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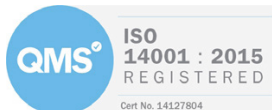
PHASE 2 & Phase 3

ENVIRONMENTAL & REMEDIATION REPORT

job number	C2623/24/E/6533	date	07.05.2024
site address	Land on Brendon Avenue Moston Manchester M40 9DN		
written by	S. Hale	checked by	R.A. Palmer
issued by	S. Hale		



Please consider the environment before printing this report.



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<ENVIRONMENTAL> <GEOTECHNICAL>

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Report on a Phase 2 & 3 Environmental Investigation & Remediation Report

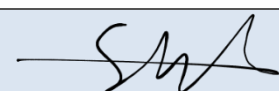
Location: **Land on Brendon Avenue**
Moston, Manchester, Greater Manchester, M40 9DN

For: **Mkenny Properties Limited**

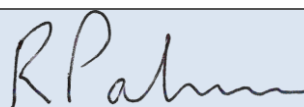
Report No. **C2623/24/E/6533**

Report date: **May 2024**

For and on behalf of **Rogers Geotechnical Services Ltd**



Steven Hale BSc FGS
Geo-environmental Technician



Rob Palmer MSc FGS ACIEH
Engineering Director

Report Summary¹

Item	Comments	Section
Development	Construction of six new residential properties with associated garden areas.	1.
Contamination	Lead and PAH contamination. Remediation required.	6.

1. Introduction

It is understood that the land on Brendon Avenue, Moston is to be developed by the construction of six new residential properties with associated garden areas. Consequently, a site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to take into consideration the risk of any contamination present. This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not

¹ This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.

investigated, for example between positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Desk Study

A Contaminated Land Phase 1 Assessment has been undertaken by Aval Consulting Group and the results were presented as report job code 92071 in July 2022. This report has been used during the current environmental investigation.

4. Strata Conditions

4.1 General Strata

Three hand pits were excavated in order for chemical samples to be taken. These pit locations are recorded upon the site plan in Appendix 1.

In general, the trial pit excavations indicated that the strata varied across the site. Made ground was found at HP01 which comprised of soft, dark brown slightly sandy, slightly gravelly silt. The sand was present in a fine to coarse condition and the gravel was represented by angular to sub-angular, fine to coarse brick, concrete, sandstone and glass. Rootlets were found to be common throughout the hand pit.

The soil within HP02 was also revealed to be made ground, however, this was present as a brown, silty, sandy, sub-angular and fine to coarse gravel consisting of sandstone. The sand within this hand pit was found to be in a fine to coarse condition.

A soft to firm, brown, slightly sandy, slightly gravelly, silty clay was found to be present within HP03. The sand was fine to medium and the gravel was found to be sub-angular and fine to medium consisting of sandstone. It is considered that this soil is reworked natural soils

5. Laboratory Testing - Environmental

A suite of testing was conducted on samples from across the site and the following regime was undertaken.

- Metals – Cd, Cr(VI), Cu, Hg, Ni, Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN⁻.
- Polycyclic aromatic hydrocarbons (PAHs).
- Others – pH, organic content and total/soluble SO₄²⁻.
- Asbestos.

This testing was undertaken by i2 Analytical and the results of all of the chemical testing are presented in Appendix 2 of this report.

6. Discussion of Ground Conditions - Environmental

6.1 Discussion of Test Results

It is understood that the site is to be developed by the construction of six new residential properties with associated garden areas. Consequently, the site may be classified as residential with plant uptake.

6.1.1 Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. With respect to the results it should be appreciated that the soil organic matter (SOM) content for the samples tested was found to range between 0.9% and 7.5%. On this basis, it is considered that the screening values associated with 6% SOM should be adopted. These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website² and these include many local authorities.

A comparison of the results of the testing, together with the data given above, can be found within Appendix 3. These results indicate the following:

Table 1: Summary of Contaminated Areas

Location	Strata	Depth (m)	Contaminants found to be exceeding SSVs (Residential with plant uptake)
HP01	Made Ground	0.3	Lead. PAHs (benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene).
HP02	Made Ground	0.3	PAHs (benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene).
HP03	Made Ground	0.3	PAHs (benzo(g,h,i)perylene).

