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Analytical Report Number : 19-39051

Project / Site name:	Nestles Avenue, Hayes and Harlington, London	**Samples received on:**	25/04/2019
Your job number:	J19090	**Samples instructed on:**	26/04/2019
Your order number:	J19090	**Analysis completed by:**	07/05/2019
Report Issue Number:	1	**Report issued on:**	07/05/2019
Samples Analysed:	13 soil samples - 1 bulk sample		

Signed: ______________

Zina Abdul Razzak
Assistant Quality/Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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Project / Site name: Nestles Avenue, Hayes and Harlington, London
Your Order No: J19090

Lab Sample Number				1210377	1210378	1210379	1210380	1210381
Sample Reference				BH13	BH15	BH7	BH10	BH16
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.40	0.40	0.30	0.30
Date Sampled				18/04/2019	23/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	15	13	13	11	17
Total mass of sample received	kg	0.001	NONE	1.6	1.8	1.4	1.5	1.1
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	9.0	7.8	11.0	8.1	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	1100	910	2700	680	2000
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.15	0.13	0.15	0.047	0.37
Sulphide	mg/kg	1	MCERTS	68	1.0	1.2	2.2	40
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	35	13	20	21	32
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.2	1.7	0.9	1.7	3.2
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.96	0.61	0.93	0.71	1.5
Anthracene	mg/kg	0.05	MCERTS	0.19	0.14	0.22	0.19	0.32
Fluoranthene	mg/kg	0.05	MCERTS	2.1	1.4	2.7	2.1	3.4
Pyrene	mg/kg	0.05	MCERTS	1.9	1.4	2.4	1.9	3.2
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.96	0.91	1.4	1.1	1.9
Chrysene	mg/kg	0.05	MCERTS	0.96	0.71	1.1	0.96	1.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.1	1.0	1.6	1.6	2.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.83	0.59	0.74	0.57	0.91
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.99	0.78	1.3	0.96	1.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.43	0.43	0.53	0.53	0.48
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.72	0.58	0.83	0.67	1.0
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	11.1	8.54	13.6	11.3	18.8

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Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.40	0.40	0.30	0.30
Date Sampled				18/04/2019	23/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	30	18	16	19
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	0.4	0.7
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	24	24	30	30	30
Copper (aqua regia extractable)	mg/kg	1	MCERTS	70	99	74	85	150
Lead (aqua regia extractable)	mg/kg	1	MCERTS	210	240	190	200	220
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.0	1.4	0.9	3.3	0.6
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	25	24	30	52
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	1.4	2.1
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	87	150	140	190	320
Monoaromatics & Oxygenates								
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	130	45	45	13	54
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	5.4	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	13	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	33	12	14	4.8	14
TPH (C21 - C35)	mg/kg	1	MCERTS	71	30	30	7.7	38

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Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.40	0.40	0.30	0.30
Date Sampled				18/04/2019	23/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

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Date Sampled				18/04/2019	23/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenol	mg/kg	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Isophorone	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	0.96	0.61	0.93	0.71	1.5
Anthracene	mg/kg	0.05	MCERTS	0.19	0.14	0.22	0.19	0.32
Carbazole	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Fluoranthene	mg/kg	0.05	MCERTS	2.1	1.4	2.7	2.1	3.4
Pyrene	mg/kg	0.05	MCERTS	1.9	1.4	2.4	1.9	3.2
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.96	0.91	1.4	1.1	1.9
Chrysene	mg/kg	0.05	MCERTS	0.96	0.71	1.1	0.96	1.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.1	1.0	1.6	1.6	2.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.83	0.59	0.74	0.57	0.91
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.99	0.78	1.3	0.96	1.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.43	0.43	0.53	0.53	0.48
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.72	0.58	0.83	0.67	1.0

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Lab Sample Number				1210377	1210378	1210379	1210380	1210381
Sample Reference				BH13	BH15	BH7	BH10	BH16
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.40	0.40	0.30	0.30
Date Sampled				18/04/2019	23/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	< 0.007	-	< 0.007	-	-

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Project / Site name: Nestles Avenue, Hayes and Harlington, London
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Lab Sample Number				1210382	1210383	1210384	1210385	1210386
Sample Reference				BH18	BH19	BH17	BH20	BH21
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.50	0.30	0.20	0.40
Date Sampled				18/04/2019	18/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	18	11	13	12	16
Total mass of sample received	kg	0.001	NONE	1.6	1.3	1.3	1.5	2.0
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.5	7.7	8.3	8.3	7.9
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	3400	680	1500	2700	1300
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1.2	0.13	0.20	0.91	0.32
Sulphide	mg/kg	1	MCERTS	2.3	< 1.0	13	1.2	1.4
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	14	5.3	8.3	22	30
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.9	1.1	0.9	2.1	2.0
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.4	1.2	0.46	2.5	1.5
Anthracene	mg/kg	0.05	MCERTS	0.32	0.31	< 0.05	0.97	0.28
Fluoranthene	mg/kg	0.05	MCERTS	5.6	3.1	1.2	6.4	4.0
Pyrene	mg/kg	0.05	MCERTS	5.6	3.0	1.1	5.5	3.5
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.6	1.6	0.64	3.0	2.0
Chrysene	mg/kg	0.05	MCERTS	2.6	1.7	0.53	2.7	1.9
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.4	2.0	0.71	3.5	2.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.8	1.5	0.33	1.7	1.7
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.0	2.1	0.46	2.8	2.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.4	0.90	0.23	1.2	1.1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.32	0.29	< 0.05	< 0.05	0.37
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.9	1.2	0.36	1.8	1.6
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	29.9	19.0	5.97	32.1	23.0

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Lab Sample Number				1210382	1210383	1210384	1210385	1210386
Sample Reference				BH18	BH19	BH17	BH20	BH21
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.50	0.30	0.20	0.40
Date Sampled				18/04/2019	18/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	19	17	23	14	16
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	< 0.2	0.4	< 0.2	0.3
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	28	29	30	21
Copper (aqua regia extractable)	mg/kg	1	MCERTS	87	53	79	170	98
Lead (aqua regia extractable)	mg/kg	1	MCERTS	1900	160	350	140	300
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.5	0.7	1.3	0.6	2.0
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	34	27	28	35	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	260	100	150	120	130
Monoaromatics & Oxygenates								
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	150	88	59	3100	150
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	< 0.001	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	< 0.001	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	< 0.001	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	< 1.0	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	20	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	470	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	1100	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	1600	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	< 0.001	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	< 0.001	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	< 0.001	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	< 1.0	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	3.1	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	330	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	1100	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	1400	-
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	5.9	< 4.0	23	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	42	28	15	800	26
TPH (C21 - C35)	mg/kg	1	MCERTS	100	53	42	2200	110

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Lab Sample Number				1210382	1210383	1210384	1210385	1210386
Sample Reference				BH18	BH19	BH17	BH20	BH21
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.50	0.30	0.20	0.40
Date Sampled				18/04/2019	18/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

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Project / Site name: Nestles Avenue, Hayes and Harlington, London
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Lab Sample Number				1210382	1210383	1210384	1210385	1210386
Sample Reference				BH18	BH19	BH17	BH20	BH21
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.50	0.30	0.20	0.40
Date Sampled				18/04/2019	18/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenol	mg/kg	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Isophorone	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	1.4	1.2	0.46	2.5	1.5
Anthracene	mg/kg	0.05	MCERTS	0.32	0.31	< 0.05	0.97	0.28
Carbazole	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Fluoranthene	mg/kg	0.05	MCERTS	5.6	3.1	1.2	6.4	4.0
Pyrene	mg/kg	0.05	MCERTS	5.6	3.0	1.1	5.5	3.5
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.6	1.6	0.64	3.0	2.0
Chrysene	mg/kg	0.05	MCERTS	2.6	1.7	0.53	2.7	1.9
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.4	2.0	0.71	3.5	2.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.8	1.5	0.33	1.7	1.7
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.0	2.1	0.46	2.8	2.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.4	0.90	0.23	1.2	1.1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.32	0.29	< 0.05	< 0.05	0.37
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.9	1.2	0.36	1.8	1.6

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Project / Site name: Nestles Avenue, Hayes and Harlington, London
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Lab Sample Number				1210382	1210383	1210384	1210385	1210386
Sample Reference				BH18	BH19	BH17	BH20	BH21
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.50	0.30	0.20	0.40
Date Sampled				18/04/2019	18/04/2019	18/04/2019	18/04/2019	18/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	-	< 0.001	< 0.001	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	< 0.001	< 0.001	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	< 0.001	< 0.001	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	< 0.001	< 0.001	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	< 0.001	< 0.001	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	< 0.001	< 0.001	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	< 0.001	< 0.001	-
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	-	-	< 0.007	< 0.007	-

