

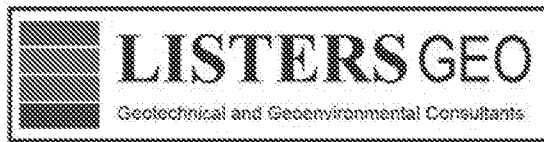
Frontier Estates Limited

Supplementary Geoenvironmental Investigation and Remediation Strategy

**Dappers Lane
Angmering
West Sussex
BN16 4DA**

**Report No: 21.05.026
July 2021**

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Project Address	Dappers Lane, Angmering, West Sussex BN16 4DA
Project Number	21.05.026
Client	Frontier Estates Limited

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For and on behalf of ListersGeo, trading name of Listers Geotechnical Consultants Ltd

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EXECUTIVE SUMMARY

Project Reference	21.05.026
Site Location	Dappers Lane, Angmering, West Sussex BN16 4DA.
OS Grid Reference	507340, 104711.
Development Proposals	A new two storey main care home building with associated car parking and communal gardens with no home grown produce or fruit trees.
Current Site Usage	Former residential property and garden with buildings now demolished and site partially overgrown.
Existing Buildings	None.
Topography	Site slopes down some 5.5m from the northern boundary to Water Lane at the southern boundary.
Vegetation	An overgrown area with dense shrubs and mature trees was present in the southern part of the site. Mature trees and dense vegetation along the sites boundaries and within landscaped areas, along with occasional trees in the paddock.
Published Geology	Superficial Head deposits underlain by Lambeth Group deposits across the site with the exception of the extreme south western corner, where the underlying Tarrant Chalk member is shown sub cropping beneath the Head deposits. The London Clay Formation, which overlies the Lambeth Group is shown immediately to the north west of the site.
Hydrology	The nearest surface watercourse is an unnamed tertiary river 32m south of the site that flows towards the south west. A pond is also recorded 15m to the south east of the site.
Hydrogeology	Secondary (undifferentiated) Aquifer, associated with the superficial deposits. Secondary A Aquifer and Principal Aquifer associated with the Lambeth Group and Tarrant Chalk Member bedrock deposits respectively.
Site History	Open ground until circa 1942 when a small gravel pit is shown on the site. Broadless recorded circa 1957 along with out-buildings and a glass house. Post 1970 gravel pit no longer recorded and house extended sometime after 1994 and the glass house is no longer shown on the 2010 map.
Potential Contamination Sources	Made Ground associated with the development of the site and subsequent demolition, on-site activities and the partial infill of a gravel pit.
Ground Conditions Encountered	Topsoil/Made Ground overlying suspected Head deposits, which in turn directly overlie the London Clay Formation in the northern part of the site and the Lambeth Group in the southern and eastern parts of the site.
Groundwater Encountered	Ground water seepages/inflows were encountered within the Head deposits and the granular Lambeth Group deposits at depths of between 0.9m to 5.5m. Entries were also recorded within the London Clay Formation at depths of 6.5m and 7.5m below the existing ground level.
Risks to Human Health	No significant risk identified based on a care home end use and no homegrown produce or fruit trees.
Risks to Controlled Waters	Low risk to groundwater receptors.
Remediation Required	None required with respect to soil contamination.
Ground Gas Risk	Protection measures required for radon and ground gas protection to Characteristic Situation CS2
Recommendations /Further Work	Approval of the recommendations of this report with the Local Authority/EA as appropriate. Discovery Strategy Consideration with regards the risk from chalk dissolution features

This executive summary should be read in conjunction with the main report.

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- PAH Double Ratio Plots

SUPPLEMENTARY GEOENVIRONMENTAL INVESTIGATION AND REMEDIATION STRATEGY

INTRODUCTION

A Supplementary Geoenvironmental Investigation and Remediation Strategy has been undertaken for a proposed new residential care home on land adjoining Dappers Lane, Angmering, West Sussex BN16 4DA. A Site Location Plan is provided in Appendix A. The Ordnance Survey National Grid reference for the approximate centre of the site is 507340, 104711.

Instructions to undertake the investigation were received from Fed3Projects, the client's Management Consultants, acting on behalf of the client, Frontier Estates Limited, in their email dated 25th May 2021.

This report supplements a previous ground investigation report prepared by ListersGeo, report number 14.11.004, dated January 2015, and we have used information within this report to aid our recommendations.

This current report should be read in conjunction with the previous report for full details of the investigations undertaken at the site.

To our knowledge, the site has not been subject to any other previous investigations.

This report describes the work carried out by ListersGeo, the ground conditions encountered and discusses their geoenvironmental implications with regard to the proposed development. The report presents initial human health and groundwater risk assessments based on the findings of the previously undertaken desk study information and subsequent contamination laboratory testing across both phases of the investigation. The contamination risk assessment has been carried out using the source-pathway-receptor risk assessment methodology.

This report has been prepared for the sole use of the client and their professional advisors. This report shall not be relied upon by third parties without the express written authority of ListersGeo. If an unauthorised third-party comes into possession of this report, they must not rely on it and the authors owe them no duty of care and skill.

SCOPE OF THE INVESTIGATION

The scope of the investigation as requested by Fed3 Projects was to undertake a supplementary geoenvironmental investigation to provide an assessment of the extent of any soil or groundwater contamination on the site. An updated contaminated land risk assessment was undertaken based on the Contaminated Land Exposure Assessment (CLEA) and Environment Agency (EA) Remedial Targets Methodology (RTM) guidelines. If remedial measures were found to be required, then a remediation strategy detailing the required remediation, is to be included.

The previous investigation, reference 14.11.004, covered a wider area which included the area of a proposed care home, in the southwest of the site, and some adjacent self-contained two-storey apartments and

bungalows which are proposed to the north and northeast of the proposed care home. This current investigation only covers the area of the proposed care home as shown on the plans in Appendix A.

A ground gas risk assessment was undertaken as part of the original investigation and this assessment will not be subject to further assessment during this current investigation unless potential volatile contamination is identified.

PROPOSALS

It is proposed to redevelop the site to accommodate a new two-storey care home building with associated communal gardens/soft landscaping, access roads and car parking. It is understood that homegrown produce will not be grown at the site and fruit trees are not proposed. A proposed site layout plan is provided in Appendix A. As part of this development, it is understood that site levels will be reduced in the order of up to 1.0m in parts with site levels in the south and west being raised from current site levels. In the north a nominal 0.43m reduction in site levels is proposed.

It is understood that this information is required to assist in the discharge of Condition 18 of the Planning permission for the site. As such, the findings of this report will require approval by the Local Authority as soon as possible to avoid delays to the development.

The report is based upon the above development proposals and the existing and proposed ground levels. Should either of these alter significantly following issue of this report, then the contents will require re-evaluation.

SITE INFORMATION AND WALKOVER SURVEY

A walkover survey of the site and its immediate surrounds was undertaken on the 7th June 2021, preceding the fieldwork. A selection of site photographs is presented in Appendix A along with a plan showing the pre-demolition site layout.

The site lies in a predominantly residential area and is currently unoccupied and fenced off from adjacent sites.

The site consists of an irregular shape parcel of land measuring approximately 95m x 90m and occupied an area of approximately 1.7 hectares. The site slopes down some 5.5m from the northern boundary to Water Lane which forms the southern boundary.

Access to the site was afforded via a driveway off Dappers Lane which forms the western site boundary. The driveway leads to an area of a former residential property in the north, which has recently been demolished, with associated former garden to the south and paddock to the east. An area overgrown with dense shrubs and mature trees was present in the southern part of the site. Further trees and vegetation were present along the sites boundaries and in landscaped areas along with occasional trees within the paddock present to the east of the former house.

GEOLOGY

Published Geology

Reference to the British Geological Survey 1:50,000 scale map and other published geological information on the area indicate that the site is underlain by superficial Head deposits of the Quaternary age. The Head deposits are underlain by Lambeth Group deposits across the site with the exception of the extreme south western corner, where the underlying Tarrant Chalk member is shown sub cropping beneath the Head deposits. The London Clay Formation, which overlies the Lambeth Group, is shown immediately to the northwest of the site.

Superficial Deposits

Head deposits are generally poorly sorted and poorly stratified deposits formed mostly by solifluction and/or hillwash and soil creep. Head typically comprises sand and gravel, locally with lenses of silt, clay or peat and organic material.

Bedrock

The London Clay Formation is generally represented by a blue grey or grey brown silty to very silty clay, clayey silt and sometimes silts, with some layers of sandy clay. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. Generally the London Clay Formation occurs to in excess of 30m in thickness however it is likely to be much thinner in this area as the underlying Lambeth Group is shown sub cropping at the site.

The Lambeth Group is typically represented by mottled, variable sequences mainly of clay, sometimes silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerates. The Lambeth Group can occur to thicknesses in the order of 28m in the area however is likely to be significantly reduced in thickness at the site and is possibly absent towards the south western corner, where the underlying Tarrant Chalk Member is shown.

The underlying Tarrant Chalk Member typically comprises white chalk with flints and forms part of the Upper Chalk which extends to in excess of 100m thickness.

PREVIOUS WORK

A Ground investigation was previously undertaken by ListersGeo, report number 14.11.004, dated January 2015. This previous report covered a wider area, but the salient points relevant to this report/area of investigation are included here, but the full report should be referred to for more detail:

- The site was open ground until circa 1942 when a small gravel pit is shown on the site. Residential property recorded circa 1957 along with out-buildings and a glass house. Post 1970 the gravel pit is no longer recorded and the house was extended sometime after 1994. The glass house is no longer shown on the 2010 map. The former residential property has since been demolished ahead of the proposed development.

- The nearest surface watercourse was an unnamed tertiary river 32m south of the site that flows towards the southwest. A pond is also recorded 15m to the southeast of the site.
- Superficial Head deposits are recorded as a Secondary (undifferentiated) Aquifer. Secondary A Aquifer and Principal Aquifer associated with the Lambeth Group and Tarrant Chalk Member bedrock deposits respectively.
- The previous ground investigation pertinent to this part of the site included eight exploratory holes with five machine excavated trial pits, two hand auger boreholes and one cable percussion borehole undertaken between the 14th and 26th November 2014.
- The exploratory holes encountered Topsoil/Made Ground down to between 0.2m and 1.0m. Made Ground comprised Topsoil with pockets of ash and brick fragments and also locally included metal car parts, rubber tyres, ceramic and metal fragments.
- Head Deposits were encountered at each test location where the base of the Made Ground was proven from between 0.2m and 1m depth down to depths of between 6.8m and 1.6m where the full depth was proven. The Head deposits reduced in thickness from the north to the southeast of the site, where site levels are at their lowest. The Head deposits were represented in general by a variable mix of orange brown and brown sandy gravel, with variable proportions of clay, and firm through to stiff slightly gravelly clay. Infrequent soft clay lenses were noted within the predominantly granular soils, which are considered to be as a result of perched groundwater seepages.
- London Clay was encountered in the east of the site from 6.0m and comprised firm blue grey silty slightly sandy becoming sandy clay which extended beyond the base of the borehole at 12.0m bgl.
- The Lambeth Group was encountered within the trial pits in the southern and south eastern parts of the site at depths between 1.6m and 2.6m and continued down to beyond the base of the pits at a maximum depth of 3.2m below ground level. Represented in general by stiff light brown and light orange brown, slightly sandy, clay and very silty, fine sand with clay laminations and gravelly beds.
- Ground water seepages/inflows were encountered within the Head deposits and the granular Lambeth Group deposits at depths of between 0.9m to 5.5m. Entries were also recorded within the London Clay Formation at depths of 6.5m and 7.5m below the existing ground level.
- Four samples of the Made Ground/Topsoil and one sample of the Head collected on site during this investigation were tested for a range of contaminants. Results were compared against the generic screening criteria for a residential end use with home-grown produce.
- Elevated Lead, Benzo(a)pyrene (BaP), benzo(b)fluoranthene and dibenzo(a,h)anthracene were encountered at concentrations above corresponding guideline screening values .
- It is considered that the elevated Lead, BaP, benzo(b)fluoranthene and dibenzo(a,h)anthracene correspond to localised Made Ground within the base of the former pit within the southern part of the site, encountered in hand auger HA01.
- Elsewhere elevated Lead and dibenzo(a,h)anthracene levels were encountered which are considered to be as a result of anthropogenic fragments within the Made Ground at isolated locations at the site including HA02 and trial pit TP3 in the centre and south of the site respectively. Remedial measures

or further investigation were therefore considered necessary in these areas to minimise the risk to human health or further quantify the risks.

- The elevated concentrations of contaminants encountered within the Made Ground soils were considered to have the potential to cause significant harm to the end users of the site if direct contact to them is available to the end users from such routes as soil ingestion or inhalation of dust.
- The contamination has been shown not to be widespread across the site, but appears to exist in localised areas. Based on the development proposals it was considered that much of the contaminated soils are likely to be covered by the care home and may be removed or covered over during levelling of the site. However, should such deposits remain in proposed gardens or areas of landscaping then suitable precautions were determined to be necessary.
- It was therefore considered that it may be necessary to implement remedial measures at the site to break the source-pathway-receptor linkage between the contaminated soils and the end users pending further investigation and assessment of proposed development plans. Such remedial measures may include Removal of contaminated soils or incorporation of a cover layer system in proposed gardens and landscaped areas.
- The report identified a low risk to groundwater receptors.
- Characteristic Situation CS2 in accordance with BS8485:2007 and traffic light colour 'Amber 1' in accordance with NHBC Report No 10627 for residential properties. The BGS advises that basic radon gas protection measures are necessary.

REVISED CONCEPTUAL SITE MODEL

The results of the current walkover and previous ground investigation indicate that the following sources of ground contamination are present at or in close proximity to the site:

- Made Ground is present at the site associated with demolition of historical structures and former on-site activities.
- A gravel pit is recorded on site. The topography suggests that has not been infilled however HA1 has shown the pit to be at least partially infilled.

The following most sensitive receptors have been identified at the site:

Human Health

- End users of the site (residents/staff)
- Surrounding residents
- Construction workers

Environmental

- Controlled Waters - the pond 15m to the southeast of the site
- Controlled Waters - the watercourse 32m to the southeast of the site

- Controlled Waters - the Secondary Aquifer and Principal Aquifer beneath the site.

It is considered that a number of potential pathways exist between these potential sources and the above identified receptors.

Based on the updated development proposals, for the human receptors these include:

- Direct soil ingestion in areas of exposed soil.
- Inhalation of indoor and outdoor vapours and dust.
- Dermal contact with contaminated soil.
- Inhalation of soil gases or vapours migrating through permeable strata into the building.

For the environmental receptors the pathways include:

- Migration of contaminants through the unsaturated zone.
- Migration of contaminants through the groundwater.
- Movement of contaminants through drains or services runs.
- Run-off to the nearby watercourse.
- Migration of soil gases through permeable strata.

SUPPLEMENTARY EXPLORATION AND TESTING

A total of seven hand auger boreholes, HA101 to HA107, were formed at the site on the 7th June 2021.

