban background and there is no current UK guidance to indicate that urban background soil concentrations are likely to result in significant harm. However, given the presence of a small number of individual concentrations exceeding the urban NBC, it is considered that the more elevated concentrations of lead in soil could potentially result in a significant possibility of significant harm. With reference to TN8 and TN17, the reported concentrations from the exploratory sampling and pilot trial exceed the health based C4SLs for residential and allotments land uses in some samples, but do not exceed the commercial C4SL in any sample. As a result, there is not considered to be a source of significant concern with respect to commercial workers. Aluminium is one of the most common naturally occurring elements in soil and rock and there is no evidence of unusually high concentrations around the Tower. The maximum concentration reported in the exploratory sampling was lower than the mean and median background urban soil concentrations reported in TN9. Equally, there is no suggestion that normal soil concentrations would be expected to cause adverse human health effects that could be considered to result in a significant possibility of significant harm and aluminium has been excluded from further consideration as there is no reasonable possibility of significant harm.	P1 - Ingestion of soil and indoor dust	The C4SL report for lead indicates that the soil and dust ingestion pathway contributes between 4.8% (for allotments) and 91% (for commercial) of the total lead exposure in the different land-use scenarios. This pathway is therefore of potential significance in all land-use scenarios. For maintenance and construction workers, the general occupational health protective requirements to reduce exposure to soil and dust is expected to be sufficient to result in the pathway not being significant given the much-reduced frequency and duration of exposure compared to nearby residents. N/A for aluminium. No potentially significant source identified
		P2 - Inhalation of soil derived dust (indoor and outdoor)	No significant pathway for lead. N/A for aluminium. No potentially significant source identified
		P3 - Dermal contact with soil (outdoor)	No significant pathway for lead. N/A for aluminium. No potentially significant source identified
		P4 - Dermal contact with soil derived dust (indoor)	No significant pathway for lead. N/A for aluminium. No potentially significant source identified
		P5 - Consumption of produce and attached soil **N.B. - only potentially applicable to R1 (nearby residents) receptor group**	The C4SL report for lead indicates that the consumption of produce and attached soil pathway contributes to 25% of total exposure for a residential scenario (for allotments) and to 66% of the total exposure for an allotment scenario. This pathway is therefore of potential significance in areas where produce may be grown (allotments, private gardens, community kitchen gardens), but is not of significance in public open space areas or for commercial workers. N/A for aluminium. No potentially significant source identified
		P6i - Inhalation of vapours (indoor)	No significant pathway for lead. N/A for aluminium. No potentially significant source identified
		P6o - Inhalation of vapours (outdoor)	No significant pathway for lead. N/A for aluminium. No potentially significant source identified.
S3 – Dioxins, furans and dioxin-like PCBs	The concentrations reported in the exploratory sampling (TN15) were not clearly different to expected urban background (summarised in TN9), although the reported concentrations in a small proportion of samples exceeded the maximum background concentrations reported in TN9. Eighteen (18) exploratory and pilot study samples were reported at concentrations above the dioxins and furans SGV for a residential land use scenario; however, using the TEF hazard index approach described in TN17, none of the exploratory samples are of concern in a residential scenario. Given there is no consistent evidence of a source from the fire and none of the exploratory sample concentrations exceed the residential hazard index, then dioxins, furans and dioxin-like PCBs are not considered to be a COPC that could reasonably lead to a significant possibility of significant harm.	P1 - Ingestion of soil and indoor dust	N/A. No potentially significant source identified. The Environment Agency's SGV report for dioxins indicates that this is the dominant route of exposure for residential and commercial exposure scenarios (57-95% contribution to overall exposure).
		P2 - Inhalation of soil derived dust (indoor and outdoor)	N/A. No potentially significant source identified, and insignificant route of exposure.
		P3 - Dermal contact with soil (outdoor)	N/A. No potentially significant source identified. The Environment Agency's SGV report for dioxins indicates that this can contribute up to 41% to overall exposure for residential exposure.
		P4 - Dermal contact with soil derived dust (indoor)	
		P5 - Consumption of produce and attached soil **N.B. - only potentially applicable to R1 (nearby residents) receptor group**	N/A. No potentially significant source identified. The Environment Agency's SGV report for dioxins indicates that this can contribute up to 84% of overall exposure for allotment and 17% for residential land uses.
		P6i - Inhalation of vapours (indoor)	N/A. No potentially significant source identified, and an insignificant route of exposure.
		P6o - Inhalation of vapours (outdoor)	N/A. No potentially significant source identified, and an insignificant route of exposure.
S4 – non-dioxin-like PCBs	The concentrations reported in the exploratory sampling (TN15) were below the laboratory detection limit of <5µg/kg in all but 12 of the samples. Of these 12 samples, single PCB compounds in two of them exceeded the maximum urban background concentration (TN9), both by less than a factor of two. Further, both of these samples	P1 - Ingestion of soil and indoor dust	N/A. No potentially significant source identified.
		P2 - Inhalation of soil derived dust (indoor and outdoor)	N/A. No potentially significant source identified.

