Report on an

ENVIRONMENTAL GROUND INVESTIGATION

Ref: 23/37713 | Date: November 2023

For the site at:

8 Westbourne Park Road
London
W2 5PH

Prepared for:

Mr Edoardo Zegna

DOCUMENT CONTROL

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	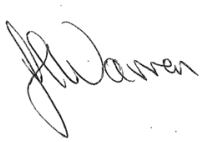
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CONTENTS

LIST OF FIGURES / APPENDICES

EXECUTIVE SUMMARY

Site Location	8 Westbourne Park Road, London, W2 5PH
Proposed Development	At the time of reporting (November 2023), it is proposed to construct a basement beneath the footprint of the existing building.
Environmental Setting	Bedrock Geology: London Clay (Unproductive). There are no Surface water features within 250m. There are no sensitive land use sites within 250m.

GEOLOGICAL CONDITIONS

Ground Conditions Encountered	The borehole and trial pits revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 1.30m or over 1.50m in the pits resting on the Kempton Park River Terrace Gravel with the London Clay Formation at depth.
Groundwater	Groundwater was not encountered in the trial pits and the material remained essentially dry throughout. Groundwater was encountered at a depth of 2.63m below ground level in Borehole 1 after a period of approximately four weeks after installation of the monitoring pipe.

ENVIRONMENTAL INVESTIGATION

Soil Contamination	The findings of the Phase 2 site investigation have demonstrated that in the context of a proposed residential use with home grown produce, the contaminant of concern with respect to end-user protection is Lead.
Pollutant Linkages	The following Sources, Pathways and Receptors have been identified: Sources • Lead Pathways • Direct contact, ingestion and inhalation Receptors • Site end users, construction groundworkers
Recommendations	• There is a risk to end-users of the site from Lead encountered in the Made Ground on-site. Mitigation should be undertaken on-site to negate this risk. • There is a risk to the workforce on-site from Lead encountered in the Made Ground on-site. Normal PPE and following Health and Safety regulations would negate this risk. Due to presence of Lead in the Made Ground this material should not be reused on-site.

1.0 INTRODUCTION

1.1 Outline and Limitations of Report

At the request of Mr Edoardo Zegna, a ground investigation was carried out in connection with a proposed development at the above site.

The information was required in order to assess whether any remediation was required for the protection of the end-user from the presence of potential contamination within the soils encountered.

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

1.2 Report Objectives

This report comprises a Phase 2 - Intrusive Investigation Report to determine the geotechnical parameters of the ground and to assess potential contamination within the soils and waters encountered and assess potential risks to the end-user of the site from the presence of such contamination.

Planning permission granted by councils for development of Brownfield land often have conditions attached which require the following site investigation to be undertaken and submitted to the local authority for approval:

1. Phase 1 - Preliminary Risk Assessment
2. Phase 2 - Intrusive Investigation
3. Phase 3 - Remediation Strategy
4. Phase 4 - Validation Report

A Phase 1 - Preliminary Risk Assessment has previously been undertaken at the site by Site Analytical Services Limited in July 2023, reference 23/37125. There has also been a Basement Impact Assessment report comprising a Geotechnical Ground Investigation carried out by Site Analytical Services Limited in December 2021, references 21/34529-1 and 21/34529-2.

2.0 SITE DETAILS

2.1 Site Location

The site is located on the northern side of Westbourne Park Road – 30m to the west of the junction connecting Westbourne Park Road, the B411 Porchester Road and Celbridge Mews. The site is located in the north-east of Westminster, London, at approximate postcode W2 5PH. The site is bound by residential terraced properties to the east (10 Westbourne Park Road) and west (6 Westbourne Park Road) and part bound by a residential terraced property (4 Westbourne Park Villas) and institutional property (Paddington Children's Library) to the north.

The site is trapezoidal in shape and covers an approximate area of 0.03 Hectares with the general area being under the authority of the City of Westminster.

The site is at National Grid Reference: TQ 257 814.

The site location map is presented below in Figure 1:

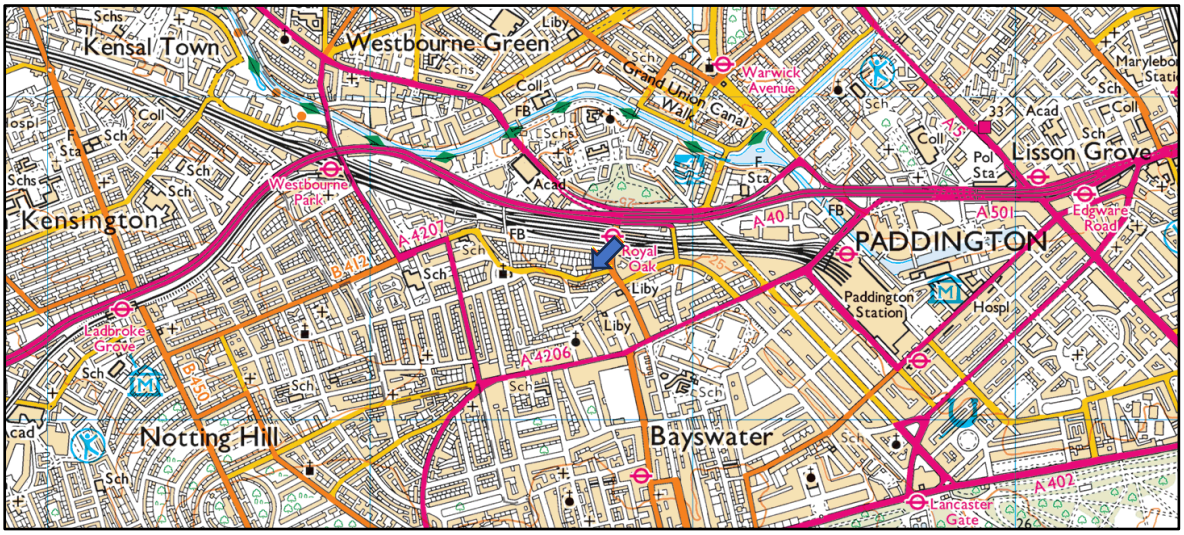

Figure 1 - Site Location Map

2.2 Published Geology

The Geological Survey of Great Britain indicates the site to be underlain by bedrock formed by the London Clay Formation.

2.3 Previous Investigations

A Phase 1 - Preliminary Risk Assessment has previously been undertaken at the site by Site Analytical Services Limited in July 2023, reference 23/37125. There has also been a Basement Impact Assessment report comprising a Geotechnical Ground Investigation carried out by Site Analytical Services Limited in December 2021, references 21/34529-1 and 21/34529-2.

2.4 Proposed Development

At the time of reporting (November 2023), it is proposed to construct a basement beneath the footprint of the existing building.

A proposed site plan (ground floor) is presented below in Figure 2:

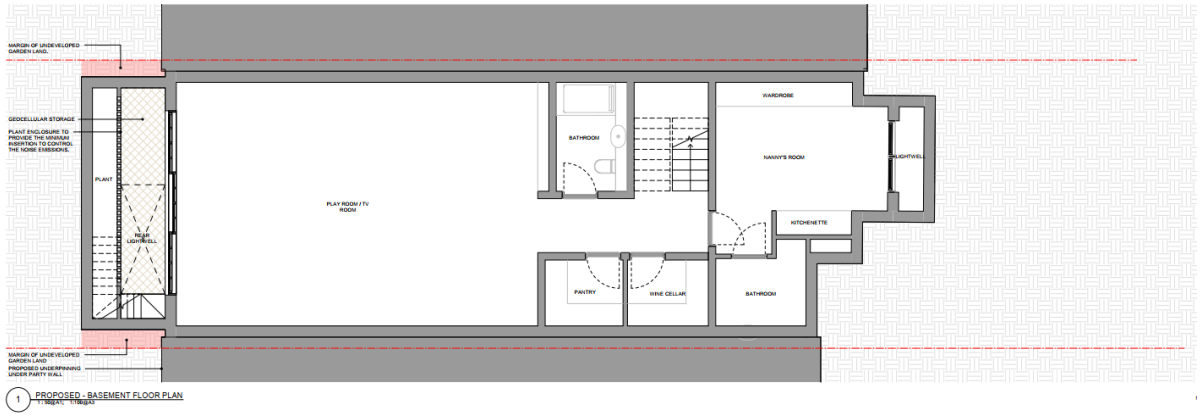

Figure 2 – Proposed Site Plan

2.5 References of Planning Applications

There are several recent planning applications for the site registered on the City of Westminster planning portal. One application is relevant to this report and is detailed below.

Reference	22/04023/FULL
Alternative Reference	PP-11336706
Application Received	Monday 20th June 2022
Application Validated	Monday 20th June 2022
Address	8 Westbourne Park Road, London W2 5PH
Proposal	Excavation of basement extension beneath existing dwelling house, with associated front and rear lightwells and plant in basement.
Status	Decided
Decision	Application Permitted
Decision Issued Date	Thursday 15th December 2022
Appeal Status	Unknown
Appeal Decision	Not Available

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3.0 SCOPE OF WORK

3.1 Site Works

The original proposed scope of works for the geotechnical investigation undertaken by SAS Limited was agreed by the client prior to the commencement of the investigations. To achieve this, the following works were undertaken:-

- The drilling of two Continuous Flight Auger boreholes to a depth of 10.00m below ground level (Boreholes 1 and 2).
- The hand excavation of two foundation inspection pits, excavated to a maximum depth of 1.50m below ground level.
- The installation of a groundwater monitoring standpipe to an approximate depth of 6.00m in Borehole 1, together with two return monitoring visits.
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the exploratory holes.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory holes.

