HEMSLEY CONSULTING
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Unit 18, Park Farm, Hundred Acre Lane, Wivelsfield Green, West Sussex RH17 7RU
Telephone: (01273) 891738
email: mail@hemsleyconsulting.com
VAT REG N°816 2864 19

HEMSLEY CONSULTING LTD

WOODVILLE CENTRE AND ST RICHARDS C E PRIMARY SCHOOL, HAM, SURREY, TW10 7QW

CONTAMINATION ASSESSMENT: INTRUSIVE INVESTIGATION

Client:
A3ARC
118 Beckenham Road
Beckenham
Kent
BR3 4RN

HC6101
Date: 11.09.2024

HEMSLEY CONSULTING LTD
WOODVILLE CENTRE AND ST RICHARDS C E PRIMARY SCHOOL
HAM, SURREY, TW10 7QW

CONTAMINATION ASSESSMENT: INTRUSIVE INVESTIGATION

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CONTAMINATION ASSESSMENT: INTRUSIVE INVESTIGATION

1.0 Introduction

A Desk Study which included the area bounded by Ashburnham Road, Woodville Road and Ham Close, Grid reference TQ 170 722, was prepared (Report dated 21st March 2024). The Desk Study also included the area proposed for a new MUGA pitch. Drawing N° 1017/010F by A3ARC Architects shows details of the area, which includes a playing field and a school garden.

The area was reclaimed from former gravel pits in the mid-1960's and the Desk Study suggested the fill may be contaminated, particularly with lead.

The intrusive investigation comprised a grid of shallow machine excavated trial holes, approximated 15m x 15m, in the playing field. In addition three hand augured boreholes were drilled in the school garden. The field work was undertaken on 20th August 2024. The samples recovered were assayed for a range of heavy metals and poly-aromatic hydrocarbons, with a few samples screened for asbestos. The results of the contamination assays are given in Analytical Report 24-55435 by the Environmental Laboratory Ltd.

2.0 Intrusive Investigation

The whole area proved to have been infilled with building waste, comprising brick, concrete, stone, gravel and soil in the main. There were also quantities of clinker, metal and glass. The fill was examined for materials that may contain asbestos and only a few such fragments were noted. Generally the topsoil was thin and the topsoil contained gravel and some brick. In particular the coarse nature of the soil, together with numerous large roots in the school garden made drilling hand augured boreholes difficult.

Sampling the soils was biased as only the relatively fine material could be placed in the sample containers, particularly 125mm amber jars. A visual inspection of the excavated spoil suggested that more than half the material comprised coarse debris greater that 25mm in size.

2.1 Playing Field

The Playing Field, including the site for the MUGA pitch have been considered a public open spaces and appropriate screening concentrations for various compounds are given in Table 1A.

2.1.1 Metals

The major contaminant proved to be lead and the concentration of the metal ranged from 354 to 12,200mg/kg compared to the screening value of 630mg/kg. One sample (Trial Pit 1) contained a very high concentration of lead, possibly including metallic lead, and the assay has not been included in the analysis. The average concentration of lead in the samples recovered was 1156mg/kg, with 95 percentile bound for the mean of 1625mg/kg

All the other metals were at concentrations below the screening values for public open spaces.

The concentration of both copper and zinc exceeded values that would be considered excessive in normal agricultural soils in many of the samples assayed (Soil Code MAFF 1998). However the soils were strongly alkaline and the metals will be virtually insoluble and hence not available to plants.

2.1.2 Poly-aromatic Hydrocarbons

A total of sixteen poly-aromatic hydrocarbons were assayed and of particular concern is benzo-α-pyrene, a carcinogenic compound. The screening value for this compound in public open spaces is 11mg/kg, and only four samples of sixteen tested exceeded this concentration.

The concentration of total poly-aromatic hydrocarbons ranged from 2 to 390mg/kg and any values in excess of 50mg/kg have been considered as indicative of contamination.

2.1.3 Asbestos

As noted above very little material that could contain asbestos was noted in the trial pits. Across the site four samples were screened for asbestos and one was found to contain asbestos as millboard.

2.2 School Garden

The School Garden has been considered as an allotment and screening concentration for such site are given in Table 1B.

2.2.1 Metals

The concentration of lead in all three samples assayed exceeded the screening value of 80mg/kg for this metal. The concentration of cadmium in one sample also exceeded the screening value although not by an excessive amount.

The concentration of copper and zinc was high and would potentially affect the growth of plants, however the soils in the garden were also alkaline and the metals would not be available to plants.

2.2.2 Poly-aromatic Hydrocarbons

The concentration of poly-aromatic hydrocarbons in the samples recovered from the garden was reasonably low and the risk from this group of compounds was low.

3.0 Risk Assessment

3.1 MUGA Pitch

There are high concentrations of lead in the samples from the vicinity of the MUGA pitch, Trial Pit N^{os} 1, 8 and 9. The construction of the pitch will involve excavation of about 500mm of soil, which will remove some of the contaminated material, however the underlying rubble is also likely to be contaminated.

The new construction will isolate the deeper fill and seal the most common pathways for the migration of solid contaminants, ie. by ingestion of soil or dust. The users of the proposed facility will therefore not be at risk.

Construction staff should be made aware of the contamination and the risk arising from dust in the air. Measures to reduce dust arising when excavation takes place should be implemented as necessary e.g. water sprays. Washing facilities should be available on site and staff should avoid eating with dirty hands. The risk of handling the contaminated soil should be included in the RAM documentation for the site.

3.2 Playing Field

The concentrations of contamination with lead and poly-aromatic hydrocarbons across the playing field vary widely and do not occur in any pattern, obviously the trial pits are widely spaced but should give a measure of the overall situation.

The risk of the presence of pollution linkages on the site has been assessed using the source-pathway-receptor model given in CLRM 2020 published by DEFRA and a conceptual model for the playing field is given in Table 2.