Analytical Report Number: 19-39051

Project / Site name: Nestles Avenue, Hayes and Harlington, London
Your Order No: J19090

Lab Sample Number				1210387	1210388	1210389		
Sample Reference				BH11	BH8	BH14		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	0.60	0.30		
Date Sampled				23/04/2019	18/04/2019	23/04/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	17	18	14		
Total mass of sample received	kg	0.001	NONE	1.6	1.8	2.0		
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.0	8.3	7.8		
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Total Sulphate as SO_4	mg/kg	50	MCERTS	760	890	1200		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.12	0.26	0.33		
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	3.9	12	24		
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.5	1.0	0.7		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Phenanthrene	mg/kg	0.05	MCERTS	1.5	1.3	0.67		
Anthracene	mg/kg	0.05	MCERTS	0.30	0.27	0.19		
Fluoranthene	mg/kg	0.05	MCERTS	3.4	3.1	2.5		
Pyrene	mg/kg	0.05	MCERTS	3.1	2.8	2.3		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.5	1.4	1.6		
Chrysene	mg/kg	0.05	MCERTS	1.5	1.2	1.4		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.0	1.6	1.8		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.1	0.92	1.1		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.7	1.3	1.6		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.84	0.53	0.65		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.20	< 0.05	0.20		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.1	0.77	0.84		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	18.2	15.1	14.7		

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Project / Site name: Nestles Avenue, Hayes and Harlington, London
Your Order No: J19090

Lab Sample Number				1210387	1210388	1210389		
Sample Reference				BH11	BH8	BH14		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	0.60	0.30		
Date Sampled				23/04/2019	18/04/2019	23/04/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	19	17	13		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.2	< 0.2	< 0.2		
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	23	18	36		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	74	52	40		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	320	200	380		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	2.4	1.1	3.0		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	16	30		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	76	140		
Monoaromatics & Oxygenates								
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	39	32	90		
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	4.1		
TPH (C16 - C21)	mg/kg	1	MCERTS	8.6	13	27		
TPH (C21 - C35)	mg/kg	1	MCERTS	30	16	54		

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Project / Site name: Nestles Avenue, Hayes and Harlington, London
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Lab Sample Number				1210387	1210388	1210389		
Sample Reference				BH11	BH8	BH14		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	0.60	0.30		
Date Sampled				23/04/2019	18/04/2019	23/04/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0		
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0		
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0		
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0		
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0		
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0		

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Lab Sample Number				1210387	1210388	1210389		
Sample Reference				BH11	BH8	BH14		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	0.60	0.30		
Date Sampled				23/04/2019	18/04/2019	23/04/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1		
Phenol	mg/kg	0.2	ISO 17025	< 0.2	< 0.2	< 0.2		
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	< 0.2	< 0.2		
Isophorone	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1		
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1		
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1		
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3		
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Phenanthrene	mg/kg	0.05	MCERTS	1.5	1.3	0.67		
Anthracene	mg/kg	0.05	MCERTS	0.30	0.27	0.19		
Carbazole	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Fluoranthene	mg/kg	0.05	MCERTS	3.4	3.1	2.5		
Pyrene	mg/kg	0.05	MCERTS	3.1	2.8	2.3		
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.5	1.4	1.6		
Chrysene	mg/kg	0.05	MCERTS	1.5	1.2	1.4		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.0	1.6	1.8		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.1	0.92	1.1		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.7	1.3	1.6		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.84	0.53	0.65		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.20	< 0.05	0.20		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.1	0.77	0.84		

Analytical Report Number: 19-39051

Project / Site name: Nestles Avenue, Hayes and Harlington, London
Your Order No: J19090

Lab Sample Number				1210387	1210388	1210389		
Sample Reference				BH11	BH8	BH14		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	0.60	0.30		
Date Sampled				23/04/2019	18/04/2019	23/04/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001		
PCB Congener 52	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001		
PCB Congener 101	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001		
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001		
PCB Congener 138	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001		
PCB Congener 153	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001		
PCB Congener 180	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001		
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	< 0.007	-	< 0.007		

Analytical Report Number: 19-39051

Project / Site name: Nestles Avenue, Hayes and Harlington, London

Lab Sample Number				1210390				
Sample Reference				BH8				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				23/04/2019				
Time Taken				None Supplied				
Analytical Parameter (Bulk Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Asbestos Identification Name	Type	N/A	ISO 17025	Chrysotile-Hard/Cement Type Material				

Analytical Report Number : 19-39051

Project / Site name: Nestles Avenue, Hayes and Harlington, London

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1210377	BH13	None Supplied	0.40	Brown clay and sand with gravel.
1210378	BH15	None Supplied	0.40	Brown loam and clay with gravel and brick.
1210379	BH7	None Supplied	0.40	Brown clay and sand with gravel.
1210380	BH10	None Supplied	0.30	Brown clay and sand with gravel.
1210381	BH16	None Supplied	0.30	Brown sand with clinker and rubble.
1210382	BH18	None Supplied	0.40	Brown clay and sand with gravel.
1210383	BH19	None Supplied	0.50	Brown clay and sand with gravel and brick.
1210384	BH17	None Supplied	0.30	Brown clay and sand with rubble.
1210385	BH20	None Supplied	0.20	Brown clay and sand.
1210386	BH21	None Supplied	0.40	Brown clay and sand.
1210387	BH11	None Supplied	0.50	Brown clay.
1210388	BH8	None Supplied	0.60	Brown clay and sand with chalk.
1210389	BH14	None Supplied	0.30	Brown clay and sand with rubble.

Analytical Report Number : 19-39051

Project / Site name: Nestles Avenue, Hayes and Harlington, London

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Bulks	Asbestos Identification in bulk material with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	W	ISO 17025
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS

Analytical Report Number : 19-39051

Project / Site name: Nestles Avenue, Hayes and Harlington, London

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
BH10		S	19-39051	1210380	c	Sulphide in soil	L010-PL	c
BH10		S	19-39051	1210380	c	Total cyanide in soil	L080-PL	c
BH13		S	19-39051	1210377	c	Sulphide in soil	L010-PL	c
BH13		S	19-39051	1210377	c	Total cyanide in soil	L080-PL	c
BH16		S	19-39051	1210381	c	Sulphide in soil	L010-PL	c
BH16		S	19-39051	1210381	c	Total cyanide in soil	L080-PL	c
BH17		S	19-39051	1210384	c	Sulphide in soil	L010-PL	c
BH17		S	19-39051	1210384	c	Total cyanide in soil	L080-PL	c
BH18		S	19-39051	1210382	c	Sulphide in soil	L010-PL	c
BH18		S	19-39051	1210382	c	Total cyanide in soil	L080-PL	c
BH19		S	19-39051	1210383	c	Sulphide in soil	L010-PL	c
BH19		S	19-39051	1210383	c	Total cyanide in soil	L080-PL	c
BH20		S	19-39051	1210385	c	Sulphide in soil	L010-PL	c
BH20		S	19-39051	1210385	c	Total cyanide in soil	L080-PL	c
BH21		S	19-39051	1210386	c	Sulphide in soil	L010-PL	c
BH21		S	19-39051	1210386	c	Total cyanide in soil	L080-PL	c
BH7		S	19-39051	1210379	c	Sulphide in soil	L010-PL	c
BH7		S	19-39051	1210379	c	Total cyanide in soil	L080-PL	c
BH8		S	19-39051	1210388	c	Sulphide in soil	L010-PL	c
BH8		S	19-39051	1210388	c	Total cyanide in soil	L080-PL	c

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

1ST LINE DEFENCE

Detailed Unexploded Ordnance (UXO) Risk Assessment

Project Name	233-236 Nestles Avenue
Client	GEA Ltd
Site Address	233-236 Nestles Avenue, Hayes, UB3 4SA
Report Reference	DA8572-00
Date	17th April 2019
Originator	HS / AT

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Executive Summary

Site Location and Description

The site is located in the London Borough of Hillingdon, in the west of London

Recent aerial photography shows the site to be occupied by four distinct, large, commercial structures. Associated areas of hard-standing ground are also within the site, especially in the northern and southern areas of the site.

Nestles Avenue borders the south-west of the site and Viveash Close defines the eastern border. An area of hard-standing ground, adjacent to a railway, borders the site to the north whilst the west of the site is adjacent to a commercial structure at the junction of Station Road and Nestles avenue.

The site is approximately centred on the OS grid reference: **TQ 0975279308.**

Proposed Works

The exact nature and extent of proposed works on site were not available at the time of writing this report. Ground investigation works are planned on site prior to any construction commencing.

Geology and Bomb Penetration Depth

The British Geological Survey (BGS) map shows the bedrock geology of the site to be underlain by the Thames Group - clay, silt, sand and gravel of the Palaeogene Period. The superficial deposits are comprised of River Terrace Deposits (undifferentiated) - sand and gravel of the Quaternary Period.

