Your Ref:

Our Ref: 735445-(01)/AW

Date: 25 January 2021

STRUCTURAL SOILS LTD

SITE INVESTIGATION

SOIL, ROCK & MATERIAL TESTING

GEOTECHNICAL CONSULTANCY

CONTAMINATED LAND ASSESSMENT

Dave Barratt
Barratt & Canniford Ltd
Western House
Cookway
Bindon Road
Taunton
TA2 6BJ

Dear Dave,

REAR OF 11 DEAN LANE, BEDMINSTER, BRISTOL
SOIL CONTAMINATION ANALYSIS

INTRODUCTION

This soil testing was carried out on the instruction of and on behalf of Barratt & Canniford Ltd.

Structural Soil Ltd (SSL) have previously prepared a desk study with Preliminary Risk Assessment of the site the site for others (Report Reference 734539). That report identified the potential for soil contamination on the site as the primary risk and recommended It is understood that the report was submitted to Bristol City Council to pursue discharge of the land contamination planning conditions for the proposed scheme, and that discharge was not granted as the applicant did not confirm what remedial measures would be adopted.

The scope of this report was to undertake a limited investigation of the shallow soils on the site to enable a comment to be made on the plausible contamination linkages identified in that desk study, and to provide contamination analysis results to allow the client to obtain costs for disposal of excess soils from the scheme.

All information, comments and opinions given in this report are based on observations made during the field works and on the results of laboratory tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata or contaminant concentrations upon below or between the investigation locations.

This report was prepared by Structural Soils Ltd for the sole and exclusive use of Barratt & Canniford Ltd in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

THE OLD SCHOOL
STILLHOUSE LANE
BEDMINSTER
BRISTOL
BS3 4EB
TEL: 0117 947 1000
FAX: 0117 947 1004
ask@soils.co.uk
www.soils.co.uk

HEAD OFFICE:
Bristol
BRANCH OFFICES:
Castleford
Glasgow
Hemel Hempstead

REAR OF 11 DEAN LANE, BEDMINSTER, BRISTOL
SOIL CONTAMINATION ANALYSIS

FIELDWORK

SSL attended the site at the rear of 11 Dean Lane on 17 December 2020. Access to the site was made from Murray Street Road. At the time of the visit the site was enclosed by a combination of wooden fences and brick walls. It contained no buildings and was partially overgrown with ruderal vegetation. The surface of the site was a combination of bare ground and a small area of concrete and was empty save for a small number of miscellaneous items including a domestic wheelie bin, wheelbarrow, occasional lengths of timber and plant pots.

Three hand dug trial pits were opened on the site by representatives of the client. Trial pits TP1 and TP2 were located in the proposed garden area, whilst TP3 was located within the footprint of the proposed buildings. The trial pits were logged and sampled in general accordance with the recommendations of BS5930:2015. Logs for the trial pits and an exploratory hole location plan are appended for your records.

The soils encountered within the trial pits are considered fairly typical for the local area; Topsoil-like soft to firm dark brown slightly sandy gravelly clays in the near surface which include cobbles and gravel of brick, and gravel including concrete, ceramics, clinker, glass, chert and coal. This is underlain between 0.45m and 0.60m depth by typically firm to still greyish brown clay, locally with inclusions or apparent beds of reddish brown clay. This greyish brown clay is almost certainly Tidal Flats Deposits (alluvium) whilst the reddish brown clays are derived from the Mercia Mudstone Group. The geological sequence beneath the site it expected to be made ground, over Tidal Flats Deposits over Mercia Mudstone, however, unless the Tidal Flat Deposits are very thin and the Mercia Mudstone is very close to the surface here, it is reasonably likely that this mixed deposits are actually reworked and thus made ground. Accordingly this mixed material was logged as possible made ground in trial pits TP2 and TP3, whereas in TP1, where the greyish brown clay contained no reddish brown material, it was logged as natural.

The samples were taken in containers provided by the testing laboratory and were placed in cool boxes with icepacks for despatch to Envirolab; an MCERTS and UKAS accredited testing laboratory. Contamination testing was carried out in accordance with MCERTs and UKAS standards and the results are enclosed.

Three soil samples were analysed for a general suite of contaminants comprised of arsenic, cadmium, chromium (total), lead, mercury, selenium, copper, nickel, zinc, speciated polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH), organic matter, pH, sulphate (acid soluble), asbestos screen.

Two additional soil samples were scheduled for full Waste Assessment Criteria (total solids and leachate) suite.

REAR OF 11 DEAN LANE, BEDMINSTER, BRISTOL
SOIL CONTAMINATION ANALYSIS

ASSESSMENT OF SOIL ANALYSIS RESULTS

The Preliminary Risk Assessment previously undertaken for the site identified two potentially complete contaminant linkages.

1. Direct contact by future site residents with soils that may be impacted with heavy metals asbestos or polycyclic aromatic hydrocarbons.

2. Permeation of polythene water supply pipes and contamination of the drinking water supply.

These potential linkages are assessed by comparison of the available testing results against published Generic Assessment Criteria (GAC). For human health these GAC are a combination of the CLEA SGVs, Defra C4SL and internally derived assessment criteria. The background to their generation is included on the appended GAC sheets. For drinking water supply pipes, the GAC are those published by UKWIR for the selection of pipe materials in potentially contaminated ground.

Direct contact by future site residents with soils that may be impacted with heavy metals asbestos or polycyclic aromatic hydrocarbons.

This assessment compares the results to the GAC for residential use with potential consumption of homegrown produce. The exceedances are summarised in Table 1 below. Note that no exceedances have been presented for elemental mercury or hexavalent chromium as the presence of significant proportions of these species is considered unlikely given the residential history of the site.

TABLE 1 : GAC EXCEEDANCES FOR HUMAN HEALTH

Contaminant	GAC (mg/kg)	Exceedance (mg/kg)
Arsenic	37	49 – TP2 0.10-0.30m
Lead	200	262 – TP1 0.30-0.50m 885 – TP2 0.10-0.30m
Benzo(b)fluoranthene	3.3	3.46 – TP2 0.10-0.30m
Dibenzo(ah)anthracene	0.28	0.43 – TP2 0.10-0.30m

The assessment shows that there area a number of exceedances of the assessment criteria, with the most significant appearing to that for lead, where the average concentration across the three samples tested (429 mg/kg) is more that double of the GAC of 200 mg/kg.

Given the size of the site, and the nature of the soils, and the volume of the testing it is not considered valid to consider identifying any of the samples as hotspots of contamination. Rather it is considered that the variable results represent the inhomogeneity of the soils on the site and other similarly elevated results could be present elsewhere on the site.

Accordingly, the soils are considered unsuitable for use in any areas of the scheme where the future resident could come into contact with them, such as in areas of soft landscaping or gardens. Where the building, pavements or parking areas are present, there is no pathway for direct contact, and the soils may remain in-situ.

Given the degree of contamination and the potential for areas of higher concentrations of metals to be present, we consider that the risk in soft landscaping is likely to be best managed through the removal of all of these soils within 600mm of the surface and replacement with certified clean topsoil and subsoil. Any such capping layer should incorporate a permeable geotextile membrane at the base and sides to avoid waterlogging of the soils whilst preventing mixing of the replacement soils with any residual impacted soil.

All imported soils should be sourced from a reputable source and be suitable for plant cultivation. They should be provided with the supplier's certificates of analysis which should cover a wide range of contaminants (including those used to screen the existing soil on this contract as a minimum). Assessment of suitability for use can be considered using the enclosed GAC. If the provenance of the soil is poor, or if there is any suspicion that the supplied certificates may not represent the soil supplied, we would recommend that the developer secure independent 3rd party testing of the imported soils.

Permeation of polythene water supply pipes and contamination of the drinking water supply

Assessment of the results against the UKWIR thresholds for standard polyethylene pipe and fittings indicates some low-level exceedances in TP2. The TPH banding results for bands C21 to C21 of 44 mg/kg exceed the threshold of 10 mg/kg, whilst the benzo(a)pyrene result of 2.95 mg/kg exceeds the general SVOC threshold of 2 mg/kg.

Given the scale of the development, we would recommend installing barrier pipe and fittings for any water supply pipes in the ground as this is likely to be cost effective over undertaking any further investigation once the route of the new water supply pipe is identified.

ASSESSMENT OF SOIL ANALYSIS RESULTS FOR OFF-SITE DISPOSAL OF SOIL

Envirolab have produced an assessment tool that characterises contaminated waste soil by following the guidance within WM3. The total solid testing results from this investigation have been run through this assessment tool to aid potential future off-site disposal of materials. This

assessment produces an 'initial' characterisation of the waste which determines if it is hazardous or not.

None of the soils have triggered any hazardous risk phrases and accordingly none would be considered hazardous waste.

Th Waste Acceptance Criteria Testing undertaken shows that for the near surface, topsoil-like made ground, the levels of organic matter are too high to meet the inert landfill Waste acceptance criteria (Total Organic Carbon result of 10.8% exceeds the Inert waste landfill threshold of 3%). Accordingly, these soils may be classified as non-hazardous waste for disposal to landfill.

For the deeper reworked natural soils represented by TP3 0.80- 0.90m, there are no exceedances of the inert landfill Waste Acceptance Criteria and those soils may be classed as inert waste.

TABLE 2 : WASTE ASSESSMENT SUMMARY

Sample	Initial Waste Characterisation	Results which fail relevant WAC criteria	Classification
TP1 0.30-0.50 (Topsoil like Made Ground)	Not Hazardous	N/A	**N/A**
TP1 0.30-0.50 (Topsoil like Made Ground)	Not Hazardous	Total Organic Carbon 10.8% exceeds inert WAC limit of 3%	**Non-Hazardous**
TP3 0.80-0.90 (Reworked natural soils)	Not Hazardous	None	**Inert**

It is important to note that whilst we believe our in-house assessment tool to be an accurate interpretation of the requirements of WM3, thereby producing initial classifications in accordance with it, landfill operators often have their own assessment tools and can often come to a different conclusion. As a result, some landfill operators could even refuse to take apparently suitable waste.

It is possible that alternative disposal routes may be explored, such as waste treatment centres, for which the above classifications are not necessarily relevant. These options should be discussed with your waste disposal contractor.

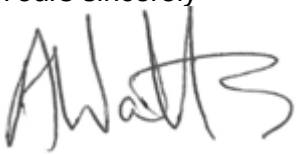
CLOSING REMARKS

REAR OF 11 DEAN LANE, BEDMINSTER, BRISTOL
SOIL CONTAMINATION ANALYSIS

The assessment of the soil results for contamination risks has identified that both plausible linkages identified in the Preliminary Risk Assessment for the site are likely to be complete, and accordingly some remedial measures will need to built into the development. Discussions should be entered into with BCC to agree what level of information and commitment will be required from you as developer to agree the detail of those measures and what information you will be required to produce to validate their implementation. If required SSL can produce a separate remediation strategy report and be involved in the validation of the works, however the given the simplicity of the measure this may be something that you are happy to arrange and document in-house.