Concentrations of lead in the fill and topsoil of the playing field range from acceptable to very high with the likely average well above acceptable levels for a public open space. There are also isolated areas where high concentrations of poly-aromatic hydrocarbons occur.

Use of the pitch will be limited to short periods mostly when games are being played, hence exposure of individuals will be limited. The playing fields adjoins a

primary school and the young children will be at risk of ingestion of soil and dust both from using the field and from soil or dust migrating from the field.

Over-all the risk of lead contamination was considered to be high as viable pathways for ingestion of soil and dust are present. To ameliorate the risk to human health, particularly for children, remediation of the playing field will be necessary.

3.3 School Garden

The School Garden is also underlain by fill and the lead content in the surface soils was variable. Although only three samples were recovered from the garden, the soils and fill are similar to that of the playing field and the lead content of all the samples was greater than the screening value for allotments. The concentration in one sample exceeded the screening values for cadmium and benzo-α-pyrene.

The soils in the garden, and in the whole of the site, are alkaline and most of the metals will be almost insoluble and thus not available to plants. There is a risk, however, that the soil adhering to root vegetables will be ingested if these are not thoroughly washed. There will also be a high risk of ingestion of dust and soil to people working the garden.

To reduce the risk from contamination of the garden to an acceptable level it will be necessary to remediate the area.

4.0 Proposed Remediation

The playing field at the Woodville Centre and St Richards C E Primary School are underlain by fill in what was a former gravel pit. The fill is believed to be about 5m deep, which comprised general building rubble with a thin topsoil. The fill and topsoil was contaminated with high concentration of lead, ad to a lesser extent with poly-aromatic hydrocarbons. Clearly removing the source of contamination is not practicable and it is proposed the land be remediated by covering with a blanket of clean soil and reference is made to " Cover Systems for Land Regeneration" BRE 2004.

4.1 MUGA Pitch

The construction of the MUGA Pitch will seal the underlying fill below the pitch and no further remediation will be required.

The site operatives should be protected from dust and soil arising during excavations to form the pitch as the arisings will be contaminated.

4.2 Playing Field

The playing fields are large in area and covering the land will clean soil will required a large quantity of material.

Given that the fill/topsoil contains a high proportion of coarse material and assuming the contamination is confined to the fine fraction it would be possible to reduce the over-all concentration of lead in the upper 600mm of the fill.

This gives;

$$T = \frac{X \times 50}{0.6} + \frac{(0.6 - X)}{0.6} \times 1625 \times 50\% \text{ mg/kg}$$

with a 50% reduction for coarse material in the fill and assuming 50mg/kg lead in the imported soil. The effect of various thickness of cover are shown below;

Cover thickness (mm)	Concentration of lead (mg/kg)
300	431
200	558
100	685

Given the variability of the concentration of lead in the field it is proposed a minimum cover of 200mm of clean topsoil be used to remediate the playing field.

Prior to use the topsoil should be stockpiled and assayed to ensure the lead concentration is below 50mg/kg, and that any other contaminants are at acceptable concentrations for a good quality topsoil.

The new cover will also ameliorate those areas contaminated with benzo-α-pyrene.

4.3 School Garden

The cultivated areas of the School Garden are in defined beds. To ensure the vegetables are growing in a clean safe soil, it is proposed the beds are re-constructed to 600mm deep and filled with clean topsoil. Soil mixing below this depth should not occur and the contaminated fill will not lead to slow pollution of the soil in the raised beds.

The topsoil used to fill the beds should be certified clean material and samples delivered to the garden should be assayed for a range of common contaminants.
There are a number of trees growing in the garden area and to reduce dust arising from the soil around the trees it is proposed the root protection areas be covered with 200mm wood chips or bark.

5.0 Conclusions

The land associated with the Woodville Centre and St Richards C E Primary School are on a former gravel pit infilled with building debris, brick, concrete, gravel, soil, metal, glass etc. with a thin topsoil. Assays of the fill demonstrate that the material is contaminated with a high and variable concentration of lead together with minor amounts of the contaminants.

Considering the area as a public open space it will be necessary to reduce the average concentration of lead to an acceptable level. Fill by nature is a heterogeneous material and each load may be different, hence the remedial measures should be robust.

Of the various areas involved the following recommendations are made:

(i) MUGA Pitch
The construction of the pitch will involve the excavation of some fill and construction of the pitch on a gravel drainage layer. The new construction will seal common pathways for migration of solid contaminants and no further remediation will be required.

(ii) Playing Field
Concentrations of lead are high and a target concentration of 630mg/kg for lead has been selected. This corresponds to that for a public open space used as a park. To remediate the area it is recommended the playing field be dressed with a cover layer of certified clean topsoil with a minimum thickness of 200mm.

(iii) School Garden
Rather than remediate the whole area it is proposed vegetables are gown in raised beds. The beds to be a minimum of 600mm deep, and filled with certified clean topsoil.

The remediation of the area should be checked and a Validation Report prepared. The Validation Report to include photographs of the work in progress, certificates and quantities of material imported, a check on the thickness of the new topsoil and assays of the topsoil at the rate of one per $40m^2$.

Investigation & Report by

W K Elson Ph.D., C.Eng., M.I.C.E.
Director

TABLE 1 A

Site Screening Values for Soils

Public Open Spaces

Metals

Determinand	Screening Value	Reference
Arsenic	79 mg/kg	DEFRA SP1010 [1]
Boron (water soluble)	3 mg/kg 21000 mg/kg	MAFF (1998)[3] LQM/CIEH[2]
Cadmium	120 mg/kg	DEFRA SP1010 (2014)[1]
Chromium	1500 mg/kg	LQM/CIEH[2]
Copper	130 mg/kg 12000 mg/kg	MAFF (1998)[3] LQM/CIEH[2]
Lead	630 mg/kg	DEFRA SP1010 [1]
Mercury (inorganic)	120 mg/kg	LQM/CIEH[2]
Nickel	230 mg/kg	LQM/CIEH[2]
Selenium	1100 mg/kg	LQM/CIEH[2]
Zinc	300 mg/kg 81000 mg/kg	MAFF (1998)[3] LQM/CIEH[2]

cont.....