The positions of all exploratory holes undertaken at the site as part of this investigation can be seen on the Exploratory Hole Location Plans in Appendix A. The logs are provided in Appendix B and the results of the chemical laboratory testing are provided in Appendix C.

Coordinates have been obtained from freely available aerial imagery and should be treated with an appropriate level of accuracy in the order of say $\pm 5\text{m}$. Levels have been interpolated from Extract from Greenhatch Group Site Survey for Dappers Lane, Angmering Drawing number 20959_OGL Rev 0 dated 15.10.14.

Geoenvironmental conclusions given in this report are based on data obtained from these sources but it should be noted that variations, which affect these conclusions, may inevitably occur between and beyond the test locations. Also, water levels may vary seasonally and with other factors.

SAMPLING STRATEGY

The investigation was undertaken in accordance with the scope of works agreed with Fed3 Projects. The positions of the exploratory holes were selected by ListersGeo to provide a wide coverage of information on the site area and to further investigate the extent of contaminated Made Ground identified during the previous investigation.

Vegetation limited access to the southern and southwestern parts of the site, though hand augers were located as far as possible into the vegetation with clearance being undertaken using hand tools.

HA104 and HA107 were located to the north and south of the old pit, respectively, which was investigated by HA1 during the initial ground investigation. HA105 was located to the northeast and HA106 to the southwest of the exceedance identified around TP3. HA101 was located to the west of the exceedance previously encountered in HA2.

METHODOLOGY

Health and Safety

Prior to commencement of boring/testing, and in order to minimise the dangers from/to buried services, the proposed locations were scanned using a Cable Avoidance Tool.

Exploratory Holes

Hand auger boreholes HA101 to HA107, were put down using a Dutch portable hand auger and hand digging tools to a maximum depth of 1.0m below ground level (bgl). The 55mm diameter auger head was rotated and pushed down into the soil by means of a T-handle to obtain selected disturbed soil samples at regular intervals.

GROUND CONDITIONS

The general succession of strata revealed by the fieldwork is summarised in the table below, followed by a discussion of the Ground Model for the site:

Stratum	Locations encountered	Top of stratum (m)	Base of stratum (m)	Thickness (m)	Comments
Topsoil	HA104, HA106 and HA107	0.0	0.15 to 0.30	0.15 to 0.30	In the south of the site
Made Ground	HA101 to HA103	0.0	0.20 to 0.35	0.20 to 0.35	In the north of the site and paddock
Head	All exploratory holes	0.0 to 0.35	>0.50 to >1.00	>0.70	-

TOPSOIL

Encountered in HA104, HA106 and HA107 in the south of the site from ground level down to depths of between 0.15m and 0.30m.

Represented in general by brown to grey brown, slightly organic, slightly gravelly, clayey sand and silty gravelly sand with gravel of flint, sandstone, brick and occasional barbed wire.

MADE GROUND

Encountered in HA101 to HA103 located towards the north of the site from ground level down to depths of between 0.15m and 0.30m bgl.

The Made Ground soils comprised a variable mix of red brown and brown, slightly sandy, gravelly clayey silt and clayey, gravelly, sand. Gravel comprised flint, chalk and occasional brick, metal, plastic and limestone aggregate.

HEAD DEPOSITS

Encountered at each test location from beneath the Topsoil and Made Ground, and from surface in HA105, down to beyond the base of the investigation at a maximum depth of 1.0m bgl.

Head deposits were variable and were encountered as brown and orange brown, slightly sandy, slightly gravelly, clay and silty, gravelly sand and locally clay bound sandy gravel. Gravel was of flint.

GROUNDWATER

Groundwater was not encountered in any of the exploratory holes during the fieldwork down to 1.0m depth for the short time that the holes were open.

OBSERVED SOIL CONTAMINATION

No visual or olfactory signs of free-phase contamination were noted during the site works.

GROUND CONTAMINATION ASSESSMENT

The results of the laboratory tests from this investigation are included in Appendix C. The following is a description of: the testing schedule (number of tests from each stratum and the tests performed); the guidelines adopted for assessing the results, and a comparison of the test results from this investigation with those adopted guideline values. The implications of these comparisons are provided in the Risk Assessment sections that follow.

The contamination risk assessment has been undertaken in line with the EA's new online guidance Land Contamination: Risk Management (LCRM) published in October 2020. The guidance is based upon the principles of CLR11, Model procedures for the management of land contamination, 2004, now withdrawn.

The assessment has been undertaken in order to validate the Preliminary Risk Assessment (PRA) using a Generic Quantitative Risk Assessment (GQRA) followed by a Detailed Quantitative Risk Assessment (DQRA), if required.

SOIL TESTING

Two samples of the Made Ground, two of the Topsoil and three of the Head deposits collected on site during this investigation were tested for a range of constituents of potential concern (CoPC). The majority of the samples to be tested were recovered from the test locations targeting the potential sources of contamination listed in the Conceptual Site Model and the previously identified elevated contamination levels. These are summarised below:

Trial Pit	Target	Sample depth (m)
HA101	Made Ground around the former house, and to the south of now-offsite previously encountered contamination.	0.4
HA102	West of the landscaped mound	0.2
HA103	Area of proposed soft landscaping	0.1
HA104	North of the old/partially infilled pit and contamination noted in HA1	0.1
HA105	To the northeast of contamination encountered in TP3 and in an area of proposed soft landscaping.	0.3
HA106	To the southwest of contamination encountered in TP3 and in an area of proposed soft landscaping.	0.1
HA107	North of the old/partially infilled pit and contamination noted in HA1	0.4

The suite of testing carried out on the samples was decided upon following consultation of R&D CLR Publications, published as part of the Contaminated Land Exposure Assessment (CLEA), a joint venture between the Department for Environment, Food and Rural Affairs (DEFRA) and the EA.

The test suite included:

Group	Details
Asbestos	Screening for ACMs and fibres with the naked eye and microscopy
Inorganic substances	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc Sulphates
Organic substances	16 (EPA) Speciated Polycyclic Aromatic Hydrocarbons (PAH) Total Petroleum Hydrocarbons (TPH) with eight-band split
Other	pH Total organic carbon (TOC)

Unless explicitly stated on the laboratory report, the soil samples were tested to obtain 'Total' values within the soil.

The results of the tests from this investigation are included in Appendix C.

RISK ASSESSMENT GUIDELINES – HUMAN HEALTH

The human health risk assessment has been undertaken using the guidance provided in the EA's LCRM guidance, published October 2020 and the CLEA guidelines.

This assesses risks associated with the ingestion, dermal contact, and vapour inhalation pathways related to contaminated soils and groundwater. Risks associated with the inhalation of Ground Gas, for example that resulting from landfill, is not addressed by LCRM. The assessment for ground gases has been undertaken separately in the Ground Gas Risk Assessment section of this report.

Human health assessment criteria used are based upon the proposed final land use of the site. As the site is to be redeveloped to accommodate a care home the Generic Assessment Criteria (GACs) for the standard land-use, 'Residential without homegrown produce' have been used as an initial screening criteria.

Where exceedances have been identified, site specific assessment criteria for a Care Home scenario modelled using the CLEA software have been used as described below. The SACs derived from the CLEA software have also been applied to the exceedances noted during the previous site investigation.

Consideration has also been given to potential risks to groundworkers coming into contact with the soil during demolition or construction phases.

If the proposed site use should alter from the above, then the human health risk assessment will require re-evaluation for the new end use scenario

The results of the soil samples tested have been compared to the following published assessment criteria:

Category 4 Screening Levels (C4SLs)

Published in March 2014 by DEFRA, a limited number of generic Category 4 Screening Levels (C4SLs) were produced to support the revised Statutory Guidance to support Part 2A of the Environmental Protection Act 1990, which was published in April 2012. This Guidance 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.

Although not the primary purpose, the DEFRA letter dated 3rd September 2014 from Lord de Mauley established that the C4SLs are also suitable for use in planning situations, as did the Department for Communities and Local Government (DCLG)'s 'Planning Portal' document from June 2014.

Suitable 4 Use Levels (S4ULs)

To supplement the small number of C4SL, a set of Suitable for Use Levels (S4UL) were produced, in 2015, by Land Quality Management (LQM) and the Chartered Institute of Environmental Health (CIEH), using the EA's Contaminated Land Exposure Assessment (CLEA) software, version 1.06 (2009), and the revised assumptions used in deriving the C4SL. The S4UL are more conservative than the C4SL and are derived to represent the minimal levels of risk to human health as described in the EA's SR2 guidance, with the intention of being 'suitable for use' under planning.

Detailed Quantitative Risk Assessment (DQRA)

Where results exceed the C4SLs or S4ULs used in the GQRA, or if a more site-specific model is required, then a Detailed Quantitative Risk Assessment (DQRA) is undertaken to establish site specific assessment criteria. This final stage uses specific information regarding the contamination and its potential receptors and pathways. The CLEA software was updated to version 1.071 in November 2015 to enable both site specific C4SLs and S4ULs to be determined by contaminated land practitioners, which produces less conservative, more accurate, site specific soil assessment criteria (SACs).

The model is based on the most sensitive receptor being female and aged between 16 to 75 years old (to cover both workers and residents). The occupancy period has been modelled as 20 hours per day inside, 2 hours per day outside, 365 days per year. An allowance has also been made for a female aged up to the age of 16 to visit the care home 180 days per year and spend 4 hours inside and 2 hours outside. A semi-detached house has been used to model the proposed care home and a sandy clay loam of 1% soil organic matter (SOM) to model the soils at the site. The worksheets for the CLEA model settings are provided in Appendix D.

Data Sources

Where chemical specific data has been used in the above assessments, data has been sourced from available TOX reports, published by DEFRA, The Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) literature and toxicological and physical data obtained from EA Publication, 'Human Health Toxicological Assessment of Contaminants in Soil', August 2008.

RESULTS OF ASBESTOS SCREENING

Screening for the presence of asbestos did not reveal any asbestos containing material (ACM) or fibres in the two samples of Made Ground soils tested as part of this investigation one from the previous investigation.

RESULTS OF TOTAL SOIL TESTS

Results of the total soil testing have been compared to relevant published GAC as discussed above. For S4ULs, a range of values have been published for the organic contaminants based on the soil's organic matter content.

The soil testing indicates that the soils have a total organic carbon (TOC) content of between 0.5% and 5.4%, which is approximately 0.87% to 9.3% soil organic matter (SOM). Therefore, the S4ULs for 1% SOM have been referred to for the organic contaminants as an initial conservative screening tool.

Of the remaining determinands tested for, none of the samples obtained as part of this supplementary investigation recorded values higher than their relevant GAC for human health for a residential setting without homegrown produce.

The results of the chemical testing undertaken as part of our previous report, reference 21.05.026, have been compared against up to date GACs for a 'residential without homegrown produce' end use and recorded exceedances of Lead, Benzo[b]fluoranthene, Benzo[a]pyrene, Dibenzo(a,h)Anthracene. However, when compared to the SACs for a care home without homegrown produce, no exceedances were recorded as outlined below.

Lead

Of the twelve samples tested, across both phases of the investigation that fall within this site area, the values obtained from 13mg/kg to 1,200mg/kg. The C4SL for lead is 310mg/kg.

Two samples of Made Ground recovered from 0.3m depth in HA1 (490mg/kg) and HA2 (1,200mg/kg) exceeded that GAC. The SAC for Lead is 1,463mg/kg. In addition, the Made Ground in the area of HA2 will be beneath the proposed car park/hardstanding, which will remove the ingestion pathway. Therefore, it is considered that the elevated concentrations of Lead do not pose a significant risk to the identified receptors.

Polycyclic Aromatic Hydrocarbons (PAHs)

Of the twelve samples tested, across both phases of the investigation that fall within this site area, three samples recorded polycyclic aromatic hydrocarbon (PAH) compounds in exceedance of the selected GACs. The samples which recorded exceedances were of Made Ground and were recovered from:

- 0.050m in TP3
- 0.30m in HA1
- 0.30m in HA2

Three of the PAHs exceeded the GACs and were then subject to further assessment using the SACs, as detailed below.

Contaminant	Range of exceedances (mg/kg)	GAC (mg/kg)	No. >GAC	SAC (mg/kg)	No. >SAC	Pathway of Concern
Benzo(b)fluoranthene	7.3	3.9	1	22	0	Ingestion and contact
Benzo(a)pyrene	5.6	5.3	1	33	0	Ingestion
Dibenz(a,h)anthracene	0.32 to 0.92	0.31	1	1.72	0	Ingestion and contact

Therefore, it is considered that the elevated concentration of PAHs do not pose a significant risk to the identified receptors.

HUMAN HEALTH RISK ASSESSMENT

The following quantitative risk assessment has been carried out using the source-pathway-receptor principle. Potential sources of contamination identified in the Conceptual Site Model (CSM) have been assessed using the CLEA Guidelines. This takes into account the fact that a complete pathway must exist between a potential source of contamination and a potential receptor for there to be considered a risk.

The potential human receptors evaluated for their individual risk are:

Long-Term Exposure

- End users of the site – the future residents/staff.
- Nearby residents.

Short-Term Exposure

- Construction workers and the general public (during redevelopment).
- Maintenance workers

If the proposed site use or layout should alter significantly, then the human health risk assessment will require re-evaluation.

SOIL CONTAMINATION RISK

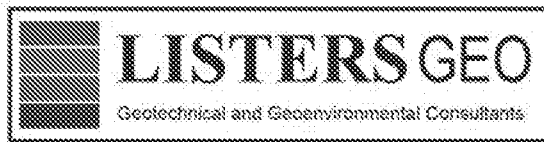
None of the soil contamination tests carried out as part of this investigation revealed elevated concentrations of contaminants in the soil when compared with the relevant SACs. In addition, site levels are due to be reduced and raised in order to bring site levels down to the level of Water Lane. As such the Made Ground soils are considered to be stripped from the site, almost completely, or covered as is the case of the Made Ground encountered in HA1. The remaining site will be predominantly covered with a building and car parking with limited areas of soft landscaping/communal gardens, no private gardens and no fruit trees or homegrown produce.

As such there is considered to be no significant risk of significant harm to the above referenced long term exposure receptors.

CONSTRUCTION WORKERS

For construction workers and maintenance workers that are exposed to the ground, there is a short-term exposure risk (at each site they attend, which contributes to an overall lifetime exposure risk) and the pathway of primary concern is 'direct soil ingestion'.

To reduce the risk to as low as reasonably practicable for the construction workers it is recommended that appropriate health and safety measures be implemented along with the use of Personal Protective Equipment (PPE). All personnel coming into contact with the soil, ground workers in particular, should be instructed to use gloves when on site to avoid dermal contact and restrict inadvertent hand-to-mouth ingestion. Washing facilities should be provided for the site staff to use and should be used prior to eating or smoking. Reference



should be made to the HSE Document, "Protection of Workers and the General Public during Development of Contaminated Land".

Although no asbestos was identified in the soils at the site, the presence of ACM and fibres within Made Ground at any site cannot be ruled out. Groundworkers should be made aware of potential risks of asbestos during the groundworks prior to beginning work.