COPC Group	Potential significance of source based on exploratory soil sample results	Pathway	Likelihood and potential significance of pathway being present
	were collected in the Waynflete Square pilot study, for which TN17 has concluded that the land is likely to meet the definition of Category 4. Given the above, it is considered that there is no evidence of a source in soil surrounding the Tower that could reasonably lead to a significant possibility of significant harm.	P3 - Dermal contact with soil (outdoor)	N/A. No potentially significant source identified.
		P4 - Dermal contact with soil derived dust (indoor)	N/A. No potentially significant source identified
		P5 - Consumption of produce and attached soil **N.B. - only potentially applicable to R1 (nearby residents) receptor group**	N/A. No potentially significant source identified.
		P6i - Inhalation of vapours (indoor)	N/A. No potentially significant source identified.
		P6o - Inhalation of vapours (outdoor)	N/A. No potentially significant source identified.
S6 – phosphate esters	Of the three phosphate ester compounds that could be tested in soil during the exploratory sampling, ATSDR only reported information for TCPP, and did not identify any threshold adverse health effects. As a precautionary approach it may be considered that exposure to phosphate ester compounds could cause significant harm at a sufficiently high dose, although the available information has a high level of uncertainty. TN7 did not identify information relating to the fate and transport of phosphate ester compounds in soils; however, in general the compounds for which information was identified appear likely to degrade in the atmosphere with a half lives from 3 to 12 hours, and in water environments with half lives of 3 to 20 days, predominantly through photochemical and hydrolysis reactions. As such, they might be expected to continue to degrade once deposited on the soil surface if remaining in sunlight, or if in contact with rainwater. During the exploratory sampling, only TCPP, TPP and TEHP could be reported quantitatively in soil. Of these, only TCPP was reported at a concentration above the laboratory MDL in 5 of 68 samples. The maximum concentration of 0.77mg/kg was 220 times lower than the USEPA RSL identified in TN8 for this compound. Given the above, it is considered that there is no evidence of a source in soil surrounding the Tower that could reasonably lead to a significant possibility of significant harm.	P1 - Ingestion of soil and indoor dust	N/A. No potentially significant source identified.
		P2 - Inhalation of soil derived dust (indoor and outdoor)	N/A. No potentially significant source identified.
		P3 - Dermal contact with soil (outdoor)	N/A. No potentially significant source identified.
		P4 - Dermal contact with soil derived dust (indoor)	N/A. No potentially significant source identified
		P5 - Consumption of produce and attached soil **N.B. - only potentially applicable to R1 (nearby residents) receptor group**	N/A. No potentially significant source identified.
		P6i - Inhalation of vapours (indoor)	N/A. No potentially significant source identified.
		P6o - Inhalation of vapours (outdoor)	N/A. No potentially significant source identified.
S7 - cyanides	During the exploratory sampling, free cyanide was reported above the laboratory detection limit in 1 of 68 samples, with total cyanide and thiocyanate reported in 38 and 43 of 68 samples respectively. The spatial pattern of detected concentrations does not suggest any evidence of a fire-related source. The maximum detected concentrations of free and total were all lower than the available screening values identified in TN8; a screening value for thiocyanate was not identified. The single detected concentration of free cyanide of 0.6mg/kg was lower than the Dutch Intervention Value of 20mg/kg, and the maximum total cyanide concentration of 22.2mg/kg was lower than the residential USEPA Regional Screening Level of 78mg/kg. Given the above, it is considered that there is no evidence of a source in soil surrounding the Tower that could reasonably lead to a significant possibility of significant harm.	P1 - Ingestion of soil and indoor dust	N/A. No potentially significant source identified.
		P2 - Inhalation of soil derived dust (indoor and outdoor)	N/A. No potentially significant source identified.
		P3 - Dermal contact with soil (outdoor)	N/A. No potentially significant source identified.
		P4 - Dermal contact with soil derived dust (indoor)	N/A. No potentially significant source identified
		P5 - Consumption of produce and attached soil **N.B. - only potentially applicable to R1 (nearby residents) receptor group**	N/A. No potentially significant source identified.
		P6i - Inhalation of vapours (indoor)	N/A. No potentially significant source identified.
		P6o - Inhalation of vapours (outdoor)	N/A. No potentially significant source identified.
S8 – asbestos and SVF	Asbestos fibres were identified in 21 of 68 samples, with 5 of the 21 samples reported with concentrations exceeding the quantification limit of 0.001% by weight. No spatial pattern indicating source from the Tower fire was identified. The maximum reported concentration (0.083% by weight) from all of the exploratory sampling was identified in a sample collected at Waynflete Square. The risk assessment conducted for the Waynflete Square pilot study (TN17) concluded that this area would be classified as Category 4 and does not pose a significant possibility of significant harm. Given the above, it is considered that there is no evidence of a source in soil surrounding the Tower that has the potential to cause a significant possibility of significant harm. The toxicological review in TN8 did not identify reliable information to indicate that SVFs can cause adverse health effects that would be defined as significant harm, with the majority of discernible health effects described as reversible irritation. Specifically, the ATSDR concluded that occupational exposure was not associated with increased lung problems. Although SVFs were identified in 22 of 68 samples, quantification was not possible. However, given the very low concentrations of asbestos fibres reported, it does not seem likely that exposure from SVFs in soil is likely to exceed the exposure levels in the occupational studies reviewed by ATSDR. Given that the asbestos identified in soils in Waynflete Square was considered to fall within Category 4, it is also reasonably concluded that the reported detections of SVFs in soil in the investigation area either cannot or are unlikely to cause a significant possibility of significant harm.	P1 - Ingestion of soil and indoor dust	N/A. No potentially significant source identified and not a critical exposure pathway for fibres
		P2 - Inhalation of soil derived dust (indoor and outdoor)	N/A. The critical exposure pathway for fibres but no potentially significant source identified
		P3 - Dermal contact with soil (outdoor)	N/A. No potentially significant source identified and not a critical exposure pathway for fibres
		P4 - Dermal contact with soil derived dust (indoor)	N/A. No potentially significant source identified and not a critical exposure pathway for fibres
		P5 - Consumption of produce and attached soil **N.B. - only potentially applicable to R1 (nearby residents) receptor group**	N/A. No potentially significant source identified and not a critical exposure pathway for fibres
		P6i - Inhalation of vapours (indoor)	N/A. No potentially significant source identified and not a critical exposure pathway for fibres
		P6o - Inhalation of vapours (outdoor)	N/A. No potentially significant source identified and not a critical exposure pathway for fibres