Concentrations of chromium(VI), selenium and free cyanide were below the detection limits for the tests. Detectable levels of all other contaminants were recorded, but these fell below the associated Atrisk Soil Screening Values. In addition, no asbestos was detected within the soil samples tested.

It should be appreciated that the soil screening values for PAHs and TPHs (where appropriate) represents vapour saturation limits. The inhalation of vapour pathway contributes less than 10% of total exposure, which is unlikely to significantly affect the combined assessment criterion³. In view of this, the ATRISK soil SSVs notes that the users may wish to consider using a combined assessment criterion if free product is not observed, the values for which are also provided on the summary of contamination analysis. It is therefore considered that the criteria for no free product should be adopted for the PAHs and TPHs at this site.

² <http://www.atrisksoil.co.uk/pages/general/subscribers.asp>

³ Ref: ATRISK soil, SSVs derived using CLEA v1.071 for 1% SOM, Residential with home grown produce land use, 23.06.17.

The results of the contaminants found to exceed these screening values are tabulated below:

Table 2: Summary of Areas Contaminated by PAHs			
Location	Strata	Depth (m)	Contaminants found to be exceeding SSVs (Residential with plant uptake)
HP01	Made Ground	0.3	PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene).
HP02	Made Ground	0.3	PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene).
HP03	Made Ground	0.3	None.

On the basis of the above information, the results of the investigation have concluded that the site is contaminated with respect to the intended end use. PAH and lead contamination has been revealed within two locations.

6.2 Site Specific Risk Assessment

6.2.1 Approach

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency⁴ advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.⁵ This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'⁶

6.2.2 Conceptual Ground Model and Risk Assessment

In view of the results of the chemical testing undertaken the conceptual site model is presented accordingly as Table 3. Sources of contamination include the following:

On-site – Made Ground (Lead and PAH).

⁴ R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.

⁵ The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.

⁶ See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.

The preliminary risk assessment has been evaluated with reference to the following ratings and definitions:

- | | |
|-------------------|---|
| N/A - | A source-pathway-receptor linkage is not considered to exist and therefore a risk assessment is not required. |
| Low - | A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence. |
| Moderate - | The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary |
| High - | The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary. |

The results of the risk assessment are presented in Table 3.

Table 3: Conceptual Site Model and Site-Specific Risk Assessment [Contamination: Lead and PAHs]

Conceptual Site Model			Site Specific Risk Assessment	
Pathways	Receptor	Linkage Present?	Risk Rating	Notes
Direct contact/dermal absorption/soil ingestion	Operative	Yes – contamination found to be present at the site and contact with soil likely during works.	High	Some contamination is present within the made ground at the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. Contamination unlikely to be mobile.
	End User	Yes – contamination found to be present at the site and site to be developed into six residential dwellings with gardens.	High	
	Neighbours	Yes – contamination found to be present at the site and a populated residential area surrounds the site.	Low	
Inhalation of Dust/Vapours	Operative	Yes – dust may be derived from contaminated soils.	High	Some contamination is present within the made ground at the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. Measures shall be taken to reduce dust generation and prevention of site migration of dust to nearby residents.
	End User	Yes – dust may be derived from contaminated soils.	High	
	Neighbours	Yes – contamination found to be present at the site and residential and properties located within 250m radius of the site. Possible inhalation of dust during the works.	Moderate	
Ingestion of fruit/vegetables and/or waters	Operative	No – no edible plants or contained water sources in the area of the proposed new works.	N/A	Some contamination is present within the made ground at the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. Contamination unlikely to be mobile.
	End User	Yes – contamination found to be present at the site and site to be developed by the construction of six new residential properties with associated garden areas.	High	
	Neighbours	Yes – contamination found to be present at the site and residential area adjoins the site.	Low	