We trust that this is satisfactory but please contact us if you have any queries.

Yours sincerely



Adam Watts

Senior Geoenvironmental Engineer

Encs.

Site Location Map

Exploratory Hole Location Plan

Hand Dug Trial Pit Logs

Laboratory Testing Certificates

Haswaste Initial Waste Classification Output

RSK Generic Assessment Criteria

UKWIR Generic Assessment Critieria

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB
Tel: 0117 947 1000
ask@soils.co.uk
www.soils.co.uk

CLIENT: Barratt & Canniford Ltd.

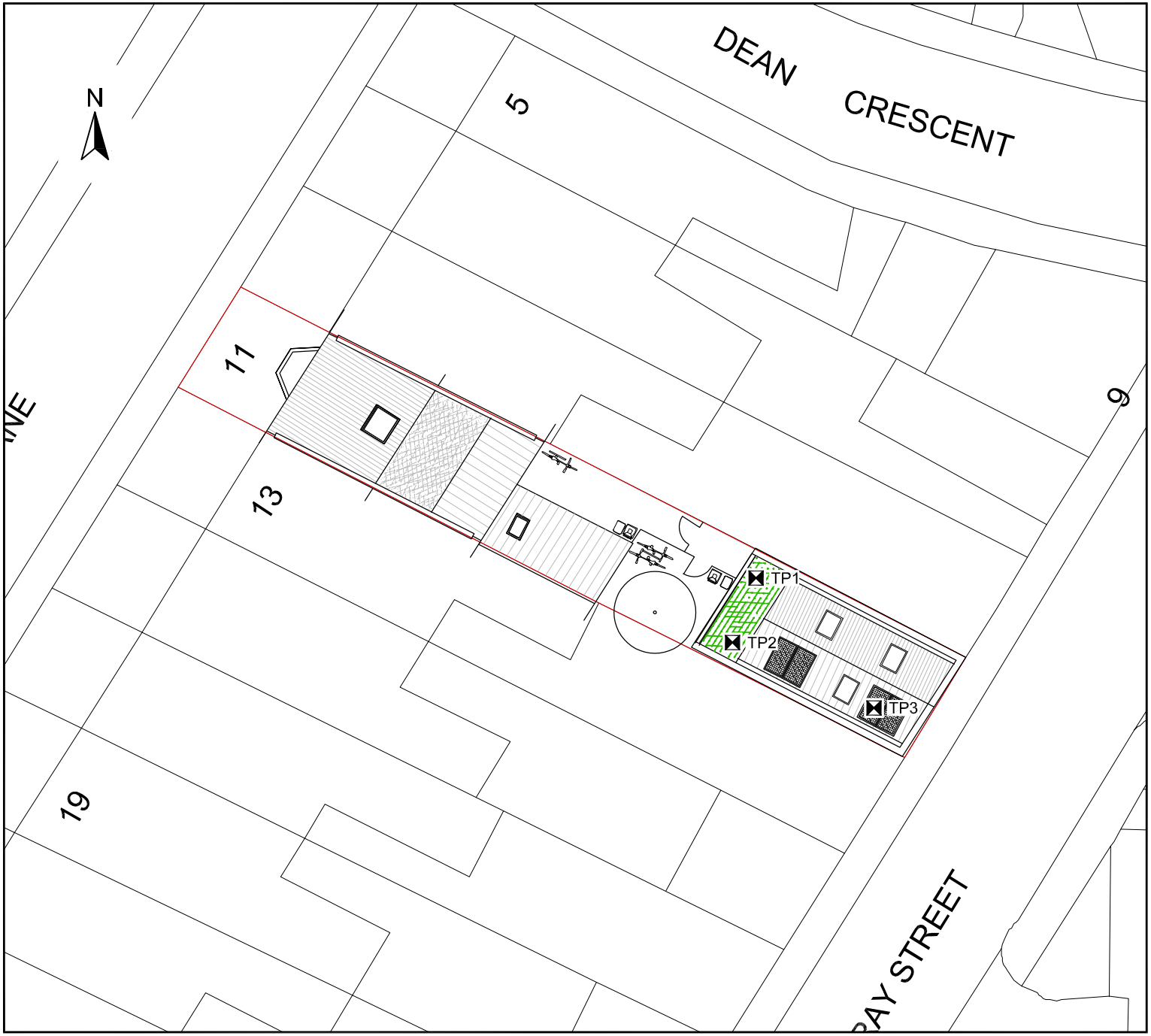
PROJECT: Rear of No.11 Dean Lane, Southville

TITLE: SITE LOCATION MAP

REV.	DATE	DESCRIPTION	BY	CHD.	APR.
00	21.01.2021	-	NP	JE	-

DIMENSION	SCALE	DRAWING STATUS
m	1:25,000	-

JOB NO	GRID REF	SCALE BAR	ORIGIN SIZE	FIGURE
735445	ST 584 717	0 250 500 750 1,000m	A4	1



LEGEND

Trial Pit Location

REV	DATE	DESCRIPTION	BY	CHD	APR
00	21.01.2021	-	NP	JE	-

DIMENSION	SCALE	ORIGIN SIZE
m	1:250	A4

STRUCTURAL SOILS

The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Tel: 0117 947 1000
ask@soils.co.uk
www.soils.co.uk

CLIENT

Barratt & Canniford Ltd.

PROJECT

Rear of No.11 Dean Lane, Southville

TITLE

EXPLORATORY HOLE LOCATION PLAN

JOB NO	FIGURE
735445	2
DRAWING STATUS	REV
-	00

SCALE BAR

0 2 4 6 8 10m

STRUCTURAL SOILS

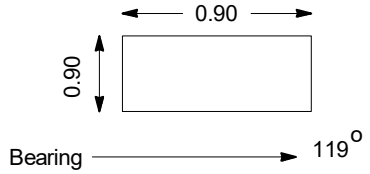
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Rear of No. 11 Dean Lane, Southville	**Barratt & Canniford Ltd.**	**TP1**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
735445	**17.12.20**	**---**	**---**	**1** of **1**
	End: **17.12.20**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: CONCRETE.	0.04	
0.05-0.15	101	ES	1xT, 1xJ			MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY with abundant rootlets and occasional roots, plastic packaging and metal fragments. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick, chert, coal, concrete, ceramics, clinker and glass.	0.17	
						. . . at 0.10 m depth, metal pipe.		
0.30-0.50	102	ES	1xT, 1xJ			MADE GROUND: Soft brown mottled dark brown slightly sandy slightly gravelly CLAY with rare roots and rootlets. Sand is fine to coarse. Gravel is angular to subangular fine to medium of brick, coal, chert and mortar.	(0.43)	
							0.60	
0.80-1.00	103	ES	1xT, 1xJ			Firm to stiff brown mottled grey silty CLAY with rare rootlets.	(0.50)	
0.85		HP	c_u=105/90/105				1.10	
						Trial pit terminated at 1.10m depth.		

Plan (Not to Scale)



General Remarks

1. Trial pit dug by client.
2. Trial pit dry and walls stable.
3. Trial pit left open on instruction of client.

All dimensions in metres | Scale: **1:10**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**JDEvans**	AW.

STRUCTURAL SOILS

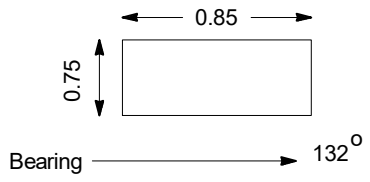
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Rear of No. 11 Dean Lane, Southville	**Barratt & Canniford Ltd.**	**TP2**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
735445	**17.12.20**	**---**	**---**	**1** of **1**
	End: **17.12.20**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.10-0.30	101	ES	1xT, 1xJ			MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY with medium cobble content and abundant rootlets, roots and rare wood and plastic fragments. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick, chert, concrete, sandstone, coal and clinker. Cobbles are angular of brick (<80mm).	(0.45) 0.45	
0.50-0.70	102	ES	1xT, 1xJ			MADE GROUND: Stiff brown mottled dark brown and grey slightly sandy slightly gravelly CLAY with rare roots and rootlets. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick, mudstone, limestone, concrete and ceramics.	(0.40) 0.85	
0.90-1.00 0.90	103	ES HP	1xT, 1xJ c_u=75/85/100			POSSIBLE MADE GROUND: Firm to stiff brown occasionally mottled grey silty CLAY with rare rootlets.	(0.15) 1.00	
						Trial pit terminated at 1.00m depth.		

Plan (Not to Scale)



General Remarks

1. Trial pit dug by client.
2. Trial pit dry and walls stable.
3. Trial pit left open on instruction of client.

All dimensions in metres | Scale: **1:10**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**JDEvans**	AW.

STRUCTURAL SOILS

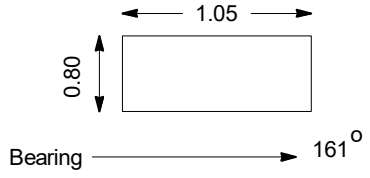
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Rear of No. 11 Dean Lane, Southville	**Barratt & Canniford Ltd.**	**TP3**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
735445	**17.12.20**	**---**	**---**	**1** of **1**
	End: **17.12.20**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20-0.40	101	ES	1xT, 1xJ			MADE GROUND: Soft to firm dark brown slightly sandy slightly gravelly CLAY with low cobble content and abundant rootlets, roots and occasional plastic fragments. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick, concrete, ceramics, mudstone, coal, clinker and glass. Cobbles are angular of brick (<80mm).	(0.60) 0.60	
0.60-0.75	102	ES	1xT, 1xJ			MADE GROUND: Firm to stiff reddish brown rarely mottled grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of mudstone.	(0.15) 0.75	
0.80-0.90	103	ES	1xT, 1xJ			MADE GROUND: Firm to stiff friable greyish brown sandy CLAY. Sand is fine to coarse.	(0.15) 0.90	
0.90-1.00	104	ES	1xT, 1xJ			POSSIBLE MADE GROUND: Soft to firm brown slightly sandy silty CLAY. Sand is fine to medium.	1.00	
						Trial pit terminated at 1.00m depth.		