Site-specific geotechnical information was not available to 1st Line Defence at the time of the production of this report. An assessment of maximum bomb penetration depth can be made once such data becomes available, or by a UXO specialist during on-site support.

It should be noted that the maximum depth that a bomb could reach may vary across a site and will be largely dependent on the specific underlying geological strata and its density.

UXO Risk Assessment

1st Line Defence has assessed that there is a **Low-Medium Risk** from items of historic LSA/SAA (Land Service Ammunition/Small Arms Ammunition), originating from the site's WWI usage as a royal ordnance factory. A **Low Risk** has been assessed from German aerial delivered ordnance. This assessment is based on the following factors:

<u>The Likelihood of German Aerial Delivered Ordnance Contamination</u>

- During WWII, the Urban District of Hayes and Harlington sustained an overall low- moderate density bombing campaign, with an average of 40 items falling per 1,000 acres according to Home Office statistics. Most bombing in the local area of Nestle Avenue can be attributed to its location within London and proximity to areas of local industry and the railway.
- Whilst London bomb census mapping does record strikes to have affected areas within the vicinity of the site, including a UXB in the Nestle Sports Field, no bombs are recorded to have fallen within the site boundary. Additionally, these strikes in the vicinity are accounted for in an MCC Log Book of Incidents for Hayes and Harlington, which report one bomb to have fallen on the Nestle Factory and a UXB to have landed in the Nestle Sports Field.
- It has not been possible to determine the exact composition of the site during the war, although it is thought likely that the site was somewhat developed. Pre-war historic OS mapping suggests a rectangular structure was present within the west of the site, while 1946 post-war aerial photography shows that this area was cleared and the rest of the site was occupied by various warehouse buildings. These structures do not appear to have been recently constructed and are anticipated to have been present for the duration of the war, although this cannot be explicitly confirmed.
- Post-war 1946 aerial imagery suggests that the site and bordering areas escaped serious bomb damage. No obvious signs of damage are visible in these areas, such as the presence of cratering, ruins, rubble or debris.
- It is thought that the site would have sustained a relatively good level of access during the war. Pre-war mapping suggests at least one structure was located on site during the war. No evidence, such as damage or nearby bomb strikes, could be found to suggest that this access would have been significantly impeded over the course of the war, or that the ground cover present could have restricted evidence of UXO. Accordingly it is considered likely that post-raid checks were maintained, and thus items of UXO would have been observed and reported.

UXO Risk Assessment

- One structure in the west of the site does appear to have been cleared post-war. However, this this cleared area appears to have been neatly replaced with a hard-standing yard and it is not thought likely that this clearance was due to bomb damage.
- The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are considered analogous to those regarding aerial delivered ordnance.

The Likelihood of Allied Ordnance Contamination

- During the WWI period, the site area was located within the boundary of the National Filling Factory No.7, and as such there is potential for contamination from items of historic Allied ordnance to have occurred.
- Available records indicate that the factory was concerned with filling explosive material in a wide variety of ordnance items, in significant quantities during WWI, and later in the war also began to assemble components. Items filled included: HE and shrapnel shells, fuzes, detonators, small arms ammunition and exploders. All of these items were mass-produced in quantity throughout the war by some 10,000 workers.
- The site area was situated within the eastern section of the factory which is recorded to have dealt with the filling of fuzes, friction tubes and exploders. Rows of magazine buildings are shown to have been located on site, surrounded by piled earth to insulate damage should an accident occur.
- Taking this into account, there is considered to be a residual risk from contamination of WWI-era military ordnance at the site. At the time it was likely not anticipated that the land would be later sold for civilian development, and consequently appropriate explosive ordnance disposal procedure was not always adhered to. It was not uncommon for excess or unwanted ordnance such as fuzes to be buried or burnt within the wider premises as a means of disposal. Records of such practice were rarely kept.

The Risk of UXO Remaining

- The site was demolished and cleared in the inter-war period, as shown in historical OS mapping from 1934, which highlights the site area as vacant unoccupied land, aside from a rectangular structure within its western section. This structure was subsequently also cleared and a number of industrial warehouses built on site circa WWII. Additional warehousing was constructed within the western section of the site in the post war period. This demolition, clearance and subsequent re-development is anticipated to have involved some significant intrusive work into the ground.
- If UXO had contaminated the site following its WWI use as an NFF, the contamination is only likely to have been present at relatively shallow depths. The risk of UXO remaining is considered to have been mitigated at the location of and down to the depth of post-war foundations and excavations. It is considered likely that the vast majority of the site will have been subject to excavations to shallow depths as a result of post WWI redevelopment.
- Consequently, while the risk of contamination from the National Filling Factory is considered to have been significant, the residual risk of ordnance remaining is considered relatively low, due largely to the clearance and redevelopment work that has taken place.

Recommended Risk Mitigation Measures

The following risk mitigation measures are recommended to support the proposed works at the 233-236 Nestles Avenue site:

All Works

- Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.

Glossary

Abbreviation	Definition
AA	Anti-Aircraft
AFS	Auxiliary Fire Service
AP	Anti-Personnel
ARP	Air Raid Precautions
AWAS	Air Warfare Analysis Section
DA	Delay-action
EOC	Explosive Ordnance Clearance
EOD	Explosive Ordnance Disposal
FP	Fire Pot
GM	G Mine (Parachute mine)
HAA	Heavy Anti-Aircraft
HE	High Explosive
IB	Incendiary Bomb
LAA	Light Anti-Aircraft
LCC	London County Council
LRRB	Long Range Rocket Bomb (V-2)
LSA	Land Service Ammunition
MOL	Molotov (Incendiary Bomb)
OB	Oil Bomb
PAC	Pilotless Aircraft (V-1)
PB	Phosphorous Bomb
PM	Parachute Mine
POW	Prisoner Of War
RAF	Royal Air Force
RCAF	Royal Canadian Air Force
RFC	Royal Flying Corps
RNAS	Royal Naval Air Service
ROF	Royal Ordnance Factory
SA	Small Arms
SAA	Small Arms Ammunition
SD1000	1,000kg high explosive bomb
SD2	Anti-personnel "Butterfly Bomb"
SIP	Self-Igniting Phosphorous
U/C	Unclassified bomb
UP	Unrotated Projectile (rocket)
USAAF	United States Army Air Force
UX	Unexploded
UXAA	Unexploded Anti-Aircraft
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	Flying Bomb (Doodlebug)
V-2	Long Range Rocket
WAAF	Women's Auxiliary Air Force
X	Exploded

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1st Line Defence Limited
Detailed Unexploded Ordnance (UXO) Risk Assessment

Site: 233-236 Nestles Avenue
Client: GEA

1. Introduction

1.1. Background

1st Line Defence has been commissioned by GEA to conduct a Detailed Unexploded Ordnance (UXO) Risk Assessment for the proposed works at 233-236 Nestles Avenue.

Buried UXO can present a significant risk to construction works and development projects. The discovery of a suspect device during works can cause considerable disruption to operations as well as cause unwanted delays and expense.

UXO in the UK can originate from three principal sources:

1. Munitions resulting from wartime activities including German bombing in WWI and WWII, long range shelling, and defensive activities.
2. Munitions deposited as a result of military training and exercises.
3. Munitions lost, burnt, buried or otherwise discarded either deliberately, accidentally, or ineffectively.

This report will assess the potential factors that may contribute to the risk of UXO contamination. If an elevated risk is identified at the site, this report will recommend appropriate mitigation measures, in order to reduce the risk to as low as is reasonably practicable. Detailed analysis and evidence will be provided to ensure an understanding of the basis for the assessed risk level and any recommendations.

This report complies with the guidelines outlined in *CIRIA C681*, 'Unexploded Ordnance (UXO) A Guide for the Construction Industry'.

2. Method Statement

2.1. Report Objectives

The aim of this report is to conduct a comprehensive assessment of the potential risk from UXO at 233-236 Nestles Avenue. The report will also recommend appropriate site and work-specific risk mitigation measures to reduce the risk from explosive ordnance during the envisaged works to a level that is as low as reasonably practicable.

2.2. Risk Assessment Process

1st Line Defence has undertaken a five-step process for assessing the risk of UXO contamination:

1. The risk that the site was contaminated with UXO.
2. The risk that UXO remains on the site.
3. The risk that UXO may be encountered during the proposed works.
4. The risk that UXO may be initiated.
5. The consequences of initiating or encountering UXO.

In order to address the above, 1st Line Defence has taken into consideration the following factors:

- Evidence of WWI and WWII German aerial delivered bombing as well as the legacy of Allied occupation.
- The nature and conditions of the site during WWII.
- The extent of post-war development and UXO clearance operations on site.
- The scope and nature of the proposed works and the maximum assessed bomb penetration depth.
- The nature of ordnance that may have contaminated the proposed site area.