Migration of hazardous gases via permeable strata or shallow mining activity	Operative	No – as noted within the Phase 1 (Ref: 92071) there are no credible sources of hazardous gases within the surrounding area.	N/A	No further action required.
	End User			
	Neighbours			
Spillage/loss/run off direct to receiving water	Controlled Waters	No – no known controlled waters within 250m.	N/A	Some contamination is present within the made ground at the site. Remediation will be required to either remove the contamination or break pathways. Old services to be removed or capped.
Migration via permeable unsaturated strata	Controlled Waters	Yes – a secondary A aquifer is present beneath the site. Contamination by lead is not anticipated to be significantly mobile.	Low	
Run off via drainage/sewers etc	Controlled Waters	Yes – old services may be present on site. Contamination by lead is not anticipated to be significantly mobile. Volatilisation of PAHs is likely to result in a diminishing source.	Low	
Direct contact with contaminated soils	Plants	Yes – contamination present at the site which may affect plants.	High	Some contamination is present within the made ground at the site.
Uptake via root system			High	Remediation will be required to either remove the contamination or break pathways.
Direct contact with contaminated soils	Building Materials	Yes – PAH contamination revealed at the site may represent a risk to building materials or plastic water pipes. Moreover, testing indicates that the aggressive chemical environment for concrete classification is AC-1.	Moderate (plastic services)	Please see section 6.3 for information on good building practice.
Direct contact with contaminated groundwater			Low (buried concrete)	
Exposure to Radon	Operative	Yes – the property is in an Intermediate probability radon area (1 to 3% of homes are estimated to be at or above the Action Level).	Low	The publication BR211 states that no protection measures are necessary.
	End User			

6.3 Remediation Strategy

In view of the site-specific risk assessment it is considered that remediation will be required at this site. Such a strategy should include the following main elements.

6.3.1 Remediation Objectives

Based on the site-specific risk assessment the object of the remediation is likely to be as follows.

- To protect the site operatives during the construction process from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust.
- To protect the end user from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust.
- To protect neighbours from the inhalation and ingestion of dust during the construction process.
- To protect plants from direct contact with contamination and prevent uptake via root system.
- To protect plastic services from being penetrated by, or degrading due to the presence of, contamination in the soil or groundwater.

6.3.2 Development Requirements

It is understood that the site is to be developed by the construction of six new residential properties with associated garden areas. In view of the above a site-specific remediation strategy should be undertaken.

6.3.3 Strategy

In order to fulfil the objectives defined above it is likely that the following remedial strategy could be utilised. It is recommended that a pragmatic approach be undertaken, with observational techniques being employed at each stage of the work.

Ground-works

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore, the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site-specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the hazards of working with contaminated soils and the potential hazards associated with materials containing lead and PAHs.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives be encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use in dry weather.
- In order for contaminated soils to be disposed of to an appropriate landfill, it may be necessary to carry out Waste Acceptance Criteria (WAC) testing in accordance with BS EN 12457.

- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.
- Any stockpiles of contaminated soil on site should be sheeted over to prevent excessive amounts of airborne dust and cross contamination of imported fill.
- Where vehicles are transferring soil to the landfill site they should be covered to prevent contamination of the surrounding area by dust.
- Where vehicles are transferring materials to and from site, vehicles shall be cleaned between delivering materials to landfill and collecting materials for filling to prevent cross contamination.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade would be required. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.

Construction

During the construction phase of the contract the following items are required to protect the end user from the potential contaminants revealed at this site.

- Beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- Any redundant services revealed at this site should be de-commissioned and piped services sealed. Any existing services that are to be employed in the new development should be carefully inspected to ensure that they are serviceable.
- New plastic services should be constructed in a surround of clean inert material and selected in accordance with the recommendation given in the United Kingdom Water Industry Research (UKWIR) website under Report Ref. No. 10/MM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'. The statutory water authority for the area in which site is located may have a risk assessment form to complete which allows these recommendations to be met. However, further determinand specification contamination testing may be necessary.
- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1.

Landscaped Areas

The development plans indicate that that site shall include garden and soft landscaped areas. In view of this and the potential contamination on site, it is considered that landscaped areas will require some remediation.

It is recommended that a clean cover system is installed in soft landscaped areas. This system would need to employ a capping layer of say 500mm of inert material, which will put the contaminated ground out of the end users' dig range. At the base of this layer, a granular capillary break of say 100mm of free draining granular soil should be placed in order to prevent mobile contamination rising upward. This expedient should also provide a suitable root barrier to isolate the plants from the underlying contaminated ground.

6.4 Fill Materials

It should also be appreciated that any fill material, either site-won or imported, to be employed at the site should be subjected to the following assessment to determine its suitability.