Plan (Not to Scale)



General Remarks

1. Trial pit dug by client.
2. Trial pit dry and walls stable.
3. Trial pit left open on instruction of client.

All dimensions in metres | Scale: **1:10**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**JDEvans**	AW.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/11175
Issue Number: 1 **Date:** 15 January, 2021

Client:
Structural Soils Limited (Bristol)
The Old School
Stillhouse Lane
Bedminster
Bristol
UK
BS3 4EB

Project Manager: Adam Watts/Jonathan Evans
Project Name: Rear of No:11 Dean Lane, Southville
Project Ref: 735445
Order No: N/A
Date Samples Received: 22/12/20
Date Instructions Received: 22/12/20
Date Analysis Completed: 15/01/21

Prepared by:

Danielle Brierley
Client Manager

Approved by:

Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 20/11175

Client Project Name: Rear of No:11 Dean Lane, Southville

Client Project Ref: 735445

Lab Sample ID	20/11175/1	20/11175/2	20/11175/3					Units	Limit of Detection	Method ref
Client Sample No	102	101	103							
Client Sample ID	TP1	TP2	TP3							
Depth to Top	0.30	0.10	0.80							
Depth To Bottom	0.50	0.30	0.90							
Date Sampled	17-Dec-20	17-Dec-20	17-Dec-20							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	6A	2A	2A							
% Moisture at <40C$_A$	19.7	24.0	13.0					% w/w	0.1	A-T-044
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH$_D^{M\#}$	8.40	7.76	8.42					pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	0.02	0.03	0.08					g/l	0.01	A-T-026s
Organic matter$_D^{M\#}$	9.8	18.6	2.5					% w/w	0.1	A-T-032 OM
Arsenic$_D^{M\#}$	29	49	11					mg/kg	1	A-T-024s
Cadmium$_D^{M\#}$	2.4	10.9	0.8					mg/kg	0.5	A-T-024s
Copper$_D^{M\#}$	69	162	51					mg/kg	1	A-T-024s
Chromium$_D^{M\#}$	27	39	8					mg/kg	1	A-T-024s
Lead$_D^{M\#}$	262	885	139					mg/kg	1	A-T-024s
Mercury$_D$	2.30	3.91	1.71					mg/kg	0.17	A-T-024s
Nickel$_D^{M\#}$	31	51	8					mg/kg	1	A-T-024s
Selenium$_D^{M\#}$	1	3	2					mg/kg	1	A-T-024s
Zinc$_D^{M\#}$	248	1030	146					mg/kg	5	A-T-024s

Envirolab Job Number: 20/11175

Client Project Name: Rear of No:11 Dean Lane, Southville

Client Project Ref: 735445

Lab Sample ID	20/11175/1	20/11175/2	20/11175/3					Units	Limit of Detection	Method ref
Client Sample No	102	101	103							
Client Sample ID	TP1	TP2	TP3							
Depth to Top	0.30	0.10	0.80							
Depth To Bottom	0.50	0.30	0.90							
Date Sampled	17-Dec-20	17-Dec-20	17-Dec-20							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	6A	2A	2A							
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	NAD	NAD							A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	N/A	N/A							A-T-045

Envirolab Job Number: 20/11175

Client Project Name: Rear of No:11 Dean Lane, Southville

Client Project Ref: 735445

Lab Sample ID	20/11175/1	20/11175/2	20/11175/3					Units	Limit of Detection	Method ref
Client Sample No	102	101	103							
Client Sample ID	TP1	TP2	TP3							
Depth to Top	0.30	0.10	0.80							
Depth To Bottom	0.50	0.30	0.90							
Date Sampled	17-Dec-20	17-Dec-20	17-Dec-20							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	6A	2A	2A							
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	0.07	<0.01					mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.29	<0.01					mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	0.63	<0.02					mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	2.84	0.06					mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	2.95	0.06					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	3.46	0.09					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	1.51	<0.05					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	1.21	<0.07					mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	3.09	0.08					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	0.43	<0.04					mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	5.36	<0.08					mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	0.09	<0.01					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	1.86	0.05					mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	0.09	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	2.03	0.08					mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	4.74	<0.07					mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	30.6	0.42					mg/kg	0.01	A-T-019s
TPH Banded 1 with ID										
>C6-C8$_A^{M\#}$	<5	<5	<5					mg/kg	5	A-T-007s
>C8-C10$_A^{M\#}$	<2	<2	<2					mg/kg	1	A-T-007s
>C10-C12$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-007s
>C12-C16$_A^{M\#}$	2	5	2					mg/kg	2	A-T-007s
>C16-C21$_A^{M\#}$	6	39	7					mg/kg	2	A-T-007s
>C21-C40$_A^{M\#}$	20	329	26					mg/kg	5	A-T-007s
TPH ID (for FID characterisations)$_A$	C6-C40 Hydrocarbons with unknown profile	C6-C44 Hydrocarbons with some PAHs and humic substances	C6-C40 Hydrocarbons with unknown profile							A-T-007s
Total TPH Banded 1 with ID$_A$	28	373	35					mg/kg	5	A-T-007s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Structural Soils Limited (Bristol), The Old School , Stillhouse Lane, Bedminster, Bristol, UK, BS3 4EB

Project: Rear of No:11 Dean Lane, Southville

Clients Project No: 735445

Project No: 20/11175

Date Received: 22/12/2020 (am)

Cool Box Temperatures (°C): 8.1

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Units 7 & 8, Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

Final Test Report

Envirolab Job Number:	20/11175
Issue Number:	1
Date:	15-Jan-21
Client:	Structural Soils Limited (Bristol) The Old School Stillhouse Lane Bedminster Bristol UK, BS3 4EB
Project Manager:	Adam Watts/Jonathan Evans
Project Name:	Rear of No:11 Dean Lane, Southville
Project Ref:	735445
Order No:	N/A
Date Samples Received:	22-Dec-20
Date Instructions Received:	22-Dec-20
Date Analysis Completed:	15-Jan-21

Notes - Soil analysis

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General

This report shall not be reproduced, except in full, without written approval from Envirolab.

Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts

For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations.

If results are in italic font they are associated with such quality control failures and may be unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid

Predominant Matrix Codes: 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample

Secondary Matrix Codes: A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis, NDP indicates No Determination Possible and NAD indicates No Asbestos Detected.

Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

Prepared by:

Danielle Brierley
Client Manager

Approved by:

Holly Neary-King
Client Services Supervisor

envirolab

Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details								Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	20/11175/2						
Client Sample Number				101				Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Client Sample ID				TP2						
Depth to Top				0.1						
Depth to Bottom				0.30						
Date Sampled				17/12/2020						
Sample Type				Soil - ES						
Sample Matrix Code				2A						
Solid Waste Analysis										
pH (pH Units)$_D$	A-T-031	N	N	**7.76**				-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**1.06**				-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**0.05**				-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	N	N	**19.9**				-	-	10
Total Organic Carbon (%)$_D$	A-T-032	N	N	**10.8**				3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**30.9**				100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**<30**				500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**<0.007**				1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**				6	-	-
Eluate Analysis				**2:1**	**8:1**	**2:1**	**Cumulative 10:1**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
				mg/l		**mg/kg**				
Arsenic	A-T-025	N	N				**0.430**	0.5	2	25
Barium	A-T-025	N	N				**1.190**	20	100	300
Cadmium	A-T-025	N	N				**0.030**	0.04	1	5
Chromium	A-T-025	N	N				**0.030**	0.5	10	70
Copper	A-T-025	N	N				**0.340**	2	50	100
Mercury	A-T-025	N	N				**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N				**<0.01**	0.5	10	30
Nickel	A-T-025	N	N				**0.030**	0.4	10	40
Lead	A-T-025	N	N				**2.320**	0.5	10	50
Antimony	A-T-025	N	N				**0.140**	0.06	0.7	5
Selenium	A-T-025	N	N				**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N				**2.740**	4	50	200
Chloride	A-T-026	N	N				**<10**	800	15000	25000
Fluoride	A-T-026	N	N				**5.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N				**<10**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N				**570**	4000	60000	100000
Phenol Index	A-T-050	N	N				**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N				**<200**	500	800	1000
Leach Test Information										
pH (pH Units)	A-T-031	N	N							
Conductivity (µS/cm)	A-T-037	N	N							
Mass Sample (kg)										
Dry Matter (%)	A-T-044	N	N	80.3						
Stage 1										
Volume Leachant, L_2 (l)	A-T-046									
Filtered Eluate Volume, VE_1 (l)	A-T-046									
Stage 2										
Volume Leachant, L_8 (l)	A-T-046									

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

envirolab

Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details								Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	20/11175/3						
Client Sample Number				103				Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Client Sample ID				TP3						
Depth to Top				0.8						
Depth to Bottom				0.90						
Date Sampled				17/12/2020						
Sample Type				Soil - ES						
Sample Matrix Code				2A						
Solid Waste Analysis										
pH (pH Units)$_D$	A-T-031	N	N	8.42				-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	3.81				-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	0.09				-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	N	N	4.2				-	-	10
Total Organic Carbon (%)$_D$	A-T-032	N	N	1.47				3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	0.43				100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	<30				500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	<0.007				1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	<0.01				6	-	-
Eluate Analysis				2:1	8:1	2:1	Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
				mg/l		mg/kg				
Arsenic	A-T-025	N	N				0.350	0.5	2	25
Barium	A-T-025	N	N				0.380	20	100	300
Cadmium	A-T-025	N	N				<0.01	0.04	1	5
Chromium	A-T-025	N	N				<0.01	0.5	10	70
Copper	A-T-025	N	N				0.100	2	50	100
Mercury	A-T-025	N	N				<0.005	0.01	0.2	2
Molybdenum	A-T-025	N	N				<0.01	0.5	10	30
Nickel	A-T-025	N	N				<0.01	0.4	10	40
Lead	A-T-025	N	N				0.300	0.5	10	50
Antimony	A-T-025	N	N				0.050	0.06	0.7	5
Selenium	A-T-025	N	N				<0.01	0.1	0.5	7
Zinc	A-T-025	N	N				0.250	4	50	200
Chloride	A-T-026	N	N				<10	800	15000	25000
Fluoride	A-T-026	N	N				3.0	10	150	500
Sulphate as SO_4	A-T-026	N	N				165	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N				560	4000	60000	100000
Phenol Index	A-T-050	N	N				<0.1	1	-	-
Dissolved Organic Carbon	A-T-032	N	N				<200	500	800	1000
Leach Test Information										
pH (pH Units)	A-T-031	N	N							
Conductivity (µS/cm)	A-T-037	N	N							
Mass Sample (kg)										
Dry Matter (%)	A-T-044	N	N	87						
Stage 1										
Volume Leachant, L_2 (l)	A-T-046									
Filtered Eluate Volume, VE_1 (l)	A-T-046									
Stage 2										
Volume Leachant, L_8 (l)	A-T-046									

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

envirolab

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Haswaste, developed by Dr. Iain Haslock.