Additional works undertaken by Malci Construction Limited comprised of:

- The excavation of six trial pits to investigate the existing foundation and to obtain samples for laboratory testing (Trial Pits 1 to 6 inclusive).
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the trial pits.
- Laboratory testing to determine the chemical properties of the soils encountered in some of the exploratory holes.

3.2 Ground Conditions

The locations of the exploratory holes are shown on the site investigation plan, Figure 3.

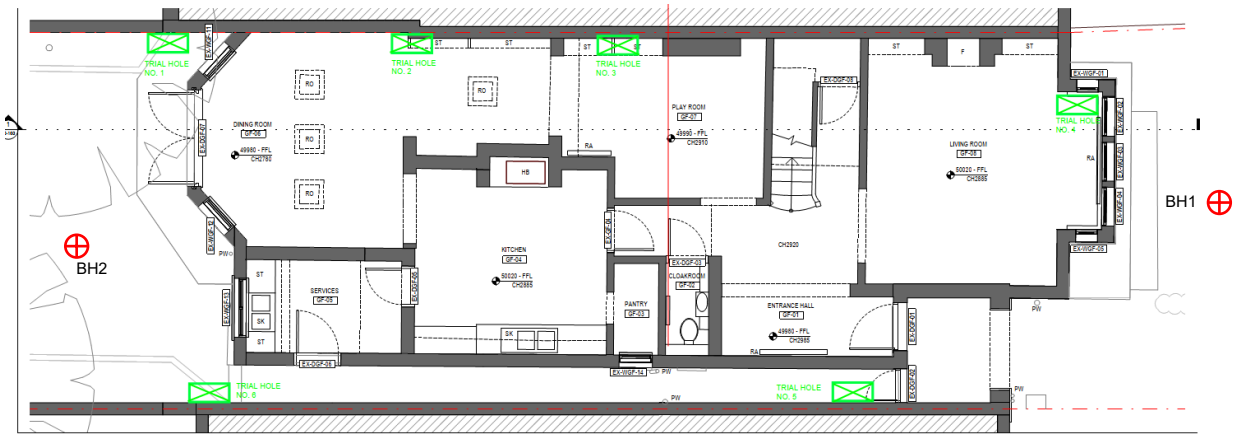

Figure 3 - Site Investigation Plan

The exploratory holes revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 1.20m in thickness underlain by the London Clay Formation.

These ground conditions are summarised in the following table. For detailed information on the ground conditions encountered in the borehole and trial pits, reference should be made to the exploratory hole records presented in Appendix A.

Strata	Depth to top of strata (mbgl)	Depth to base of strata (mbgl)	Description
Made Ground	0.00	0.90 to 1.20	Gravel / Concrete slab over concrete then dark brown sandy clay with brick and concrete fragments
London Clay Formation	0.90 to 1.20	10.00 (max depth of boreholes)	Firm/Stiff silty sandy CLAY

Summary of Ground Conditions in Exploratory Holes

3.3 Groundwater

Groundwater was not encountered in either the boreholes or the trial pits and they essentially remained dry throughout the investigation.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the boreholes and trial pits and hence be detected, particularly within more cohesive soils.

Groundwater was encountered at a depth of 4.25m below ground level in Borehole 1 after a period of approximately 2.5 weeks. However, based on the geology encountered it is anticipated that the groundwater recorded is an accumulation of surface (rain) water that has entered the monitoring pipework.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (November and December 2021) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

3.3.1 Radon Gas

The UK Health Security Agency describes Radon as a colourless, odourless radioactive gas. It is formed by the radioactive decay of the small amounts of Uranium that occur naturally in all rocks and soils. Outdoors everywhere and indoors in many areas the radon levels are low and the risk to health is small.

The Site is not in a Radon Affected Area (as defined by the Health Protection Agency), as less than 1% of properties are above the action level set by the Health Protection Agency. According to BR211 (by the Building Research Establishment), Radon Protection Measures are not required for new properties in these areas.

However, all basements are at increased risk of elevated levels of Radon gas (BR211 Section 6.12) and the UK National Radon Action Plan published in 2018 states: 'Radon measurements should be made in regularly occupied basements of properties irrespective of their geographical location. That said, the UK Health Security Agency also state the following conditions on their website in relation to the validity of monitoring:

- The building should be in normal use during the measurement.