Table TN16-05. Contaminant Linkages for PAHs affecting Human Health Receptors

Source	COPC	Pathway	Receptor
Dust, ash and debris deposited from the smoke plume Larger pieces debris emitted from the fire and deposited more locally to the Tower relatively independently of the smoke plume behaviour	S2 – PAHs and related SVOC compounds.	P1 - Ingestion of soil and indoor dust	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers
		P2 - Inhalation of soil derived dust (indoor and outdoor)	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers
		P3 - Dermal contact with soil (outdoor)	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers
		P4 - Dermal contact with soil derived dust (indoor)	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area
		P5 - Consumption of produce and attached soil	R1 – Residents
		P6i - Inhalation of vapours (indoor)*	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area
		P6o - Inhalation of vapours (outdoor)*	R1 - Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers

* Vapour pathways are dashed as they are only relevant to the more volatile PAHs; naphthalene, acenaphthene and acenaphthylene

Further consideration of source and pathway validity for PAHs can also be made, as follows:

Potential significance of soil source based on exploratory soil sample results	Pathway	Likelihood and potential significance of pathway being present
The concentrations reported in the exploratory sampling (TN15) were not clearly different to expected urban background (summarised in TN9) and the risk assessment completed for the Waynflete Square pilot trial (TN17) concluded that PAH concentrations (typically similar to urban background) would fall into Category 4 and not pose a significant possibility of significant harm. However, due to the varied land uses, some of which are more sensitive than Waynflete Square, and due to a small number of individual samples with reported concentrations of benzo(a)pyrene (BaP) above the urban normal background concentration (NBC), the potential significance of the reported PAH concentrations remains unresolved. In addition, reported concentrations of BaP exceeded the residential C4SL in a small number of exploratory samples. The C4SL for BaP is protective of the additive health risks of a number of genotoxic PAH compounds[2], where the PAH mixture is reasonably consistent with that in the coal tar used for the relevant toxicological study. In addition, reported concentrations of dibenzo(ah)anthracene and benzo(ghi)perylene in a small number of exploratory samples exceeded the maximum background concentrations reported in TN9. Although the reported concentrations of naphthalene and acenaphthylene also exceeded the maximum background concentrations reported in TN9 in a small number of exploratory samples, the maximum concentration did not exceed the residential land-use screening criteria and these non-genotoxic PAH compounds are not considered to present a reasonable possibility of significant harm. It is noted that the maximum BaP concentration is considerably lower than the commercial land-use C4SL and therefore commercial workers are not considered to be at potential risk of significant harm or possibility of significant harm. A large number of PAH-related compounds were tentatively identified as semi-volatile organic compounds, although 7,12-dimethylbenzo(a)anthracene, which was specifically identified as a fire effluent COPC, was not reported above laboratory detection limits in any sample tested.	P1 - Ingestion of soil and indoor dust	The S4UL report and the BaP C4SL report both indicate that the soil and dust ingestion pathway has the highest contribution to total exposure for land uses where consumption of produce is not an active pathway. For land-uses where consumption of produce is an active pathway, the significance of ingestion varies depending on the individual PAH compound, but it remains the most significant pathway for all of the genotoxic PAH compounds (of those within the speciated chemical analysis) in residential land use scenarios. Given the mixed land use scenarios across the assessment area, this pathway is therefore of potential significance. For maintenance and construction workers, the general occupational health protective requirements to reduce exposure to soil and dust is expected to be sufficient to result in the pathway not being significant given the much-reduced frequency and duration of exposure compared to nearby residents.
	P2 - Inhalation of soil derived dust (indoor and outdoor)	The S4UL report indicates that for all of the land-use scenarios considered, the dust inhalation pathway (both indoor and outdoor) contributes negligibly to total exposure and as such does not have a reasonable possibility of significant harm.
	P3 - Dermal contact with soil (outdoor) P4 - Dermal contact with soil derived dust (indoor)	The contribution from the dermal contact pathway varies with land-use and individual PAH compound. In the S4UL residential scenarios the contribution is around 5% or less, for allotments it ranged between 0.2% and 25%, for commercial, combined contribution is around 17%, and for the public open space scenarios combined contribution is around 8% (residential) and 17% (parks). Given the mixed land use scenarios across the assessment area, this pathway is therefore of potential significance.
	P5 - Consumption of produce and attached soil **N.B. - only potentially applicable to R1 (nearby residents) receptor group**	The S4UL report indicates that the consumption of produce and attached soil pathway contributes to a significant proportion of total exposure in the residential (between 3.4% and 85%) and allotments (between 36% and 99%) scenarios, indicating that this pathway is of potential significance for all PAH compounds.
	P6i - Inhalation of vapours (indoor)	The deposition scenario means that PCOC from the fire cannot be present beneath buildings and therefore it is not reasonable to consider that indoor inhalation of vapours could be a significant pathway.
	P6o - Inhalation of vapours (outdoor)	The S4UL report indicates that for all of the land-use scenarios considered, the outdoor vapour inhalation pathway contributes negligibly to total exposure and as such does not have a reasonable possibility of significant harm.