Rear of 11 Dean Lane, Southville

TP/WS/BH		TP1	TP2	TP3						
Depth (m)		0.30-0.50	0.10-0.30	0.80-0.90						
Envirolab reference		20/11175/1	20/11175/2	20/11175/3						
% Moisture	%	19.7	24.0	13.0						
pH (soil)		8.40	7.76	8.42						
pH (leachate)										
Arsenic	mg/kg	29	49	11						
Cadmium	mg/kg	2.4	10.9	0.8						
Copper	mg/kg	69	162	51						
CrVI or Chromium	mg/kg	27	39	8						
Lead	mg/kg	262	885	139						
Mercury	mg/kg	2.30	3.91	1.71						
Nickel	mg/kg	31	51	8						
Selenium	mg/kg	1	3	2						
Zinc	mg/kg	248	1,030	146						
Barium	mg/kg									
Beryllium	mg/kg									
Vanadium	mg/kg									
Cobalt	mg/kg									
Manganese	mg/kg									
Molybdenum	mg/kg									
Antimony	mg/kg									
Aluminium	mg/kg									
Bismuth	mg/kg									
CrIII	mg/kg									
Iron	mg/kg									
Strontium	mg/kg									
Tellurium	mg/kg									
Thallium	mg/kg									
Titanium	mg/kg									
Tungsten	mg/kg									
Ammoniacal N	mg/kg									
ws Boron	mg/kg									
PAH (Input Total PAH **OR** individual PAH results)										
Acenaphthene	mg/kg	0.01	0.07	0.01						
Acenaphthylene	mg/kg	0.01	0.29	0.01						
Anthracene	mg/kg	0.02	0.63	0.02						
Benzo(a)anthracene	mg/kg	0.04	2.84	0.06						
Benzo(a)pyrene	mg/kg	0.04	2.95	0.06						
Benzo(b)fluoranthene	mg/kg	0.05	3.46	0.09						
Benzo(ghi)perylene	mg/kg	0.05	1.51	0.05						
Benzo(k)fluoranthene	mg/kg	0.07	1.21	0.07						
Chrysene	mg/kg	0.06	3.09	0.08						
Dibenzo(ah)anthracene	mg/kg	0.04	0.43	0.04						
Fluoranthene	mg/kg	0.08	5.36	0.08						
Fluorene	mg/kg	0.01	0.09	0.01						
Indeno(123cd)pyrene	mg/kg	0.03	1.86	0.05						
Naphthalene	mg/kg	0.03	0.09	0.03						
Phenanthrene	mg/kg	0.03	2.03	0.08						
Pyrene	mg/kg	0.07	4.74	0.07						
Coronene	mg/kg									
Total PAHs (16 or 17)	mg/kg									
TPH										
Petrol	mg/kg									
Diesel	mg/kg									
Lube Oil	mg/kg									
Crude Oil										
White Spirit / Kerosene	mg/kg									
Creosote	mg/kg									
Unknown TPH with ID	mg/kg	28.0	373.0	35.0						
Unknown TPHCWG	mg/kg									
Total Sulphide	mg/kg									
Complex Cyanide	mg/kg									
Free (or Total) Cyanide	mg/kg									
Thiocyanate	mg/kg									
Elemental/Free Sulphur	mg/kg									
Phenols Input Total Phenols HPLC **OR** individual Phenol results.										
Phenol	mg/kg									
Cresols	mg/kg									
Xylenols	mg/kg									
Resourcinol	mg/kg									
Phenols Total by HPLC	mg/kg									
BTEX Input Total BTEX **OR** individual BTEX results.										
Benzene	mg/kg									
Toluene	mg/kg									
Ethylbenzene	mg/kg									
Xylenes	mg/kg									
Total BTEX	mg/kg		0.01	0.01						
PCBs (POPs)										
PCBs Total (eg EC7/WHO12)	mg/kg		0.007	0.007						
PBBs (POPs)										
Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)	mg/kg									

envirolab

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Haswaste, developed by Dr. Iain Haslock.

Rear of 11 Dean Lane, Southville

TP/WS/BH		TP1	TP2	TP3					
Depth (m)		0.30-0.50	0.10-0.30	0.80-0.90					
Envirolab reference		20/11175/1	20/11175/2	20/11175/3					
POPs Dioxins and Furans Input Total Dioxins and Furans **OR** individual Dioxin and Furan results.									
2,3,7,8-TeCDD	mg/kg								
1,2,3,7,8-PeCDD	mg/kg								
1,2,3,4,7,8-HxCDD	mg/kg								
1,2,3,6,7,8-HxCDD	mg/kg								
1,2,3,7,8,9-HxCDD	mg/kg								
1,2,3,4,6,7,8-HpCDD	mg/kg								
OCDD	mg/kg								
2,3,7,8-TeCDF	mg/kg								
1,2,3,7,8-PeCDF	mg/kg								
2,3,4,7,8-PeCDF	mg/kg								
1,2,3,4,7,8-HxCDF	mg/kg								
1,2,3,6,7,8-HxCDF	mg/kg								
2,3,4,6,7,8-HxCDF	mg/kg								
1,2,3,7,8,9-HxCDF	mg/kg								
1,2,3,4,6,7,8-HpCDF	mg/kg								
1,2,3,4,7,8,9-HpCDF	mg/kg								
OCDF	mg/kg								
Total Dioxins and Furans	mg/kg								
Some Pesticides (POPs unless otherwise stated)									
Aldrin	mg/kg								
α Hexachlorocyclohexane (alpha-HCH) *(leave empty if total HCH results used)*	mg/kg								
β Hexachlorocyclohexane (beta-HCH) *(leave empty if total HCH results used)*	mg/kg								
α Cis-Chlordane (alpha) ***OR*** *Total Chlordane*	mg/kg								
δ Hexachlorocyclohexane (delta-HCH) *(leave empty if total HCH results used)*	mg/kg								
Dieldrin	mg/kg								
Endrin	mg/kg								
χ Hexachlorocyclohexane (gamma-HCH) (lindane) ***OR*** *Total HCH*	mg/kg								
Heptachlor	mg/kg								
Hexachlorobenzene	mg/kg								
o,p'-DDT *(leave empty if total DDT results used)*	mg/kg								
p,p'-DDT ***OR*** *Total DDT*	mg/kg								
χ Trans-Chlordane (gamma) *(leave empty if total Chlordane results used)*	mg/kg								
Chlordecone (kepone)	mg/kg								
Pentachlorobenzene	mg/kg								
Mirex	mg/kg								
Toxaphene (camphechlor)	mg/kg								
Tin									
Tin *(leave empty if Organotin and Tin excl Organotin results used)*	mg/kg								
Organotin									
Dibutyltin; DiBT	mg/kg								
Tributyltin; TriBT	mg/kg								
Triphenyltin; TriPT	mg/kg								
Tetrabutyltin; TeBT	mg/kg								
Tin excluding Organotin									
Tin excl Organotin	mg/kg								

envirolab

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Haswaste, developed by Dr. Iain Haslock.

Rear of 11 Dean Lane, Southville

TP/WS/BH		TP1	TP2	TP3					
Depth (m)		0.30-0.50	0.10-0.30	0.80-0.90					
Envirolab reference		20/11175/1	20/11175/2	20/11175/3					
Asbestos in Soil	Thresholds								
Asbestos detected in Soil (enter Y or N)	Y	N	N	N					
		If Asbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7							
Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)	see "Carc HP7 % Asbestos in Soil (Fibres)" below								
Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces) *Please be advised, if the calculation cell is "0.00000" DOES NOT MEAN asbestos testing has been undertaken and the result is zero.*	≥0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
		If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1%", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You cannot use Asbestos % results when visual identifiable pieces are present.							
Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)	Y								

If visual identifiable pieces of asbestos are present, you cannot use Asbestos % results and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06 05.
Therefore, if Asbestos in Soil above is "Y", the Asbestos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste.

Identifiable Pieces are Cement, Fragments, Board, Rope etc. ie anything ACM that is not Loose Fibres.
All visual asbestos pieces need to be removed leaving only fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste.

Hazardous Property	Thresholds	Cut Off Value	If cells below turn yellow and the text turns red, the samples should be classified as Hazardous Waste.								
Corrosive HP8	≥5%	<1%	0.00724	0.01061	0.00260	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Irritant HP4	≥10%	<1%	0.00933	0.01883	0.00628	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Irritant HP4	≥20%	<1%	0.01130	0.02233	0.00644	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specifc Target Organ Toxicity HP5	≥1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specifc Target Organ Toxicity HP5	≥20%		0.00000	0.00015	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specifc Target Organ Toxicity HP5	≥1%		0.00503	0.00783	0.00141	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specifc Target Organ Toxicity HP5	≥10%		0.02104	0.06726	0.01209	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aspiration Toxicity HP5	≥10%		0.00225	0.02835	0.00305	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Oral)	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Oral)	≥0.25%	<0.1%	0.00326	0.00521	0.00141	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Oral)	≥5%	<0.1%	0.00428	0.00601	0.00158	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Oral)	≥25%	<1%	0.03253	0.09042	0.01860	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Dermal)	≥0.25%	<0.1%	0.00018	0.00030	0.00015	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Dermal)	≥2.5%	<0.1%	0.00416	0.00569	0.00134	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Dermal)	≥15%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Dermal)	≥55%	<1%	0.00019	0.00083	0.00007	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Inhal)	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Inhal)	≥0.5%	<0.1%	0.00454	0.00682	0.00155	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Inhal)	≥3.5%	<0.1%	0.00011	0.00032	0.00025	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6 (Inhal)	≥22.5%	<1%	0.03233	0.08900	0.01851	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carcinogenic HP7	≥0.1%		0.02104	0.06726	0.01209	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carcinogenic HP7	≥0.1%		0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
Carcinogenic HP7	≥1%		0.00000	0.00014	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		22.48	283.48	30.45	0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%		0.11471	0.60107	0.14914	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		8.40	7.76	8.42	0.00	0.00	0.00	0.00	0.00	0.00
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		8.40	7.76	8.42	0.00	0.00	0.00	0.00	0.00	0.00
Toxic for Reproduction HP10	≥0.3%		0.02104	0.06726	0.01209	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Toxic for Reproduction HP10	≥3%		0.00416	0.02835	0.00305	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Mutagenic HP11	≥0.1%		0.00416	0.00569	0.00134	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		22.48	283.48	30.45	0.00	0.00	0.00	0.00	0.00	0.00
Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%		0.11471	0.60107	0.14914	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Mutagenic HP11	≥1%		0.00503	0.00783	0.00141	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HP13 Sensitising	≥10%		0.00503	0.00783	0.00141	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

envirolab

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Haswaste, developed by Dr. Iain Haslock.

Rear of 11 Dean Lane, Southville

TP/WS/BH			TP1	TP2	TP3					
Depth (m)			0.30-0.50	0.10-0.30	0.80-0.90					
Envirolab reference			20/11175/1	20/11175/2	20/11175/3					
Ecotoxic HP14 amended v6	≥25%	<0.1%	0.06500	0.20107	0.03752	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ecotoxic HP14 amended v6	≥25%	<0.1% / 1.0%	0.06724	0.22942	0.04057	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ecotoxic HP14 amended v6	≥25%	<0.1% / 1.0%	6.52213	20.39070	3.78239	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Persistent Organic Pollutant (PCB, PBB or POP Pesticides)	>0.005%		0.00000000	0.00000053	0.00000061	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Persistent Organic Pollutant (Total Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
Persistent Organic Pollutant (Individual Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000

If other contaminants need adding to Haswaste, please contact Envirolab.