2.3. Sources of Information

Every reasonable effort has been made to ensure that relevant evidence has been consulted and presented in order to produce a thorough and comprehensible report for the client. To achieve this the following, which includes military records and archive material held in the public domain, have been accessed:

- The National Archives (Kew, England), London Metropolitan Archives and Hillingdon Archives.
- Historical mapping datasets.
- Historic England National Monuments Record.
- Relevant information supplied by GEA Ltd.
- Available material from 33 Engineer Regiment (EOD) Archive.
- 1st Line Defence’s extensive historical archives, library and UXO geo-datasets.
- Open sources such as published books and internet resources.

Research involved a visit to Hillingdon Archives, London Metropolitan Archives and The National Archives.

2.4. General Considerations of Historical Research

This desktop assessment is based largely upon analysis of historical evidence. Every reasonable effort has been made to locate and present significant and pertinent information. 1st Line Defence cannot be held accountable for any changes to the assessed risk level or risk mitigation measures, based on documentation or other data that may come to light at a later date, or which was not available to 1st Line Defence during the production of this report.

It is often problematic and sometimes impossible to verify the completeness and accuracy of WWII-era records. As a consequence, conclusions as to the exact location and nature of a UXO risk can rarely be quantified and are to a degree subjective. To counter this, a range of sources have been consulted and analysed. The same methodology is applied to each report during the risk assessment process. 1st Line Defence cannot be held responsible for any inaccuracies or the incompleteness in available historical information.

3. Background to Bombing Records

During WWII bombing records were gathered by the police, Air Raid Precaution (ARP) wardens and military personnel. Records were maintained in the form of local and regional written records, maps depicting the locations of individual strikes, and maps indicating the levels of damage sustained by structures. Records typically documented when, where and what types of bombs had fallen during an air raid. Records of bomb strikes were made either through direct observation or by post-raid surveys. The immediate priority was focused on assisting casualties and minimising damage. As a result some records were incomplete and contradictory.

The quality, detail and nature of record keeping could vary considerably between boroughs and towns. No two areas identically collated or recorded data. While some local authorities maintained records with a methodical approach, sources in certain areas can be considerably more vague, dispersed, and narrower in scope. Many records were even damaged or destroyed in subsequent bombing raids. Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are therefore not always reliable. Furthermore, records of attacks on military or strategic targets were often maintained separately from the general records and have not always survived.

4. Background to Allied Records

During WWII considerable areas of land were requisitioned by the War Office for the purpose of defence, training, munition production and the construction of airfields. Records relating to military features vary and some may remain censored. Within urban environments datasets will be consulted detailing the location of munition production as well as air and land defences. In rural locations it may be possible to obtain plans of airfields and military establishments, as well as operational training logs, plans and personal memoirs.

The level of detail available in records concerning explosives factories vary due to factors such as their size and importance. In addition, the exact details on the operations of such facilities are often difficult to ascertain for secrecy reasons. There is generally considered to be an elevated 'background' risk in areas defined by a large historic munitions presence. Whilst a wide range of records were consulted in order to determine the risk from items of Allied ordnance, a lack of detailed source availability can sometimes lead to an assumed level of risk from the presence of an ordnance factory. 1st Line Defence cannot be held responsible for inaccuracies or gaps in the available historical information.

5. UK Regulatory Environment

5.1. General

There is no formal obligation requiring a UXO risk assessment to be undertaken for construction projects in the UK, nor is there any specific legislation stipulating the management or mitigation of UXO risk. However, it is implicit in the legislation outlined below that those responsible for intrusive works (archaeology, site investigation, drilling, piling, excavation etc.) should undertake a comprehensive and robust assessment of the potential risks to employees and that mitigation measures are implemented to address any identified hazards.

5.2. CDM Regulations 2015

The Construction (Design and Management) Regulations 2015 (CDM 2015) define the responsibilities of parties involved in the construction of temporary or permanent structures.

The CDM 2015 establishes a duty of care extending from clients, principle co-ordinators, designers, and contractors to those working on, or affected by, a project. Those responsible for construction projects may therefore be accountable for the personal or proprietary loss of third parties, if correct health and safety procedure has not been applied.

Although the CDM does not specifically reference UXO, the risk presented by such items is both within the scope and purpose of the legislation. It is therefore implied that there is an obligation on parties to:

- Provide an appropriate assessment of potential UXO risks at the site (or ensure such an assessment is completed by others).
- Put in place appropriate risk mitigation measures if necessary.
- Supply all parties with information relevant to the risks presented by the project.
- Ensure the preparation of a suitably robust emergency response plan.

5.3. The 1974 Health and Safety at Work etc. Act

All employers have a responsibility under the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999, to ensure the health and safety of their employees and third parties, so far as is reasonably practicable and conduct suitable and sufficient risk assessments.

5.4. Additional Legislation

In the event of a casualty resulting from the failure of an employer/client to address the risks relating to UXO, the organisation may be criminally liable under the Corporate Manslaughter and Corporate Homicide Act 2007.

6. Role of Commercial UXO Contractors and The Authorities

6.1. Commercial UXO Contractors

In the event that a risk of UXO contamination is detected at the proposed site, the support of a UXO specialist may be recommended. A UXO specialist may be able to avoid unnecessary call-outs to the authorities through the disposal or removal of low risk items. In addition a specialist will assist in the swift recognition of high risk items, and will thereafter co-ordinate with the local authority with the objective of causing minimal levels of disruption to site operations, whilst putting in place safe and appropriate measures.

For more information on the role of commercial UXO specialists, see *CIRIA C681*.

6.2. The Authorities

The police have a responsibility to co-ordinate the emergency services in the event of an ordnance-related incident at a construction site. Upon inspection they may impose a safety cordon, order an evacuation, and call the military authorities Joint Services Explosive Ordnance Disposal (JSEOD) to arrange for investigation and/or disposal. In the absence of a UXO specialist, police officers will usually employ such precautionary safety measures, thereby causing works to cease, and possibly requiring the evacuation of neighbouring businesses and properties.

The priority given to the police request will depend on JSEOD's judgement of the nature of the UXO risk, the location, people and assets at risk, as well as the availability of resources. The speed of response varies; authorities may respond immediately or in some cases it may take several days for the item of ordnance to be dealt with.

Depending on the on-site risk assessment the item of ordnance may be removed from the site and/or destroyed by a controlled explosion. The latter process is lengthy and may necessitate the establishment of addition cordons and evacuations.

Following the removal of an item of UXO, the military authorities will only undertake further investigations or clearances in high risk situations. If there are regular UXO finds on a site the JSEOD may not treat each occurrence as an emergency and will recommend the construction company puts in place alternative procedures, such as the appointment of a commercial contractor to manage the situation.

7. The Site

7.1. Site Location

The site is located in the London Borough of Hillingdon, in the west of London.

Nestles Avenue borders the south-west of the site and Viveash Close defines the eastern border. An area of hard-standing ground, adjacent to a railway, borders the site to the north whilst the west of the site is adjacent to a commercial structure at the junction of Station Road and Nestles avenue.

The site is approximately centred on the OS grid reference: **TQ 0975279308.**

Site location maps are presented in **Annex A**.

7.2. Site Description

Recent aerial photography shows the site to be occupied by four distinct, large, commercial structures. Associated areas of hard-standing ground are also within the site, especially in the northern and southern areas of the site.

A recent aerial photograph and site plan are presented in **Annex B** and **Annex C** respectively.

8. Scope of the Proposed Works

8.1. General

The nature and extent of proposed works on site were not available at the time of writing this report. Ground investigation works are planned on site prior to any construction commencing.

9. Ground Conditions

9.1. General Geology

The British Geological Survey (BGS) map shows the bedrock geology of the site to be underlain by the Thames Group - clay, silt, sand and gravel of the Palaeogene Period. The superficial deposits are comprised of River Terrace Deposits (undifferentiated) - sand and gravel of the Quaternary Period.

9.2. Site Specific Geology

Site specific geotechnical data was not available during the production of this report.

10. Site History

10.1. Introduction

The purpose of this section is to identify the composition of the site pre and post-WWII. It is important to establish the historical use of the site, as this may indicate the site's relation to potential sources of UXO as well as help with determining factors such as the land use, groundcover, likely frequency of access and signs of bomb damage.

10.2. Ordnance Survey Historical Maps

Relevant historical maps were obtained for this report and are presented in **Annex D.** See below for a summary of the site history shown on acquired mapping.

WWI Period		
Date	**Scale**	**Description**
1914	1:2,500	This map shows the site to be situated within vacant unoccupied land, which is located to the south of an orchard lining the railway. A road is situated to the south of the site, with several terraced residential properties visible in the south-west.