The tests are invalid if:

- There is building work during the test.
- The building is empty for more than 2-3 weeks of the test.
- There is a change in occupier during the test.

Therefore, any monitoring undertaken should be following completion of the basement construction and under normal occupation conditions. Monitoring is low cost and very simple, it does require placing passive recording devices for a three-month period followed by a short period when the monitoring devices are analysed.

In low-risk locations such as London, it may be possible to mitigate the potential minimal risk and the need for monitoring through the incorporation of a suitably designed waterproofing system for a basement. This should be prepared by an appropriate specialist qualified in both waterproofing and radon management (BR211 Section 6.12), as part of the design of the basement.

The design of this system is outside of the scope of this report and also the technical expertise of Site Analytical Services Limited and should therefore be submitted separately to the local authority by the client, or the architect/planning consultant or specialist designer.

An example of a suitable protective membrane complying to these requirements, is the Delta AT800 produced by Delta Membranes. It will be necessary to provide independent certification for the system to prove it has been installed correctly.

4.0 CONTAMINATION TESTING

4.1 Intended Future Uses of the Site

At the time of reporting (November 2023), the proposal for the site is to construct a basement beneath the footprint of the existing building.

For the purposes of the assessment within this section of the report the site has been considered as 'Residential without Home Grown Produce' due to the proposed use of the property.

4.2 Preliminary Site Conceptual Model

In accordance with current UK guidance on contaminated land risk assessment (CLR7, Land Contamination Risk Management framework and BS10175), the following Conceptual Site Model has been generated to summarise the primary sources, receptors and migration and exposure pathways present on the site and to aid in the decision-making process.

For an environmental risk to exist there has to be a source of contamination, receptor or receptors at risk from the contamination and one or more pathway which links the two. Such contaminant – pathway – receptor relationships are termed pollutant linkages.

The subject site has been assessed within the source – pathway – receptor methodology as described above in the framework of a conceptual site model. A conceptual site model can be defined as a testable representation of environmental processes on a site and its vicinity. Its purpose is to identify potential contaminants, pathways and receptors with a view to, initially identifying potential and eventually, quantifying significant pollutant linkages. It should highlight any limitation and uncertainties present in the risk assessment and be able to communicate the results of the risk assessment to all stakeholders.

A Phase 1 Desk Study has been undertaken at the site by Site Analytical Services Limited (July 2023, reference 23/37125) and the site conceptual model from that report has been reproduced below.

Feature/Source	Pathway	Receptor	Hazard (Potential Consequence)	Likelihood of Contaminant Linkage	Risk Assessment	Justification /Further Action
On-Site: Made Ground **Contaminants as listed in Section 8.2**	Direct soil and dust ingestion Dermal contact Inhalation of dust, vapours, and ground gases	Construction workers	**Mild** Acute and chronic toxicity, carcinogenic impact Fire and explosion	*Likely*	*Moderate/Low Risk*	Significant reconstruction is planned. As such, groundwork would be involved in the construction process. Due to the location in a city environment, there is potential for lead from atmospheric fallout to be present in potential hazardous concentrations. Further investigation is considered appropriate.
	Dermal contact Inhalation of dust, vapours	Future site users	**Mild** Acute and chronic toxicity, carcinogenic impact	*Likely*	*Moderate/Low Risk*	The proposed development will have areas of soft landscaping. Due to the location in a city environment, there is potential for lead from atmospheric fallout to be present in potential hazardous concentrations. Further investigation is considered appropriate.
	Inhalation of dust, vapours	Off-site receptors / neighbouring residents and property	**Minor** Acute and chronic toxicity, carcinogenic impact	*Unlikely*	*Very Low Risk*	No potential sources of contamination identified. No further action is considered necessary.
	Inhalation of vapours Inhalation of ground gases	Future users – within building footprint	**Mild** Acute and chronic toxicity Fire and explosion	*Unlikely*	*Very Low Risk*	No potential sources of contamination identified. No further action is considered necessary.
	Surface water run-off	Surface water	**Mild** Water pollution	*Unlikely*	*Very Low Risk*	There are no surface water features within 250m of the site. No further action is considered necessary.
	Surface water run-off	Built materials and services. Off-site buildings	**Mild** Degradation	*Unlikely*	*Very Low Risk*	No further action is considered necessary.

Feature/Source	Pathway	Receptor	Hazard (Potential Consequence)	Likelihood of Contaminant Linkage	Risk Assessment	Justification /Further Action
	Surface water run-off	Environmentally Sensitive Land use	**Minor** Phytotoxicity	*Unlikely*	*Very Low Risk*	There is no significant sensitive land use located within 250m of the site. No further action is considered necessary.