Generic assessment criteria for human health: residential scenario with home-grown produce

Background

RSK's generic assessment criteria (GAC) were initially prepared following the publication by the Environment Agency (EA) of soil guideline value (SGV) and toxicological (TOX) reports, and associated publications in 2009[1]. RSK GAC were updated following the publication of GAC by LQM/CIEH in 2009[2]. RSK GAC are periodically revised when updated information on toxicological, land use or receptor parameters is published.

Updates to the RSK GAC

In 2014, the publication of Category 4 Screening Levels (C4SL)[3,4], as part of the Defra-funded research project SP1010, included modifications to certain exposure assumptions documented within EA Science Report SC050221/SR3 (herein after referred to as SR3)[5] used in the generation of SGVs.

C4SL were published for six substances (cadmium, arsenic, benzene, benzo(a)pyrene, chromium VI and lead) for a sandy loam soil type with 6% soil organic matter, based on a low level of toxicological concern (LLTC; see Section 2.3 of research project report SP1010[3]). Where a C4SL has been published, the RSK GAC duplicates the C4SL published values using all input parameters within the SP1010 final project report[3] and associated appendices[6], and adopts them as GAC for these six substances.

For all other substances the C4SL exposure modifications, with the exception of the "top two" produce type approach taken in the C4SL, have been applied to the current RSK GAC. These include alterations to daily inhalation rates for residential and commercial scenarios, reducing soil adherence factors in children (age classes 1 to 12 only) for residential land use, reducing exposure frequency for dermal contact outdoors for residential land use, and updated produce type consumption rates (90th percentile) based on recent data from the National Diet and Nutrition Survey.

The RSK GAC have also been revised with updated toxicology published by LQM/CIEH in 2015[7] or by the USEPA[14], where a C4SL has not been published.

RSK GAC derivation for metals and organic compounds

Model selection

Soil assessment criteria (SAC) were calculated using the Contaminated Land Exposure Assessment (CLEA) tool v1.071, supporting EA guidance[5,8,9] and revised exposure scenarios published for the C4SL[3]. The SAC are also termed GAC.

Conceptual model

In accordance with SR3[5], the residential with home-grown produce scenario considers risks to a female child between the ages of 0 and 6 years old as the highest risk scenario. In accordance with Box 3.1 of SR3[5], the pathways considered for production of the SAC in the residential with home-grown produce scenario are

- direct soil and dust ingestion

- consumption of home-grown produce
- consumption of soil attached to home-grown produce
- dermal contact with soil and indoor dust
- inhalation of indoor and outdoor dust and vapours.

Figure 1 is a conceptual model illustrating these linkages.

In line with guidance in the EA SGV report for cadmium[1], the RSK GAC for cadmium has been derived based on estimates representative of lifetime exposure. Although young children are generally more likely to have higher exposures to soil contaminants, the renal toxicity of cadmium, and the derivation of the TDI_{oral} and TDI_{inh}, are based on considerations of the kidney burden accumulated over 50 years or so. It is therefore reasonable to consider exposure not just in childhood but averaged over a longer period.

With respect to volatilisation, the CLEA model assumes a simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase[9]. The upper boundaries of this partitioning are represented by the maximum aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA model estimates saturated soil concentrations where these limits are reached[9]. The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous- or vapour-based soil saturation limits. Model output cells are flagged red where the saturated soil concentration has been exceeded and the contribution of the indoor and outdoor vapour pathway to total exposure is greater than 10%. In this case, further consideration of the following is required[9]:

- Free phase contamination may be present.
- Exposure from the vapour pathways will be over-predicted by the model, as in reality the vapour phase concentration will not increase at concentrations above saturation limits
- Where the vapour pathway contribution is greater than 90%, it is unlikely the relevant health criteria value (HCV) will be exceeded at soil concentrations at least a factor of ten higher than the relevant HCV.

Where the vapour pathway is the predominant pathway (contributes greater than 90% of exposure) or the only exposure route considered and the cell is highlighted red (SAC exceeds saturation limit), the risk based on the assumed conceptual model is likely to be negligible as the vapour risk is assumed to be tolerable at maximum possible soil concentrations. In such circumstances, the vapour pathway exposure should be considered based on the presence of free phase or non-aqueous phase liquid sources and the measured concentrations of volatile organic compounds (VOC) in the vapour phase. Screening could be considered based on setting the SAC as the modelled soil saturation limits. However, as stated within the CLEA handbook[9], this is likely to not be practical in many cases because of the very low saturation limits and, in any case, is highly conservative.

It should also be noted that for mixtures of compounds, free phase may be present where soil (or groundwater) concentrations are well below saturation limits for individual compounds.

Where the vapour pathway is only one of the exposure pathways considered, an additional approach can then be utilised as detailed within Section 4.12 of the CLEA model handbook[9], which explains how to calculate an effective assessment criterion manually.

SR3[5] states that, as a general rule of thumb, it is recognised that estimating vapour phase concentrations from dissolved and sorbed phase contamination by petroleum hydrocarbons are

at least a factor of ten higher than those likely to be measured on-site. RSK has therefore applied an empirical subsurface to indoor air correction factor of 10 into the CLEA model chemical database for all petroleum hydrocarbon fractions (including BTEX, trimethylbenzenes and the polycyclic aromatic hydrocarbons (PAH) naphthalene, acenaphthene and acenaphthylene) to reduce this conservatism.

Input selection

The most up-to-date published chemical and toxicological data was obtained from EA Report SC050021/SR7[10], the EA TOX[1] reports, the C4SL SP1010 project report and associated appendices[3,6], the 2015 LQM/CIEH report[7] or the USEPA IRIS database[14]. Where a C4SL has been published, the RSK GAC have duplicated the C4SL published values using all input parameters within the SP1010 final project report[3] and associated appendices[6], and has adopted them as GAC for these six substances. Toxicological and specific chemical parameters for 1,2,4-trimethylbenzene, barium and methyl tertiary-butyl ether (MTBE) were obtained from the CL:AIRE Soil Generic Assessment Criteria report[11].

For TPH, aromatic hydrocarbons C_5–C_8 were not modelled, as this range comprises benzene (>EC5-EC7) and toluene (>EC7-EC8), which are modelled separately.

Physical parameters

For the residential with home-grown produce scenario, the CLEA default building is a small, two-storey terrace house with a concrete ground-bearing slab. The house is assumed to have a 100m^2 private garden consisting of lawn and flowerbeds, incorporating a 20m^2 plot for growing fruit and vegetables consumed by the residents. SR3[5] notes this residential building type to be the most conservative in terms of potential for vapour intrusion. The building parameters used in the production of the RSK GACs are the default CLEA v1.06 inputs presented in Table 3.3 of SR3[3], with a dust loading factor detailed in Section 9.3 of SR3[5]. The parameters for a sandy loam soil type were used in line with Table 4.4 of SR3[5]. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for SOM, RSK has produced an additional set of GAC for SOM of 1% and 2.5% for all substances using the CLEA tool.

Summary of modifications to the default CLEA SR3[5] input parameters for residential with home-grown produce land-use scenario

In summary, the RSK GAC were produced using the default input parameters for soil properties, the air dispersion model, building properties and the vapour model detailed in SR3[5]. Modifications to the default SR3[5] exposure scenarios based on the C4SL exposure scenarios[3] are presented in Tables 2 and 3 below.

The final selected GAC are presented by pathway in Table 4 and the combined GAC in Table 5.

Figure 1: Conceptual model for residential scenario with home-grown produce

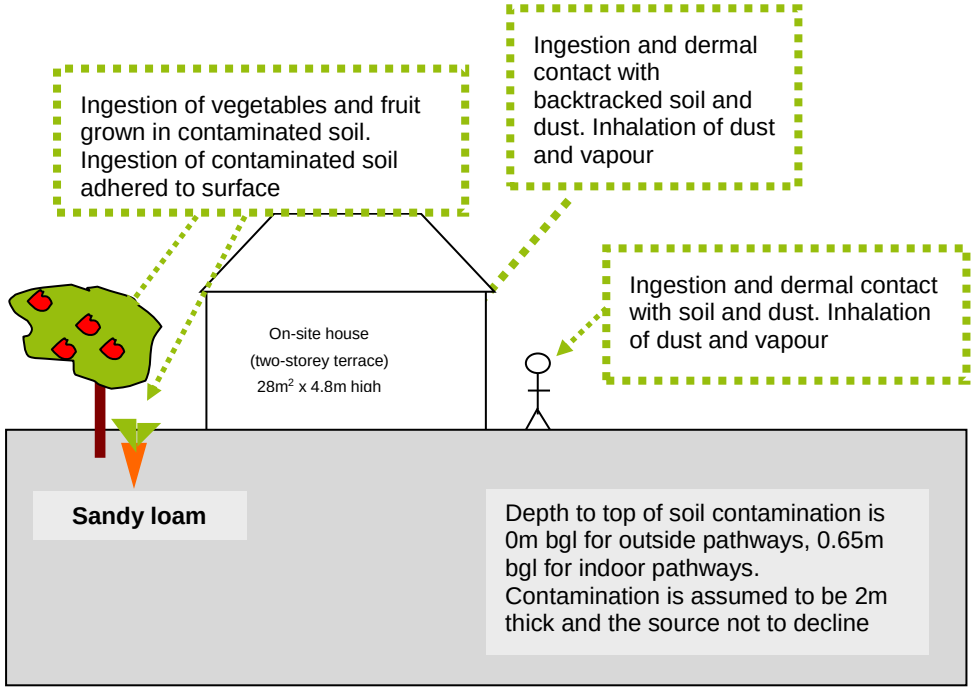


Table 1: Exposure assessment parameters for residential scenario with home-grown produce – inputs for CLEA model

Parameter	Value	Justification
Land use	Residential with homegrown produce	Chosen land use
Receptor	Female child age 1 to 6	Key generic assumption given in Box 3.1, SR3[5]
Building	Small terraced house	Key generic assumption given in Box 3.1, SR3. Small, two-storey terraced house chosen, as it is the most conservative residential building type in terms of protection from vapor intrusion (Section 3.4.6, SR3)[5]
Soil type	Sandy Loam	Most common UK soil type (Section 4.3.1, from Table 3.1, SR3)[5]
Start AC (age class)	1	Range of age classes corresponding to key generic assumption that the critical receptor is a young female child aged 0–6. From Box 3.1, SR3[5]
End AC (age class)	6	
SOM (%)	6	Representative of sandy loamy soil according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[13]
	1	To provide SAC for sites where SOM <6% as often observed by RSK
	2.5	
pH	7	Model default