WWII-era		
Date	**Scale**	**Description**
1938	1:2,500	This map edition shows the site area to be situated within an expansive area of open ground labelled as a *Sports Ground.* Some development can be seen to the west of the site, and a building is partially located within the north-east of the site. To the south of the site, the road has now been labelled Nestles Avenue, with the opposite side being lined by a line of residential properties.
1941	1:10,560	A structure can be seen within the west of the site, along with development to the east of the site.

Post-WWII		
Date	**Scale**	**Description**
1963-1966	1:1,250	This map illustrates some significant structural changes to have taken place on site in the immediate post-war years. The site is now occupied by four large industrial structures, with one of these labelled as an Employment Exchange. Construction has also occurred to the west and east of the site, with a Depot and Government Offices recorded respectively.

10.3. Historical Photographs of the Site

Historical photographs have been consulted from the Aerofilms collection available from Britain From Above. The following photographs provide a view of the site in 1935 and 1939 (see **Annex E**). See below for a description of this photography.

Title of Photograph	**Comments**
Gramophone Company (HMV) factory buildings and environs, Hayes, from the south-east, 1930	These two photos show the site's undeveloped nature in the early 1930s. The eastern part of the site is occupied by a sports field, while some buildings can be seen to the north-west of the site.
The HMV Gramophone Factories, Hayes, from the south-east, 1932	
Nestles Cocoa Factory, Hayes, from the north-east, 1939	This image does not show the area of the site itself, instead focusing on an area to the east of the site. This shows that the development recorded in the wider area of the site had taken place pre-war. It is thus assumed that the development of the Nestle factory on site occurred pre-war.

11. Aerial Bombing Introduction

11.1. General

During WWI and WWII, many towns and cities across the UK were subjected to bombing which often resulted in extensive damage to city centres, docks, rail infrastructure and industrial areas. The poor accuracy of WWII targeting technology and the nature of bombing techniques often resulted in neighbouring areas to targets sustaining collateral damage.

In addition to raids which concentrated on specific targets, indiscriminate bombing of large areas also took place, this occurred most prominently in the London 'Blitz', though affected many other towns and cities. As discussed in the following sections, a proportion of the bombs dropped on the UK did not detonate as designed. Although extensive efforts were made to locate and deal with these UXBs at the time, many still remain buried and can present a potential risk to construction projects.

The main focus of research for this section of the report will concern German aerial delivered weapons dropped during WWII, although WWI bombing will also be considered.

11.2. Generic Types of WWII German Aerial-delivered Ordnance

An understanding of the type and characteristics of the ordnance used by the Luftwaffe during WWII allows an informed assessment of the hazards posed by any unexploded items that may remain in situ on a site.

Generic Types of WWII German Aerial Delivered Ordnance		
Type	**Frequency**	**Likelihood of detection**
High Explosive (HE) bombs	In terms of weight of ordnance dropped, HE bombs were the most frequently deployed by the Luftwaffe during WWII.	Although efforts were made to identify the presence of unexploded ordnance following an air raid, often the damage and destruction caused by detonated bombs made observation of UXB entry holes impossible. The entry hole of an unexploded bomb can be as little as 20cm in diameter and was easily overlooked in certain ground conditions (see **Annex F**). Furthermore, ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded 50kg bomb. UXBs therefore present the greatest risk to present–day intrusive works.
Aerial or Parachute mines (PM)	There were deployed less frequently than HE and IBs due to size, cost and the difficulty of deployment.	If functioning correctly, PMs generally would have had a slow rate of descent and were very unlikely to have penetrated the ground. Where the parachute failed, mines would have simply shattered on impact if the main charge failed to explode. There have been extreme cases when these items have been found unexploded. However, in these scenarios, the ground was either extremely soft or the munition fell into water.
1kg Incendiary bombs (IB)	In terms of the number of weapons dropped, small IBs were the most numerous. Millions of these were dropped throughout WWII.	IBs had very limited penetration capability and in urban areas would often have been located in post-raid surveys. If they failed to initiate and fell in water, on soft vegetated ground, or bombed rubble, they could have gone unnoticed.
Large Incendiary bombs (IB)	These were not as common as the 1kg IBs, although they were more frequently deployed than PMs and AP bomblets.	If large IBs did penetrate the ground, complete combustion did not always occur and in such cases they could remain a risk to intrusive works.
Anti-personnel (AP) bomblets	These were not commonly used and are generally considered to pose a low risk to most works in the UK.	SD2 bomblets were packed into containers holding between 6 and 108 submunitions. They had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.

Images and brief summaries of the characteristics of the above listed German aerial delivered ordnance are presented in **Annex G**.

11.3. Failure Rate of German Aerial-delivered Ordnance

It has been estimated that 10% of WWII German aerial delivered HE bombs failed to explode as designed. Reasons for why such weapons might have failed to function as designed include:

- Malfunction of the fuze or gain mechanism (manufacturing fault, sabotage by forced labour or faulty installation).
- Many were fitted with a clockwork mechanism that could become immobilised on impact.
- Failure of the bomber aircraft to arm the bombs due to human error or an equipment defect.
- Jettisoning the bomb before it was armed or from a very low altitude. This most likely occurred if the bomber aircraft was under attack or crashing.

From 1940 to 1945 bomb disposal teams dealt with a total of 50,000 explosive items of 50kg, over, 7,000 anti-aircraft projectiles and 300,000 beach mines. Unexploded ordnance is still regularly encountered across the UK, see press articles in **Annex H**.

11.4. V-Weapons

Hitler's 'V-weapon' campaign began from mid-1944. It used newly developed unmanned cruise missiles and rockets. The V-1 known as the *flying bomb* or *pilotless aircraft* and the V-2, a long range rocket, were launched from bases in Germany and occupied Europe. A total of 2,419 V-1s and 517 V-2s were recorded in the London Civil Defence region alone.

Although these weapons caused considerable damage their relatively low numbers allowed accurate records of strikes to be maintained. These records have mostly survived. There is a negligible risk from unexploded V-weapons on land today since even if the 1000kg warhead failed to explode, the weapons are so large that they would have been observed and the risk dealt with at the time. Therefore, V-weapons are referenced in this report not as a viable risk factor, but primarily in order to help account for evidence of damage and clearance reported.

12. UXB Ground Penetration

12.1. General

An important consideration when assessing the risk from a UXB is the likely maximum depth of burial. There are several factors which determine the depth that an unexploded bomb will penetrate:

- Mass and shape of bomb.
- Height of release.
- Velocity and angle of bomb.
- Nature of the ground cover.
- Underlying geology.

Geology is perhaps the most important variable. If the ground is soft, there is a greater potential of deeper penetration. For example, peat and alluvium are easier to penetrate than gravel and sand, whereas layers of hard strata will significantly retard and may stop the trajectory of a UXB.

12.2. The J-Curve Effect

J-curve is the term used to describe the characteristic curve commonly followed by an aerial delivered bomb dropped from height after it penetrates the ground. Typically, as the bomb is slowed by its passage through underlying soils, its trajectory curves towards the surface. Many UXBs are found with their nose cone pointing upwards as a result of this effect. More importantly however is the resulting horizontal offset from the point of entry. This is typically a distance of about one third of the bomb's penetration depth, but can be up to 15m.

12.3. WWII UXB Penetration Studies

During WWII the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by bomb disposal (BD) teams. Conclusions were made as to the likely average and maximum depths of penetration of different sized bombs in different geological strata.

For example, the largest common German bomb (500kg) had a likely concluded penetration depth of 6m in sand or gravel but 11m in clay. The maximum observed depth for a 500kg bomb was 11.4m and for a 1,000kg bomb 12.8m. Theoretical calculations suggested that significantly greater penetration depths were probable.

12.4. Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site of proposed works the following parameters have been used:

- WWII geology – Thames Group - Clay, Silt, Sand and Gravel.
- Impact angle and velocity – 10-15° from vertical and 270 metres per second.
- Bomb mass and configuration – The 500kg SC HE bomb, without retarder units or armour piercing nose (this was the largest of the common bombs used against Britain).

It has not been possible to determine maximum bomb penetration capabilities at this stage due to the lack or limitations of site specific borehole geotechnical information. An assessment can be made once such information becomes available or by an UXO Specialist on-site.

13. Initiation of Unexploded Ordnance

13.1. General

Unexploded ordnance does not spontaneously explode. All high explosive filling requires significant energy to create the conditions for detonation to occur. In the case of unexploded German bombs discovered within the construction site environment, there are a number of potential initiation mechanisms.