Asbestos in soils is not normally hazardous to humans unless it is disturbed and fibres become airborne and can be inhaled. Asbestos is most frequently encountered bonded in cement in fragments of corrugated roofing sheets, in tiles or in insulation materials. Any groundworks involving asbestos needs to be appropriately controlled.

REGULATORY APPROVAL

We recommend that the conclusions of this report are agreed with the relevant Local Authority at the earliest stage, to reduce potential delays to the development.

CONTROLLED WATERS RISK ASSESSMENT

The following Controlled Waters risk assessment has been carried out in accordance with the procedures set out in the EA's RTM *Hydrogeological risk assessment for contaminated land* (2006). Using the source-pathway-receptor principle, this takes into account the fact that a complete pathway must exist between a potential source of contamination and a potential receptor for there to be considered a risk.

The potential Controlled Waters receptors considered during this risk assessment were:

- Controlled Waters - the pond 15m to the south east of the site.
- Controlled Waters - the watercourse 32m to the south east of the site
- Controlled Waters - the Secondary Aquifer and Principal Aquifer beneath the site

Following the intrusive investigation and contamination testing, the CSM can now be revised.

DISCUSSION

The previous investigation undertook leachate testing of the Made Ground. Of the contaminants tested for within the leachate samples, none recorded values in excess of their respective EQS or UKDWS.

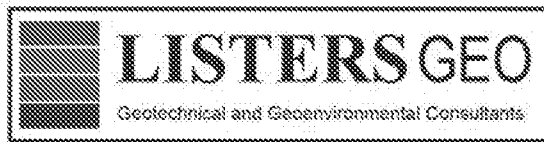
Elevated concentrations of PAHs have been identified during both investigations. The origin of the PAH in the soil was ascertained by plotting the results on a double ratio plot, provided in Appendix D. The PAH identified at this site has been attributed to coal derived products, including tarmac and coal ash and combustion products such as soot and ash. As these substances are not readily mobile in the environment, it is considered that the low levels of PAHs at this site do not pose a significant risk to controlled waters.

No visual or olfactory evidence of free-phase contamination has been identified during either phase of the investigation.

It is therefore considered that the above recognised environmental receptors are unlikely to be at significant risk from potential groundwater pollution at the site.

REGULATORY APPROVAL

The Environment Agency is the regulatory body charged with protection of controlled waters and may be a consultee in the planning process. We recommend that the conclusions of this report are agreed with the relevant Local Authority at the earliest stage, to reduce potential delays to the development.



INFRASTRUCTURE RISK ASSESSMENT

UNDERGROUND SERVICES

Elevated levels of lead and various PAHs were recorded in the Made Ground at the site. Generally, plastic pipes will not be affected by inorganic contaminants, but they could be affected by organic contaminants and extremes of pH in the soils.

It should be noted that the utility companies often have their own local guidelines and standards on levels of shallow soil contamination in the ground that may or may not be acceptable for the installation of below ground services. These standards may be different to those specified for assessing risks to human health and groundwater.

The local requirements should be obtained from the particular service supply company as soon as possible to avoid unexpected delays or additional development costs.

Guidance can be sought from the UK Water Industry Research (UKWIR), 'Guidance for the selection of water supply pipes to be used in brownfield sites', reference 10/WM/03/21, 2010. This document proposes that the assessment of the hazard to potable water supply pipes should be based on the following pathways: contact with migrating groundwater, permeation of vapour, and direct contact with soil.

Approval should be sought for the type of pipes proposed before they are installed.

REMEDIATION

Based on the above updated assessment using the CLEA model, the proposed site development plans, and proposed changed in site levels it is considered that remedial measures are not required for the proposed care home development with respect to elevated levels of contaminants within the soil.

Protection measures with respect to ground gas are discussed below along with some other discussion points regarding the proposed development.

TOPSOIL AND SUBSOIL

Based upon the human health risk assessment, the existing Topsoil and Made Ground could be reused on site subject to approval from the Local Authority.

Should imported Topsoil or Subsoil be required then any new Topsoil or Subsoil imported to the site will require testing for a range of contaminants to ensure that the soil is suitable for the particular development. The analysis should include a range of inorganic and organic contaminants and samples should be screened for asbestos.

If there are no chemical testing results available for the soils to be imported, then testing for contaminants must be undertaken to demonstrate that the imported soils are clean and suitable for use.

The Imported Topsoil or Subsoil should contain levels of contaminants at or below the current Category 4 Screening Levels (C4SLs) or Suitable for Use Levels (S4ULs) for residential end use.

Following the EA regulatory position statement, *RPS 190 Use of manufactured topsoil*, up to 1,000 tonnes of manufactured Topsoil may be imported without an environmental permit. The Topsoil must follow *BS 3882:2015 Specification for topsoil*. It is recommended that confirmation on the soil quality is sought from a landscape architect.

GROUND GAS PROTECTION MEASURES

As described in the Ground Gas Risk Assessment, in ListersGeo report reference 14.11.004, the site has been characterised as Characteristic Situation (CS) 2 in accordance with BS8485.

Table 4 of BS8485, provides minimum gas protection scores for measures to be incorporated into the building design. Various gas protection design systems for the floor slabs, ventilation measures and gas resistant membrane are detailed in Tables 5, 6 and 7 of the document in order to achieve the required level of protection.

The details of the gas protection measures to be installed are to be submitted separately by the developer.

The installation of any membranes should be validated in accord with CIRIA guidance C735.

The BGS advises that basic radon gas protection measures are necessary. If underground rooms are present, then protection measures to a higher level may be required.

CONCRETE DESIGN CLASSIFICATION

In terms of BRE Special Digest 1, the site assessment corresponds to the following classifications:

BRE Special Digest 1 Category	Class
Design Sulphate (Made Ground, Head, Lambeth Group - mobile)	DS-1
Design Sulphate (London Clay – static)	DS-2
Aggressive Chemical Environment for Concrete (ACEC) (Made Ground, Head, Lambeth Group - mobile)	AC-1
Aggressive Chemical Environment for Concrete (ACEC) (London Clay – static)	AC-1s

Notes: * This higher rating only applies where the Gault Formation has the potential to oxidise, such as if piles are bored and left open for extended periods prior to casting concrete. See BRE SD1 Appendix A1 and Box C8 for further guidance.

WATER SUPPLY PIPES

The water supply service pipes on site will be installed to a suitable specification as agreed with the local water supply company.

DISCOVERY STRATEGY

As the Made Ground varies across the site area, and the depth of Made Ground in the infilled gravel pit has not been confirmed the developer should prepare a method statement to cater for unexpected contamination uncovered during the groundworks. Should any suspicious soils be encountered that differ from our ground model, work should cease in that area and further assessment will be necessary by a suitably qualified geoenvironmental engineer. This may require further intrusive investigation or soil sampling along with supplementary contamination risk assessment and potentially remediation. Any further recommendations will require regulatory approval.

The Discovery Strategy should be implemented throughout the groundworks and a Remediation Strategy developed and approved by the regulators if necessary.

REGULATORY APPROVAL

With regard to soil and groundwater contamination, it is considered that no significant source-pathway-receptor linkage exists at the site and consequently no remedial measures are considered necessary. This should be confirmed by the relevant Regulatory Authority as soon as possible prior to development.

FURTHER WORK/RECOMMENDATIONS

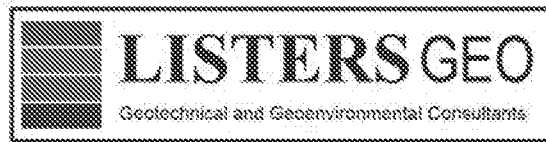
No elevated concentrations of contaminants with respect to the SACs were recorded by this investigation and whilst there is considered to be a low risk of contamination at this site, some areas of the site have not been investigated such as in areas of dense vegetation and the depth of Made Ground in HA01 has not been proven. A Discovery Strategy should therefore be implemented during demolition and groundworks, and should suspicious soils be encountered, work should cease immediately and the soils be assessed by a suitably qualified engineer.

Soil is a heterogeneous material and variations, which affect our conclusions, may inevitably occur between and beyond the test locations. Should ground conditions vary noticeably from our Ground Model, then we recommend further assessment by a suitably qualified person.

Whilst outside the scope of this investigation, we recommend that additional geotechnical works are undertaken to increase the level of certainty in the original ground model, this includes the area of the former gravel pit and possible risks with regards to chalk dissolution features and mining. As a minimum precaution, we recommend a watching brief is prepared during groundworks and should any evidence of loosened or weak zones of soil be encountered, then we recommend further advice is sought from a specialist.

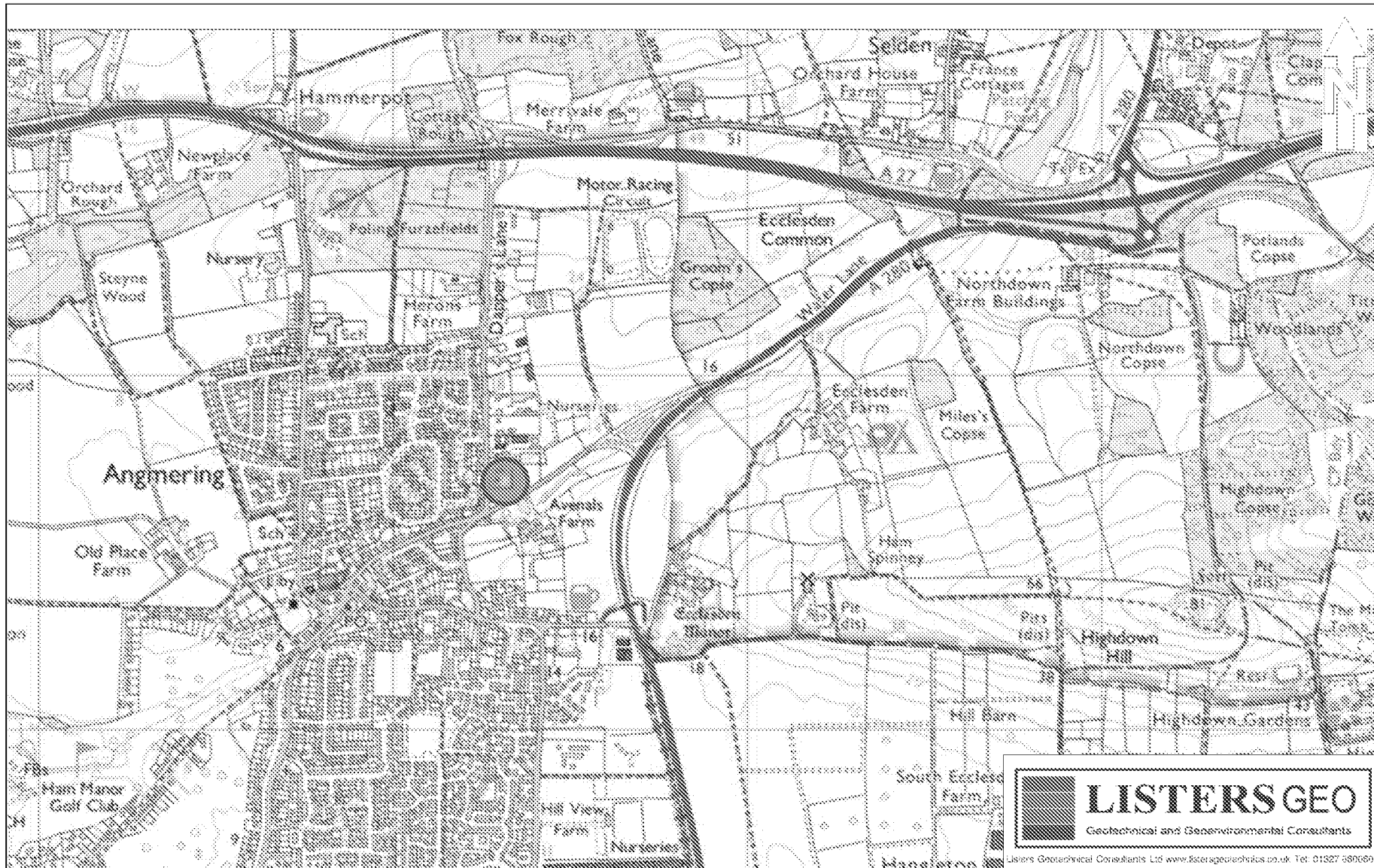
REFERENCES

- British Standards Institution (BSI), Site Investigations: Code of Practice, BS5930:2015+A1:2020, 2020
- BSI, Investigation of Potentially Contaminated Sites: Code of Practice, BS10175:2011+A2:2017, 2017
- Association of Geotechnical and Geoenvironmental Specialists, Site Investigation Asbestos Risk Assessment, AGS Interim Guidance, 2013
- CIRIA, Asbestos in soil and made ground: good practice site guide, C765, 2017
- Environment Agency, Land contamination: risk management, October 2020
<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>
- CIRIA, Contamination Land Risk Assessment – A Guide to Good Practice, C552, 2001
- Environment Agency, Human Health Toxicological Assessment of Contaminants in Soil, SR2, 2009
- Amherst Scientific Publishers, The Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) Series - Volumes 1-5, 1998
- Department for Environment, Food and Rural Affairs, SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document, 2014
- Land Quality Management, The LQM/CIEH S4ULs for Human Health Risk Assessment, S4UL3032, 2015
- Health and Safety Executive, Protection of Workers and the General Public during Development of Contaminated Land, HS(G) 66, 1991
- Health and Safety Executive (HSE), Health and safety in construction, HSG150. HMSO London 2006.
<https://www.hse.gov.uk/pubns/priced/hsg150.pdf>
- CAR-SOIL™, Control of Asbestos Regulations, 2012, Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials, CL:AIRE 2016
- HSE, Approved Code of Practice, Managing and working with asbestos, 2013
- Environment Agency, Remedial Target Methodology, Hydrogeological Risk Assessment for Contaminated Land, 2006
- The Water Supply (Water Quality) Regulations 2016
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- WHO Guidelines for drinking-water quality, 4th edition, 2011
- WHO Guidelines for drinking-water quality, Petroleum Products in Drinking Water, 2008
- UKTAG, 'Guide to the Metal Bioavailability Assessment Tool (M-BAT) Water Framework Directive: River and Lake', 2014



- BRE, Cover Thickness Design for Regeneration, BR 465, 2004
- UK Water Industry Research (UKWIR), Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites, 10/WM/03/21, 2010

APPENDIX A PLANS & PHOTOGRAPHS



Title: Site Location Plan

Site: Dappers Lane, Angmering, West Sussex BN16 4DA

Scale: NTS

Job Number: 21.05.026

Drawn By: AJ

Key:

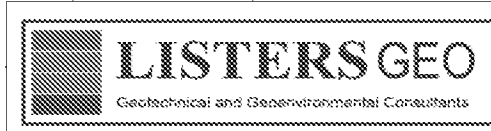


Approximate site location

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ARUN DISTRICT COUNCIL 1999/01/01