Site Screening Values for Soils

Public Open Spaces

Organic Compounds

Determinand	Screening Value	Reference
Total PAH	50 mg/kg	WRAS Paper 9-04-03[4]
Benzo-α-pyrene	11 mg/kg	DEFRA SP1010 (2014)[1]
Fluorene	20000 mg/kg	LQM/CIEH[2]
Dibenzo (a,h) Anthracene	1.1 mg/kg	LQM/CIEH[2]
Naphthalene	1200 mg/kg	LQM/CIEH[2]

[1] DEFRA Category 4 Screening Values SP1010 July 2014

[2] Generic Assessment Criteria for Human Health Assessment by Land Quality Management and Chartered Institute of Environmental Health, 2015 (S4UL).

[3] The Soil Code MAFF 1998. Phyto-toxic criteria for plant growth.

[4] Selection of Materials for Water Supply Pipes to be Laid in Contaminated Lane, WRSA Paper 9-04-03, October 2002.

TABLE 1 B

Site Screening Values for Soils

Allotments

Metals

Determinand	Screening Value	Reference
Arsenic	49 mg/kg	DEFRA SP1010 [1]
Beryllium	35 mg/kg	LQM/CIEH[2]
Boron (water soluble)	3 mg/kg 45 mg/kg	MAFF (1998)[3] LQM/CIEH[2]
Cadmium	1.9 mg/kg	DEFRA SP1010 (2014)[1]
Chromium	18000 mg/kg	LQM/CIEH[2]
Copper	130 mg/kg 520 mg/kg	MAFF (1998)[3] LQM/CIEH[2]
Lead	80 mg/kg	DEFRA SP1010 [1]
Mercury (inorganic)	19 mg/kg	LQM/CIEH[2]
Nickel	53 mg/kg	LQM/CIEH[2]
Selenium	88 mg/kg	LQM/CIEH[2]
Vanadium	91 mg/kg	LQM/CIEH[2]
Zinc	300 mg/kg 620 mg/kg	MAFF (1998)[3] LQM/CIEH[2]

cont.....

Site Screening Values for Soils

Allotments

Organic Compounds

Determinand	Screening Value	Reference
Total PAH	50 mg/kg	WRAS Paper 9-04-03[4]
Benzo-α-pyrene	2 mg/kg	DEFRA SP1010 (2014)[1]
Fluorene	6.7 mg/kg	LQM/CIEH[2]
Dibenzo (a,h) Anthracene	0.27 mg/kg	LQM/CIEH[2]
Naphthalene	10 mg/kg	LQM/CIEH[2]

[1] DEFRA Category 4 Screening Values SP1010 July 2014

[2] Generic Assessment Criteria for Human Health Assessment by Land Quality Management and Chartered Institute of Environmental Health, 2015 (S4UL).

[3] The Soil Code MAFF 1998. Phyto-toxic criteria for plant growth.

[4] Selection of Materials for Water Supply Pipes to be Laid in Contaminated Lane, WRSA Paper 9-04-03, October 2002.

TABLE 2
Conceptual Model of Pollution Linkages

Woodville Centre and St Richards CE School,
Ham, Surrey, TW10 7QW.

Pollution Linkage	Metals	Petroleum/ Poly -aromatic Hydrocarbons	Asbestos
Human Health			
• Ingestion of soil/dust	H	M	L
• Ingestion of contaminated food	X	M	L
• Dermal contact	H	M	X
• Inhalation of VOC's	X	X	X
• Risk of explosion or asphyxiation	X	X	X
Water Environment			
• Uncontained surface run-off	L	L	X
• Migration of mobile constituents into ground/surface water	H	L	X
Flora and Fauna			
• Potential impact on landscape or plants	M	L	X
• Potential impact on water plants and fauna	X	X	X
Building Materials			
• Direct contact with foundations	X	X	X
• Permeation through water pipes	X	X	X