13.2. UXB Initiation Mechanisms

UXB Initiation	
Direct Impact	Unless the fuze or fuze pocket is struck, there needs to be a significant impact e.g. from piling or large and violent mechanical excavation, onto the main body of the weapon to initiate a buried iron bomb. Such violent action can cause the bomb to detonate.
Re- starting the Clockwork Fuze	A small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion would have taken place within the fuze mechanism over the last 70+ years that would prevent clockwork mechanisms from functioning. Nevertheless, it was reported that the clockwork fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did re-start.
Friction Impact	The most likely scenario resulting in the detonation of a UXB is friction impact initiating the shock-sensitive fuze explosive. The combined effects of seasonal changes in temperature and general degradation over time can cause explosive compounds to crystallise and extrude out from the main body of the bomb. It may only require a limited amount of energy to initiate the extruded explosive which could detonate the main charge.

Annex H2 details incidents where intrusive works have caused items of UXO to detonate, resulting in death or injury and damage to plant.

13.3. Effects of Detonation

When considering the potential consequences of a detonation, it is necessary to identify the significant receptors that may be affected. The receptors that may potentially be at risk from a UXO detonation on a construction site will vary depending on the site specific conditions but can be summarised as follows:

- People – site workers, local residents and general public.
- Plant and equipment – construction plant on site.
- Services – subsurface gas, electricity, telecommunications.
- Structures – not only visible damage to above ground buildings, but potentially damage to foundations and the weakening of support structures.
- Environment – introduction of potentially contaminating materials.

14. The Risk from German Aerial Delivered UXBs

14.1. World War I

During WWI Britain was targeted and bombed by Zeppelin Airships as well as Gotha and Giant fixed-wing aircraft. An estimated 250 tons of ordnance (high explosive and incendiary bombs) was dropped on Greater London, more than half of which fell on the City of London (see **Annex I** for a WWI bomb plot map of London). WWI maps detailing Zeppelin and Bomber raids in Greater London were consulted, yet no significant attacks were recorded to have directly affected the site area during the war.

WWI bombs were generally smaller than those used in WWII and were dropped from a lower altitude. This resulted in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons there is a limited risk that UXBs passed undiscovered in the urban environment. When combined with the relative infrequency of attacks and an overall low bombing density the risk from WWI UXBs is considered low and will not be further addressed in this report.

14.2. World War II Bombing of Hayes and Harlington

The Luftwaffe's main objective for the attacks on London was to inhibit the capital's commercial output. To achieve this they targeted the docks, warehouses, wharves, railway lines, factories and power stations. As the war progressed this strategy gradually changed to the indiscriminate bombing of civilian areas in an attempt to subvert public morale.

During WWII the site was located within the Urban District of Hayes and Harlington, which sustained an overall low-medium density of bombing, as represented by bomb density mapping presented in **Annex J**. This was mainly due to its location on the periphery of west London, which avoided the majority of the bombing campaigns focused on the central and eastern areas of the capital. However, Hayes and Harlington did still sustain regular bombing, with a number of targets identified in the wider surrounding area.

Uxbridge RAF depot, situated approximately 5.6km north-west of the site boundary, is highlighted on Luftwaffe reconnaissance photography (see **Annex K**) which confirms its status as a target. The depot was one of several RAF stations in the region – RAF Northolt, RAF Langley and RAF Heston were also situated in the surrounding area of the site. Another potential target not identified on Luftwaffe reconnaissance photography was RAF Heathrow, the modern day Heathrow Airport, situated approximately 3km south of the site boundary; the aerodrome was bombed on several occasions during WWII. Neighbouring areas would often be affected by the presence of such targets, largely due to the inaccuracy of aerial bombing on adjacent areas to avoid having to return to base with ordnance still on board – known as 'tip and run' raids. Much of the bombing on the region can be attributed to these potential targets and any bombing inflicted upon the civilian population.

Records of bombing incidents in the civilian areas of London were collected by the Air Raid Precautions wardens and collated by the Civil Defence Office. Some other organisations, such as port and railway authorities, maintained separate records. Records would be in the form of typed or hand written incident notes, maps and statistics. Bombing data was carefully analysed, not only due to the requirement to identify those parts of the country most needing assistance, but also in an attempt to find patterns in the Germans' bombing strategy in order to predict where future raids might take place.

Records of bombing incidents for the U.D. of Hayes and Harlington are presented in the following sections.

14.3. WWII Home Office Bombing Statistics

The following table summarises the quantity of German aerial delivered bombs (excluding 1kg incendiaries and anti-personnel bombs) dropped on Hayes and Harlington between 1940 and 1945.

Record of German Ordnance Dropped on the Urban District of Hayes and Harlington		
Area Acreage		**5,160**
Weapons	High Explosive bombs (all types)	189
	Parachute mines	2
	Oil bombs	8
	Phosphorus bombs	0
	Fire pots	0
	Pilotless aircraft (V-1)	6
	Long range rocket bombs (V-2)	2
Total		**207**
Number of Items per 1,000 acres		**40.1**

Source: Home Office Statistics
This table does not include UXO found during or after WWII.

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record. Although the risk relating to IBs is lesser than that relating to larger HE bombs, they were similarly designed to inflict damage and injury. Anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. Although Home Office statistics were not recorded, both types of item should not be overlooked when assessing the general risk to personnel and equipment.

14.4. London Civil Defence Region ARP Bomb Census Maps

During WWII, the ARP Department within the Research and Experiments Branch of the Ministry of Home Security produced consolidated, weekly and V-1 pilotless aircraft bomb census maps for the London Civil Defence Region. These maps collectively shows the approximate locations of bombs, mines and rockets. The site area was checked on each available map sheet, those showing bomb incidents on and in the immediate vicinity of the site are discussed below and are presented in **Annex L.**

London Consolidated Bomb Census Maps – Annex L1- L2	
Date Range	**Comments**
Day Bombing 8th October to 31st December 1940	No bomb strikes are recorded to have affected the site boundary, however one is plotted on the railway to the north-west in the vicinity of Hayes train station.
Night Bombing 7th October 1940 to June 1941	No bombs are recorded to have affected the site, however multiple bomb strikes are recorded in the vicinity. Three strikes are recorded to have affected the north and north-west of the site on the railway, with a further four recorded on the vicinity of the Nestle factory to the east.

London Weekly Bomb Census Maps – Annex L3	
Date Range	**Comments**
7th to 14th October 1940	No bombs are plotted within or close to the site boundary. Four HE bombs are recorded to have affected the area to the east of the site, two of which are plotted to have fallen on the Nestle Cocoa Factory, with two plotted on open ground further to the west.
11th to 18th November 1940	No bombs are plotted to have affected the site. Three HE bombs are recorded to have fallen to the north of the site area on the railway, with a further HE recorded to the south-west.

V-1 Pilotless Aircraft Bomb Census Map – Annex M	
Date Range	**Comments**
1944-45	One V-1 flying bomb fell in the general area of the site. Due to distance, this strike is not considered to have directly impacted the proposed site. Damage from V-1 weapons cannot be attributed to the site in question.

14.5. Hayes and Harlington Bomb Census Reports

Bomb census reports compiled by the Research and Experiments Branch of the Ministry of Home Security during WWII were consulted at The National Archives. These reports recorded information such as the date, time, type and damage caused by major bomb incidents in Hayes and Harlington and are therefore not often comprehensive. Whilst these records were consulted, no reference to the site area or its environs could be found.

14.6. Middlesex County Council Log of Air Raid Incidents for Hayes/Harlington

A log of air raid incidents likely compiled by information produced by local ARP wardens, volunteers and police officers for Middlesex County Council was consulted at London Metropolitan Archives. These reports recorded information such as the date, time, type and damage caused by bomb incidents in the Urban District of Hayes and Harlington. A transcribed example of the records affecting the site area and the surrounding vicinity are presented below.

Middlesex County Council Log of Air Raid Incidents for Hayes and Harlington	
Date Range	**Comments**
10th October 1940	Minor bombing, HE on Nestle's Factory, Sandow Rd. 1 casualty.

14.7. Hayes and Harlington File of Air Raids

This file from Hillingdon Archives was comprised of message forms that were relayed to headquarters, with requests and information on the condition of damaged properties. This record was compiled by local Air Raid Precaution (ARP) personnel and volunteers during the war. Though no reference was found to any bombs falling within the site boundary a transcript of the associated written records for bombs which fell in the vicinity of the site area is presented in the table below. Example imagery of these entries is presented in **Annex N**.

Hayes and Harlington Bomb Incident Records	
Date Range	**Comments**
10th October 1940	20:20pm- One HE bomb is recorded to have fallen on the Nestle Cocoa Factory. The report notes that '1 serious casualty' was sustained by this attack. A stretcher party was dispatched to attend to the casualty and left the depot at 20:46pm.
10th October 1940	22:05pm-A UXB is reported in the sports field of the Nestle Factory, which is alter confirmed.