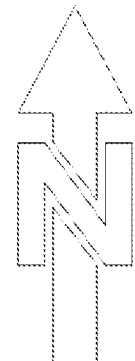
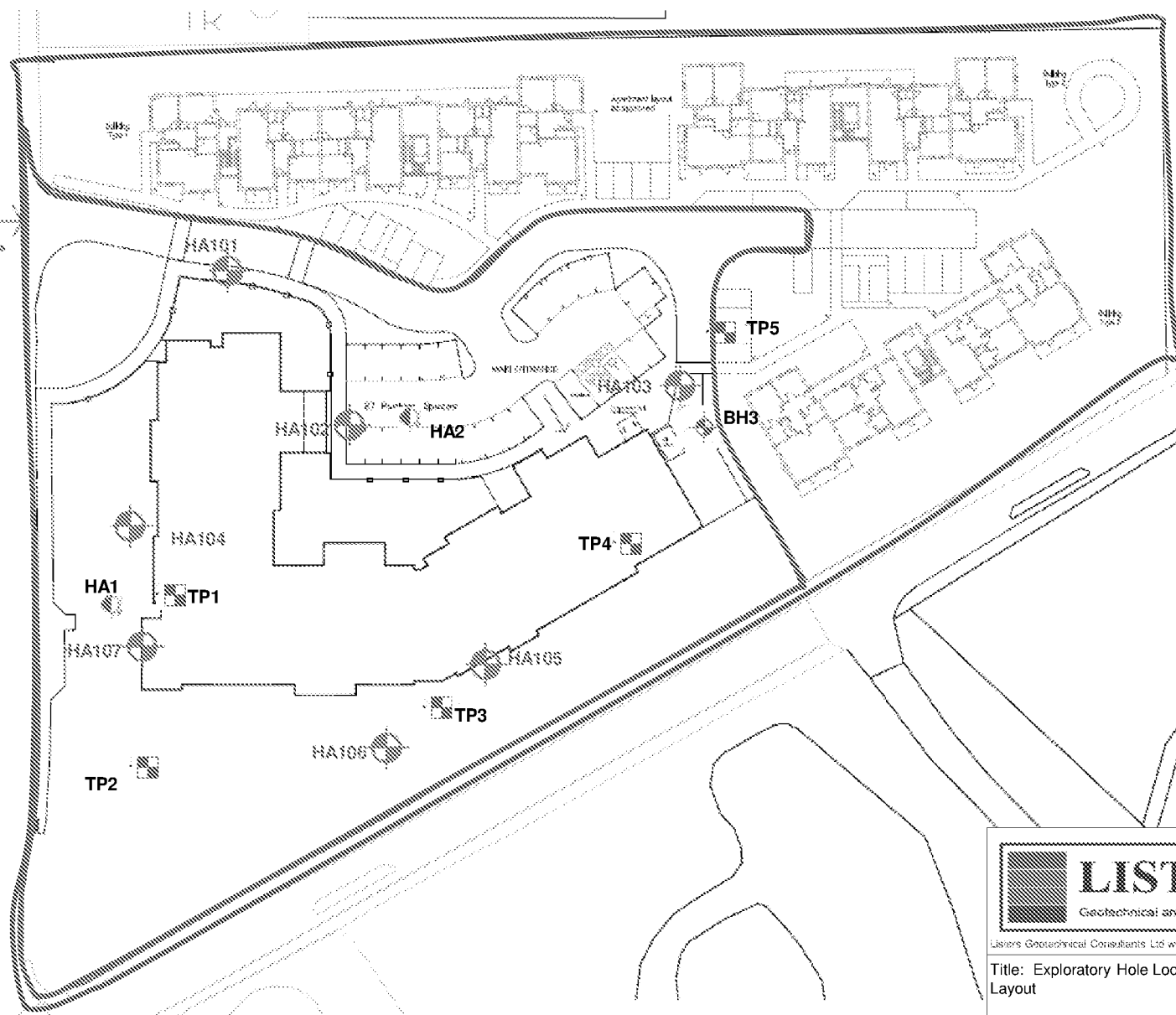
Title: Exploratory Hole Location Plan – Pre-demolition Site Layout

Key:

- | | | | | | |
|--|---------------------------------------|--|---|--|---------------------------------------|
| | Approximate Site Boundary (21.05.026) | | Hand Auger Borehole (21.05.026) | | Hand Auger Borehole (14.11.004) |
| | Approximate Site Boundary (14.11.004) | | Machine Excavated Trial pit (14.11.004) | | Cable Percussion Borehole (14.11.004) |

Site: Dappers Lane, Angmering, West Sussex BN16 4DA

Scale: NTS	Job Number: 21.05.026	Drawn By: AJ
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LISTERSGEO

Geotechnical and Geoenvironmental Consultants

Listers Geotechnical Consultants Ltd www.listersgeotechnical.co.uk Tel: 01323 580060

Title: Exploratory Hole Location Plan – Proposed Site Layout

Key:

 **Approximate Site Boundary**

ARUN DISTRICT COUNCIL drawing reference: 1877 Rev.P2: ARP: Amends following site survey

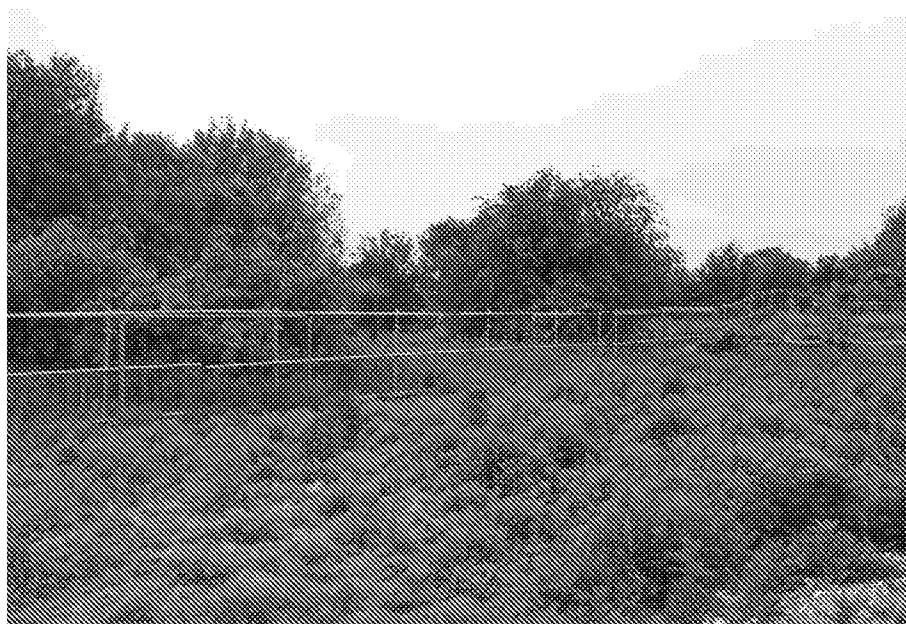
Site: Dappers Lane, Angmering, West Sussex BN16 4DA

Scale: NTS	Job Number: 21.05.026	Drawn By: AJ
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Looking Southeast from the northern site boundary across the area of the former residential property.

Photo 1



Looking roughly southwest along the boundary between the former residential property and the largely overgrown southern end of the site.

Photo 2

SITE PHOTOGRAPHS

Report:
21.05.014



Looking southwest across the overgrown southern section of the site towards Water Lane.

Photo 3



Looking west towards Dappers Lane showing the overgrown nature of the site.

Photo 4

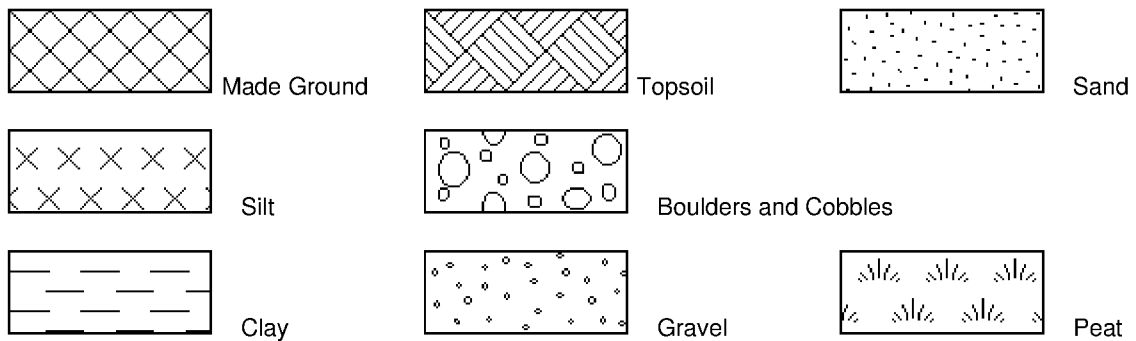
SITE PHOTOGRAPHS

Report:
21.05.014

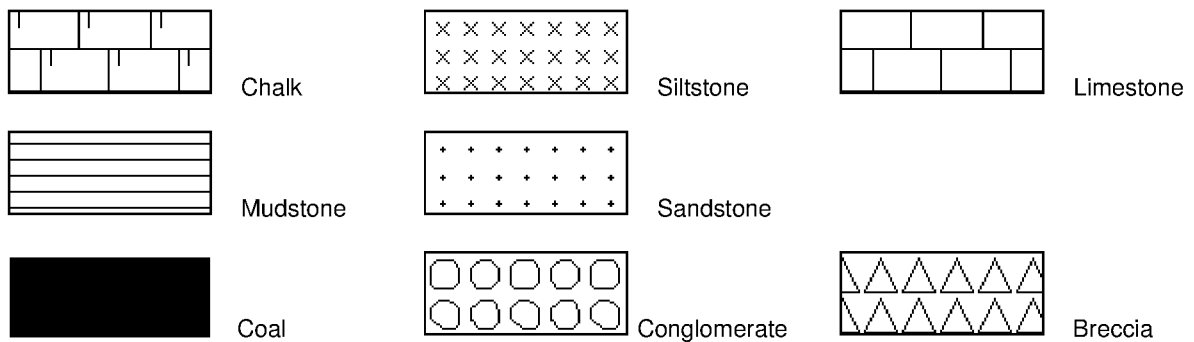
APPENDIX B

FIELDWORK AND TESTING

LEGEND - Soils



LEGEND - Rocks (Sedimentary)



LOG ABBREVIATIONS

W Water Sample B Bulk Sample D Disturbed Sample J Jar Sample U Undisturbed Sample (No. of blows shown in brackets for U100 samples) WAC Waste Acceptance Criteria Sample	 Water Strike  Water (Standing Level) PP Pocket Penetrometer HV Hand Vane SPT Standard Penetration Test CPT Cone Penetration Test CBR California Bearing Ratio * Extrapolated Value
--	---

Pocket penetrometer testing provides values of unconfined compressive strength. The results have been converted to an approximate equivalent shear strength which should be used with due circumspection. As the pocket penetrometer tends to overestimate shear strength, we have used an appropriate reduction factor.

LOG KEY

Hand Auger Log

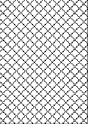
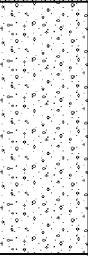
Borehole No.
HA 101
Project Location: Dappers Lane, Angmering, West Sussex BN16 4DA

Co-ords: 507294E - 104716N

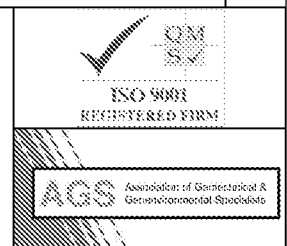
Project Number:
21.05.026

Level:
Logged By:
Dates: 07/06/2021

 Adam Jones
to BS 5930:2015

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth (m)	Type	Result					
	0.10	D		0.20			MADE GROUND Red brown slightly clayey gravelly SAND (dense) with cloth membrane at base. Gravel is angular to sub-rounded of flint and aggregate	
	0.40	D		0.60			HEAD Brown stiff clay bound sandy GRAVEL (dense). Gravel is sub-angular to sub-rounded of flint	
							End of Borehole at 0.60m	

Method of excavation: Hand tools
Stability: Sides Stable
Groundwater: None encountered
Hand Auger Dimensions: 0.20mW x 0.20mL x 0.60mD
Remarks: Backfilled with arisings



Hand Auger Log

Borehole No.

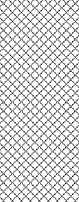
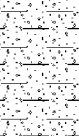
HA 102
Project Location: Dappers Lane, Angmering, West Sussex BN16 4DA

Co-ords: 507305E - 104695N

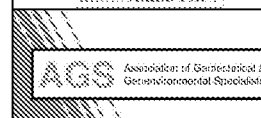
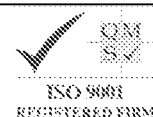
Project Number:
21.05.026

Level:
Logged By:
Dates: 07/06/2021

 Adam Jones
to BS 5930:2015

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth (m)	Type	Result					
	0.20	D					MADE GROUND Grass over brown slightly clayey gravelly SAND (very dense) with occasional rootlets. Gravel is angular to sub-rounded of flint, chalk and occasional brick	
	0.50	D					HEAD Brown slightly clayey gravelly SAND (very dense). Gravel is sub-angular to sub-rounded of flint	
				0.60			End of Borehole at 0.60m	

Method of excavation: Hand tools
Stability: Sides Stable
Groundwater: None encountered
Hand Auger Dimensions: 0.20mW x 0.20mL x 0.60mD
Remarks: Backfilled with arisings



Hand Auger Log

Borehole No.

HA 103
Project Location: Dappers Lane, Angmering, West Sussex BN16 4DA

Co-ords: 507358E - 104708N

Project Number:
21.05.026

Level:
Logged By:
Dates: 07/06/2021

 Adam Jones
to BS 5930:2015

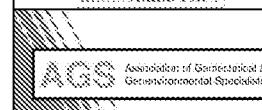
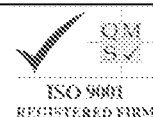
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth (m)	Type	Result					
	0.10	D					MADE GROUND Grass over brown slightly sandy slightly gravelly clayey SILT with frequent rootlets. Gravel is angular to sub-angular of brick, metal, plastic and flint	
	0.30	D		0.30			HEAD Orange brown slightly sandy slightly gravelly CLAY. Gravel is sub-angular to sub-rounded of flint	
				1.00			End of Borehole at 1.00m	1
								2

Method of excavation: Hand tools

Stability: Sides Stable

Groundwater: None encountered

Hand Auger Dimensions: 0.25mW x 0.25mL x 1.00mD

Remarks: Backfilled with arisings


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Sheet 1 of 1

Hand Auger Log

Borehole No.