Fill materials should be initially screened, by a suitably qualified engineer to establish that:

- It is a suitable growing media if it is to be employed as such, including compliance with BS3883 (2007)
- It is free from obvious contamination i.e. visual or olfactory evidence
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to be growing
- It is not a statutory nuisance, such as being odorous
- It is free from unsuitable material i.e. whole bricks, brick ties, timber or glass.

It should also be appreciated that any fill should be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG⁷ documentation and may be used as a guide. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this should be in agreement with any regulatory bodies (such as the Local Authority).

Table 4: Validation Sampling and Testing

Fill Type	Frequency	Minimum Determinands
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 500m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).
Greenfield/ Manufactured Soils	Minimum 3 Dependent on source and receptor, between 1 per 50m ³ and 1 per 250m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).
Brownfield/ Screened Soils	Minimum 6 Dependent on source and receptor, between 1 per 50m ³ and 1 per 100m ³	Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE)..

⁷ YALPAG Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V3.3 Appendix 1a, October 2016.

The screening values for the above regime should also be agreed with any regulatory bodies; however, the following is recommended in the first instance.

Table 5: Fill screening values

Contaminant	Screening Value (Residential with Plant Uptake) (mg/kg)		Reference
	1% SOM	6% SOM	
As	37	37	Atrisk ^{SOIL} SSVs
Cd	22.1	22.1	Atrisk ^{SOIL} SSVs
Cr(VI)	3.62	3.63	Atrisk ^{SOIL} SSVs
Cu	4730	4790	Atrisk ^{SOIL} SSVs
Hg	8.81	15.8	Atrisk ^{SOIL} SSVs
Ni	136	136	Atrisk ^{SOIL} SSVs
Pb	200	200	Atrisk ^{SOIL} SSVs
V	136	138	Atrisk ^{SOIL} SSVs
Zn	20000	20300	Atrisk ^{SOIL} SSVs
TPH CWG	See attached summary sheet (Appendix 4)		Atrisk ^{SOIL} SSVs
PAH 16 USEPA	See attached summary sheet (Appendix 4)		Atrisk ^{SOIL} SSVs

The above screening values should be considered with respect to the Soil Organic Matter (SOM) of the subject material i.e. 1% SOM would be typical for granular fill and 6% SOM for topsoil. Testing should comply with UKAS and MCERTS, where applicable, and undertaken by an accredited laboratory.

Where the material has been derived from a commercial company, certificates or other industry quality protocol compliance i.e. WRAP should be obtained. However, it will be necessary to ensure that this documentation specifically related to the material being imported, it is no more than two months old and complies with the screening and frequency requirements given above.

Suitable fill materials should be either placed immediately or sufficiently quarantined to prevent cross-contamination. If it is necessary, the quarantined material should be placed on appropriate sheeting and covered to prevent it becoming mixed with contaminated soils or dust, or penetrated by mobile contaminants.

6.5 Verification Report

In order to demonstrate that the remedial works and provision of clean cover has been sufficiently carried out where applicable, it will be necessary to produce a verification report for submission to any statutory authorities.

It will be necessary for this report to include the following:

- The extents of any areas where made ground has been wholly removed.
- Characterisation of the suitability of the clean material including the derivation of the material, comments from a visual screen, the tests results of chemical screening, delivery tickets where appropriate and the conditions by which the clean material has been stored and handled on site.
- Photographic and logged evidence the clean material has been handled on site and placed in a sufficient thickness over areas where made ground remains. This may be either at the time of placement or after placement by means of hand excavated trialpits. Photographs should include visual site references or reference boards to prove the location and date taken. A measurement reference should be visible in the photographs to substantiate the

thickness of material placed. Please note that it may also be necessary to undertake a topographical survey and the requirement for which should be checked with any statutory authorities.

The report detailed above should be produced by a suitably qualified engineer. The number of verification areas for the development should be confirmed with any statutory authorities for the site.

7. Recommendations for Further Work

- This report should be forwarded to the relevant authorities as soon as practicable to ensure they have sufficient time to review and discuss any issues.
- Discussions with ground work contractors in relation to the requirement for testing of materials to be disposed off-site (Waste Acceptance Criteria) and the suitability of imported materials.
- Discussions with service providers regarding suitable materials for pipe work given the nature of chemical determinands found within the soils on site.
- Produce a validation report to demonstrate that the geo-environmental risks discussed in this report have been mitigated.