14.8. Hayes and Harlington Register of Unexploded Bombs and Shells

A register complied by Hayes and Harlington Civil Defence personnel detailing unexploded bomb (UXB) and shell incidents to have affected this district was consulted at Hillingdon Archives. Though no reference was found to any bombs falling within the site boundary a transcript of the associated written records for bombs which fell in the vicinity of the site area is presented in the table below.

Hayes and Harlington Register of Unexploded Bombs and Shells	
Date Range	**Comments**
10th October 1940	20:30pm- 1 HE Nestle Factory Sports Field. Police report exploded bomb crater, bomb disposed of.

14.9. Middlesex County Council War Damage Map

Map sheets compiled by Middlesex County Council (MCC) showing the extent of wartime bomb damage on the Urban District of Hayes and Harlington were consulted at London Metropolitan Archives. Unfortunately, the site is situated in an area where mapping has been lost or destroyed.

14.10. WWII-Era Aerial Photography

A high-resolution scan of WWII-era aerial photography for the site area was obtained from the National Monuments Record Office (Historic England). This photograph provides a record of the potential composition of the site during the war, as well as its condition immediately following the war (**see Annex O**).

WWII-Era Aerial Photography – Annex O	
Date	**Description**
RAF Photography 22nd June 1946	This immediate post war photograph indicates that the site is predominantly occupied by industrial structures. An area in the west of the site is undeveloped, but appears to be hard-standing. This area was previously marked on bomb mapping as a structure, which has since been cleared.

14.11. Abandoned Bombs

A post air-raid survey of buildings, facilities, and installations would have included a search for evidence of bomb entry holes. If evidence of an entry hole was encountered, Bomb Disposal Officer Teams would normally have been requested to attempt to locate, render safe, and dispose of the bomb. Occasionally, evidence of UXBs was discovered but due to a relatively benign position, access problems, or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an 'abandoned bomb'.

Given the inaccuracy of WWII records and the fact that these bombs were 'abandoned', their locations cannot be considered definitive or the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

1st Line Defence holds no records of officially registered abandoned bombs at or near the site of the proposed works.

14.12. Bomb Disposal Tasks

The information service from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD) is currently facing considerable delay. It has therefore not been possible to include any updated official information regarding bomb disposal/clearance tasks with regards to this site. A database of known disposal/clearance tasks has been referred to which does not make reference to such instances occurring within the site of proposed works. If any relevant information is received at a later date GEA will be advised.

14.13. Evaluation of German Aerial Delivered UXB Risk

Factors	Conclusion
Density of Bombing *It is important to consider the bombing density when assessing the possibility that UXBs remain in an area. High levels of bombing density could allow for error in record keeping due to extreme damage caused to the area.*	The U.D. of Hayes and Harlington was subject to an overall low – medium density of bombing, with an average of 40 bombs recorded per 1,000 acres according to Home Office statistics. London bomb census mapping indicates that the area surrounding the site was affected by several bomb incidents, however none are recorded to have directly affected the site footprint. Whilst the Middlesex County Council incident log for Hayes and Harlington does not directly refer to any bomb incidents directly affecting the site, it does detail several incidents to have affected the Nestle Cocoa Factory, to the east of the site area. One HE bomb is recorded to have affected the factory with one serious casualty sustained. The Hayes and Harlington UXB register also records a UXB in the Nestle Factory sports field to the east of the site. A Visual Overlay of bombing incidents is presented in **Annex O2.**
Damage *If buildings or structures on a site sustained bomb or fire damage any resulting rubble and debris could have obscured the entry holes of unexploded bombs dropped during the same, or later, raids. Similarly, a High Explosive bomb strike in an area of open agricultural land will have caused soil disturbance, increasing the risk that a UXB entry hole would be overlooked.*	Due to the absence of MCC war damage mapping, it has not been possible to discern if the site area was recorded to have sustained any bomb damage. Despite the absence of this damage mapping, no obvious signs of bomb related damage is observable within the site area. Historical OS mapping, does illustrate significant changes to have taken place between pre-and post-war map editions, with multiple industrial structures having been constructed both on and surrounding the site. Immediate post-war aerial photography from 1946 shows no immediately obvious signs of bomb related damage such as craters, debris, or structural damage to neighbouring buildings. One structure in the west of the site does appear to have been cleared post-war. The cleared area appears to be hard-standing, and it is not thought likely that this clearance was due to bomb damage.
Access Frequency *UXO in locations where access was irregular would have a greater chance of passing unnoticed than at those that were regularly occupied. The importance of a site to the war effort is also an important consideration as such sites are likely to have been both frequently visited and subject to post-raid checks for evidence of UXO.*	It is thought that the site would have sustained some level of access during the war. Pre-war mapping suggests at least one structure was located on site during the war. No evidence, such as damage or nearby bomb strikes, could be found to suggest that this access would have been significantly impeded over the course of the war, or that the ground cover present could have restricted evidence of UXO. Accordingly it is considered likely that frequent checks were maintained, and thus items of UXO would have been observed and reported. One structure in the west of the site does appear to have been cleared post-war. The cleared area appears to be hard-standing, and it is not thought likely that this clearance was due to bomb damage.
Ground Cover *The nature of the ground cover present during WWII would have a substantial influence on any visual indication that may indicate UXO being present.*	During the war, it is anticipated that the site featured ground cover that was conducive to the observation of UXO entry holes, being comprised of structures and open areas.
Bomb Failure Rate	There is no evidence to suggest that the bomb failure rate in the locality of the site would have been dissimilar to the 10% normally used.

Abandoned Bombs	1st Line Defence holds no records of abandoned bombs at or within the site vicinity.
Bombing Decoy sites	1st Line Defence could find no evidence of bombing decoy sites within the site vicinity.
Bomb Disposal Tasks	1st Line Defence could find no evidence of bomb disposal tasks within the site boundary and immediate area.

15. The Risk from Allied Ordnance

15.1. Introduction

According to records, the site resided within the boundaries of the former No.7 National Filling Factory; also known as Emergency Factory No.2, which was constructed in 1915 to increase the output of munitions during WWI. This factory occupied 200 acres and was primarily involved with the filling of shells, fuzes and detonators with explosives as well as the assembly of shells fuzes and gaines.

When undertaking work within or immediately adjacent to an historic ordnance production facility, it can often be assumed that the risk of contamination from explosive ordnance is elevated above the 'background' level of the surrounding area. This assumption of risk is based on the following reasoning:

- In most cases, explosive ordnance would be produced and stored within the vicinity of such facilities. The types of ordnance produced varied depending on the specifics of the concerned facility. This may have included small arms, high explosive bombs and artillery projectiles.
- Not all ordnance production facilities were engaged in the production of high explosive material. Some works that concerned only the manufacturing of bomb, shell and cartridge casings. These factories are notably distinct and differently categorised from other facilities however, if no specific information is available for an individual facility, the potential for explosive ordnance production must be assumed.
- Due to the nature of ordnance production facilities, production often started and ceased in a hurried manner. The military generally did not anticipate or were not concerned by the fact that the land would be later sold for civilian development, and consequently appropriate ordnance disposal procedure was not always adhered to. It was not uncommon for excess or unwanted ordnance to be buried or burnt within the perimeters of a military establishment as a means of disposal. Records of such practice were rarely kept.

There are several factors that may serve to either affirm, increase, or decrease the level of risk within an ordnance manufacturing facility. Such factors are typically dependent upon the proximity of the proposed area of works to a number of features. The risk of contamination from Allied ordnance may also relate to the function of the facility and any incidents recorded within, or proximate to the factory.

This section will examine the history of the factory and assess to what degree, if any, the site could have become contaminated as a result of the historic military use of the surrounding area.

15.2. History of National Filling Factory No.7

It is understood that National Filling Factory No.7 not only specialised in the filling of munitions, but also diversified into production, to include a variety of military ordnance and related components. See below for further information.

15.3. WWI-era

The construction of National Filling Factory (NFF) No.7 at Hayes was completed in October 1915, in order to increase the production and filling of shells for use in WWI. The location of the factory was chosen due to its close proximity to the Great Western Railway (GWR), and was situated on its line from Paddington to Slough, providing excellent transportation links both for receiving assembly components and the transportation of the finished munitions to where they were needed.

Originally the factory was primarily tasked with the filling of 18-pounder artillery shells with block explosive propellant charges, however when plans to construct an additional filling factory in Watford were abandoned, the factory was extended. The resulting extension increased the factor area to some 200 acres and allowed the factory to fill 200 tons of amatol and 100 tons of lyddite per week. As the war progressed, the factory was tasked with more assembly and filling tasks, including the filling of gaines when the NFF at Southwark ceased this work. The factory also needed a substantial workforce in order to complete its production quota. Initially this comprised of mainly men, however as the war progressed women took over the majority of the workforce, indeed, in March 1917 the workforce consisted of 8,780 women and 1,849 men.