Assessed degree of risk : H - high, M - moderate, L – low, X – no risk

APPENDICES

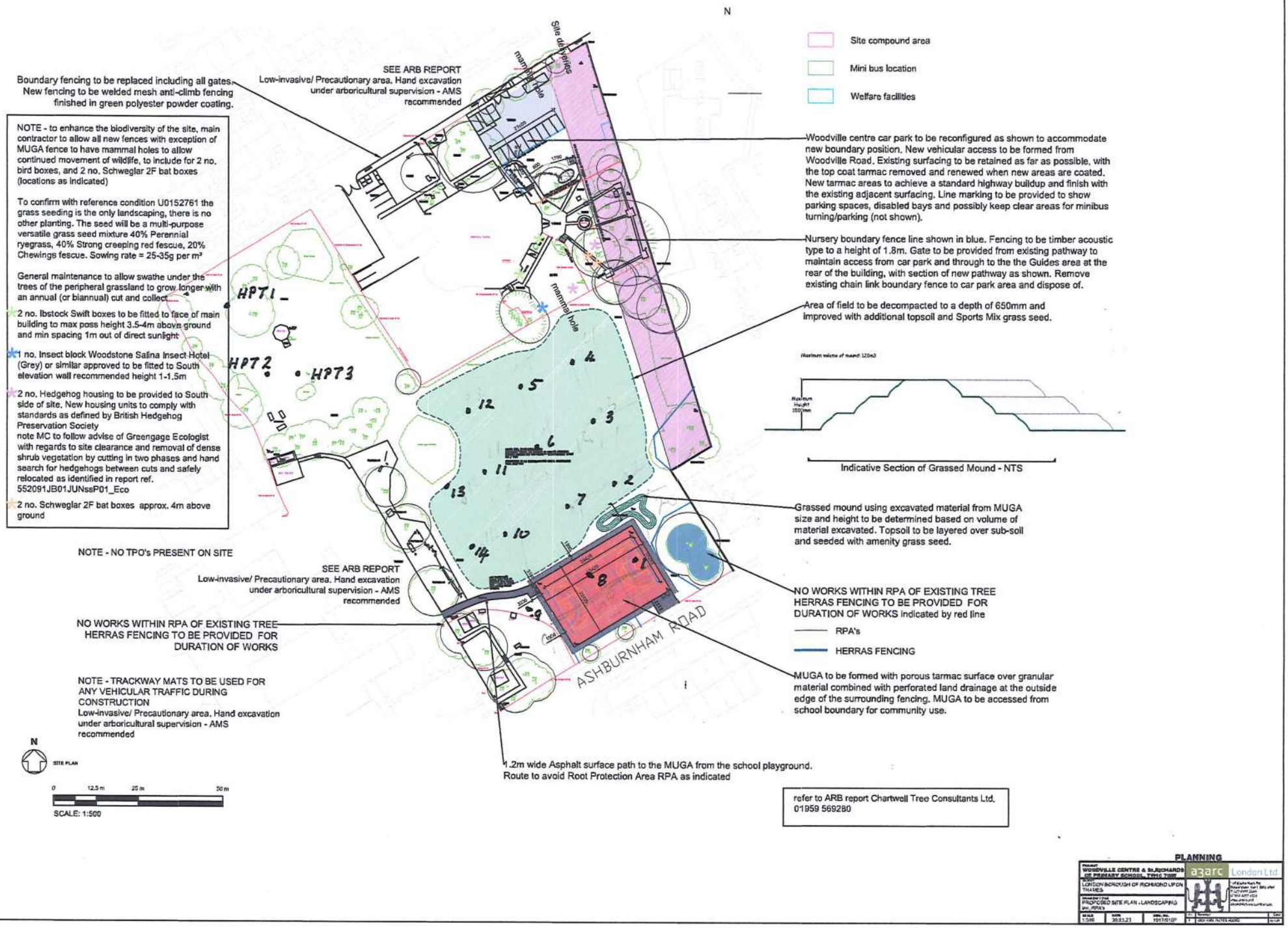
A. Site Plan

B. Trial Pit Logs

C. Contamination Assays

APPENDIX A

Site Plan


N
Site compound area
Mini bus location
Welfare facilities
Boundary fencing to be replaced including all gates. New fencing to be welded mesh anti-climb fencing finished in green polyester powder coating.
SEE ARB REPORT
Low-invasive/ Precautionary area. Hand excavation under arboricultural supervision - AMS recommended
Site deliveries
mammal hole
NOTE - to enhance the biodiversity of the site, main contractor to allow all new fences with exception of MUGA fence to have mammal holes to allow continued movement of wildlife, to include for 2 no. bird boxes, and 2 no. Schwegler 2F bat boxes (locations as indicated)
To confirm with reference condition U0152761 the grass seeding is the only landscaping, there is no other planting. The seed will be a multi-purpose versatile grass seed mixture 40% Perennial ryegrass, 40% Strong creeping red fescue, 20% Chewings fescue. Sowing rate = 25-35g per m²
General maintenance to allow swathe under the trees of the peripheral grassland to grow longer with an annual (or biannual) cut and collect
2 no. Ibstock Swift boxes to be fitted to face of main building to max poss height 3.5-4m above ground and min spacing 1m out of direct sunlight
1 no. Insect block Woodstone Salina Insect Hotel (Grey) or similar approved to be fitted to South elevation wall recommended height 1-1.5m
2 no. Hedgehog housing to be provided to South side of site. New housing units to comply with standards as defined by British Hedgehog Preservation Society
note MC to follow advise of Greengage Ecologist with regards to site clearance and removal of dense shrub vegetation by cutting in two phases and hand search for hedgehogs between cuts and safely relocated as identified in report ref. 552091JB01JUNssP01_Eco
2 no. Schweglar 2F bat boxes approx. 4m above ground
HPT1
HPT2
HPT3
Woodville centre car park to be reconfigured as shown to accommodate new boundary position. New vehicular access to be formed from Woodville Road. Existing surfacing to be retained as far as possible, with the top coat tarmac removed and renewed when new areas are coated. New tarmac areas to achieve a standard highway buildup and finish with the existing adjacent surfacing. Line marking to be provided to show parking spaces, disabled bays and possibly keep clear areas for minibus turning/parking (not shown).
Nursery boundary fence line shown in blue. Fencing to be timber acoustic type to a height of 1.8m. Gate to be provided from existing pathway to maintain access from car park and through to the the Guides area at the rear of the building, with section of new pathway as shown. Remove existing chain link boundary fence to car park area and dispose of.
Area of field to be decompacted to a depth of 650mm and improved with additional topsoil and Sports Mix grass seed.
Indicative Section of Grassed Mound - NTS
Grassed mound using excavated material from MUGA size and height to be determined based on volume of material excavated. Topsoil to be layered over sub-soil and seeded with amenity grass seed.
NOTE - NO TPO's PRESENT ON SITE
SEE ARB REPORT
Low-invasive/ Precautionary area. Hand excavation under arboricultural supervision - AMS recommended
NO WORKS WITHIN RPA OF EXISTING TREE HERRAS FENCING TO BE PROVIDED FOR DURATION OF WORKS
NO WORKS WITHIN RPA OF EXISTING TREE HERRAS FENCING TO BE PROVIDED FOR DURATION OF WORKS indicated by red line
RPA's
HERRAS FENCING
ASHBURNHAM ROAD
MUGA to be formed with porous tarmac surface over granular material combined with perforated land drainage at the outside edge of the surrounding fencing. MUGA to be accessed from school boundary for community use.
NOTE - TRACKWAY MATS TO BE USED FOR ANY VEHICULAR TRAFFIC DURING CONSTRUCTION
Low-invasive/ Precautionary area. Hand excavation under arboricultural supervision - AMS recommended
1.2m wide Asphalt surface path to the MUGA from the school playground. Route to avoid Root Protection Area RPA as indicated
refer to ARB report Chartwell Tree Consultants Ltd. 01959 569280
N
SITE PLAN
0 12.5 m 25 m 50 m
SCALE: 1:500
PLANNING
WOODVILLE CENTRE & ST.RICHARDS OF PRIMARY SCHOOL, TYPIC 7000
LONDON BOROUGH OF RICHMOND UPON THAMES
PROPOSED SITE PLAN - LANDSCAPING
azarc London Ltd
1:500
30.03.23
1017/010
T