[2] Including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenzo(ah)anthracene, indeno(123cd)pyrene

Table TN16-06. Contaminant Linkages for VOCs affecting Human Health Receptors

Source	COPC	Pathway	Receptor
Dust, ash and debris deposited from the smoke plume Larger pieces debris emitted from the fire and deposited more locally to the Tower relatively independently of the smoke plume behaviour	S5 – VOCs (benzene)	P1 - Ingestion of soil and indoor dust	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers
		P2 - Inhalation of soil derived dust (indoor and outdoor)	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers
		P3 - Dermal contact with soil (outdoor)	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers
		P4 - Dermal contact with soil derived dust (indoor)	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area
		P5 - Consumption of produce and attached soil	R1 – Residents
		P6i - Inhalation of vapours (indoor)*	R1 – Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area
		P6o - Inhalation of vapours (outdoor)*	R1 - Residents, R2 - Commercial workers in businesses in the area, R3 - Visitors to the area, R4 - Maintenance and construction workers

Further consideration of source and pathway validity for VOCs can also be made, as follows:

Potential significance of soil source based on exploratory soil sample results	Pathway	Likelihood and potential significance of pathway being present
With the exception of chloromethane, the concentrations reported for individual compounds in the exploratory sampling (TN15) exceeded the laboratory detection limit in a maximum of nine samples (toluene). Chloromethane was reported in 88 of the 93 samples but was addressed in the Waynflete Square risk assessment (TN17). Its presence was attributed to natural biological activity in shallow soils, and indicative of a Category 4 land classification. Toluene was also identified in Waynflete Square samples (at concentrations similar to others where it was detected) with a Category 4 classification. Benzene, the VOC compound identified as COPC related to the fire, was reported at a concentration above the detection limit in one sample at a concentration of 0.096mg/kg. This is lower than the C4SL values summarised in TN8 for all land-uses and suggests that this benzene concentration would also fall into Category 4 and be unlikely to lead to significant harm. Given the above, and the lack of evidence for the other VOCs and VOC TICs of any source in soil related to the fire, it is considered that the identified VOCs in soil are unlikely to lead to a significant possibility of significant harm.	P1 - Ingestion of soil and indoor dust	N/A. No potentially significant source identified.
	P2 - Inhalation of soil derived dust (indoor and outdoor)	N/A. No potentially significant source identified.
	P3 - Dermal contact with soil (outdoor)	N/A. No potentially significant source identified.
	P4 - Dermal contact with soil derived dust (indoor)	N/A. No potentially significant source identified.
	P5 - Consumption of produce and attached soil **N.B. - only potentially applicable to R1 (nearby residents) receptor group**	N/A. No potentially significant source identified.
	P6i - Inhalation of vapours (indoor)	N/A. No potentially significant source identified.
	P6o - Inhalation of vapours (outdoor)	N/A. No potentially significant source identified.

Table TN16-07. Contaminant Linkages for R5, R6 and R7 (pets, homegrown produce, buildings) Property Receptors

Source	COPC	Receptor	Potential significance of the soil source based on the exploratory soil samples	Pathway	Likelihood and potential significance of pathway being present
Dust, ash and debris deposited from the smoke plume Larger pieces debris emitted from the fire and deposited more locally to the Tower relatively independently of the smoke plume behaviour	S1 - Metals (particularly lead, aluminium)	R5 - Pets	The PCOC have the potential to cause significant adverse health effects on domestic pets in much the same way that they do to humans, as noted in table above. Adverse health effects are discussed in TN8 - primarily in relation to human health - although many health effects are similar particularly for mammalian species, and toxicological studies using animals are often used to help derive health criteria for humans.	P1 - Ingestion of soil and indoor dust	The detailed discussion of exposure pathways presented in relation to human health in the tables above applies in general to pet receptors, although the specific proportion of exposure from each pathway will vary. However, it is considered that the key pathways will be the same as for humans (soil and dust ingestion, indoor and outdoor dermal contact, consumption of produce and attached soil). Although many pets may be closer to the ground than the 0-6 year old residential child receptors, outdoor vapour inhalation is not considered to be a significant pathway due to the absence of potentially significant VOC sources.
	S2 - Polycyclic Aromatic Hydrocarbons and associated SVOCs			P2 - Inhalation of soil derived dust (indoor and outdoor)	
	S3 - Dioxins, Furans and dioxin-like PCBs;			P3 - Dermal contact with soil (outdoor)	
	S4 - Non-dioxin-like PCBs			P4 - Dermal contact with soil derived dust (indoor)	
	S5 – VOCs			P5 - Consumption of produce and attached soil	
	S6 - Organophosphorous Compounds (mainly TEHP)			P6i - Inhalation of vapours (indoor)	
	S7 – Cyanides			P6o - Inhalation of vapours	