Feature/Source	Pathway	Receptor	Hazard (Potential Consequence)	Likelihood of Contaminant Linkage	Risk Assessment	Justification /Further Action
Off Site: Railway Tracks	Direct soil and dust ingestion Dermal contact Inhalation of dust, vapours, and ground gases	Construction workers	**Mild** Acute and chronic toxicity, carcinogenic impact Fire and explosion	*Unlikely*	*Very Low Risk*	The railway land is lower than the site level and the London Clay geology will prevent migration of any potential contaminants towards the site.
Contaminants as listed in Section 8.2	Dermal contact Inhalation of dust, vapours	Future users – open landscaped areas.	**Mild** Acute and chronic toxicity, carcinogenic impact	*Unlikely*	*Very Low Risk*	The railway land is lower than the site level and the London Clay geology will prevent migration of any potential contaminants towards the site.

4.3 Discussion

4.3.1 Human Health Risk Assessment (On-Site Users, Workforce and Neighbouring Residents)

Comparison of the measured concentrations of the contaminants of concern to their respective screening values indicated that none of the measured parameters exceeded the screening values, except for the following:

- Lead – 2No. of 3No. samples tested

The presence of Lead within the soils in an urban environment is not unexpected due to the historic use of leaded fuels in vehicles resulting in the atmospheric fallout of Lead. The concentrations of Lead identified within the testing suggest that this is the most likely source of the contaminants.

4.3.2 Asbestos Containing Materials

The Made Ground at each exploratory location was screened for the presence of asbestos containing material. In all of the samples analysed, asbestos containing material was not observed during the investigation or identified during the laboratory analysis.

4.3.3 Landscape Planting/Ecological Features

The concentrations of the phytotoxic substances Total Zinc, Total Copper and Total Nickel encountered in the samples obtained were generally below the landscape planting generic assessment levels. These results suggest that there would be little detrimental impact upon sensitive plants.

4.3.4 Buildings and Construction Materials

Concrete Cast In-Situ

The concentrations of Total Sulphate encountered exceeded the BRE guidance level of 2400mg/kg. The Water Soluble Sulphate concentrations when compared with BRE Special Digest 1: 2005, Tables C1 and C2 would classify the samples submitted as up to Class DS-3. This should be taken into account should any concrete structures be installed within the soils represented by these samples.

Potable Water Supply Pipes

If at any point in the future it is intended to install new water supply pipes within the Made Ground then consideration to the pipe materials used and/or the trench construction in accordance with UKWIR (2010) and the WATER UK HBF guide. Based upon the concentrations of TPH returned by the samples of Made Ground and the analysis undertaken, the use of standard PE pipe materials at the site may be suitable.

4.3.5 Soil Disposal

The samples were analysed using the 'HazWasteOnline' assessment tool, which concluded that none of the samples contained hazardous properties:

Where soils on-site are excavated with the intension of disposal at an off-site facility, then prior to removal the results of all the chemical analysis should be provided to the chosen disposal facility for assessment.

4.4 Revised Site Conceptual Model and Conclusions

The findings of the Phase 2 site investigation have demonstrated that in the context of a proposed residential use without home grown produce, the contaminants of concern with respect to end-user protection is a 'hot-spot' of PAH's. Elevated zinc may be detrimental to sensitive plants.

A Phase 2 Site Investigation has identified the following Source/Pathway/receptor linkages present on-site or potentially present.

Potential Contaminants / Source	Pathway	Receptor	Site specific settings	Risk Classification: (Phase 2)	Action Required
LEAD	Inhalation, ingestion and dermal contact.	Human Health Residents	Residential witht home grown produce	Low/Medium	Further action required
LEAD	Inhalation, ingestion and dermal contact	Human Health Groundworkers	Workers should follow regulation on health and safety during development (HSE, 1991).	Low	Further action required – Good standard of site hygiene required

Phase 2 Conceptual Site Model

4.5 Viable Risks Requiring Action

- There is a risk to end-users of the site from Lead encountered in the Made Ground on-site. Mitigation should be undertaken on-site to negate this risk.
- There is a risk to the workforce on-site from Lead encountered in the Made Ground on-site. Normal PPE and following health and safety regulations would negate this risk.

Due to presence of Lead in the Made Ground this material should not be reused on-site.

4.6 Discovery Strategy

The discovery strategy sets out the actions that must be taken if contamination is encountered during the course of a development.

The contractor should develop their discovery strategy as p[art of the construction management plan.