TP3
TP2
TP1
Ham and Petersham SOS Neighbourhood...
Richmond Maker Labs
St Richard's CE Primary School
Ultimate Fitness World
Richmond School
Google
78
80
82
142
81
83
85
204
200
24
41A
43
45
47

APPENDIX B

Trial Pit Logs

Project Title : WOODVILLE CENTRE HAM							Project No.:
TRIAL PIT RESULTS							Pit No. & Location
Date : 20 - 08 - 2024 Engineer : MJK.Q							TP1 TP2 TP3
Ground Level							
Description	Legend	water Level	Depth	Reduced Level	Samples	Insitu Tests	Remarks
TOPSOIL			0m 0.15				
FILL, Brick, concrete gravel soil					D		
			0.80				
TP1			1m				
TOPSOIL, stones			0m 0.20		D		
FILL Brick, concrete, soil, ash metal, wire rope					D		
			0.80				
TP2			3m				
TOPSOIL			0m 0.15				
FILL Brick rubble concrete soil, gravel.					D		
TP3			0.90m				
			1m				

KEY:-

D	Disturbed sample
B	Bulk sample
W	Water sample
U	U100 Undisturbed

INSITU TESTS :-

Shear strength in K Pa

P	Penetrometer
V	Vane test

Project Title : WOODVILLE CENTRE HAM							Project No.:
TRIAL PIT RESULTS							Pit No. & Location
Date : 20 - 08 - 2024 Engineer : M.K.Q							TP4 TP5 TP6
Ground Level							
Description	Legend	water Level	Depth	Reduced Level	Samples	Insitu Tests	Remarks
TOPSOIL, concrete debris			0m 0.25		D		
FILL Concrete, brick, soil ash							
			0.90				
			1m				
TP4							
TOPSOIL			0m 0.20		D		
FILL Brick, soil, ash concrete, trace ACM							Band of clay at 0.50m
			0.90				
TP5			1m				
TOPSOIL			0m 0.15		D		
FILL Brick, stone concrete glass, bed springs, soil					D		Trace Marley tile
TP6			0.90				
			1m				

KEY:-

D	Disturbed sample
B	Bulk sample
W	Water sample
U	U100 Undisturbed

INSITU TESTS :-

Shear strength in K Pa

P	Penetrometer
V	Vane test

Project Title : WOODVILLE CENTRE HAM							Project No.:
TRIAL PIT RESULTS							Pit No. & Location
Date : 20 - 08 - 2024 Engineer : MK.R							TP 7 TP 8 TP 9
Ground Level							
Description	Legend	water Level	Depth	Reduced Level	Samples	Insitu Tests	Remarks
TOPSOIL			0m 0.15m				
FILL Brick, paving slab, stone					D		
soil							
Sand			0.70				
			0.80				
TP 7			1m				
TOPSOIL			0m 0.15 to 0.20				
FILL Brick, concrete, gravel,					D		
soil, cast iron pipe			0.60				
TP 8							
			3m				
TOPSOIL			0m 0.15		D		
FILL, Brick, concrete, clinker,							
soil, flint, rebar							
TP 9			0.90				
			1.5m				

KEY :-

D	Disturbed sample
B	Bulk sample
W	Water sample
U	U100 Undisturbed

INSITU TESTS :-

Shear strength in K Pa

P	Penetrometer
V	Vane test

Project Title : WOODVILLE CENTRE HAM							Project No.:
TRIAL PIT RESULTS							Pit No. & Location
Date : 20 - 08 - 2024 Engineer : M.K.Q							TP 10 TP 11 TP 12
Ground Level							
Description	Legend	water Level	Depth	Reduced Level	Samples	insitu Tests	Remarks
TOPSOIL			0m 0.15				
FILL Concrete, brick, soil metal, glass fibre, copper wire, clinker					P		
			0.90				
TP 10			1m				
TOPSOIL			0m 0.26				
Brick, mortar gravel							
FILL Dark brown clay, gravel			0.56				
Sand and gravel			0.85 1.00		P		
			3m				
TP 11							
TOPSOIL			0m 0.25		D		
FILL Concrete brick clinker soil, chalk							
TP 12			0.80				
			1m				

KEY:-

D	Disturbed sample
B	Bulk sample
W	Water sample
U	U100 Undisturbed

INSITU TESTS :-

Shear strength in K Pa

P	Penetrometer
V	Vane test

Project Title : WOODVILLE CENTRE HAM							Project No.:
TRIAL PIT RESULTS							Pit No. & Location
Date : 20 - 08 - 2024 Engineer : MKQ							TP 13 TP 14
Ground Level							
Description	Legend	water Level	Depth	Reduced Level	Samples	Insitu Tests	Remarks
TOPSOIL			0m to 0.20m		D		
FILL Concrete tile brick glass, cinder gravel, slate, metal							
			0.80				
TP 13			1m				
TOPSOIL			0m 0.20				
FILL Concrete, brick, soil chalk, slate					D		
			0.70				
TP 14			3m				
			4m				
			5m				