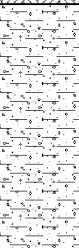
HA 104
Project Location: Dappers Lane, Angmering, West Sussex BN16 4DA

Co-ords: 507280E - 104688N

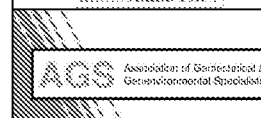
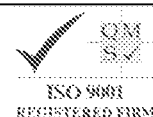
Project Number:
21.05.026

Level:
Logged By:
Dates: 07/06/2021

 Adam Jones
to BS 5930:2015

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth (m)	Type	Result					
	0.10	D					TOPSOIL Grass over brown slightly gravelly clayey SAND with frequent rootlets. Gravel is sub-angular to sub-rounded of flint, sandstone and brick	
				0.30			HEAD Brown slightly gravelly sandy CLAY with occasional roots. Gravel is angular to sub-angular of flint	
	0.60	D						
				0.70			End of Borehole at 0.70m	

Method of excavation: Hand tools
Stability: Sides Stable
Groundwater: None encountered
Hand Auger Dimensions: 0.20mW x 0.60mL x 0.70mD
Remarks: Backfilled with arisings
 Roots visible to 0.70m bgl



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Sheet 1 of 1

Hand Auger Log

Borehole No.

HA 105
Project Location: Dappers Lane, Angmering, West Sussex BN16 4DA

Co-ords: 507323E - 104667N

Project Number:
21.05.026

Level:
Logged By:
Dates: 07/06/2021

 Adam Jones
to BS 5930:2015

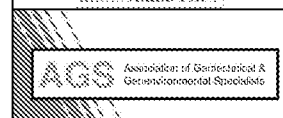
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth (m)	Type	Result					
	0.30	D		0.50			HEAD Grass over brown gravelly very clayey SAND (dense) with pockets of sandy clay. Gravel is angular to sub-angular of flint	
							End of Borehole at 0.50m	
								1
								2

Method of excavation: Hand tools

Stability: Sides Stable

Groundwater: None encountered

Hand Auger Dimensions: 0.20mW x 0.20mL x 0.50mD

Remarks: Backfilled with arisings
Roots visible to 0.20m bgl


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Sheet 1 of 1

Hand Auger Log

Borehole No.

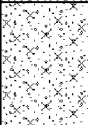
HA 106
Project Location: Dappers Lane, Angmering, West Sussex BN16 4DA

Co-ords: 507316E - 104660N

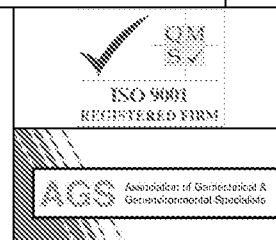
Project Number:
21.05.026

Level:
Logged By:
Dates: 07/06/2021

 Adam Jones
to BS 5930:2015

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth (m)	Type	Result					
	0.10	D					TOPSOIL Weeds over grey brown silty gravelly SAND. Gravel is angular to sub-angular of flint, occasional brick and barbed wire	
	0.40	D					HEAD Orange brown silty gravelly SAND (very dense). Gravel is angular to sub-angular of flint	
				0.50			End of Borehole at 0.50m	

Method of excavation: Hand tools
Stability: Sides Stable
Groundwater: None encountered
Hand Auger Dimensions: 0.20mW x 0.30mL x 0.50mD
Remarks: Backfilled with arisings
 Terminated at 0.50m bgl due to refusal in Head



Listers Geotechnical Consultants LTD

Sheet 1 of 1

Hand Auger Log

Borehole No.

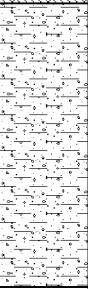
HA 107
Project Location: Dappers Lane, Angmering, West Sussex BN16 4DA

Co-ords: 507284E - 104674N

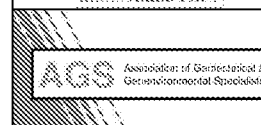
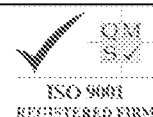
Project Number:
21.05.026

Level:
Logged By:
Dates: 07/06/2021

 Adam Jones
to BS 5930:2015

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth (m)	Type	Result					
				0.15			TOPSOIL Weeds over grey brown silty gravelly SAND. Gravel is angular to sub-angular of flint	
	0.40	D		0.60			HEAD Brown slightly sandy slightly gravelly CLAY. Gravel is angular to sub-angular of flint	
							End of Borehole at 0.60m	

Method of excavation: Hand tools
Stability: Sides Stable
Groundwater: None encountered
Hand Auger Dimensions: 0.20mW x 0.20mL x 0.60mD
Remarks: Backfilled with arisings



Listers Geotechnical Consultants LTD

Sheet 1 of 1

APPENDIX C

LABORATORY TEST REPORTS



Final Report

Report No.: 21-19433-1
Initial Date of Issue: 16-Jun-2021
Client Listers Geotechnical Consultants
Client Address: Slapton Hill Barn, Blakesley Road
Slapton
Towcester
Northamptonshire
NN12 8QD
Contact(s): Adam Jones
Project P21.05.026 Dappers Lane, Angmering,
West Sussex

Quotation No.:		Date Received:	09-Jun-2021
Order No.:	P21.05.026/943	Date Instructed:	09-Jun-2021
No. of Samples:	7		
Turnaround (Wkdays):	5	Results Due:	15-Jun-2021
Date Approved:	16-Jun-2021		

Approved By:



Details: Glynn Harvey, Technical Manager

Results - Soil

Project: P21.05.026 Dappers Lane, Angmering, West Sussex

Client: Listers Geotechnical Consultants	Chemtest Job No.:				21-19433	21-19433	21-19433	21-19433	21-19433	21-19433	21-19433
Quotation No.:	Chemtest Sample ID.:				1217230	1217231	1217232	1217233	1217234	1217235	1217236
Order No.: P21.05.026/943	Client Sample Ref.:				HEAD	MG	MG	TOP	HEAD	TOP	HEAD
	Sample Location:				HA101	HA102	HA103	HA104	HA105	HA106	HA107
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.4	0.2	0.1	0.1	0.3	0.1	0.4
	Date Sampled:				07-Jun-2021	07-Jun-2021	07-Jun-2021	07-Jun-2021	07-Jun-2021	07-Jun-2021	07-Jun-2021
	Asbestos Lab:					DURHAM	DURHAM				
Determinand	Accred.	SOP	Units	LOD							
ACM Type	U	2192		N/A		-	-				
Asbestos Identification	U	2192		N/A		No Asbestos Detected	No Asbestos Detected				
Moisture	N	2030	%	0.020	10	10	12	16	12	21	11
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached	See Attached	See Attached	See Attached	See Attached
pH	U	2010		4.0	8.3	8.7	9.7	8.8	6.1	6.9	6.2
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.029	0.014	0.024	0.39	0.022	< 0.010	< 0.010
Arsenic	U	2450	mg/kg	1.0	15	13	17	17	8.8	8.2	8.1
Cadmium	U	2450	mg/kg	0.10	0.51	0.41	0.47	0.45	0.37	0.45	0.44
Chromium	U	2450	mg/kg	1.0	23	16	24	21	19	16	22
Copper	U	2450	mg/kg	0.50	17	26	36	23	13	20	18
Mercury	U	2450	mg/kg	0.10	< 0.10	0.29	0.20	0.37	< 0.10	0.11	< 0.10
Nickel	U	2450	mg/kg	0.50	19	14	18	15	16	14	16
Lead	U	2450	mg/kg	0.50	38	160	150	140	24	64	27
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	0.50	0.39	0.42
Zinc	U	2450	mg/kg	0.50	67	200	200	100	54	170	55
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20	0.50	1.5	2.1	2.1	0.65	5.4	0.92
TPH >C6-C8	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C8-C10	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C12	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C12-C16	N	2670	mg/kg	1.0	< 1.0	13	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C16-C21	N	2670	mg/kg	1.0	< 1.0	240	16	14	< 1.0	< 1.0	< 1.0
TPH >C21-C25	N	2670	mg/kg	1.0	< 1.0	230	25	30	< 1.0	< 1.0	< 1.0
TPH >C25-C35	N	2670	mg/kg	1.0	< 1.0	340	46	40	< 1.0	< 1.0	< 1.0
TPH >C35-C40	N	2670	mg/kg	1.0	< 1.0	22	14	< 1.0	< 1.0	< 1.0	< 1.0
Total TPH >C6-C40	U	2670	mg/kg	10	< 10	840	100	84	< 10	< 10	< 10
Naphthalene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10	< 0.10	1.2	1.5	0.69	< 0.10	0.36	0.14
Anthracene	U	2800	mg/kg	0.10	< 0.10	0.33	0.49	0.11	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10	< 0.10	3.5	3.1	2.1	0.80	0.88	0.21
Pyrene	U	2800	mg/kg	0.10	< 0.10	3.2	2.8	1.9	0.71	0.64	0.24
Benzo[a]anthracene	U	2800	mg/kg	0.10	< 0.10	2.1	1.3	0.93	0.45	0.48	< 0.10

Results - Soil

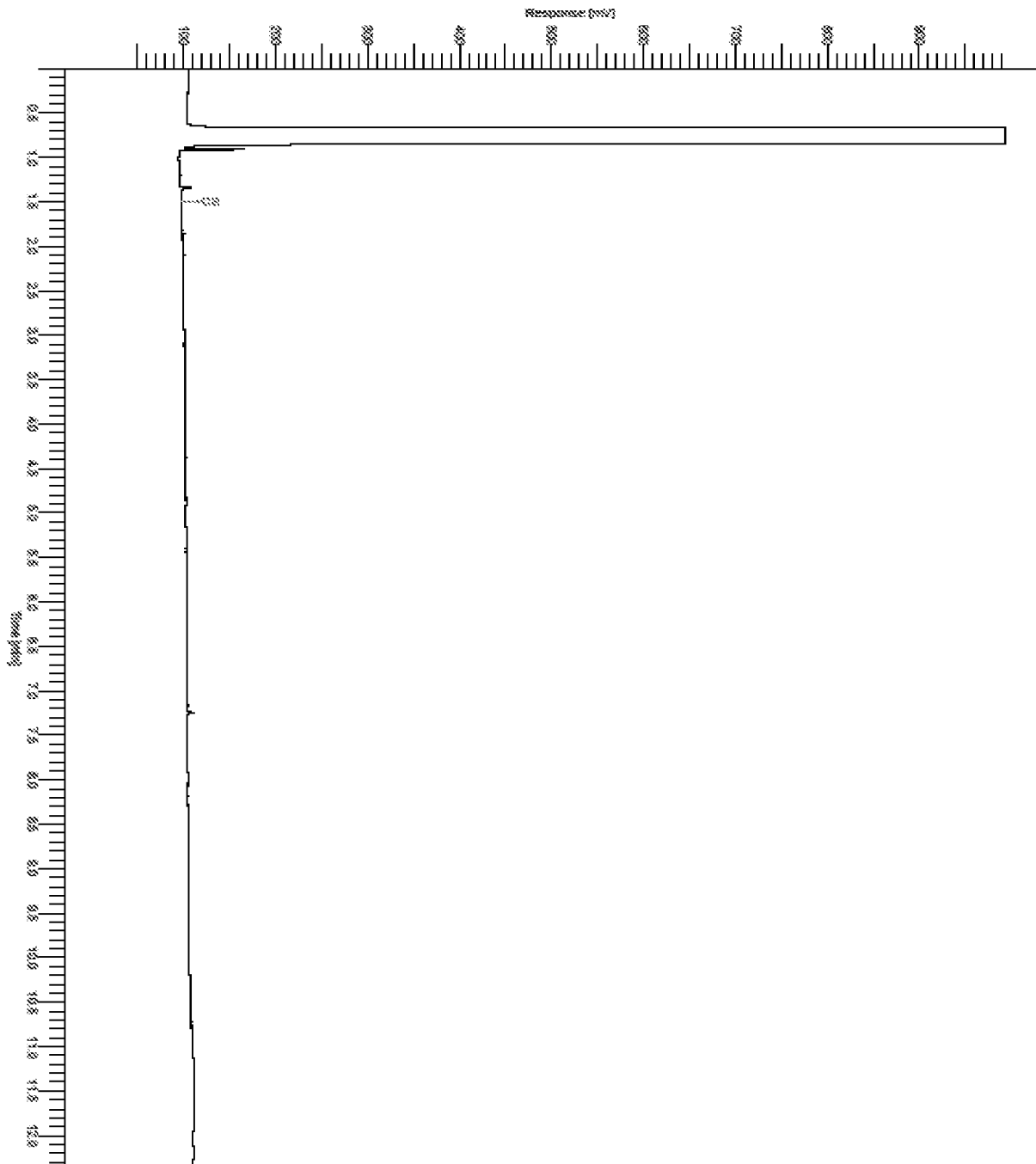
Project: P21.05.026 Dappers Lane, Angmering, West Sussex

Client: Listers Geotechnical Consultants	Chemtest Job No.:				21-19433	21-19433	21-19433	21-19433	21-19433	21-19433	21-19433
Quotation No.:	Chemtest Sample ID.:				1217230	1217231	1217232	1217233	1217234	1217235	1217236
Order No.: P21.05.026/943	Client Sample Ref.:				HEAD	MG	MG	TOP	HEAD	TOP	HEAD
	Sample Location:				HA101	HA102	HA103	HA104	HA105	HA106	HA107
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.4	0.2	0.1	0.1	0.3	0.1	0.4
	Date Sampled:				07-Jun-2021	07-Jun-2021	07-Jun-2021	07-Jun-2021	07-Jun-2021	07-Jun-2021	07-Jun-2021
	Asbestos Lab:					DURHAM	DURHAM				
Determinand	Accred.	SOP	Units	LOD							
Chrysene	U	2800	mg/kg	0.10	< 0.10	1.4	0.92	0.67	0.34	0.32	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10	2.7	1.8	1.3	0.62	0.71	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10	0.93	0.73	0.37	0.18	0.23	< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10	2.6	1.5	1.0	0.50	0.63	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	< 0.10	1.3	1.0	0.49	0.27	0.30	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	0.31	0.11	0.14	0.11	0.10	< 0.10
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	< 0.10	1.3	0.96	0.69	0.27	0.33	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	< 2.0	21	16	10	4.3	5.1	< 2.0