5.0 LIST OF APPENDICES

Appendix A – Borehole Logs (2021 Investigation)

Appendix B – Laboratory Test Data

Appendix C – Generic Values used in the Risk Assessment

6.0 REFERENCES

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APPENDIX A

Borehole Logs (2021 Investigation)

Ref: 23/37713
Date: November 2023

Site Analytical Services Ltd.

Site	Borehole Number
8 WESTBOURNE PARK ROAD, LONDON, W2 5PH	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MR EDOARDO ZEGNA	2134529
	Location	**Dates**	**Engineer**	**Sheet**
	TQ256814	22/11/2021	MARK PINNY ARCHITECTS	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.05	MADE GROUND: Ornamental stones		
0.25	D1						MADE GROUND: Soft, dark brown silty sandy clay containing brick and other man-made fragments		
0.50	D2					(1.15)			
0.75	D3								
1.00 1.00-1.30	D4 M1 82/300					1.20	Stiff, brown orange silty sandy CLAY		
1.50 1.50	D5 V1 76								
2.00 2.00	D6 V2 95					(1.60)			
2.50 2.50	D7 V3 117								
3.00 3.00	D8 V4 137					2.80	Stiff, dark brown silty sandy CLAY		
3.50 3.50	D9 V5 140+								
4.00 4.00	D10 V6 140+								
4.50 4.50	D11 V7 140+								
5.00 5.00	D12 V8 140+								
6.00 6.00	D13 V9 140+					(7.20)			
7.00 7.00	D14 V10 140+								
8.00 8.00	D15 V11 140+								
9.00 9.00	D16 V12 140+								
10.00 10.00	D17 V13 140+					10.00			

Remarks
Groundwater was not encountered during boring/excavation
V= Vane Test - Results in kPa
M= Makintosh Probe-Blows/Penetration (mm)
D= Disturbed Sample
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	EW

Figure No. 2134529.BH1

Site Analytical Services Ltd.

Site	Borehole Number
8 WESTBOURNE PARK ROAD, LONDON, W2 5PH	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MR EDOARDO ZEGNA	2134529
	Location TQ256814	**Dates** 02/12/2021	**Engineer** MARK PINNY ARCHITECTS	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.06			
						0.15	MADE GROUND: Concrete slabs		
0.25	D1						MADE GROUND: Concrete		
0.50	D2					(0.75)	MADE GROUND: Dark brown silty sandy clay containing brick and concrete fragments		
0.75	D3					0.90			
1.00	D4						Firm becoming stiff, brown orange silty sandy CLAY		
1.00	V1 73								
1.50	D5					(1.30)			
1.50	V2 80								
2.00	D6								
2.00	V3 86					2.20	Stiff, brown orange silty sandy CLAY		
2.50	D7								
2.50	V4 112								
3.00	D8					(1.40)			
3.00	V5 134								
3.50	D9					3.60			
3.50	V6 140+						Brown orange silty CLAY		
4.00	D10								
4.00	V7 140+								
4.50	D11								
4.50	V8 140+								
5.00	D12								
5.00	V9 140+								
6.00	D13								
6.00	V10 140+								
						(6.40)			
7.00	D14								
7.00	V11 140+								
8.00	D15								
8.00	V12 140+								
9.00	D16								
9.00	V13 140+								
10.00	D17								
10.00	V14 140+					10.00			

Remarks
D= Disturbed Sample
V= Vane Test - Results in kPa
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	EW

Figure No. 2134529.BH2

APPENDIX B

Laboratory Test Data

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Analytical Report Number : 23-66784

Project / Site name:	8 Wextbourne Park Road	**Samples received on:**	03/11/2023
Your job number:	C84	**Samples instructed on/ Analysis started on:**	03/11/2023
Your order number:	C84-10712	**Analysis completed by:**	13/11/2023
Report Issue Number:	1	**Report issued on:**	13/11/2023
Samples Analysed:	3 soil samples		

Signed: JSzwagrak

Joanna Szwagrzak
Reporting Specialist
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.