Source	COPC	Receptor	Potential significance of the soil source based on the exploratory soil samples	Pathway	Likelihood and potential significance of pathway being present
	S8 - Fibres (asbestos and SVF)			(outdoor)	
	S1 - Metals (particularly lead, aluminium) S2 - Polycyclic Aromatic Hydrocarbons and associated SVOCs S3 - Dioxins, Furans and dioxin-like PCBs; S4 - Non-dioxin-like PCBs S5 – VOCs S6 - Organophosphorous Compounds (mainly TEHP) S7 – Cyanides	R6 - Homegrown Produce	Significant damage to homegrown produce could occur through uptake of COPC present in the soil if they are present at sufficiently high concentrations. It is considered that there is a reasonable possibility that the main COPC identified widely across the investigation area in the exploratory sampling, and for which the PRA has identified a potential SCL in relation to human health (S1, S2) could cause significant harm, or the significant possibility of such harm, to homegrown crops or crops on allotments and in community kitchen gardens. As noted for human health receptors, these COPC have sufficient potential for plant uptake to result in a significant exposure contribution for human health effects via consumption of homegrown produce, therefore they are considered to be of concern as COPC for causing significant harm to the produce itself.	P11 - Deposition onto homegrown produce and absorption P12 - Root uptake of contaminants to homegrown produce from surrounding soil P13 - Vapour uptake / permeation	It is likely that where a COPC is present in soils in allotments, private gardens and community kitchen gardens the root uptake pathway will be active. The tables for human health CLs indicate that plant uptake is an active pathway to some extent for COPCs S1 and S2 and therefore at this stage it is considered that there is a possibility of adverse effects on produce. Whilst dust deposition and absorption is conceptually possible, it is considered unlikely to be a potentially significant pathway given that the main COPC are expected to bind relatively strongly with the dust particles and are unlikely to be absorbed to any great extent through the leaves. The vapour absorption pathway is not considered likely to be significant given the rare identification of VOCs in the exploratory sampling and lack of evidence of any VOC source from the fire.
Dust, ash and debris deposited from the smoke plume Larger pieces debris emitted from the fire and deposited more locally to the Tower relatively independently of the smoke plume behaviour Firewater from the firefighting effort that flowed to surface water drains, infiltrated to ground in the immediate vicinity of the Tower, and was pumped from the basement to the Thames Water sewer	S1 - Metals (particularly lead, aluminium) S2 - Polycyclic Aromatic Hydrocarbons and associated SVOCs + TICs; S3 - Dioxins, Furans and dioxin-like PCBs; S4 - Non-dioxin-like PCBs S5 – VOCs S6 - Organophosphorous Compounds (mainly TEHP) S7 – Cyanides	R7 - Buildings (above ground and underground)	The identified COPC would not be expected to cause significant (if any) damage to buildings by direct contact, particularly at the concentrations typically identified with the expectation that they are generally limited to surface and near surface soil. UK guidance associated with risks to building structures from land contamination (or natural ground conditions) includes assessments for ground gas (e.g. CIRIA C665) and attack on concrete (e.g. BRE Special Digest 1) by low pH, sulphate, magnesium, ammonium and chloride ions. The BRE SD1 guidance notes that phenols are the most commonly encountered troublesome group of organic compounds with respect to risks to concrete, however, the guidance notes that their concentration is rarely a concern for attacks on hardened concrete and no generic criteria are provided, whereas they are provided for sulphate and pH. The exploratory sampling has not identified phenols in excess of laboratory MDLs to any extent that would suggest they are a fire-related COPC. Since the key UK guidance does not explicitly consider that COPC groups S1, S2 and S3 are of particular concern for building receptors, and given they have not been identified at concentrations noticeably above urban background, they are considered to be unlikely to have the potential to cause significant harm to building receptors.	Direct contact with structures causing corrosion or other damage (P14) Leaching and migration in unsaturated zone to below ground receptor (P7-P8)	As discussed in the 'hazard and severity' column, there is not considered to be a source of PCOC that is of concern for building receptors.