Clearly Rogers Geotechnical Services Ltd would be happy to offer advice with respect to the above and assist where necessary.

8. References

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(<http://www.bgs.ac.uk/lexicon/>)
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 - Part C: *Assessing the aggressive chemical environment*.
 - Part D: *Specifying concrete for general cast-in-situ use*.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health toxicological assessment of contaminants in soil*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs (2014) SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*.
- Wilson S, Oliver S, Mallet H, Hutchings H, Card G, *Assessing risks posed by ground gasses to buildings*, CIRIA Report C665.

Appendix 1

Site Plan



Notes:



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Client:
Mkenny Properties Limited

Job Number:
C2623/24/E/6533

Project Details:
Brendon Avenue, Moston

Scale:	Not to scale - reference only
---------------	-------------------------------



Appendix 2

Laboratory Testing

Rogers Geotechnical Services Ltd
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Analytical Report Number : 24-013986

Project / Site name: Brendon Avenue

Samples received on: 10/04/2024

Your job number: C2623

**Samples instructed on/
Analysis started on:** 15/04/2024

Your order number:

Analysis completed by: 18/04/2024

Report Issue Number: 1

Report issued on: 18/04/2024

Samples Analysed: 3 soil samples



Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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

Analytical Report Number: 24-013986
Project / Site name: Brendon Avenue

Lab Sample Number	169868	169869	169870
Sample Reference	HP01	HP02	HP03
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	0.30	0.30
Date Sampled	09/04/2024	09/04/2024	09/04/2024
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status

Stone Content	%	0.1	NONE	< 0.1	61	< 0.1
Moisture Content	%	0.01	NONE	22	8.9	15
Total mass of sample received	kg	0.1	NONE	1	1.2	1.5

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SCA	SCA	SCA

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.7	8.2	7.5
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	430	32	56
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	217	16.2	28.1
Organic Matter (automated)	%	0.1	MCERTS	7.5	1.2	0.9

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	1.7	4.2	0.21
Acenaphthylene	mg/kg	0.05	MCERTS	0.55	0.11	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	8.5	7.5	0.15
Fluorene	mg/kg	0.05	MCERTS	5.6	5.3	0.1
Phenanthrene	mg/kg	0.05	MCERTS	43	34	1.3
Anthracene	mg/kg	0.05	MCERTS	12	9.7	0.3
Fluoranthene	mg/kg	0.05	MCERTS	51	37	1.5
Pyrene	mg/kg	0.05	MCERTS	49	32	1.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	28	17	0.63
Chrysene	mg/kg	0.05	MCERTS	26	14	0.69
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	29	16	0.65
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	11	7	0.24
Benzo(a)pyrene	mg/kg	0.05	MCERTS	25	14	0.55
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	12	6.6	0.28
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	3.2	1.8	0.08
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	13	7.1	0.29

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	317	212	8.22
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	21	5.9	8.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.6	0.3	0.4
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	12	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	170	13	21
Lead (aqua regia extractable)	mg/kg	1	MCERTS	270	20	13
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.6	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	25	10	13
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	32	12	28
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	430	61	180

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

Analytical Report Number : 24-013986

Project / Site name: Brendon Avenue

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
169868	HP01	None Supplied	0.3	Brown clay and sand with gravel and vegetation
169869	HP02	None Supplied	0.3	Brown sandy clay with gravel and stones
169870	HP03	None Supplied	0.3	Brown clay and sand

Analytical Report Number : 24-013986

Project / Site name: Brendon Avenue

Water matrix abbreviations:

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Appendix 3

Soil Screening Value Comparison Sheet



Rogers Geotechnical Services: Soil Screening Values Comparison Sheet



Rogers Geotechnical Services Ltd: Soil Screening Value (SSV) Comparison Sheet															
Job Number	C2623			A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than 12's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used. KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD) 											
Job Name	Brendon Avenue														
Date				Sample Location	HP01	HP02	HP03								
Client	Mkenny Prperties Limited			Depth Top	0.30	0.30	0.30								
				Depth Base											
Determinand	Units	Ref	LOD	Residential With Plant Uptake 6%											
				Atrisk 2015 (No Free Product)	Atrisk 2017										
Cadmium	mg/kg	C	0.2		22.1	1.60	0.30	0.40							
Chromium (Hexavalent)	mg/kg	B/C	1.8	20.5	3.62	< 1.8	< 1.8	< 1.8							
Copper	mg/kg	A+	1.0		4790	170.00	13.00	21.00							
Mercury	mg/kg	A/D	0.3		15.8	0.60	< 0.3	< 0.3							
Nickel	mg/kg	A+	1.0		136	25.00	10.00	13.00							
Lead	mg/kg	C	1.0		200	270.00	20.00	13.00							
Zinc	mg/kg	A+	1.0		20300	430.00	61.00	180.00							
Vanadium	mg/kg	A+	1.0		138	32.00	12.00	28.00							
Arsenic	mg/kg	C	1.0		37	21.00	5.90	8.90							
Selenium	mg/kg	A	1.0		375	< 1.0	< 1.0	< 1.0							
Cyanide (Free)	mg/kg	A	1.0		34	< 1.0	< 1.0	< 1.0							
Total Phenols	mg/kg	A	1.0		1200										
Naphthalene	mg/kg	A+	0.05		12.2	1.70	4.20	0.21							
Acenaphthylene	mg/kg		0.05			0.55	0.11	< 0.05							
Acenaphthene	mg/kg	A+	0.05		2760	8.50	7.50	0.15							
Fluorene	mg/kg	A+	0.05		2610	5.60	5.30	0.10							
Phenanthrene	mg/kg		0.05			43.00	34.00	1.30							
Anthracene	mg/kg	A+	0.05		26200	12.00	9.70	0.30							
Fluoranthene	mg/kg	A+	0.05		2980	51.00	37.00	1.50							
Pyrene	mg/kg	A+	0.05		2120	49.00	32.00	1.30							
Benzo[a]anthracene	mg/kg	A	0.05		8.54	28.00	17.00	0.63							
Chrysene	mg/kg	A	0.05	927	2.64	26.00	14.00	0.69							
Benzo[b]fluoranthene	mg/kg	A	0.05	9.86	7.29	29.00	16.00	0.65							
Benzo[k]fluoranthene	mg/kg	A	0.05	100	4.12	11.00	7.00	0.24							
Benzo[a]pyrene	mg/kg	B/C	0.05	5	0.998	25.00	14.00	0.55							
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.05	9.75	0.368	12.00	6.60	0.28							
Dibenz(a,h)Anthracene	mg/kg	A	0.05	4.95	2.05	3.20	1.80	0.08							
Benzo[g,h,i]perylene	mg/kg	A	0.05	103	0.112	13.00	7.10	0.29							
Total Of 16 PAH's	mg/kg		0.8			317.00	212.00	8.22							
Aliphatic TPH >C5-C6	mg/kg	A+	0.02		369										
Aliphatic TPH >C6-C8	mg/kg	A+	0.02	1240	768										
Aliphatic TPH >C8-C10	mg/kg	A+	0.05		204										
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	1180	297										
Aliphatic TPH >C12-C16	mg/kg	A+	2.0	4130	125										
Aliphatic TPH >C16-C21	mg/kg	A+	8.0		210100										
Aliphatic TPH >C21-C35	mg/kg	A+	8.0		210100										
Aliphatic TPH >C35-C44	mg/kg		10.0												
Total Aliphatic Hydrocarbons	mg/kg		10.0												
Aromatic TPH >C5-C7	mg/kg	A+	0.01		0.871										
Aromatic TPH >C7-C8	mg/kg	A+	0.01		780										
Aromatic TPH >C8-C10	mg/kg	A+	0.05		232										