TPH Chromatogram on Soil Sample: 1217230

Chromatogram

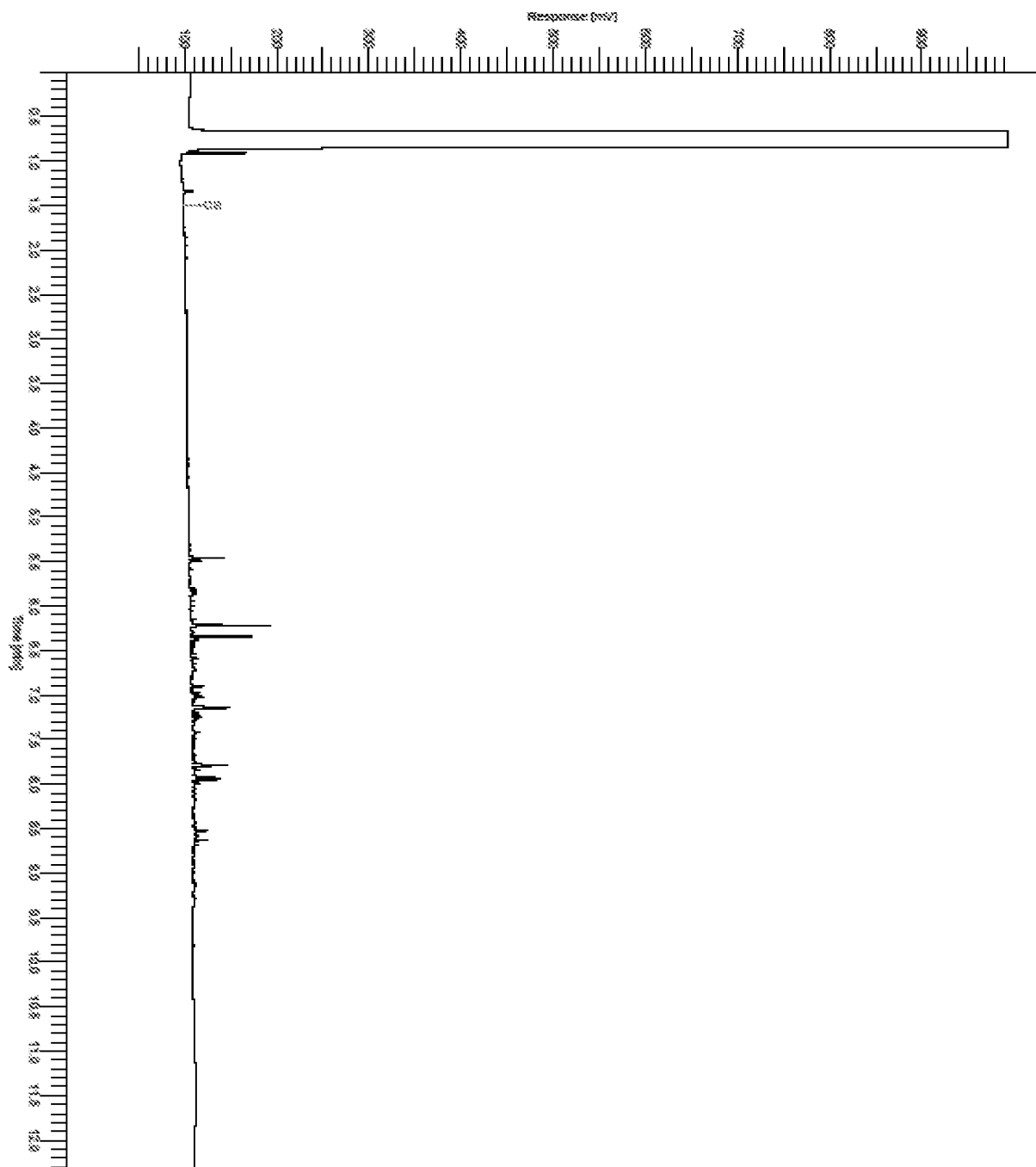
Sample Name : 1217230_sml-21-15433 Sample #: 026 Page 1 of 1
Filename : U:\2021\9035\June2006_A_TPH\A0206_A_TPH_A026.raw
Date : 15/06/2021 16:21:46
Method : Time of Injection: 12/06/2021 04:38:16
Start Time : 0.00 min End Time : 12.35 min Low Point : 47.17 mV High Point : 593.88 mV
Pul Offset: 47.17 mV Pul Scale: 946.7 mV



TPH Chromatogram on Soil Sample: 1217231

Chromatogram

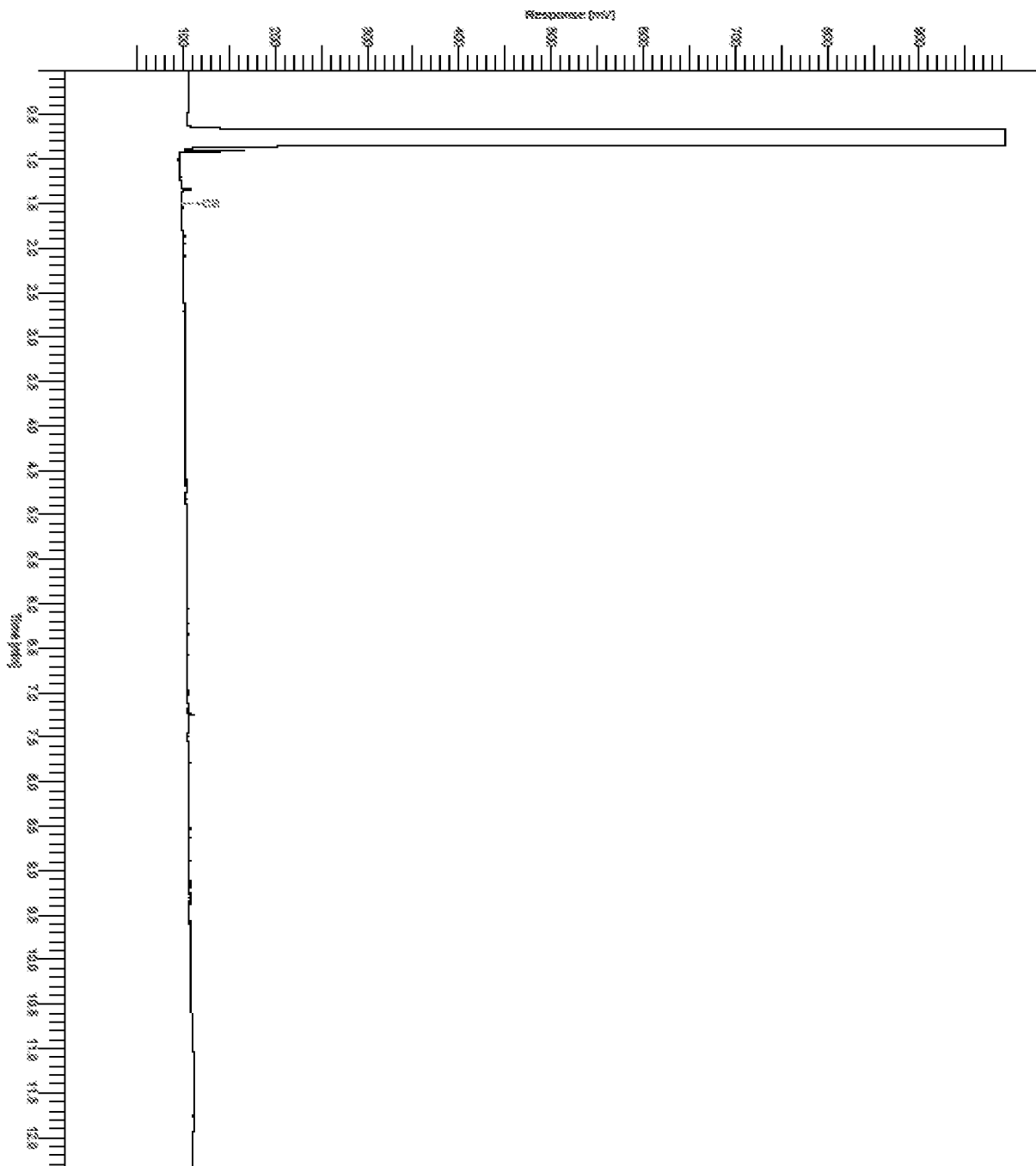
Sample Name : 1217231_srl-21-15433 Sample #: 027 Page 1 of 1
Filename : U:\2021\9035\June2006_A_TPH\A02906_A_TPH_A027.raw
Date : 15/06/2021 06:22:13
Method : Time of Injection: 12/06/2021 05:04:35
Start Time : 0.00 min End Time : 12.35 min Low Point : 48.15 mV High Point : 593.88 mV
Pul Offset: 48.15 mV Pul Scale: 945.7 mV



TPH Chromatogram on Soil Sample: 1217232

Chromatogram

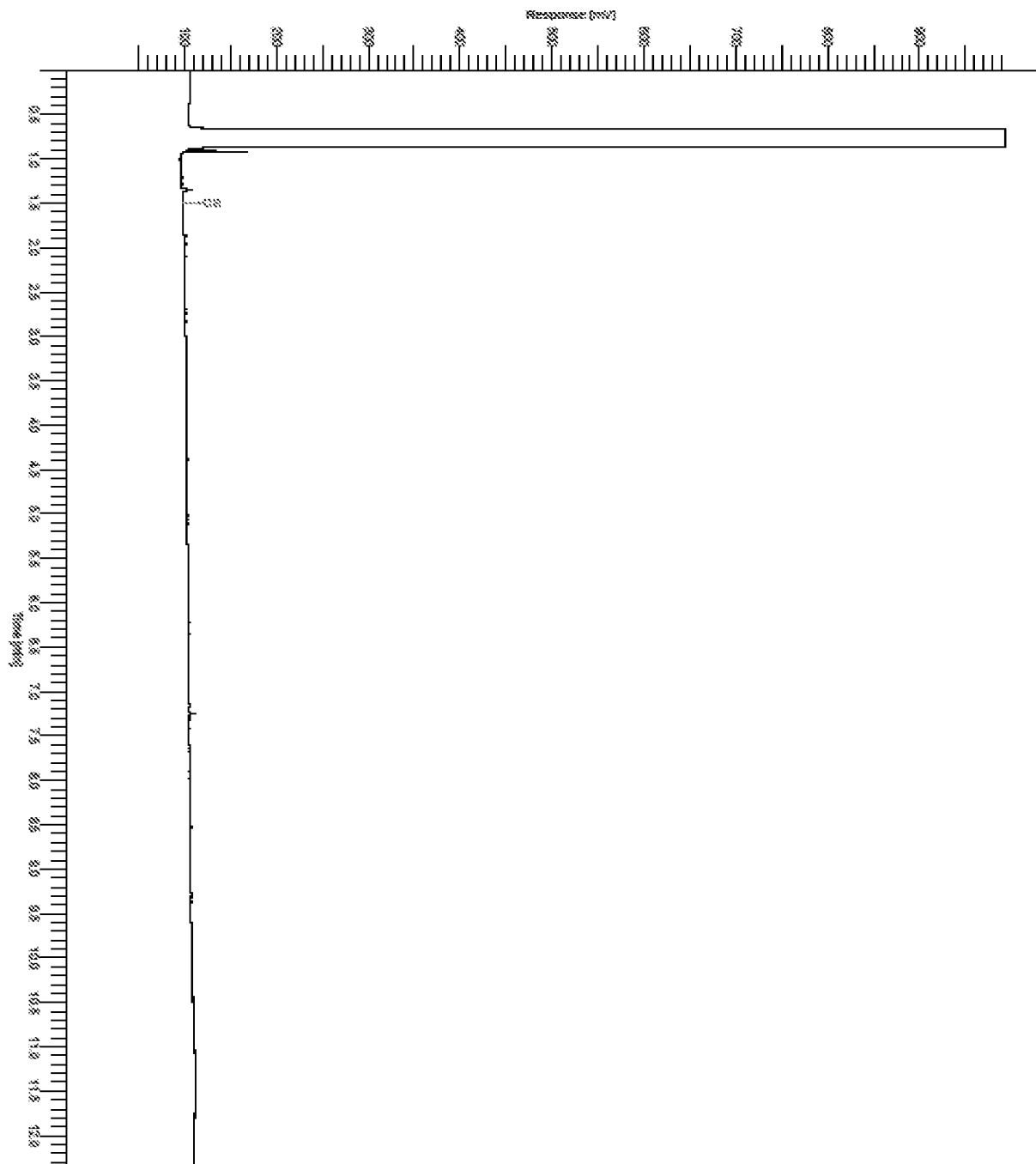
Sample Name : 1217232_srl-21-15433 Sample #: 028 Page 1 of 1
Filename : U:\2021\9035\June2008_A_TPH\A02908_A_TPH_A028.raw
Date : 15/06/2021 16:22:38
Method : Time of Injection: 12/06/2021 09:29:34
Start Time : 0.00 min End Time : 12.35 min Low Point : 47.86 mV High Point : 993.86 mV
Pul Offset: 47.86 mV Pul Scale: 946.0 mV



TPH Chromatogram on Soil Sample: 1217233

Chromatogram

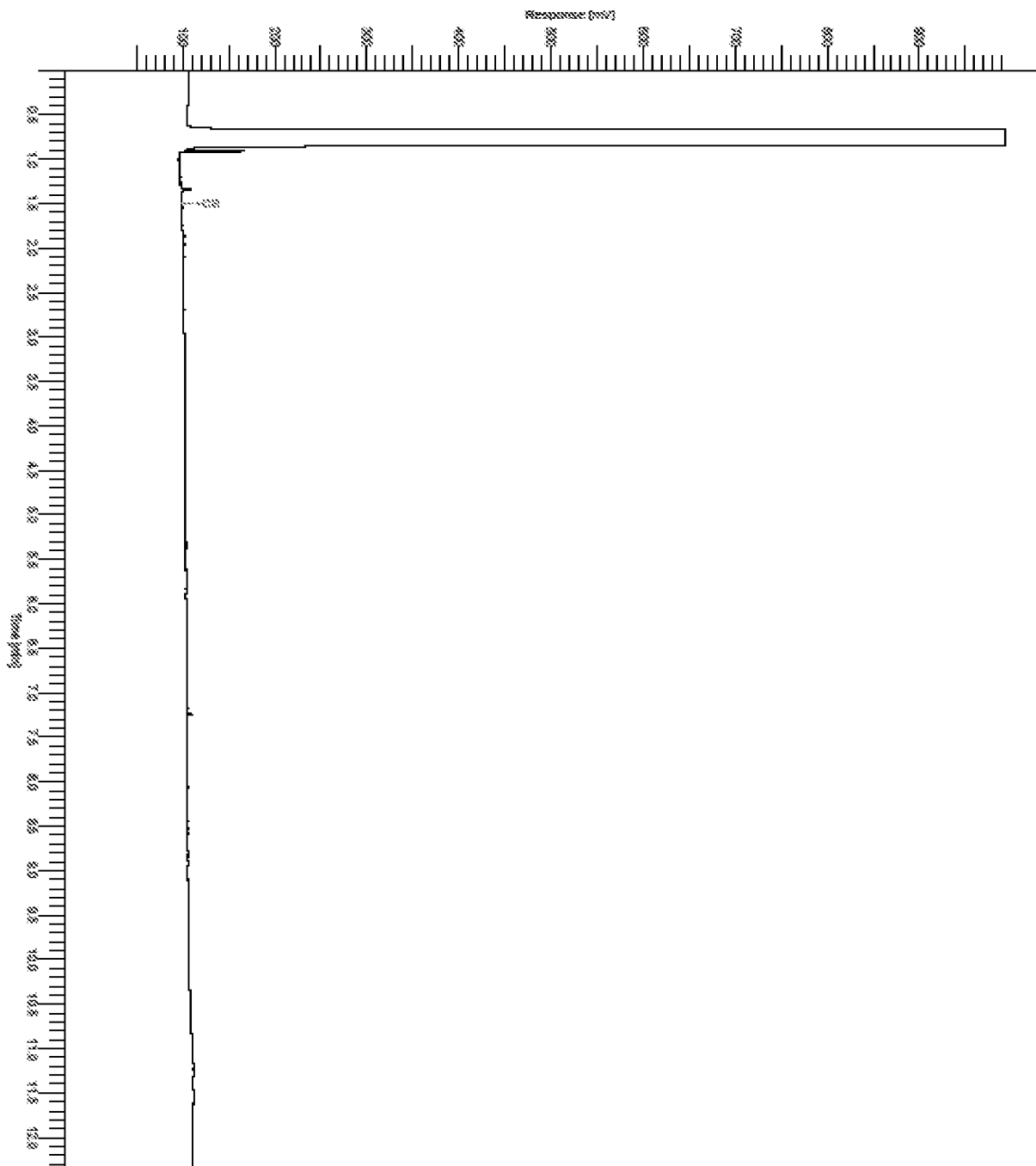
Sample Name : 1217233_srl-21-15433 Sample #: 029 Page 1 of 1
Filename : U:\2021\9035\June2006_A_TPH\A02906_A_TPH_A029.raw
Date : 15/06/2021 16:23:04
Method :
Start Time : 6.00 min End Time : 12.35 min Time of Injection: 12/06/2021 09:54:41
Pul Offset: 47.73 mV Low Point : 47.73 mV High Point : 993.88 mV
Pul Scale: 946.1 mV