Table 2: Residential with home-grown produce – modified home-grown produce data

Name	Consumption rate 90th percentile (g FW kg^{-1} BW day^{-1}) by age class						Dry weight conversion factor (g DW g^{-1} FW)	Home-grown fraction (average)	Home-grown fraction (high end)	Soil loading factor (g g^{-1} DW)	Preparation correction factor
	1	2	3	4	5	6					
Green vegetables	7.12	5.87	5.87	5.87	4.53	4.53	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	10.7	2.83	2.83	2.83	2.14	2.14	0.103	0.06	0.4	1.00E-03	1.00E+00
Tuber vegetables	16	6.6	6.6	6.6	4.95	4.95	0.21	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	1.83	3.39	3.39	3.39	2.24	2.24	0.058	0.06	0.4	1.00E-03	6.00E-01
Shrub fruit	2.23	0.46	0.46	0.46	0.19	0.19	0.166	0.09	0.6	1.00E-03	6.00E-01
Tree fruit	3.82	10.3	10.3	10.3	5.16	5.16	0.157	0.04	0.27	1.00E-03	6.00E-01
Justification	Table 3.4, SP1010 (3)						Table 6.3, SR3(5)	Table 4.19, SR3(5)		Table 6.3, SR3(5)	

Table 3: Residential with home-grown produce – modified and use and receptor data

Parameter	Unit	Age class					
		1	2	3	4	5	6
EF (soil and dust ingestion)	day yr^{-1}	180	365	365	365	365	365
EF (consumption of home-grown produce)	day yr^{-1}	180	365	365	365	365	365
EF (skin contact, indoor)	day yr^{-1}	180	365	365	365	365	365
EF (skin contact, outdoor)	day yr^{-1}	170	170	170	170	170	170
EF (inhalation of dust and vapour, indoor)	day yr^{-1}	365	365	365	365	365	365
EF (inhalation of dust and vapour, outdoor)	day yr^{-1}	365	365	365	365	365	365
Justification		Table 3.5, SP1010(3); Table 3.1, SR3(5)					
Soil to skin adherence factor (outdoor)	mg cm^{-2} day^{-1}	0.1	0.1	0.1	0.1	0.1	0.1
Justification		Table 3.5, SP1010(3)					
Inhalation rate	m^3 day^{-1}	5.4	8.0	8.9/f	10.1	10.1	10.1
Justification		Mean value USEPA, 2011(12); Table 3.2, SP1010(3)					
Notes: For **cadmium**, the exposure assessment for a residential land use is based on estimates representative of lifetime exposure AC1-18. This is because the TDI_{oral} and TDI_{inh} are based on considerations of the kidney burden accumulated over 50 years. It is therefore reasonable to consider exposure not just in childhood but averaged over a longer period. See the Environment Agency Science Report SC05002/ TOX 3(1), Science Report SC050021/Cadmium SGV(1) and the project report SP1010(3) for more information.							

References

1. Environment Agency (2009), 'Science Reports SC050021 - SGV and TOX reports for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin-like PCBs'; 'Supplementary information for the derivation of SGV for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin-like PCBs', and 'Contaminants in soil: updated collation of toxicological data and intake values for humans: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin-like PCBs'. Available at: https://www.gov.uk/government/publications/contaminants-in-soil-updated-collation-of-toxicological-data-and-intake-values-for-humans and https://www.gov.uk/government/publications/land-contamination-soil-guideline-values-sgvs (accessed 4 February 2015)

2. Nathanial, C. P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A. G., Ogden, R. C. and Scott, D. (2009), *LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment*, second edition (Nottingham: Land Quality Press).

3. Contaminated Land: Applications in Real Environment (CL:AIRE) (2014). 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination', Revision 2, DEFRA research project SP1010.

4. Department for Environment, Food and Rural Affairs (Defra) (2014), 'SP1010: Development of Category 4 Screening Levels for assessment of land affected by contamination – Policy Companion Document', Revision 2.

5. Environment Agency (2009), *Science Report – SC050021/SR3. Updated technical background to the CLEA model* (Bristol: Environment Agency).

6. Contaminated Land: Applications in Real Environment (CL:AIRE) (2014). 'Appendices C to H). DEFRA research project SP1010'.

7. Nathanial, C. P., McCaffrey, C., Gillet, A. G., Ogden, R. C. and Nathanial, J. F. (2015), *The LQM/CIEH S4ULs for Human Health Risk Assessment* (Nottingham: Land Quality Press).

8. Environment Agency (2009), *Human health toxicological assessment of contaminants in soil. Science Report – Final SC050021/SR2* (Bristol: Environment Agency).

9. Environment Agency (2009), *Science Report – SC050021/SR4 CLEA Software (version 1.05) Handbook* (Bristol: Environment Agency).

10. Environment Agency (2008), *Science Report SC050021/SR7. Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values* (Bristol: Environment Agency).

11. CL:AIRE (2010), *Soil Generic Assessment Criteria for Human Health Risk Assessment* (London: CL:AIRE).

12. USEPA (2011), *Exposure factors handbook*, EPA/600/R-090/052F (Washington, DC: Office of Research and Development).

13. Environment Agency (2009), 'Changes made to the CLEA framework documents after the three-month evaluation period in 2008', released January 2009.

14. USEPA (2010). Hydrogen cyanide and cyanide salts. Integrated Risk Information Systems (IRIS) Chemical Assessment Summary. September 2010. https://www.epa.gov/iris (accessed 9 December 2015)

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH HOME-GROWN PRODUCE

Table 4

Human Health Generic Assessment Criteria by Pathway for Residential With Home-Grown Produce Scenario

Compound	Notes	SAC Appropriate to Pathway SOM 1% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 2.5% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 6% (mg/kg)			Soil Saturation Limit (mg/kg)
		Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Metals													
Arsenic	(a,b)	3.71E+01	5.26E+02	NR	NR	3.71E+01	5.26E+02	NR	NR	3.71E+01	5.26E+02	NR	NR
Barium	(b)	1.34E+03	NR	NR	NR	1.34E+03	NR	NR	NR	1.34E+03	NR	NR	NR
Beryllium		1.13E+02	1.72E+00	NR	NR	1.13E+02	1.72E+00	NR	NR	1.13E+02	1.72E+00	NR	NR
Boron		3.00E+02	5.20E+06	NR	NR	3.00E+02	5.20E+06	NR	NR	3.00E+02	5.20E+06	NR	NR
Cadmium	(a)	2.30E+01	4.88E+02	2.21E+01	NR	2.30E+01	4.88E+02	2.21E+01	NR	2.30E+01	4.88E+02	2.21E+01	NR
Chromium (III) - trivalent	(c)	1.84E+04	9.07E+02	NR	NR	1.84E+04	9.07E+02	NR	NR	1.84E+04	9.07E+02	NR	NR
Chromium (VI) - hexavalent	(a,d)	5.85E+01	2.06E+01	NR	NR	5.85E+01	2.06E+01	NR	NR	5.85E+01	2.06E+01	NR	NR
Copper		2.72E+03	1.41E+04	2.47E+03	NR	2.72E+03	1.41E+04	2.47E+03	NR	2.72E+03	1.41E+04	2.47E+03	NR
Lead	(a)	2.01E+02	NR	NR	NR	2.01E+02	NR	NR	NR	2.01E+02	NR	NR	NR
Elemental Mercury (Hg^0)	(d)	NR	2.35E-01	NR	4.31E+00	NR	5.60E-01	NR	1.07E+01	NR	1.22E+00	NR	2.58E+01
Inorganic Mercury (Hg^{2+})		3.95E+01	3.63E+03	3.91E+01	NR	3.95E+01	3.63E+03	3.91E+01	NR	3.95E+01	3.63E+03	3.91E+01	NR
Methyl Mercury (Hg^{4+})		1.26E+01	1.87E+01	7.52E+00	7.33E+01	1.26E+01	3.62E+01	9.34E+00	1.42E+02	1.26E+01	7.68E+01	1.08E+01	3.04E+02
Nickel	(d)	1.27E+02	1.81E+02	NR	NR	1.27E+02	1.81E+02	NR	NR	1.27E+02	1.81E+02	NR	NR
Selenium	(b)	2.58E+02	NR	NR	NR	2.58E+02	NR	NR	NR	2.58E+02	NR	NR	NR
Vanadium		4.13E+02	1.46E+03	NR	NR	4.13E+02	1.46E+03	NR	NR	4.13E+02	1.46E+03	NR	NR
Zinc	(b)	3.86E+03	3.63E+07	NR	NR	3.86E+03	3.63E+07	NR	NR	3.86E+03	3.63E+07	NR	NR
Cyanide (free)		1.37E+00	1.37E+04	1.37E+00	NR	1.37E+00	1.37E+04	1.37E+00	NR	1.37E+00	1.37E+04	1.37E+00	NR
Volatile Organic Compounds													
Benzene	(a)	2.62E-01	9.01E-01	2.03E-01	1.22E+03	5.39E-01	1.68E+00	4.08E-01	2.26E+03	1.16E+00	3.48E+00	8.72E-01	4.71E+03
Toluene		1.53E+02	9.08E+02	1.31E+02	8.69E+02	3.49E+02	2.00E+03	2.97E+02	1.92E+03	7.95E+02	4.55E+03	6.77E+02	4.36E+03
Ethylbenzene		1.10E+02	8.34E+01	4.74E+01	5.18E+02	2.61E+02	1.96E+02	1.12E+02	1.22E+03	6.00E+02	4.58E+02	2.60E+02	2.84E+03
Xylene - m		2.10E+02	8.25E+01	5.92E+01	6.25E+02	5.01E+02	1.95E+02	1.40E+02	1.47E+03	1.15E+03	4.56E+02	3.27E+02	3.46E+03
Xylene - o		1.92E+02	8.87E+01	6.07E+01	4.78E+02	4.56E+02	2.08E+02	1.43E+02	1.12E+03	1.05E+03	4.86E+02	3.32E+02	2.62E+03
Xylene - p		1.98E+02	7.93E+01	5.66E+01	5.76E+02	4.70E+02	1.86E+02	1.33E+02	1.35E+03	1.08E+03	4.36E+02	3.10E+02	3.17E+03
Total xylene		1.92E+02	7.93E+01	5.66E+01	6.25E+02	4.56E+02	1.86E+02	1.33E+02	1.47E+03	1.05E+03	4.36E+02	3.10E+02	3.46E+03
Methyl tertiary-Butyl ether (MTBE)		1.54E+02	1.04E+02	6.22E+01	2.04E+04	2.97E+02	1.69E+02	1.08E+02	3.31E+04	6.03E+02	3.21E+02	2.10E+02	6.27E+04
1,1,1,2 Tetrachloroethane		5.39E+00	1.54E+00	1.20E+00	2.60E+03	1.27E+01	3.56E+00	2.78E+00	6.02E+03	2.92E+01	8.29E+00	6.46E+00	1.40E+04
1,1,2,2-Tetrachloroethane		2.81E+00	3.92E+00	1.64E+00	2.67E+03	6.10E+00	8.04E+00	3.47E+00	5.46E+03	1.36E+01	1.76E+01	7.67E+00	1.20E+04
1,1,1-Trichloroethane		3.33E+02	9.01E+00	8.77E+00	1.43E+03	7.26E+02	1.84E+01	1.80E+01	2.92E+03	1.62E+03	4.04E+01	3.94E+01	6.39E+03
1,1,2 Trichloroethane		1.95E+00	1.25E+00	7.62E-01	4.03E+03	4.21E+00	2.55E+00	1.59E+00	8.21E+03	9.35E+00	5.59E+00	3.50E+00	1.80E+04
1,1-Dichloroethene		1.93E+01	3.29E-01	3.23E-01	2.23E+03	3.85E+01	5.82E-01	5.74E-01	3.94E+03	8.15E+01	1.17E+00	1.16E+00	7.94E+03
1,2-Dichloroethane		3.17E-02	9.20E-03	7.13E-03	3.41E+03	5.73E-02	1.33E-02	1.08E-02	4.91E+03	1.09E-01	2.28E-02	1.88E-02	8.43E+03
1,2,4-Trimethylbenzene		NR	1.76E+00	NR	4.74E+02	NR	4.26E+00	NR	1.16E+03	NR	9.72E+00	NR	2.76E+03
1,3,5-Trimethylbenzene	(e)	NR	NR	NR	2.30E+02	NR	NR	NR	5.52E+02	NR	NR	NR	1.30E+03
1,2-Dichloropropane		4.28E+00	3.40E-02	3.37E-02	1.19E+03	8.44E+00	6.00E-02	5.96E-02	2.11E+03	1.77E+01	1.21E-01	1.20E-01	4.24E+03
Carbon Tetrachloride (tetrachloromethane)		3.10E+00	2.58E-02	2.57E-02	1.52E+03	7.11E+00	5.65E-02	5.62E-02	3.32E+03	1.62E+01	1.28E-01	1.27E-01	7.54E+03
Chloroethane		NR	1.17E+01	NR	2.61E+03	NR	1.59E+01	NR	3.54E+03	NR	2.57E+01	NR	5.71E+03
Chloromethane		NR	1.17E-02	NR	1.91E+03	NR	1.38E-02	NR	2.24E+03	NR	1.85E-02	NR	2.99E+03
Cis 1,2 Dichloroethene		1.56E-01	NR	NR	3.94E+03	2.66E-01	NR	NR	6.61E+03	5.18E-01	NR	NR	1.29E+04
Dichloromethane		7.04E-01	3.05E+00	6.24E-01	7.27E+03	1.27E+00	4.06E+00	1.08E+00	9.68E+03	2.33E+00	6.42E+00	1.92E+00	1.53E+04
Tetrachloroethene		4.49E+00	1.79E-01	1.76E-01	4.24E+02	1.04E+01	4.02E-01	3.94E-01	9.51E+02	2.38E+01	9.21E-01	9.04E-01	2.18E+03
Trans 1,2 Dichloroethene		6.45E+00	2.76E-01	NR	3.42E+03	1.29E+01	4.99E-01	NR	6.17E+03	2.74E+01	1.02E+00	NR	1.26E+04
Trichloroethene		2.83E-01	1.72E-02	1.62E-02	1.54E+03	6.26E-01	3.59E-02	3.40E-02	3.22E+03	1.41E+00	7.98E-02	7.55E-02	7.14E+03
Vinyl Chloride (chloroethene)		3.82E-03	7.73E-04	6.43E-04	1.36E+03	6.87E-03	1.00E-03	8.73E-04	1.76E+03	1.25E-02	1.53E-03	1.36E-03	2.69E+03
Semi-Volatile Organic Compounds													
2-Chloronaphthalene		2.76E+02	5.39E+00	5.29E+00	1.14E+02	6.59E+02	1.33E+01	1.30E+01	2.80E+02	1.45E+03	3.17E+01	3.10E+01	6.69E+02
Acenaphthene		2.27E+02	4.86E+04	2.26E+02	5.70E+01	5.41E+02	1.18E+05	5.38E+02	1.41E+02	1.18E+03	2.68E+05	1.17E+03	3.36E+02
Acenaphthylene		1.85E+02	4.59E+04	1.84E+02	8.61E+01	4.42E+02	1.11E+05	4.40E+02	2.12E+02	9.78E+02	2.53E+05	9.74E+02	5.06E+02
Anthracene		2.43E+03	1.53E+05	2.39E+03	1.17E+00	5.53E+03	3.77E+05	5.45E+03	2.91E+00	1.10E+04	8.76E+05	1.09E+04	6.96E+00