Analytical Report Number: 23-66784
Project / Site name: 8 Wextbourne Park Road
Your Order No: C84-10712

Lab Sample Number				2867593	2867594	2867595
Sample Reference				Front Garden	HR6 Front	HR10 Back
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				01/11/2023	01/11/2023	01/11/2023
Time Taken				0945	0945	0945
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	25	14	23
Total mass of sample received	kg	0.001	NONE	1.3	1.4	1.4
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	WEM	WEM	WEM

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	8.8	8.8
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	420	5000	790
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	250	3500	110
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.127	1.76	0.0549
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	127	1760	54.9
Dry solids	%	0.1	NONE	94	95	96
Moisture Content @ 105oC	%	0.01	NONE	6.5	5.2	4.3

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	< 0.05	0.09	0.57
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.13
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.13	0.8
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.11	0.68
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.05	0.4
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.09	0.41
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.1	0.42
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.22
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.06	0.37
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.18
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.19

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80	4.37

Analytical Report Number: 23-66784
Project / Site name: 8 Wextbourne Park Road
Your Order No: C84-10712

Lab Sample Number				2867593	2867594	2867595
Sample Reference				Front Garden	HR6 Front	HR10 Back
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				01/11/2023	01/11/2023	01/11/2023
Time Taken				0945	0945	0945
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Heavy Metals / Metalloids						
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	2.8	< 1.0	< 1.0
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	16	14
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	0.97	1
Boron (water soluble)	mg/kg	0.2	MCERTS	1.4	2.5	1.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	40	30	32
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	46	41
Lead (aqua regia extractable)	mg/kg	1	MCERTS	22	440	230
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	210	380	250
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.6	0.3
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	0.26	1.1	1.5
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	34	19	28
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	64	130	120
Monoaromatics & Oxygenates						
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Petroleum Hydrocarbons						
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	< 10
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-66784
Project / Site name: 8 Wextbourne Park Road

* 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 *
2867593	Front Garden	None Supplied	None Supplied	Brown clay.
2867594	HR6 Front	None Supplied	None Supplied	Brown loam and sand with gravel and brick.
2867595	HR10 Back	None Supplied	None Supplied	Brown clay and loam with gravel.

Analytical Report Number : 23-66784
Project / Site name: 8 Wextbourne Park Road

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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.	L038-PL	D	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
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Dry Solids in soil	Moisture content, determined gravimetrically.	In house method.	L047-PL	W	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	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
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. Refer to CoA for analyte specific accreditation.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-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
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
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-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	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID. Refer to CoA for band specific accreditation.	In-house method with silica gel split/clean up.	L088/76-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

Analytical Report Number : 23-66784
Project / Site name: 8 Wextbourne Park Road

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' 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.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

APPENDIX C

Generic Values used in the Risk Assessment

Ref: 21/33742-1
Date: July 2021

Qualitative Risk Assessment - Soils

The hazard caused by the presence of a substance or element is not absolute but depends on the proposed end use of the site.

It is understood that the site is to be developed for residential use with areas of private gardens. As such the S4UL screening levels for residential use with home-grown produce and Category 4 Screening Level for residential use have been used in the following soil assessment.

Site data has been assessed against current generic assessment criteria (GAC) / guideline values in accordance with current industry practice and statutory guidance; chemical toxicology (TOX), Soil Guideline Value (SGV) reports developed using the new Contaminated Land Exposure Assessment (CLEAv1.06) framework, CLR 11 (Environment Agency, 2009) and SP1010: Development of Category 4 screening levels for assessment of land affected by contamination (DEFRA, 2014).

However, it must be remembered that GAC are not binding standards but can be useful in forming judgements regarding the level of risk i.e. unacceptable or acceptable. Exceedance of GAC does not automatically result in the requirement for remedial / risk management work but would warrant further assessment.

Suitable 4 Use Levels, Category 4 Screening Levels, Soil Guideline Values, CLR Documents & Chartered Institute of Environmental Health Values

Under Part 2A of the Environmental Protection Act 1990, land is determined as contaminated if it is deemed to be causing significant harm, or where there is a Significant Possibility of Significant Harm to human health.

From January 2009 revised Soil Guidance Values for certain contaminants were issued in the Contaminated Land Reports (CLR) by the Environment Agency in conjunction with Department of the Environment, Food, Agriculture and Rural Affairs. These values and the CLEA methodology used to derive them have superseded CLEA and TOX reports for soil contaminants.

The CLR Documents are a series of contaminated land guidance documents developed by various past and present government agencies involved with protection of the environment.

These documents aim to provide a set of generic Soil Guideline Values and a site specific modelling programme based upon tolerable predicted uptakes from experimental data for a variety of common industrial toxic contaminants. In instances of carcinogenic and mutanagenic substances the guideline values are set on the basis of "As Low As Reasonably Practicable" (ALARP), as theoretically mutation can occur on exposure to a single particle of the contaminant.

Revised Statutory Guidance to support Part 2A of the Environmental Protection Act 1990 was published in April 2012, which introduced a new four-category system for classifying land under Part 2A for cases of a Significant Possibility of Significant Harm to human health, where Category 1 includes land where the level of risk is clearly unacceptable and Category 4 includes land where the level of risk posed is acceptably low.