Whilst the factory was rapidly decommissioned following the end of hostilities in 1918, little detail is known about the exact date that production was ceased and when the factory was unoccupied.

See Annex P for WWI-era photographs showing filling production within the NFF No.7 Hayes.

15.4. Post-WWI

The immediate post-WWI history of the NFF No.7 factory is not clear, however records of correspondence, obtained from The National Archives, between the Ministry of Labour and the Ministry of Munitions, indicate that the “majority of buildings were absolutely full of stores. ”It is clear from these correspondences that the Ministry of Labour was interested in obtaining the factory or a small portion of it from the Ministry of Munitions so that it could be converted into a Government Instructional Factory (GIF), for the training of unskilled workers in the trade of car building.

Correspondence shows that by 1920 the canteen and garage of the NFF was being occupied as an Instructional Factory, in order to teach former servicemen the trade of coach-building and car body work. This continued until 1923, where corresponded reveals that the “keys to the old factory at Hayes were handed to the manager of the Disposal and Liquidation Commission.”

It is unclear whether this led to the immediate demolition or clearance of the factory, however the factory is shown to have been cleared prior to the 1934 OS map edition covered in **Section 10.2.**

See **Annex Q** for excerpts of these correspondences.

15.5. Filling Production

Like other filling factories, NFF No.7 was tasked with the filling of a wide variety of munitions and ordnance components, and as the war progressed also started the assembly of some of these items. The factory was divided into the production of various items, with the west section completing the assembly of 18-pdr shells, the east with the filling of fuzes, friction tubes and C.E (Composition, Explosive) pellets. The cap and detonator section handled the filling of primer caps and detonators with unstable mercury fulminate, and was guarded. The amatol section was spaced out for safety and was tasked with filling shells with liquid amatol, initially by hand and then by machine. Finally, the cartridge section assembled cartridges and shells, and filled them with the relevant explosive propellant.

The table below presents the components produced and filled at the No.7 NFF at Hayes in May 1916.

<table>
<tr><th colspan="3">Weekly production and filling output- Week ending 18th May 1916</th></tr>
<tr><th>Item</th><th>Filled</th><th>Assembled</th></tr>
<tr><td>Shells, HE (unspecified calibre)</td><td rowspan="2">31,293</td><td>83,944</td></tr>
<tr><td>Shells, Shrapnel (unspecified calibre)</td><td>32,000</td></tr>
<tr><td>Cartridges</td><td>89,170</td><td rowspan="5">N/A</td></tr>
<tr><td>Friction Tubes</td><td>44,440</td></tr>
<tr><td>Primers</td><td>117,160</td></tr>
<tr><td>Exploders</td><td>272,000</td></tr>
<tr><td>Detonators</td><td>422,310</td></tr>
<tr><td>Fuzes</td><td>177,098</td><td rowspan="3">147,021</td></tr>
<tr><td>Gaines</td><td>177,531</td></tr>
<tr><td>Adapters</td><td>N/A</td></tr>
<tr><td>Primer Caps</td><td>125,914</td><td>N/A</td></tr>
</table>

15.6. Site Plans

A WWI-era plan of the NFF No.7 highlights the extent of the factory's footprint, and also shows the various production areas. The wider factory is shown to encompass the area from the immediate south of the GWR line in approximately the position of the Hayes and Harlington Station, this extends approximately 1.2km to the south, in the approximate vicinity of the current M4 Motorway.

The site of proposed works is situated in the eastern section of the factory, an area shown on the plan to feature a multitude of magazines and covered passageways, dispersed in order to minimise the effect of a blast should an accident occur. It is likely that earth was piled high around each magazine, to act as a buffer.

It is not possible to precisely identify the nature of the magazine structures on site, however this section of the site is within the area of the factory known to fill fuzes.

Both the plan of the NFF No.7, and a visual representation of the site within the factory are presented in **Annex R.**

15.7. Quality of Historical Record

The record set is of generally good quality, and whilst it is not comprehensive, it presents a reasonably clear picture of the history of the Filling Factory during and following WWI. Specific information on the ordnance items assembled and filled on site was available, as well as production figures.

The records are not without inconsistencies however, as the history of the factory in the immediate post-war period could not be found.

16. Examples of Types of Explosive Ordnance Found at Historical Military Sites

16.1. General

Many areas across the UK may be at risk from Allied UXO due to both wartime and peacetime military use. Typical military activities and uses that may have led to a legacy of military UXO at a site include weapons manufacture and storage areas, former minefields, home guard positions, anti-aircraft emplacements, training and firing ranges, as well as military camps.

Although land formerly used by the military were usually subject to clearance before they returned to civilian use, items of UXO are sometimes discovered and can present a potential risk to construction projects. This section of the report discusses the generic types of Allied ordnance typically encountered on areas associated with former military activity.

16.2. National Filling Factory No.7 Production Line

The most likely ordnance to be encountered on former ordnance manufacturing sites are the items or components manufactured at that installation. These items may contaminate sites where significant quantities of ordnance was being produced or stored, especially where such conditions of manufacture were unfavourable, such as emergency factories or those constructed hastily.

Items known to have been produced at the NFF No.7 are shown below, with pictorial examples presented in **Annex S.**

National Filling Factory No.7 Production Line	
Item	**Description**
Shells- HE and Shrapnel	A payload-carrying projectile that, as opposed to solid shot, contains an explosive filing designed to detonate on initiation. Usually fired from artillery, combat vehicles and warships.
Fuzes	An explosive initiator that when activated causes munitions it is used with to explode. Typical used on projectiles fired by guns (field, anti-aircraft, coast and naval), as well as howitzers and mortars. Types include time fuzes, contact fuzes and proximity fuzes.
Friction Tubes	A type of primer comprised of a copper tube packed with powder, with a branch bent at an angle, which is filled with a friction composition in which a friction bar is embedded. When removed the friction bar causes the tube to ignite, activating any secondary charge it is used with.
Detonators	An ignition based explosive trigger used to activate larger secondary charges, such as those in a shell. Often housed in a fuse, detonators of the WWI period were largely manufactured from Mercury Fulminate.
Gaines	A type of igniter that is packed with a powder pellet, and is used for igniting the detonating wave necessary for detonating a HE shell.
Primer Caps	A single-use contact initiation device containing primary explosive that is inserted into fired munitions, such as small arms ammunition and shells in order to activate propellant charges for projectiles.

16.3. Small Arms Ammunition

The most common type of ordnance encountered on land formerly occupied by the military are items of Small Arms Ammunition (SAA). SAA refers to the complete round or cartridge designed to be discharged from varying sized hand-held weapons such as rifles, machine guns and pistols. SAA can include bullets, cartridge cases and primers/caps. Example images of SAA are presented in **Annex G.**

16.4. Land Service Ammunition

Items of Land Service Ammunition (LSA) can also be found within any land of former military usage, such as an army barracks or training area. The term LSA covers items of ordnance that are propelled, placed, or thrown during land warfare. These items may be filled or charged with explosives, smoke, incendiary, or pyrotechnics and can be divided into five main groups:

Land Service Ammunition	
Item	**Description**
Mortar Rounds	A mortar round is normally nosed-fuzed and fitted with its own propelling charge. Its flight is stabilised by the use of a fin. They are usually tear-drop shaped (though older variants are parallel sided), with a finned 'spigot tube' screwed or welded to the rear end of the body which houses the propellant charge. Mortars are either High Explosive or Carrier (i.e. smoke, incendiary, or pyrotechnic).
Grenades	A grenade is a short range weapon designed to kill or injure people. It can be hand thrown or fired from a rifle or a grenade launcher. Grenades either contain high explosive or smoke producing pyrotechnic compounds. The common variants have a classic 'pineapple' shape.
Projectiles	A projectile (or shell) is propelled by force, normally from a gun, and continues in motion using its kinetic energy. The gun a projectile is fired from usually determines its size. A projectile contains a fuzing mechanism and a filling. Projectiles can be high explosive, carrier or Shot (a solid projectile).
Rockets	Rockets were commonly designed to destroy heavily armoured military vehicles (anti-tank weapon). The device contains an explosive head (warhead) that can be accelerated using internal propellants to an intended target. Anti-aircraft rocket batteries were also utilised as part of air defence measures.
Landmines	A landmine is designed to be laid on or just below the ground to be exploded by the proximity~~,~~ or contact of a person or vehicle. Landmines were often placed in defensive areas of the UK to obstruct potential invading adversaries.

In the UK unexploded or partially exploded mortars and grenades are the most common items of LSA encountered, as they could be transported and utilised anywhere. They are mostly encountered in areas used for military training and are often found discarded on or near historical military bases.

Images of the most commonly found items of LSA and weapons are presented in **Annex T.**