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH HOME-GROWN PRODUCE

Table 4

Human Health Generic Assessment Criteria by Pathway for Residential With Home-Grown Produce Scenario

Compound	Notes	SAC Appropriate to Pathway SOM 1% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 2.5% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 6% (mg/kg)			Soil Saturation Limit (mg/kg)
		Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Benzo(a)anthracene		1.01E+01	2.47E+01	7.18E+00	1.71E+00	1.42E+01	4.37E+01	1.07E+01	4.28E+00	1.69E+01	6.26E+01	1.33E+01	1.03E+01
Benzo(a)pyrene	(a)	4.96E+00	3.51E+01	NR	9.11E-01	4.96E+00	3.77E+01	NR	2.28E+00	4.96E+00	3.89E+01	NR	5.46E+00
Benzo(b)fluoranthene		2.96E+00	1.93E+01	2.56E+00	1.22E+00	3.89E+00	2.13E+01	3.29E+00	3.04E+00	4.43E+00	2.22E+01	3.69E+00	7.29E+00
Benzo(g,h,i)perylene		3.77E+02	1.87E+03	3.14E+02	1.54E-02	4.09E+02	1.94E+03	3.38E+02	3.85E-02	4.23E+02	1.97E+03	3.48E+02	9.23E-02
Benzo(k)fluoranthene		8.92E+01	5.41E+02	7.66E+01	6.87E-01	1.10E+02	5.76E+02	9.22E+01	1.72E+00	1.21E+02	5.91E+02	1.00E+02	4.12E+00
Chrysene		1.66E+01	1.19E+02	1.46E+01	4.40E-01	2.54E+01	1.49E+02	2.17E+01	1.10E+00	3.19E+01	1.66E+02	2.67E+01	2.64E+00
Dibenzo(a,h)anthracene		2.90E-01	1.45E+00	2.41E-01	3.93E-03	3.43E-01	1.64E+00	2.84E-01	9.82E-03	3.69E-01	1.74E+00	3.04E-01	2.36E-02
Fluoranthene		2.87E+02	3.83E+04	2.85E+02	1.89E+01	5.63E+02	8.87E+04	5.60E+02	4.73E+01	9.00E+02	1.83E+05	8.96E+02	1.13E+02
Fluorene		1.77E+02	6.20E+03	1.72E+02	3.09E+01	4.19E+02	1.53E+04	4.07E+02	7.65E+01	8.98E+02	3.62E+04	8.77E+02	1.83E+02
Hexachloroethane		2.68E-01	NR	NR	8.17E+00	6.57E-01	NR	NR	2.01E+01	1.55E+00	NR	NR	4.81E+01
Indeno(1,2,3-cd)pyrene		3.09E+01	2.12E+02	2.70E+01	6.13E-02	4.22E+01	2.38E+02	3.59E+01	1.53E-01	4.92E+01	2.50E+02	4.11E+01	3.68E-01
Naphthalene		2.78E+01	2.33E+01	1.27E+01	7.64E+01	6.66E+01	5.58E+01	3.04E+01	1.83E+02	1.53E+02	1.31E+02	7.06E+01	4.32E+02
Phenanthrene		9.85E+01	7.17E+03	9.72E+01	3.60E+01	2.24E+02	1.76E+04	2.22E+02	8.96E+01	4.48E+02	4.07E+04	4.43E+02	2.14E+02
Pyrene		6.25E+02	8.79E+04	6.20E+02	2.20E+00	1.25E+03	2.04E+05	1.24E+03	5.49E+00	2.05E+03	4.23E+05	2.04E+03	1.32E+01
Phenol		1.60E+02	4.58E+02	1.20E+02	2.42E+04	2.96E+02	6.95E+02	2.09E+02	3.81E+04	5.86E+02	1.19E+03	3.93E+02	7.03E+04
Total Petroleum Hydrocarbons													
Aliphatic hydrocarbons EC_5-EC_6		4.99E+03	4.24E+01	4.23E+01	3.04E+02	1.13E+04	7.79E+01	7.78E+01	5.58E+02	2.50E+04	1.61E+02	1.60E+02	1.15E+03
Aliphatic hydrocarbons >EC_6-EC_8		1.49E+04	1.04E+02	1.03E+02	1.44E+02	3.43E+04	2.31E+02	2.31E+02	3.22E+02	7.11E+04	5.29E+02	5.28E+02	7.36E+02
Aliphatic hydrocarbons >EC_8-EC_{10}		1.61E+03	2.68E+01	2.67E+01	7.77E+01	2.91E+03	6.55E+01	6.51E+01	1.90E+02	4.26E+03	1.56E+02	1.54E+02	4.51E+02
Aliphatic hydrocarbons >EC_{10}-EC_{12}		4.57E+03	1.33E+02	1.32E+02	4.75E+01	5.51E+03	3.31E+02	3.26E+02	1.18E+02	5.98E+03	7.93E+02	7.65E+02	2.83E+02
Aliphatic hydrocarbons >EC_{12}-EC_{16}		6.27E+03	1.11E+03	1.06E+03	2.37E+01	6.34E+03	2.78E+03	2.41E+03	5.91E+01	6.36E+03	6.67E+03	4.34E+03	1.42E+02
Aliphatic hydrocarbons >EC_{16}-EC_{35}	(b)	6.46E+04	NR	NR	8.48E+00	9.17E+04	NR	NR	2.12E+01	1.10E+05	NR	NR	5.09E+01
Aliphatic hydrocarbons >EC_{35}-EC_{44}	(b)	6.46E+04	NR	NR	8.48E+00	9.17E+04	NR	NR	2.12E+01	1.10E+05	NR	NR	5.09E+01
Aromatic hydrocarbons >EC8-EC_{10}		5.76E+01	4.74E+01	3.45E+01	6.13E+02	1.38E+02	1.16E+02	8.38E+01	1.50E+03	3.07E+02	2.77E+02	1.94E+02	3.58E+02
Aromatic hydrocarbons >EC_{10}-EC_{12}		8.29E+01	2.58E+02	7.52E+01	3.64E+02	1.96E+02	6.39E+02	1.79E+02	8.99E+02	4.25E+02	1.52E+03	3.91E+02	2.15E+03
Aromatic hydrocarbons >EC_{12}-EC_{16}		1.47E+02	2.85E+03	1.45E+02	1.69E+02	3.36E+02	7.07E+03	3.32E+02	4.19E+02	6.81E+02	1.68E+04	6.74E+02	1.00E+03
Aromatic hydrocarbons >EC_{16}-EC_{21}	(b)	2.63E+02	NR	NR	5.37E+01	5.45E+02	NR	NR	1.34E+02	9.34E+02	NR	NR	3.21E+02
Aromatic hydrocarbons >EC_{21}-EC_{35}	(b)	1.09E+03	NR	NR	4.83E+00	1.47E+03	NR	NR	1.21E+01	1.70E+03	NR	NR	2.90E+01
Aromatic hydrocarbons >EC_{35}-EC_{44}	(b)	1.09E+03	NR	NR	4.83E+00	1.47E+03	NR	NR	1.21E+01	1.70E+03	NR	NR	2.90E+01

Notes:

EC - equivalent carbon. SAC - soil assessment criteria.