Table TN16-08. Contaminant Linkages for R8 and R9 (groundwater and surface water) Receptors

Source	COPC	Receptor	Associated Hazard and Severity (Source / Receptor interaction discussion)	Pathway	Likelihood and potential significance of pathway being present
Dust, ash and debris deposited from the smoke plume Larger pieces debris emitted from the fire and deposited more locally to the Tower relatively independently of the	S1 - Metals (particularly lead, aluminium) S2 - Polycyclic Aromatic Hydrocarbons and associated SVOCs + TICs	R8 - Langley silt (Secondary-A Aquifer)	All of the listed COPC have the potential to cause pollution of sensitive controlled waters through the potential entry of hazardous or non-hazardous substances into the controlled water receptor. However, non-dioxin-like PCBs, benzene, organophosphorous compounds and free cyanide were reported above the laboratory MDL in a very small proportion of samples and are not considered	P7 - Leaching of contaminants from surface soils P8 - Vertical migration in the unsaturated zone P9 - Lateral migration in groundwater	Given the very shallow deposition of the COPC on the soil surface it is considered unlikely that the combination of pathways required to cause pollution of the Langley Silt aquifer will occur to any significant extent given the requirement for partitioning into the dissolved phased followed by substantial vertical migration through the unsaturated zone. Many of the PCOC - particularly those that were identified on a more widespread basis in the exploratory sampling - have relatively low mobility in soil, and those that partition to some extent into the dissolved phase will be retarded and biodegraded during vertical migration towards the groundwater.

Source	COPC	Receptor	Associated Hazard and Severity (Source / Receptor interaction discussion)	Pathway	Likelihood and potential significance of pathway being present
smoke plume behaviour	S3 - Dioxins, Furans and dioxin-like PCBs; S4 - Non-dioxin-like PCBs		to represent a source with the potential to cause measurable pollution in controlled waters.		
	S5 - VOCs S6 - Organophosphorous Compounds (mainly TEHP) S7 – Cyanides	R9 - Surface waters (River Thames to south, Grand Union Canal to North, Lakes in Kensington Gardens and Hyde Park to the east)		P9 - Lateral migration in groundwater P10 - Deposition / Run-off to surface waters	While the River Thames, Grand Union Canal and the Lakes in Kensington Gardens and Hyde park are potentially significant receptors, the required lateral migration in groundwater pathway is not considered to be significant given that the discussion above has concluded that pollution of the aquifer underlying the affected area is unlikely to occur. In addition, run-off to surface waters is not considered to be a long-term pathway of concern as any areas where run-off is occurring will have quickly removed any deposited dust/ash on the soil surface and the effect would have been highly transitory. Direct deposition on flowing waterways would not be expected to be a significant concern due to the ongoing flow and downstream migration - combined with dilution - of any COPC falling on the surface of the water in such a short timescale. For static waterbodies, there is some potential for any debris, dust and ash falling on the surface of the water to sink through the water column, raising the potential for partitioning of hydrophilic COPC into the dissolved phase of the surface water. Less hydrophilic COPC could fall to the sediment at the base of surface water body and remain within the sediment bound to organic matter. However, given the very transient short-term timeframe of the source and the lack of major sensitive static surface water bodies within the main deposition area (the Grand Union Canal will have some flow) it is considered that these linkages do not pose a reasonable possibility of significant pollution.

Pets, property and controlled water (ground water and surface water regulated by the Environment Agency) receptor classes are not critical receptors for the following reasons:

- The human health risk assessment process focuses on sensitive land-uses and the most sensitive receptors that characterise these land-uses. This critical receptor is children aged 0-6 years old. It is reasonable to conclude that if 0-6 year old children are not at risk of significant harm, then pets are not at risk of significant harm either.
- The COPC being considered in this assessment are very unlikely to damage buildings.
- The Environment Agency has confirmed that it does not consider controlled waters to be at risk because of the geology in the area and the distance to relevant receptors.
- Risks to homegrown produce intended for personal consumption are directly accounted for in the assessment of human health.

5.6 Potential significance of CLs and prioritisation of further assessment

The Part 2A statutory guidance includes two tests of significance with respect to the assessment of contaminant linkages associated with human health. Paragraph 2.13 states that if at any stage the local authority considers, on the basis of the information obtained from inspection activities, that there is no longer a reasonable possibility that a significant contaminant linkage exists on the land, the authority should not carry out any further inspection in relation to that linkage. Paragraphs 4.4-4.27 define significant harm and significant possibility of significant harm and four categories of land; categories 1-4. Category 4 is associated with a range of risk from none to low. Category 3 is associated with a range of risk from “not low” to not unacceptable. Categories 1 and 2 are associated with an unacceptable risk. These categories can be placed in a matrix that assists in prioritising which contaminant linkages should be assessed further. This matrix is illustrated below:

Table TN16-09. Prioritisation Matrix

Possibility of SCL being present	Risk	Possible land category	Priority
Less than reasonable possibility	None (e.g. no CL)	4	Lowest
Less than reasonable possibility	Low	4	
Reasonable possibility	Not Low	3	
More than reasonable possibility	Unacceptable (on a precautionary basis)	2	
High possibility	Unacceptable	1	Highest

Factors that can be used to assess the possibility of the presence of an SCL include:

- Frequency and spatial distribution of COPC detection in soil samples
- Proportion of COPC concentrations that exceed generic screening criteria (GSC)
- The degree to which COPC concentrations exceed GSC[3]
- Comparison of reported COPC soil concentrations with local, regional and national background levels
- The level of confidence in the available data (what uncertainties or data gaps remain)

[3] Footnote 2 of paragraph 3.29 of the statutory guidance states that the level of risk posed by land contamination will depend on more than simply the amount of contaminant in the soil; it will also depend on what form the contaminants take, where they are in the soil, the efficiency of the pathway by which receptors may be exposed, the sensitivity of receptors, the likely degree and duration of exposure, and the dose-response relationship of that contaminant. These factors will vary from case to case, sometimes very substantially. Footnote 3 goes on to state that GSC (because of the variability in how they are derived) can be exceeded by a substantial degree (sometimes by orders of magnitude) but in other cases there may be a considerably smaller margin and in some cases it may be that GSC are only exceeded by a few times for land to fall outside of Category 4.