TPH Chromatogram on Soil Sample: 1217234

Chromatogram

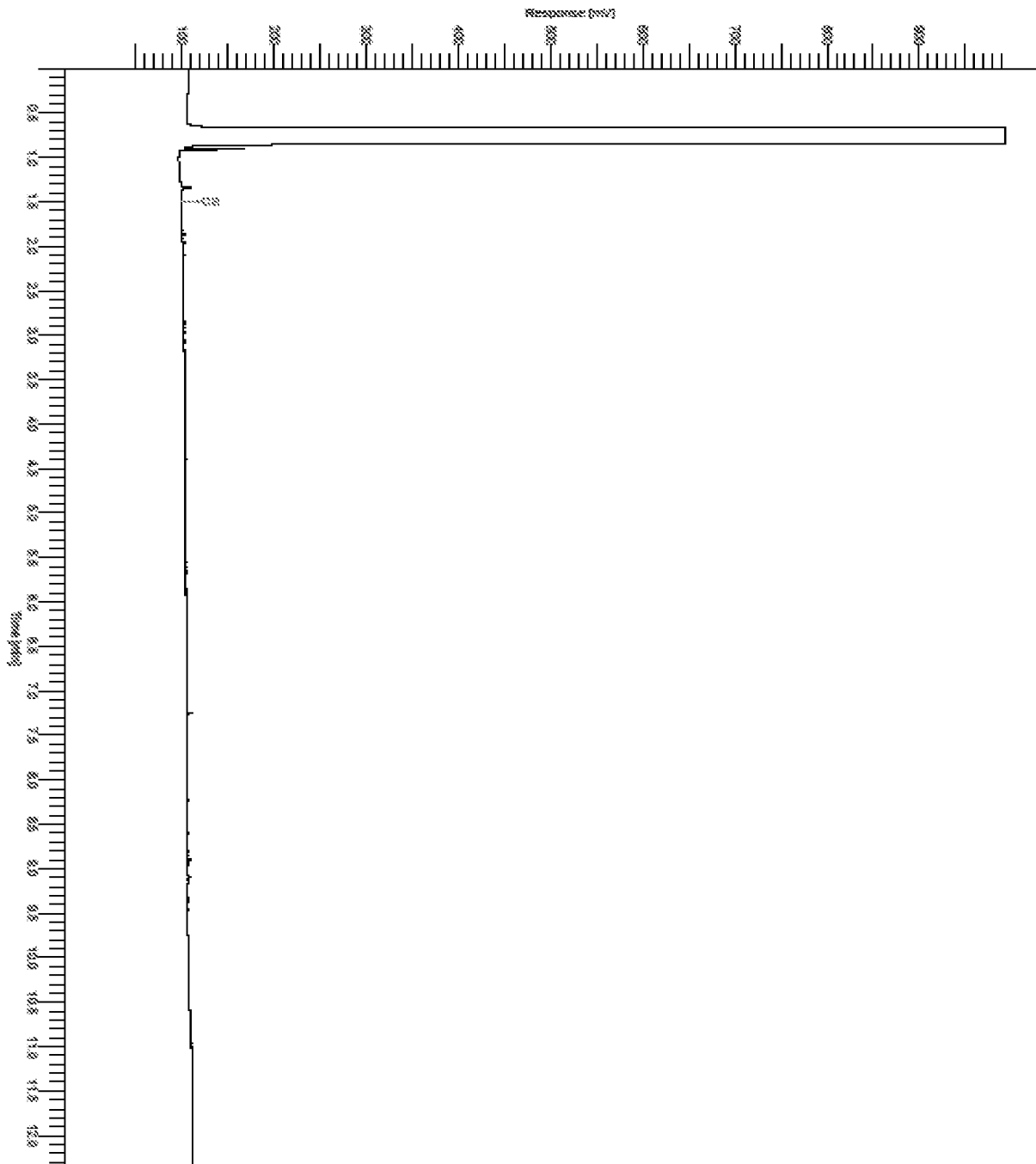
Sample Name : 1217234_srl-21-15433 Sample #: 030 Page 1 of 1
Filename : U:\2021\9035\June2006_A_TPH\A02906_A_TPH_A030.raw
Date : 15/06/2021 16:23:22
Method :
Start Time : 0.00 min End Time : 12.35 min Time of Injection: 12/06/2021 06:19:51
Pul Offset: 48.18 mV Low Point : 48.18 mV High Point : 993.88 mV
Pul Scale: 945.7 mV



TPH Chromatogram on Soil Sample: 1217235

Chromatogram

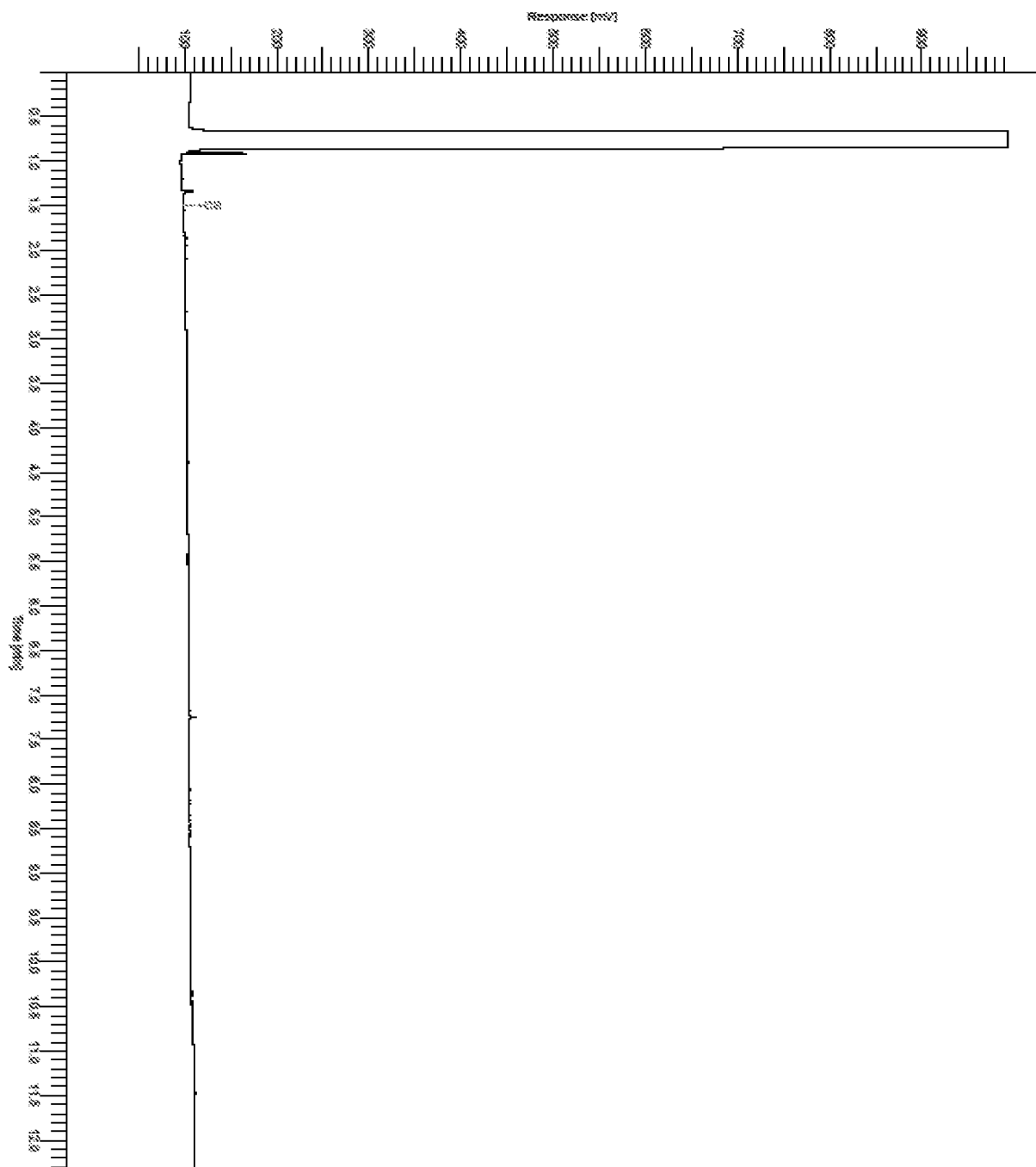
Sample Name : 1217235_sml-21-15433 Sample #: 031 Page 1 of 1
Filename : U:\2021\9035\June2006_A_TPH\A02906_A_TPH_A031.raw
Date : 15/06/2021 16:23:39
Method :
Start Time : 0.00 min End Time : 12.35 min Time of Injection: 12/06/2021 06:44:53
Pul Offset: 48.80 mV Low Point : 48.80 mV High Point : 993.88 mV
Pul Scale: 945.1 mV



TPH Chromatogram on Soil Sample: 1217236

Chromatogram

Sample Name : 1217236_sml-21-15433 Sample #: 032 Page 1 of 1
 Filename : U:\2021\9035\June2006_A_TPH\A02906_A_TPH_A032.raw
 Date : 15/06/2021 16:23:55
 Method :
 Start Time : 0.00 min End Time : 12.35 min Time of Injection: 12/06/2021 07:10:05
 POF Offset: 48.08 mV Low Point : 48.08 mV High Point : 993.88 mV
 POF Scale: 945.8 mV



Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenzo[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

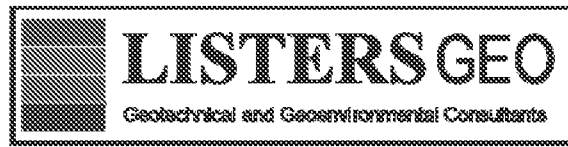
All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



APPENDIX D

CONTAMINATION RISK ASSESSMENT WORKSHEETS

Contaminated Land Risk Assessment – Definition of Methodology

The Contaminated Land Risk Assessment methodology followed in this report is based on Environment Agency's (EA) online guidance, Land Contamination: Risk Management (LCRM), published in October 2020. The new guidance is based upon the principles of the EA's CLR11 guidance, Model procedures for the management of land contamination, published in 2004, now withdrawn.

The preliminary Conceptual Site Model (CSM) has been assessed using the methodology set out in CIRIA C552, Contaminated Land Risk Assessment - A Guide to Good Practice, published in 2001, as detailed below.

Risk evaluation determines the magnitude of risks present by assessing the likelihood of a particular risk being present alongside the severity of the consequence, should that event occur. The overall risk classification is a combination of the two and provides a qualitative assessment upon which to base any further work or remedial measures, where deemed necessary.

Where complete pollutant linkages are present, the probability of a contamination risk occurring at the site has been classified in accordance with the terms listed and defined in the table below.

Classification	Definition of Probability
High Likelihood	An event appears very likely in the short term and almost inevitable in the long term; or there is evidence at the receptor that harm or pollution is occurring.
Likely	It is probable that an event will occur, however, the event is not inevitable. It is possible in the short term and is likely over the long term.
Low Likelihood	Circumstances are possible under which an event could occur. However, it is uncertain that the event would occur even over a longer period and even less likely in the short term.
Unlikely	Circumstances are such that it is improbable that an event would occur even in the very long term.

The magnitude of the consequence of a contamination event occurring at this site is classified in accordance with the definitions listed in the following table. The classification of the consequence does not take into account the probability of the consequences being realised.

Classification	Definition of Consequence	Examples
Severe	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment protection Act (1990), Part IIA. Short term risk of pollution of controlled waters. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion causing building collapse (can also equate to a short-term human health risk if buildings are occupied.).
Medium	Chronic damage to Human Health ("significant harm"). Pollution of controlled waters. A significant change in a particular ecosystem, or organism forming part of such ecosystem.	Concentrations of contaminants from site exceeding generic or site-specific screening criteria. Leaching of contaminants into a major or minor aquifer. Death of species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy. (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by measures such as protective clothing etc). Easily reparable effects of damage to buildings, structures and services	The presence of contaminants at such concentration that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discolouration of concrete.

Once the probability and consequence of each pathway has been classified, the potential overall risk classification can be evaluated using the following matrix.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

The definitions of the risk categories provided in CIRIA C552, together with actions that are likely to be necessary, are presented below.

Classification	Definition of Risk and Likely Actions Required
Very High Risk	• High probability that severe harm could arise or that severe harm is already occurring • This risk, if realised, is likely to result in a substantial liability • Urgent investigation and remediation are likely to be required
High Risk	• Harm is likely to arise • The risk, if realised, is likely to present a substantial liability • Urgent investigation is required and remediation may be necessary in the short term and likely over the longer term
Moderate Risk	• It is possible that harm could arise, however, it is unlikely that any harm would be severe and more likely it would be relatively mild • Investigation is likely to be required to clarify the risk and determine potential liability • Some remediation may be required in the longer term
Low Risk	• It is possible that harm could arise, but is likely that this harm, if realised, would be mild at worst
Very Low Risk	• There is a low possibility that harm could arise • If realised, such harm is not likely to be severe

Reference:

Rudland, D J, Lancefield, R M, Mayell, P N, Contaminated land Risk Assessment. A guide to Good Practice, CIRIA Report C552, 2001.