The CLEA model output is colour coded depending upon whether the soil saturation limit has been exceeded.

Calculated SAC exceeds soil saturation limit and may significantly affect the interpretation of any exceedances as the contribution of the indoor and outdoor vapour pathway to total exposure is >10%.

Calculated SAC exceeds soil saturation limit but the exceedance will not affect the SAC significantly as the contribution of the indoor and outdoor vapour pathway to total exposure is <10%.

Calculated SAC does not exceed the soil saturation limit.

The SAC for organic compounds are dependant upon soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, PAHs napthalene, acenaphthene and acenaphthylene, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway (Section 10.1.1, SR3)

(a) SAC for arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead are derived using the C4SL toxicology data.

(b) SAC for boron and selenium should not include the inhalation pathway as no expert group HCV has been derived; aliphatic and aromatic hydrocarbons >EC16 should not include inhalation pathway due to their non-volatile nature and inhalation exposure being minimal (oral, dermal and inhalation exposure is compared to the oral HCV); arsenic should only be based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The Oral SAC should be adopted for zinc and benzo(a)pyrene.

(c) SAC for CrIII should be based on the lower of the oral and inhalation SAC (see LQM/CIEH 2015 Section 6.8)

(d) SAC for elemental mercury, chromium VI and nickel should be based on the inhalation pathway only.

(e) SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used.

Table 5
Human Health Generic Assessment Criteria for Residential with home-grown produce

Compound	SAC for Soil SOM 1% (mg/kg)	SAC for Soil SOM 2.5% (mg/kg)	SAC for Soil SOM 6% (mg/kg)
Metals			
Arsenic	37	37	37
Barium	1,300	1,300	1,300
Beryllium	1.7	1.7	1.7
Boron	300	300	300
Cadmium	22	22	22
Chromium (III) - trivalent	910	910	910
Chromium (VI) - hexavalent	21	21	21
Copper	2,500	2,500	2,500
Lead	200	200	200
Elemental Mercury (Hg^0)	0.2	0.6	1.2
Inorganic Mercury (Hg^{2+})	39	39	39
Methyl Mercury (Hg^{4+})	10	10	10
Nickel	130	130	130
Selenium	258	258	258
Vanadium	410	410	410
Zinc	3,900	3,900	3,900
Cyanide (free)	1.4	1.4	1.4
Volatile Organic Compounds			
Benzene	0.20	0.41	0.87
Toluene	130	300	680
Ethylbenzene	50	110	260
Xylene - m	59	140	327
Xylene - o	61	143	332
Xylene - p	57	133	310
Total xylene	57	133	310
Methyl tertiary-Butyl ether (MTBE)	60	110	210
1,1,1,2 Tetrachloroethane	1.20	2.78	6.46
1,1,2,2-Tetrachloroethane	1.6	3.5	7.7
1,1,1-Trichloroethane	9	18	39
1,1,2 Trichloroethane	0.8	1.6	3.5
1,1-Dichloroethene	0.32	0.57	1.16
1,2-Dichloroethane	0.007	0.011	0.019
1,2,4-Trimethylbenzene	1.8	4.3	9.7
1,3,5-Trimethylbenzene	NR	NR	NR
1,2-Dichloropropane	0.034	0.060	0.120
Carbon Tetrachloride (tetrachloromethane)	0.026	0.056	0.127
Chloroethane	11.7	15.9	25.7
Chloromethane	0.012	0.014	0.019
Cis 1,2 Dichloroethene	0.16	0.27	0.52
Dichloromethane	0.62	1.08	1.92
Tetrachloroethene	0.2	0.4	0.9
Trans 1,2 Dichloroethene	0.28	0.50	1.02
Trichloroethene	0.02	0.03	0.08
Vinyl Chloride (chloroethene)	0.0006	0.0009	0.0014
Semi-Volatile Organic Compounds			
2-Chloronaphthalene	5	13	31
Acenaphthene	230	540	1,170
Acenaphthylene	180	440	970
Anthracene	2,400	5,500	10,900
Benzo(a)anthracene	7	11	13
Benzo(a)pyrene	5	5	5
Benzo(b)fluoranthene	2.6	3.3	3.7
Benzo(g,h,i)perylene	310	340	350
Benzo(k)fluoranthene	77	92	100
Chrysene	15	22	27
Dibenzo(a,h)anthracene	0.24	0.28	0.30
Fluoranthene	290	560	900
Fluorene	170	410	880
Hexachloroethane	0.27	0.66	1.55
Indeno(1,2,3-cd)pyrene	27	36	41
Naphthalene	13	30	71
Phenanthrene	100	220	440
Pyrene	620	1,240	2,040
Phenol	120	210	390
Total Petroleum Hydrocarbons			
Aliphatic hydrocarbons EC_5-EC_6	42	78	160
Aliphatic hydrocarbons >EC_6-EC_8	100	230	530
Aliphatic hydrocarbons >EC_8-EC_{10}	27	65	154
Aliphatic hydrocarbons >EC_{10}-EC_{12}	130 (48)	330 (118)	760 (283)
Aliphatic hydrocarbons >EC_{12}-EC_{16}	1,100 (24)	2,400 (59)	4,300 (142)
Aliphatic hydrocarbons >EC_{16}-EC_{35}	65,000 (8)	92,000 (21)	110,000
Aliphatic hydrocarbons >EC_{35}-EC_{44}	65,000 (8)	92,000 (21)	110,000
Aromatic hydrocarbons >EC_8-EC_{10}	30	80	190
Aromatic hydrocarbons >EC_{10}-EC_{12}	80	180	390
Aromatic hydrocarbons >EC_{12}-EC_{16}	140	330	670
Aromatic hydrocarbons >EC_{16}-EC_{21}	260	540	930
Aromatic hydrocarbons >EC_{21}-EC_{35}	1,100	1,500	1,700
Aromatic hydrocarbons >EC_{35}-EC_{44}	1,100	1,500	1,700
Minerals			
Asbestos	Stage 1 test – No asbestos detected with ID; Stage 2 test - <0.001% dry weight (exceedance of either equates to an exceedance of the GAC)[1]		

Notes:
'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data.
NR - SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used
EC - equivalent carbon. SAC - soil assessment criteria.
[1] LOD for weight of asbestos per unit weight of soil calculated on a dry weight basis using PLM, handpicking and gravimetry.

The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58.
1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, PAHs napthalene, acenaphthene and acenaphthylene, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

(VALUE IN BRACKETS)
RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limits given in brackets.

GENERIC ASSESSMENT CRITERIA FOR POTABLE WATER SUPPLY PIPES

A range of pipe materials is available and careful selection, design and installation is required to ensure that water supply pipes are satisfactorily installed and meet the requirements of the Water Supply (Water Fittings) Regulations 1999 in England and Wales, the Byelaws 2000 in Scotland and the Northern Ireland Water Regulations. The regulations include a requirement to use only suitable materials when laying water pipes and laying water pipes without protection is not permitted at contaminated sites. The water supply company has a statutory duty to enforce the regulations.

Contaminants in the ground can pose a risk to human health by permeating potable water supply pipes. To fulfil their statutory obligation, UK water supply companies require robust evidence from developers to demonstrate either that the ground in which new plastic supply pipes will be laid is free from specific contaminants, or that the proposed remedial strategy will mitigate any existing risk. If these requirements cannot be demonstrated to the satisfaction of the relevant water company, it becomes necessary to specify an alternative pipe material on the whole development or in specific zones.

In 2010, UK Water Industry Research (UKWIR) published *Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites* (Report Ref. No. 10/WM/03/21). This report reviewed previously published industry guidelines and threshold concentrations adopted by individual water supply companies.

The focus of the UKWIR research project was to develop clear and concise procedures, which provide consistency in the pipe selection decision process. It was intended to provide guidance that can be used to ensure compliance with current regulations and to prevent water supply pipe failing prematurely due to the presence of contamination.

The report concluded that in most circumstances only organic contaminants pose a potential risk to plastic pipe materials and Table 3.1 of the report provides threshold concentrations for polyethylene (PE) and polyvinyl chloride (PVC) pipes for the organic contaminants of concern. The report also makes recommendations for the procedures to be adopted in the design of site investigations and sampling strategies, and the assessment of data, to ensure that the ground through which water supply pipes will be laid is adequately characterised.

Risks to water supply pipes have therefore been assessed against the threshold concentrations for PE and PVC pipe specified in Table 3.1 of Report 10/WM/03/21, which have been adopted as the GAC for this linkage and are reproduced in Table A3 below.

Since water supply pipes are typically laid at a minimum depth of 0.75m below finished ground levels, sample results from depths between 0.5m and 1.5m below finished level are generally considered suitable for assessing risks to water supply. Samples outside these depths can be used, providing the stratum is the same as that in which water supply pipes are likely to be

located. The report specifies that sampling should characterise the ground conditions to a minimum of 0.5m below the proposed depth of the pipe.

It should be noted that the assessment provided in this report is a guide and the method of assessment and recommendations should be checked with the relevant water supply company.

Table A3: Generic assessment criteria for water supply pipes

		Pipe material	
		GAC (mg/kg)	
	Parameter group	**PE**	**PVC**
1	Extended VOC suite by purge and trap or head space and GC-MS with TIC (Not including compounds within group 1a)	0.5	0.125
1a	• BTEX + MTBE	0.1	0.03
2	SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C_5–C_{10}) (Not including compounds within group 2e and 2f)	2	1.4
2e	• Phenols	2	0.4
2f	• Cresols and chlorinated phenols	2	0.04
3	Mineral oil C_{11}–C_{20}	10	Suitable
4	Mineral oil C_{21}–C_{40}	500	Suitable
5	Corrosive (conductivity, redox and pH)	Suitable	Suitable
Specific suite identified as relevant following site investigation			
2a	Ethers	0.5	1
2b	Nitrobenzene	0.5	0.4
2c	Ketones	0.5	0.02
2d	Aldehydes	0.5	0.02
6	Amines	Not suitable	Suitable
Notes: where indicated as ‘suitable’, the material is considered resistant to permeation or degradation and no threshold concentration has been specified by UKWIR.			