These factors can be translated into the prioritisation matrix in Table TN16-09 above as shown in Table TN16-10 below, which is taken directly from the EA/PHE Analysis and Interpretation Methodology for the Soil Investigation at Grenfell Tower (v8_2).

Table TN16-10. Contaminant linkage prioritisation using soil data*

Detection and spatial distribution of COPC in soil		Proportion of COPC concentrations above GSC		Comparison with normal levels in urban soils	Linkage Ranking
Most if not all results less than suitable method detection limits (MDL) and/or sample depth and location inconsistent with potential exposure pathways		N/A		N/A	No further investigation required (evidence suggests that there is no reasonable possibility of a significant contaminant linkage)
Most results above MDL and sample depth and location consistent with potential exposure pathways, but no indication of spatial patterns or hot spot consistent with fire emissions		All results at or below a relevant GSC		All results considered to be within typical background levels	Low priority for further investigation (evidence suggests that there is unlikely to be a reasonable possibility of a significant contaminant linkage)
Most results above MDL and sample depth and location consistent with potential exposure pathways, but no indication of spatial patterns or hot spot consistent with fire emissions	And	Some results well-above a relevant GSC	And	Some results above typical background levels	Medium priority for targeted further investigation (evidence suggests there could be a reasonable possibility of a significant contaminant linkage)
Results above MDL and sample depth and location consistent with potential exposure pathways. Results indicate a strong spatial pattern and/or hot spot(s) that are consistent with fire emissions		Majority of results above relevant GSC and many results well-above a relevant GSC		Majority of results above typical background levels	High priority for further investigation (evidence suggests there could be a reasonable possibility of a significant contaminant linkage)
Results above MDL and sample depth and location consistent with potential exposure pathways. Results indicate of a strong spatial pattern or hot spot that is consistent with fire emissions		Majority of results well-above a relevant GSC		Majority of results well-above typical background levels	Highest priority for further investigation (evidence suggests there is a reasonable possibility of a significant contaminant linkage)

* Not shown in the above matrix is the assessment of uncertainty and the identification of information gaps for each contaminant linkage. If confidence in the assessment of a contaminant linkage is low, this may indicate the need for further investigation.

Table TN16-11 adopts this prioritisation approach for the exploratory soil data obtained at Stage 1.

Table TN16-11. Contaminant linkage prioritisation using soil data

COPC Group	Detection and spatial distribution of COPC in soil	Proportion of COPC concentrations above GSC	Comparison with normal levels in urban soils	Linkage Ranking	Uncertainty
S1 – Metals (specifically lead)	Detected in all soil samples	40 of 68 samples. Some sample results well above GSC.	Some concentrations higher than NBC	Medium	Reasonable level of uncertainty in what is a representative concentration given the high concentrations detected in a small number of samples
Other metals	Detected in all soil samples			Low	Lower level of uncertainty compared to lead given the lower exceedances (< 2x) of the GSC
Arsenic,		3 of 68 (all < 2 x GSC)	Some concentrations higher than NBC		
barium,		5 of 68 (all ≤ 2 x GSC)	Likely to be within normal range		
beryllium,		13 of 68 (all < 2 x GSC)	Likely to be within normal range		
cadmium and		2 of 68 (both ~ 2 x GSC)	Some concentrations higher than NBC		
zinc		1 of 68 (all < 2 x GSC)	Likely to be within normal range		
S2 – PAHs	Detected in all soil samples	Small	Some concentrations higher than NBC	Medium*	Concentrations reasonably consistent – lower level of uncertainty
Other SVOCs – cresols	Detected in very few samples	Only 2 samples	Not available	Low	Very few detections - uncertainty as to why detected in locations and not others
S3 – Dioxins, furans and dioxin-like PCBs	Detected in all soil samples	None (based on WHO 2005 TEQ approach and hazard index calculation – refer to TN17 for further detail)	Likely to be within normal range	Low	Concentrations reasonably consistent – lower level of uncertainty
S4 – Non-dioxin-like PCBs	Detected in very few samples	Only 1 sample	Likely to be within normal range	Lowest	Very few detections - uncertainty as to why detected in locations and not others
S5 – VOCs	Detected in very few samples (exception being chloromethane)	None (exception being chloromethane)	Not available	Lowest	Concentrations reasonably consistent – lower level of uncertainty