Rogers Geotechnical Services: Soil Screening Values Comparison Sheet



Rogers Geotechnical Services Ltd: Soil Screening Value (SSV) Comparison Sheet													
Job Number	C2623			A = WS Atkins PLC, Atrisk Soil Screening Values. A* = Values updated June 2017. A* = Atrisk's SSV is lower than i2's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used.									
Job Name	Brendon Avenue			KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD)									
Date				Sample Location	HP01	HP02	HP03						
Client	Mkenny Prperties Limited			Depth Top	0.30	0.30	0.30						
				Depth Base									
Determinand	Units	Ref	LOD	Residential With Plant Uptake 6%									
Aromatic TPH >C10-C12	mg/kg	A+	1.0		468								
Aromatic TPH >C12-C16	mg/kg	A+	2.0	830	830								
Aromatic TPH >C16-C21	mg/kg	A+	10.0		1040								
Aromatic TPH >C21-C35	mg/kg	A+	10.0		1710								
Aromatic TPH >C35-C44	mg/kg		10.0										
Total Aromatic Hydrocarbons	mg/kg		10.0										
Total Petroleum Hydrocarbons	mg/kg		10.0										
pH			N/A			8.70	8.20	7.50					
Sulphate (2:1 Water Soluble) as SO4	g/l		0.00125			0.22	0.02	0.03					
ACM Type			N/A										
Asbestos Identification	%					Not-detected	Not-detected	Not-detected					
ACM Detection Stage			N/A										
Moisture	%		0.01			22.00	8.90	15.00					
Soil Colour			N/A										
Other Material			N/A										
Soil Texture			N/A										
Sulphate (Total)	%		0.005										
Organic Matter	%		0.1			7.50	1.20	0.90					

Appendix 4

Fill Screening Values

Rogers Geotechnical Services Ltd.

Atkins ATRISK Soil Screening Values (SSVs) - Residential With Plant Uptake Landuse

Tox Data Report No.	Compound	Residential with Homegrown Produce Landuse (mg/kg)				Reference
	<i>Metals</i>	SOM: 1%		SOM: 6%		
3	Cadmium	22.1		22.1		C
4	Chromium VI	3.62	20.5	3.63	20.5	B/C
	Copper	4730		4790		A+
7	Mercury	8.81		15.80		A/D
8	Nickel	136		136		A+
	Lead	200		200		C
	Zinc	20000		20300		A+
	Vanadium	136		138		A+
	<i>Semi and Non Metals</i>					
1	Arsenic	37		37		C
10	Selenium	375		375		A
	Free Cyanide	34		34		A
9	Phenols (total)	267		1200		A
	<i>Poly Aromatic Hydrocarbons</i>	Free product	No free product	Free product	No free product	
20	Napthalene	0.829		12.2		A+
	Acenaphthene	157	608	2760		A+
	Fluorene	735		2610		A+
	Anthracene	10200		26200		A+
	Fluoranthene	983		2980		A+
	Pyrene	668		2120		A+
	Benzo(a)anthracene	1.71	4.52			A
2	Chrysene	0.44	585			A
2	Benzo(b)fluoranthene	1.22	7.72			A
2	Benzo(k)fluoranthene	0.686	84.4			A
2	Benzo(a)pyrene	1.51	4.95	2.05	4.95	B/C
2	Dibenzo(a,h)anthracene	0.00393	0.838			A*
2	Indeno(1,2,3-cd)pyrene	0.0614	7.31			A
2	Benzo(g,h,i)perylene	0.0187	96.2			A
	<i>Petroleum Hydrocarbons</i>					
	Aliphatic C5-C6	42.7		369		A+
	Aliphatic C6-C8	99.3		768	1240	A+
	Aliphatic C8-C10	13.9		204		A+
	Aliphatic C10-C12	49.9	81.7	297	1180	A+
	Aliphatic C12-C16	20.9	385	125	4130	A+
	Aliphatic C16-C21	210000		210100		A+
	Aliphatic C21-C35	210000		210100		A+
	Aromatic C5-C7 (Benzene)	0.137		0.871		A+
	Aromatic C7-C8 (Toluene)	113		780		A+
	Aromatic C8-C10	20.5		232		A+
	Aromatic C10-C12	70		468		A+
	Aromatic C12-C16	155	165	830		A+
	Aromatic C16-C21	319		1040		A+
	Aromatic C21-C35	1120		1710		A+
<i>Others</i>						
Asbestos Not Detected						
A+ = Values update June 2017.						
A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.						
B = Health Criterion Values (available from toxicological reviews published in the C4SL project methodology report).						
C = Category 4 Screening Levels (C4SLs).						
D = SSV provided is for Methyl Mercury.						