KEY :-

D	Disturbed sample
B	Bulk sample
W	Water sample
U	U100 Undisturbed

INSITU TESTS :-

Shear strength in K Pa

P	Penetrometer
V	Vane test

Project Title : WOODVILLE CENTRE HAM							Project No.:
TRIAL PIT RESULTS							Pit No. & Location
Date : 20-08-2024 Engineer : JJH.							HTP1 HTP2 HTP3
Ground Level							
Description	Legend	water Level	Depth	Reduced Level	Samples	Insitu Tests	Remarks
FILL, Topsoil, light brown sandy silty clay			0m		D		Borehole obstructed by brick/concrete
			0.25				
Obstruction							
HTP1							
			1m				
TOPSOIL, light brown sandy clay			0m 0.125				Large roots.
FILL, soil gravel clinker glass			0.30		D		Borehole obstructed by brick
Obstruction							
HTP2							
			3m				
FILL, Topsoil light brown silty sandy clay			0m				Roots to 30mm ϕ
			0.30		D		Borehole obstructed by concrete / brick.
Obstruction							
			1m				

KEY:-

D	Disturbed sample
B	Bulk sample
W	Water sample
U	U100 Undisturbed

INSITU TESTS :-

Shear strength in K Pa	
P	Penetrometer
V	Vane test

APPENDIX C

Contamination Assays

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

Certificate of Analysis

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	24-55435
Issue:	1
Date of Issue:	03/09/2024
Contact:	Keith Elson
Customer Details:	Hemsley Consulting Ltd Park Farm Unit 9 Wivelsfield Green West SussexRH17 7RU
Quotation No:	Q24-04321
Order No:	Not Supplied
Customer Reference:	Not Supplied
Date Received:	23/08/2024
Date Approved:	03/09/2024
Details:	Woodville Centre, Ham, TW10 7QW
Approved by:	

Ben Rees, Customer Services Assistant

ELAB

Sample Summary

Report No.: 24-55435, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
369973	TP1 0.30	20/08/2024	23/08/2024	Sandy silty loam	
369974	TP2 0.20	20/08/2024	23/08/2024	Silty loam	
369975	TP2 0.50	20/08/2024	23/08/2024	Sandy silty loam	
369976	TP3 0.30	20/08/2024	23/08/2024	Silty loam	
369977	TP4 0.10	20/08/2024	23/08/2024	Silty loam	
369978	TP5 0.20	20/08/2024	23/08/2024	Silty loam	
369979	TP6 0.15	20/08/2024	23/08/2024	Silty loam	
369980	TP6 0.50	20/08/2024	23/08/2024	Silty loam	
369981	TP7 0.30	20/08/2024	23/08/2024	Silty loam	
369982	TP8 0.40	20/08/2024	23/08/2024	Silty loam	
369983	TP9 0.15	20/08/2024	23/08/2024	Silty loam	
369984	TP10 0.30	20/08/2024	23/08/2024	Silty loam	
369985	TP11 0.80	20/08/2024	23/08/2024	Silty clayey loam	
369986	TP12 0.20	20/08/2024	23/08/2024	Silty loam	
369987	TP13 0.25	20/08/2024	23/08/2024	Silty loam	
369988	TP14 0.45	20/08/2024	23/08/2024	Silty loam	
369989	HTP1 0.25	20/08/2024	23/08/2024	Silty loam	
369990	HTP2 0.30	20/08/2024	23/08/2024	Silty loam	
369991	HTP3 0.30	20/08/2024	23/08/2024	Silty loam	

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Results Summary

Report No.: 24-55435, issue number 1

				ELAB Reference	369973	369974	369975	369976	369977
				Customer Reference					
				Sample ID					
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
				Sample Location	TP1	TP2	TP2	TP3	TP4
				Sample Depth (m)	0.30	0.20	0.50	0.30	0.10
				Sampling Date	20/08/2024	20/08/2024	20/08/2024	20/08/2024	20/08/2024
Determinand	**Codes**	**Units**	**LOD**						
Soil sample preparation parameters									
Moisture Content	N	%	0.1		7.5	4.8	4.7	5.4	4.0
Material removed	N	%	0.1		3.9	3.6	1.8	4.7	6.7
Description of Inert material removed	N		0		Stones	Stones	Stones	Stones	Stones
Metals									
Arsenic	M	mg/kg	1		18.0	17.6	46.0	19.0	13.9
Cadmium	M	mg/kg	0.5		0.9	1.5	1.2	0.7	1.8
Chromium	M	mg/kg	5		28.2	34.5	31.1	27.8	34.7
Copper	M	mg/kg	5		50.2	93.1	920	232	130
Lead	M	mg/kg	5		12200	745	555	719	484
Mercury	M	mg/kg	0.5		< 0.5	0.7	< 0.5	0.6	0.9
Nickel	M	mg/kg	5		16.6	24.9	180	35.3	22.1
Selenium	M	mg/kg	1		< 1.0	< 1.0	3.1	< 1.0	< 1.0
Zinc	M	mg/kg	5		1200	259	456	383	313
Inorganics									
Hexavalent Chromium	N	mg/kg	0.8		< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Water Soluble Boron	N	mg/kg	0.5		0.8	1.0	1.8	0.8	1.0
Miscellaneous									
pH	M	pH units	0.1		8.8	8.0	8.1	8.1	7.6
Polyaromatic hydrocarbons									
Naphthalene	N	mg/kg	0.5		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	N	mg/kg	0.5		1.3	< 0.5	< 0.5	1.4	< 0.5
Acenaphthene	N	mg/kg	0.5		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	N	mg/kg	0.5		1.0	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	N	mg/kg	0.5		17.5	0.9	< 0.5	3.4	< 0.5
Anthracene	N	mg/kg	0.5		3.7	< 0.5	< 0.5	1.7	< 0.5
Fluoranthene	N	mg/kg	0.5		24.8	1.9	< 0.5	10.7	0.5
Pyrene	N	mg/kg	0.5		18.6	1.6	< 0.5	9.2	< 0.5
Benzo(a)anthracene	N	mg/kg	0.5		10.8	1.3	< 0.5	9.2	< 0.5
Chrysene	N	mg/kg	0.5		11.6	1.3	< 0.5	8.6	< 0.5
Benzo(b)fluoranthene	N	mg/kg	0.5		9.0	0.9	< 0.5	7.3	0.5
Benzo(k)fluoranthene	N	mg/kg	0.5		9.2	1.1	< 0.5	8.0	0.5
Benzo(a)pyrene	N	mg/kg	0.5		11.5	1.1	< 0.5	9.3	< 0.5
Indeno(1,2,3-cd)pyrene	N	mg/kg	0.5		6.1	0.5	< 0.5	5.3	< 0.5
Dibenzo(a,h)anthracene	N	mg/kg	0.5		0.6	< 0.5	< 0.5	< 0.5	< 0.5
Benzo[g,h,i]perylene	N	mg/kg	0.5		5.8	0.6	< 0.5	4.9	< 0.5
Total PAH(16)	N	mg/kg	2		132	12.4	2.6	80.3	4.0