Chloromethane	Detected in all but six soil samples	25 of 68 samples (with 8 > 2 x GSC and maximum concentration at 5 x GSC)	Not available – however, TN17 notes that chloromethane is likely to be naturally occurring in topsoil due to microbial activity	Low**	Concentrations reasonably consistent – lower level of uncertainty
S6 – Organophosphorous compounds	Detected in very few samples	None	Not available	Lowest	Very few detections - uncertainty as to why detected in locations and not others
S7- Cyanides	Detected in majority of soil samples	None	Not available	Low	Concentrations reasonably consistent – lower level of uncertainty
S8 – Asbestos and SVF	Erratically detected in 20 of 68 samples	None	Not available	Lowest	Erratic nature of detection results in higher uncertainty in spatial distribution

* Initial screening for genotoxic PAHs within the full suite of 16 speciated compounds (the US EPA priority 16 compounds) was carried out on a precautionary basis using S4UL values for individual PAHs and for benzo[a]pyrene as a surrogate marker. The published C4SL for benzo[a]pyrene only adopts the surrogate marker approach for the other genotoxic PAHs (there are no equivalent C4SLs for the individual PAH substances), and the C4SL is a higher value than the equivalent surrogate marker S4UL. If the C4SL were adopted in preference to the S4UL then the priority for further investigation would probably be lower than medium.

** the frequent detections of chloromethane and samples reported at concentrations > 2 x GSC indicate that chloromethane could fall into the medium priority category. However, chloromethane was considered in more detail in TN17 and it was concluded that the reported concentrations would place chloromethane linkages in Category 4 (i.e. no more than low risk). This is particularly due to the absence of an indoor vapour inhalation pathway, which is the risk driving exposure pathway for chloromethane. Discussion in TN17 indicates that a screening criteria calculated with the indoor vapour inhalation pathway excluded would be orders of magnitude higher than the concentrations reported in soil during exploratory sampling. As a result, chloromethane has been shifted to the low priority category.

5.7 Summary Conceptual Site Model

Following completion of the PRA, a number of CLs have been identified for which it is considered that there remains a reasonable possibility of a significant CL to human health. This does not imply that an unacceptable risk necessarily exists, rather that further assessment should be considered in order to more reliably assess the potential significance of these linkages.

Based on the prioritisation matrix shown in Table TN16-10, these linkages are summarised in Table TN16-12 and identify the potential SCLs that could be considered for further assessment. This includes linkages with a medium, high or highest priority (as defined in Table TN16-10) plus those considered to have a sufficiently high level of uncertainty that further investigation should be considered on the uncertainty basis alone.

At this stage, COPCs have been kept in groups of similar compounds to avoid over-complication of the summary table.

Table TN16-12. Summary of Contaminant Linkages that could warrant further assessment

Sources		Pathways		Receptors	
S1	Lead	P1	Ingestion of soil and indoor dust	R1	Residents
		P5	Consumption of produce and attached soil		
S2	Genotoxic Polycyclic Aromatic Hydrocarbons and associated SVOCs (represented by BaP as a surrogate marker)	P1	Ingestion of soil and indoor dust	R1	Residents
		P3	Dermal contact with soil (outdoor)		
		P4	Dermal contact with soil derived dust (indoor)		
		P5	Consumption of produce and attached soil		
S8	Asbestos	P2	Inhalation of soil derived dust (indoor and outdoor)	R1	Residents

[Those linkages that are greyed out are included on the basis of reducing uncertainty as opposed to the reasonable possibility of a SCL]

6. Conclusions

The preliminary risk assessment has identified a number of contaminant linkages whereby there is a reasonable possibility that they could be classified as significant contaminant linkages in accordance with the statutory guidance.

Further investigation and assessment of these potential SCLs, summarised in Table TN16-12, should be considered to provide sufficient information, and sufficiently reduce uncertainty, such that the linkages can be evaluated to decide whether they are causing significant harm or a significant possibility of such harm, or not.

6.1 Source Area

The area within which contamination related to the Grenfell Tower fire may exist is not straightforward to define but is anticipated to extend to greatest distance in the north-western direction where falling dust/ash was observed on allotments in the London Borough of Brent approximately 3.5km northwest of the Tower. This observation was consistent with the Met Office smoke plume modelling report that has been reviewed by AECOM (AECOM, 2019d) which identified the zone of greatest deposition in this area. In other directions, there is no evidence of potential sources directly related to the fire being present beyond a distance of between approximately 300m and 500m from the Tower.

6.2 Relevant Chemicals of Potential Concern

The identified chemicals of potential concern include:

- Lead; and
- Poly-cyclic aromatic hydrocarbon compounds (with coal tar type toxicity) and similar associated semi-volatile organic compounds

Asbestos has been identified as a chemical of potential concern with high uncertainty in the evaluation of the human health linkage, and on this basis could be considered for further investigation.

6.3 Relevant Receptors

The identified receptors include local residents (including very frequent visitors to the area), including those in properties with gardens, those in properties without gardens, and those with access to plots in community kitchen gardens or allotments. It is also expected that such residents will utilise public amenities such as parks and other public spaces or be working locally or attending nearby school during times when they are not at home.

6.4 Relevant Pathways

The identified exposure pathways include:

- Soil and dust ingestion;
- Dermal contact;
- Consumption of homegrown produce; and
- Dust inhalation (for asbestos fibres only).

7. References

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AECOM. (2019e). *Grenfell Investigation into Potential Land Contamination Impacts. Technical Note 09: Urban Background Concentrations.*
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