CLEA Software Version 1.071

Page 1 of 5

Report generated 19/07/2021

Report title Dappers Lane, Angmering

Created by Adam Jones at ListersGeo



BASIC SETTINGS

Land Use Residential (lifetime exposure C4SL)

Building Semi-detached house

Receptor Female (res C4SL)

Start age class 17

End age class 18

Exposure Duration 59 years

Soil Sandy loam

Exposure Pathways

Direct soil and dust ingestion

☒

Consumption of homegrown produce

☐

Soil attached to homegrown produce

☐

Dermal contact with indoor dust

☒

Dermal contact with soil

☒

Inhalation of indoor dust

☒

Inhalation of soil dust

☒

Inhalation of indoor vapour

☒

Inhalation of outdoor vapour

☒



Land Use Residential (lifetime exposure C4SL)

Receptor Female (res C4SL)

Age Class	Exposure Frequencies (days yr ⁻¹)						Occupation Periods (hr day ⁻¹)		Soil to skin adherence factors (mg cm ²)		Direct soil ingestion rate (g day ⁻¹)	Body weight (kg)	Body height (m)	Inhalation rate (m ³ day ⁻¹)	Max exposed skin factor		Total skin area (m ²)	
	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Indoors	Outdoors							Indoor (m ² m ⁻²)	Outdoor (m ² m ⁻²)		
1	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	5.60	0.7	5.4	0.32	0.26	3.43E-01
2	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	9.80	0.8	8.0	0.33	0.26	4.84E-01
3	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	12.70	0.9	8.9	0.32	0.25	5.82E-01
4	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	15.10	0.9	10.1	0.35	0.28	6.36E-01
5	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	16.90	1.0	10.1	0.35	0.28	7.04E-01
6	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	19.70	1.1	10.1	0.33	0.26	7.94E-01
7	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	22.10	1.2	12.0	0.22	0.15	8.73E-01
8	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	25.30	1.2	12.0	0.22	0.15	9.36E-01
9	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	27.50	1.3	12.0	0.22	0.15	1.01E+00
10	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	31.40	1.3	12.0	0.22	0.15	1.08E+00
11	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	35.70	1.4	12.0	0.22	0.14	1.19E+00
12	180	180	180	180	180	180	180	4.0	2.0	0.06	0.10	0.10	41.30	1.4	15.2	0.22	0.14	1.29E+00
13	180	180	180	180	180	180	180	4.0	2.0	0.06	0.30	0.05	47.20	1.5	15.2	0.22	0.14	1.42E+00
14	180	180	180	180	180	180	180	4.0	2.0	0.06	0.30	0.05	51.20	1.6	15.2	0.22	0.14	1.52E+00
15	180	180	180	180	180	180	180	4.0	2.0	0.06	0.30	0.05	56.70	1.6	15.2	0.21	0.14	1.60E+00
16	365	365	365	170	365	365	365	20.0	4.0	0.06	0.30	0.05	59.00	1.6	15.2	0.21	0.14	1.63E+00
17	365	365	365	170	365	365	365	20.0	4.0	0.06	0.30	0.05	70.00	1.6	15.7	0.33	0.27	1.78E+00
18	365	365	365	170	365	365	365	20.0	4.0	0.06	0.30	0.05	70.90	1.6	13.6	0.33	0.27	1.80E+00

Consumption Rates



Age Class	Consumption rates (g FW kg ⁻¹ bodyweight day ⁻¹) by Produce Group											
	MEAN RATES						90TH PERCENTILE RATES					
	Green veg	Root veg	Tuber veg	Herb. Fruit	Shrub fruit	Tree fruit	Green veg	Root veg	Tuber veg	Herb. Fruit	Shrub fruit	Tree fruit
1	3.47E+00	5.22E+00	9.22E+00	8.90E-01	1.07E+00	1.87E+00	7.12E+00	1.07E+01	1.60E+01	1.83E+00	2.23E+00	3.82E+00
2	3.34E+00	1.61E+00	3.14E+00	1.93E+00	2.60E-01	5.84E+00	5.87E+00	2.83E+00	6.60E+00	3.39E+00	4.60E-01	1.03E+01
3	3.34E+00	1.61E+00	3.14E+00	1.93E+00	2.60E-01	5.84E+00	5.87E+00	2.83E+00	6.60E+00	3.39E+00	4.60E-01	1.03E+01
4	3.34E+00	1.61E+00	3.14E+00	1.93E+00	2.60E-01	5.84E+00	5.87E+00	2.83E+00	6.60E+00	3.39E+00	4.60E-01	1.03E+01
5	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
6	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
7	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
8	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
9	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
10	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
11	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
12	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
13	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
14	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
15	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
16	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
17	1.26E+00	6.00E-01	1.18E+00	6.90E-01	9.00E-02	1.27E+00	2.36E+00	1.12E+00	2.35E+00	1.29E+00	1.80E-01	2.38E+00
18	1.35E+00	6.40E-01	1.25E+00	7.40E-01	1.00E-01	1.36E+00	2.34E+00	1.12E+00	2.36E+00	1.28E+00	1.80E-01	2.37E+00

Top 2 applied? Yes

Where top 2 method is applied, two produce categories use 90th percentile rates, while the remainder use the mean. Produce categories vary on a chemical-by-chemical basis. Where top 2 method is not used, all produce categories for all chemicals assume 90th percentile rates.

Building Semi-detached house

Soil Sandy loam



Building footprint (m ²)	4.30E+01
Living space air exchange rate (hr ⁻¹)	5.00E-01
Living space height (above ground, m)	4.80E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	3.10E+00
Foundation thickness (m)	1.50E-01
Floor crack area (cm ²)	5.25E+02
Dust loading factor (g m ⁻³)	5.00E+01

Porosity, Total (cm ³ cm ⁻³)	5.30E-01
Porosity, Air-Filled (cm ³ cm ⁻³)	2.00E-01
Porosity, Water-Filled (cm ³ cm ⁻³)	3.30E-01
Residual soil water content (cm ³ cm ⁻³)	1.20E-01
Saturated hydraulic conductivity (cm s ⁻¹)	3.56E-03
van Genuchten shape parameter m (dimensionless)	3.20E-01
Bulk density (g cm ⁻³)	1.21E+00
Threshold value of wind speed at 10m (m s ⁻¹)	7.20E+00
Empirical function (F _s) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02
Soil pH	7.00E+00
Soil Organic Matter content (%)	1.00E+00
Fraction of organic carbon (g g ⁻¹)	5.80E-03
Effective total fluid saturation (unitless)	5.12E-01
Intrinsic soil permeability (cm ²)	4.75E-08
Relative soil air permeability (unitless)	6.42E-01
Effective air permeability (cm ²)	3.05E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	65
Default soil gas ingress rate?	Yes
Soil gas ingress rate ($\text{cm}^3 \text{s}^{-1}$)	2.50E+01
Building ventilation rate ($\text{cm}^3 \text{s}^{-1}$)	2.87E+04
Averaging time surface emissions (yr)	59
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model



Mean annual windspeed at 10m (m s^{-1})	5.00
Air dispersion factor at height of 0.8m *	2400.00
Air dispersion factor at height of 1.6m *	19000.00
Fraction of site cover ($\text{m}^2 \text{m}^{-2}$)	0.75

* Air dispersion factor in $\text{g m}^{-2} \text{s}^{-1}$ per kg m^{-3}

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction		Soil loading factor	Preparation correction factor
	g DW g^{-1} FW	Average	High		
		dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	0.103	0.06	0.40	1.00E-03	1.00E+00
Tuber vegetables	0.210	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	0.058	0.06	0.40	1.00E-03	6.00E-01
Shrub fruit	0.166	0.09	0.60	1.00E-03	6.00E-01
Tree fruit	0.157	0.04	0.27	1.00E-03	6.00E-01

Gardener type Average

CLEA Software Version 1.071

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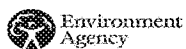
Report generated 19-Jul-21

Report title Dappers Lane, Angmering

Created by Adam Jones at ListersGeo



RESULTS



Environment Agency

										Apply Top 2 Approach to Produce Group							
		Assessment Criterion (mg kg ⁻¹)			Ratio of ADE to HCV			Saturation Limit (mg kg ⁻¹)	50% rule?		Top Two applied?	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal							
1	Lead (C4SL adult)	1.46E+03	NR	NR	1.00	NR	NR	NR	No	No	Yes	Yes	No	Yes	No	No	No
2	Benzo[b]fluoranthene	3.15E+01	7.33E+01	2.20E+01	0.70	0.30	1.00	1.22E+00 (sol)	No	No	Yes	No	No	No	No	No	No
3	Benzo[a]pyrene (C4SL adult)	3.38E+01	5.97E+01	NR	1.00	0.57	NR	9.11E-01 (vap)	No	No	Yes	No	Yes	Yes	No	No	No
4	Dibenz[ah]anthracene	2.50E+00	5.55E+00	73E+00	0.69	0.31	1.00	3.93E-03 (vap)	No	No	Yes	No	No	No	No	No	No
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Environment

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	Assessment Criterion (mg kg ⁻¹)			Ratio of ADE to HCV			Saturation Limit (mg kg ⁻¹)	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
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		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg ⁻¹	mg m ⁻³	mg kg ⁻¹	mg m ⁻³	mg m ⁻³	mg m ⁻³	mg m ⁻³	mg m ⁻³	mg kg ⁻¹ FW	mg kg ⁻¹ FW	mg kg ⁻¹ FW	mg kg ⁻¹ FW	mg kg ⁻¹ FW	mg kg ⁻¹ FW
1	Lead (C4SL adult)	100.0	0.0	0.0	100.0	1.46E+03	NR	7.32E+02	6.23E-07	7.87E-08	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
2	Benzo[b]fluoranthene	100.0	0.0	0.0	100.0	2.20E+01	7.43E-05	1.10E+01	9.38E-09	1.18E-09	6.43E-08	6.09E-08	7.69E-09	NA	NA	NA	NA	NA	NA
3	Benzo[a]pyrene (C4SL adult)	100.0	0.0	0.0	100.0	3.38E+01	7.95E-05	1.69E+01	1.44E-08	1.82E-09	6.98E-08	8.47E-08	1.07E-08	NA	NA	NA	NA	NA	NA
4	Dibenz[ah]anthracene	100.0	0.0	0.0	100.0	1.73E+00	8.62E-06	8.63E-01	7.34E-10	9.28E-11	7.15E-09	3.48E-09	4.39E-10	NA	NA	NA	NA	NA	NA
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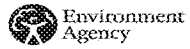
	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg ⁻¹	mg m ⁻³	mg kg ⁻¹	mg m ⁻³	mg m ⁻³	mg m ⁻³	mg m ⁻³	mg m ⁻³	mg kg ⁻¹ FW	mg kg ⁻¹ FW	mg kg ⁻¹ FW	mg kg ⁻¹ FW	mg kg ⁻¹ FW	mg kg ⁻¹ FW
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Environment
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		Average Daily Exposure (mg kg ⁻¹ bw day ⁻¹)						Distribution by Pathway (%)								
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Lead (C45L adult)	6.26E-04	0.00E+00	0.00E+00	4.34E-06	0.00E+00	0.00E+00	0.00E+00	99.31	0.00	0.00	0.69	0.00	0.00	0.00	0.00
2	Benzo[b]fluoranthene	1.57E-05	0.00E+00	1.16E-05	1.02E-07	1.20E-08	0.00E+00	0.00E+00	57.31	0.00	42.27	0.37	0.04	0.00	0.00	0.00
3	Benzo[a]pyrene (C45L adult)	2.41E-05	0.00E+00	1.78E-05	1.57E-07	1.31E-08	0.00E+00	0.00E+00	57.32	0.00	42.28	0.37	0.03	0.00	0.00	0.00
4	Dibenz[ah]anthracene	1.23E-06	0.00E+00	9.07E-07	8.00E-09	1.32E-09	0.00E+00	0.00E+00	57.30	0.00	42.26	0.37	0.06	0.00	0.00	0.00
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Environment
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	Average Daily Exposure (mg kg ⁻¹ bw day ⁻¹)							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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		Oral Health Criteria Value ($\mu\text{g kg}^{-1} \text{ BW day}^{-1}$)	Inhalation Health Criteria Value ($\mu\text{g kg}^{-1} \text{ BW day}^{-1}$)	Oral Mean Daily Intake ($\mu\text{g day}^{-1}$)	Inhalation Mean Daily Intake ($\mu\text{g day}^{-1}$)	Air-water partition coefficient (K_{ow}) ($\text{cm}^3 \text{ cm}^{-3}$)	Coefficient of Diffusion in Air ($\text{m}^2 \text{ s}^{-1}$)	Coefficient of Diffusion in Water ($\text{m}^2 \text{ s}^{-1}$)	$\log K_{ow}$ ($\text{cm}^3 \text{ g}^{-1}$)	$\log K_{ow}$ (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor ($\text{g g}^{-1} \text{ DW}$)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Lead (C4SL adult)	ID	0.63	NR	0	NR	NR	NR	NR	NR	0	0.5	1	0.6	0.64
2	Benzo[b]fluoranthene	ID	0.039	ID	0.00038	NR	NR	2.05E-06	4.36E-06	3.62E-10	5.02	6.08	0.13	0.5	1
3	Benzo[a]pyrene (C4SL adult)	ID	0.042	ID	0.0003	NR	NR	1.76E-06	4.38E-06	3.67E-10	5.11	6.18	0.13	0.5	1
4	Dibenz[ah]anthracene	ID	0.0031	ID	0.00003	NR	NR	5.40E-06	4.08E-06	3.40E-10	5.27	6.38	0.13	0.5	1
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		Oral Health Criteria Value ($\mu\text{g kg}^{-1}$ BW day $^{-1}$)	Inhalation Health Criteria Value ($\mu\text{g kg}^{-1}$ BW day $^{-1}$)	Oral Mean Daily Intake ($\mu\text{g day}^{-1}$)	Inhalation Mean Daily Intake ($\mu\text{g day}^{-1}$)	Air-water partition coefficient (K_{aw}) ($\text{cm}^3 \text{cm}^{-3}$)	Coefficient of Diffusion in Air ($\text{m}^2 \text{s}^{-1}$)	Coefficient of Diffusion in Water ($\text{m}^2 \text{s}^{-1}$)	$\log K_{oc}$ ($\text{cm}^3 \text{g}^{-1}$)	$\log K_{ow}$ (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
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		Soil-to-water partition coefficient (cm ³ g ⁻¹)	Vapour pressure (Pa)	Water solubility (mg L ⁻¹)	Soil-to-plant concentration factor for green vegetables (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for root vegetables (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for tree fruit (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)
1	Lead (C4SL adult)	1.00E+03	NR	2.96E+05	0.00419 fw	0.00402 fw	0.00731 fw	0.00074 fw	0.00020 fw	0.00022 fw
2	Benzof[b]fluoranthene	6.07E+02	6.34E-08	2.00E-03	model	model	model	model	model	model
3	Benzo[a]pyrene (C4SL adult)	7.47E+02	2.00E-08	3.80E-03	0.00041 fw	0.00178 fw	0.00088 fw	0.00050 fw	0.00000 fw	0.00004 fw
4	Dibenz[ah]anthracene	1.08E+03	1.66E-10	6.00E-04	model	model	model	model	model	model
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	Soil-to-water partition coefficient (cm ³ g ⁻¹)	Vapour pressure (Pa)	Water solubility (mg L ⁻¹)	Soil-to-plant concentration factor for green vegetables (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for root vegetables (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)	Soil-to-plant concentration factor for tree fruit (mg g ⁻¹ plant DW or FW basis over mg g ⁻¹ DW soil)
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