‘Category 4 Screening Levels’ (C4SLs) have been introduced in March 2014 to provide a simple test for deciding when land is suitable for use and definitely not contaminated land. The Category 4 Screening Levels consist of estimates of contaminant concentrations in soil that are considered to present an ‘acceptable’ level of risk, within the context of Part 2A.

In response, in November 2014, The Chartered Institute of Environmental Health Generic Assessment Criteria for Human Health Risk Assessment adopt the Environment Agency's CLEA UK (Beta) Model and Category 4 Screening Levels and as such have derived guideline values that are compatible with current English legislation, policy and technical guidance in the form of LQM/CIEH S4ULS's (Suitable 4 Use Levels).

The methodology for deriving both the previous Soil Guideline Values and the new Suitable 4 Use Levels is based on the Environment Agency's Contaminated Land Exposure Assessment (CLEA) methodology.

At the time of writing this report Suitable 4 Use Levels are in place for some heavy metals, BTEX Substances, Petroleum Hydrocarbons and Polycyclic Aromatic Hydrocarbons as well as a number of selected organic compounds.

Generic Assessment Criteria for Human Health Risk Assessment (S4UL's) have been produced by LQM / Chartered Institute of Environmental Health for the 'residential with home grown produce'. The table below summarized the relevant screening values for the contaminants of concern.

		Residential With Home Grown Produce		
		POS Res 1% SOM	*POS Res 2.5% SOM*	*POS Res 6% SOM*
Metals				
Arsenic	mg/kg	37	37	37
Beryllium	mg/kg	1.7	1.7	1.7
Boron	mg/kg	290	290	290
Cadmium	mg/kg	11	11	11
Chromium III	mg/kg	910	910	910
Chromium VI	mg/kg	6	6	6
Copper	mg/kg	2400	2400	2400
*Lead**	mg/kg	200	200	200
Mercury	mg/kg	1.2 (elemental 40 (Inorganic or methyl)	1.2 (elemental 40 (Inorganic or methyl)	1.2 (elemental 40 (Inorganic or methyl)
Nickel	mg/kg	180	180	180
Selenium	mg/kg	250	250	250
Vanadium	mg/kg	410	410	410
Zinc	mg/kg	3700	3700	3700
Total Phenols				
Total Phenols (monohydric)	mg/kg	120	200	380

Residential With Home Grown Produce

		POS Res 1% SOM	POS Res 2.5% SOM	POS Res 6% SOM
Speciated PAHs				
Naphthalene	mg/kg	2.3	5.6	13
Acenaphthylene	mg/kg	170	420	920
Acenaphthene	mg/kg	210	510	1100
Fluorene	mg/kg	170	400	860
Phenanthrene	mg/kg	95	220	440
Anthracene	mg/kg	2400	5400	11000
Fluoranthene	mg/kg	280	560	890
Pyrene	mg/kg	620	1200	2000
Benzo(a)anthracene	mg/kg	7.2	11	13
Chrysene	mg/kg	15	22	27
Benzo(b)fluoranthene	mg/kg	2.6	3.3	3.7
Benzo(k)fluoranthene	mg/kg	77	93	100
Benzo(a)pyrene	mg/kg	2.2	2.7	3.0
Indeno(1,2,3cd)pyrene	mg/kg	27	36	41
Dibenz(a,h)anthracene	mg/kg	0.24	0.28	0.3
Benzo(ghi)perylene	mg/kg	320	340	350
Aliphatic hydrocarbons				
EC5 –C6	mg/kg	42	78	160
EC6 - C8	mg/kg	100	230	530
EC8 – C10	mg/kg	27	65	150
EC10 – C12	mg/kg	130	330	770
EC12 – C16	mg/kg	1100	2400	4400
EC16-C35	mg/kg	65000	92000	110000
EC35-44	mg/kg	65000	92000	110000

Residential With Home Grown Produce

		POS Res 1% SOM	*POS Res 2.5% SOM*	*POS Res 6% SOM*
Aromatic hydrocarbons				
EC5 – C7	mg/kg	70	140	300
EC7 – C8	mg/kg	130	290	660
EC8 – C10	mg/kg	34	83	190
EC10 – C12	mg/kg	74	180	380
EC12 – C16	mg/kg	140	330	660
EC16 – C21	mg/kg	260	540	930
EC21 – C35	mg/kg	1100	1500	1700
EC35 – C44	mg/kg	1100	1500	1700
Benzene	mg/kg	0.087	0.17	0.37
Toluene	mg/kg	130	290	660
Ethylbenzene	mg/kg	47	110	260
Xylenes O	mg/kg	60	140	330
Xylenes M	mg/kg	59	140	320
Xylenes P	mg/kg	56	130	310

Note:

** Based on C4SL values*