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Results Summary

Report No.: 24-55435, issue number 1

			ELAB Reference	369978	369979	369980	369981	369982
			Customer Reference					
			Sample ID					
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP5	TP6	TP6	TP7	TP8
			Sample Depth (m)	0.20	0.15	0.50	0.30	0.40
			Sampling Date	20/08/2024	20/08/2024	20/08/2024	20/08/2024	20/08/2024
Determinand	**Codes**	**Units**	**LOD**					
Soil sample preparation parameters								
Moisture Content	N	%	0.1	4.5	4.5	9.0	3.9	5.4
Material removed	N	%	0.1	1.0	3.6	0.8	0.8	2.8
Description of Inert material removed	N		0	Stones	Stones	Stones	Stones	Stones
Metals								
Arsenic	M	mg/kg	1	21.7	19.4	19.0	19.7	16.7
Cadmium	M	mg/kg	0.5	1.2	2.5	1.1	< 0.5	1.2
Chromium	M	mg/kg	5	28.8	30.0	29.7	22.9	33.3
Copper	M	mg/kg	5	157	255	118	68.4	200
Lead	M	mg/kg	5	977	1010	2670	521	808
Mercury	M	mg/kg	0.5	1.5	4.1	1.5	0.9	1.6
Nickel	M	mg/kg	5	29.6	26.2	29.0	20.3	25.8
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc	M	mg/kg	5	568	528	733	235	489
Inorganics								
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Water Soluble Boron	N	mg/kg	0.5	0.9	1.0	0.7	< 0.5	0.7
Miscellaneous								
pH	M	pH units	0.1	8.7	7.9	9.3	8.3	8.5
Polyaromatic hydrocarbons								
Naphthalene	N	mg/kg	0.5	1.4	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	N	mg/kg	0.5	1.1	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthene	N	mg/kg	0.5	1.7	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	N	mg/kg	0.5	2.1	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	N	mg/kg	0.5	28.8	0.5	2.2	< 0.5	0.7
Anthracene	N	mg/kg	0.5	8.8	< 0.5	0.6	< 0.5	< 0.5
Fluoranthene	N	mg/kg	0.5	54.5	1.4	4.5	1.6	2.4
Pyrene	N	mg/kg	0.5	50.8	1.1	3.7	1.4	2.0
Benzo(a)anthracene	N	mg/kg	0.5	35.2	0.8	2.4	1.1	1.5
Chrysene	N	mg/kg	0.5	35.6	0.9	2.5	1.2	1.4
Benzo(b)fluoranthene	N	mg/kg	0.5	34.1	0.9	2.3	1.3	1.4
Benzo(k)fluoranthene	N	mg/kg	0.5	29.6	1.0	2.3	1.2	1.6
Benzo(a)pyrene	N	mg/kg	0.5	42.4	1.3	2.5	1.3	1.6
Indeno(1,2,3-cd)pyrene	N	mg/kg	0.5	28.6	0.9	1.6	0.8	1.0
Dibenzo(a,h)anthracene	N	mg/kg	0.5	6.4	< 0.5	< 0.5	< 0.5	< 0.5
Benzo[g,h,i]perylene	N	mg/kg	0.5	28.9	1.0	1.5	0.9	1.0
Total PAH(16)	N	mg/kg	2	390	10.4	27.2	12.2	15.5

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Results Summary

Report No.: 24-55435, issue number 1

	ELAB Reference	369983	369984	369985	369986	369987
	Customer Reference					
	Sample ID					
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
	Sample Location	TP9	TP10	TP11	TP12	TP13
	Sample Depth (m)	0.15	0.30	0.80	0.20	0.25
	Sampling Date	20/08/2024	20/08/2024	20/08/2024	20/08/2024	20/08/2024
Determinand	**Codes** / **Units** / **LOD**					
Soil sample preparation parameters						
Moisture Content	N % 0.1	5.3	4.7	22.7	5.1	5.5
Material removed	N % 0.1	3.0	11.1	< 0.1	4.0	7.0
Description of Inert material removed	N 0	Stones	Stones	None	Stones	Stones
Metals						
Arsenic	M mg/kg 1	17.4	42.1	20.0	29.3	42.1
Cadmium	M mg/kg 0.5	1.3	1.0	< 0.5	1.6	1.2
Chromium	M mg/kg 5	31.1	27.1	34.1	35.0	30.9
Copper	M mg/kg 5	394	134	90.5	287	134
Lead	M mg/kg 5	569	715	354	894	2220
Mercury	M mg/kg 0.5	1.0	0.9	0.7	1.3	1.3
Nickel	M mg/kg 5	34.1	29.2	39.7	43.7	37.5
Selenium	M mg/kg 1	< 1.0	1.9	< 1.0	< 1.0	< 1.0
Zinc	M mg/kg 5	555	489	170	772	618
Inorganics						
Hexavalent Chromium	N mg/kg 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Water Soluble Boron	N mg/kg 0.5	0.8	0.9	1.3	1.1	0.6
Miscellaneous						
pH	M pH units 0.1	8.4	7.9	8.1	7.8	8.7
Polyaromatic hydrocarbons						
Naphthalene	N mg/kg 0.5	< 0.5	5.0	< 0.5	< 0.5	< 0.5
Acenaphthylene	N mg/kg 0.5	1.4	4.4	< 0.5	< 0.5	< 0.5
Acenaphthene	N mg/kg 0.5	< 0.5	1.2	< 0.5	< 0.5	< 0.5
Fluorene	N mg/kg 0.5	0.6	3.8	< 0.5	< 0.5	< 0.5
Phenanthrene	N mg/kg 0.5	11.8	44.8	< 0.5	1.4	1.4
Anthracene	N mg/kg 0.5	4.5	16.0	< 0.5	0.5	< 0.5
Fluoranthene	N mg/kg 0.5	33.3	60.5	0.6	3.0	3.5
Pyrene	N mg/kg 0.5	26.8	46.9	0.5	2.6	2.7
Benzo(a)anthracene	N mg/kg 0.5	17.7	31.6	< 0.5	2.1	2.3
Chrysene	N mg/kg 0.5	17.7	31.3	< 0.5	2.1	2.4
Benzo(b)fluoranthene	N mg/kg 0.5	14.2	20.0	< 0.5	1.7	2.2
Benzo(k)fluoranthene	N mg/kg 0.5	15.1	21.0	< 0.5	1.9	2.2
Benzo(a)pyrene	N mg/kg 0.5	18.6	27.2	0.6	1.8	2.4
Indeno(1,2,3-cd)pyrene	N mg/kg 0.5	10.0	12.8	< 0.5	1.1	1.5
Dibenzo(a,h)anthracene	N mg/kg 0.5	0.9	1.3	< 0.5	< 0.5	< 0.5
Benzo[g,h,i]perylene	N mg/kg 0.5	9.3	11.7	< 0.5	1.1	1.5
Total PAH(16)	N mg/kg 2	183	340	4.6	20.2	23.8

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Results Summary

Report No.: 24-55435, issue number 1

			ELAB Reference	369988	369989	369990	369991
			Customer Reference				
			Sample ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP14	HTP1	HTP2	HTP3
			Sample Depth (m)	0.45	0.25	0.30	0.30
			Sampling Date	20/08/2024	20/08/2024	20/08/2024	20/08/2024
Determinand	**Codes**	**Units**	**LOD**				
Soil sample preparation parameters							
Moisture Content	N	%	0.1	7.5	5.0	2.6	3.8
Material removed	N	%	0.1	2.8	2.4	3.8	4.2
Description of Inert material removed	N		0	Stones	Stones	Stones	Stones
Metals							
Arsenic	M	mg/kg	1	24.8	21.9	14.8	17.3
Cadmium	M	mg/kg	0.5	1.5	1.8	1.4	2.3
Chromium	M	mg/kg	5	25.7	41.1	31.3	52.2
Copper	M	mg/kg	5	312	156	131	123
Lead	M	mg/kg	5	4110	2870	442	389
Mercury	M	mg/kg	0.5	7.2	1.7	0.8	1.2
Nickel	M	mg/kg	5	23.5	35.5	48.0	38.4
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
Zinc	M	mg/kg	5	1150	463	350	258
Inorganics							
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	< 0.8	< 0.8
Water Soluble Boron	N	mg/kg	0.5	0.6	1.0	1.1	0.9
Miscellaneous							
pH	M	pH units	0.1	8.5	7.9	7.9	7.9
Polyaromatic hydrocarbons							
Naphthalene	N	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	N	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthene	N	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	N	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	N	mg/kg	0.5	1.6	0.6	1.2	1.2
Anthracene	N	mg/kg	0.5	0.5	< 0.5	< 0.5	0.7
Fluoranthene	N	mg/kg	0.5	3.3	1.7	2.4	3.3
Pyrene	N	mg/kg	0.5	2.8	1.3	2.0	2.8
Benzo(a)anthracene	N	mg/kg	0.5	2.1	1.2	1.7	2.1
Chrysene	N	mg/kg	0.5	2.1	1.2	1.7	2.3
Benzo(b)fluoranthene	N	mg/kg	0.5	1.7	1.1	1.5	2.1
Benzo(k)fluoranthene	N	mg/kg	0.5	1.8	1.4	1.7	2.2
Benzo(a)pyrene	N	mg/kg	0.5	2.1	1.2	1.7	2.4
Indeno(1,2,3-cd)pyrene	N	mg/kg	0.5	1.2	0.8	1.2	1.3
Dibenzo(a,h)anthracene	N	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Benzo[g,h,i]perylene	N	mg/kg	0.5	1.3	0.9	1.3	1.3
Total PAH(16)	N	mg/kg	2	21.4	12.5	18.2	22.8

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 24-55435, issue number 1

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

In accordance with procedures, a 1kg soil sample should be analysed. For amounts less than this caution should be used when analysing the data as sample size is smaller than the recommended amount, therefore samples could be deemed as not being representative of the materials present on site.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)
369974	0.20	TP2	Brown Soil, Stones	No asbestos detected	n/t	n/t	n/t
369980	0.50	TP6	Brown Sandy Soil, Stones, Root	No asbestos detected	n/t	n/t	n/t
369984	0.30	TP10	Brown Sandy Soil, Tar, Stones, Clinker	Chrysotile, Amosite, Crocidolite (Millboard)	n/t	n/t	n/t
369990	0.30	HTP2	Brown Sandy Soil, Stones,	No asbestos detected	n/t	n/t	n/t

Total Asbestos (%)	F/mm2 (I)
n/t	n/t
n/t	n/t
n/t	n/t
n/t	n/t

Method Summary

Report No.: 24-55435, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	28/08/2024	110	Colorimetry
pH	M	Air dried sample	28/08/2024	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	28/08/2024	300	ICPMS
PAH (GC-FID)	N	As submitted sample	28/08/2024	133	GC-FID
Water soluble boron	N	Air dried sample	28/08/2024	202	Colorimetry
Asbestos identification	U	Air dried sample	28/08/2024	281	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 24-55435, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.

Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.

ELAB are unable to provide an interpretation or opinion on the content of this report.

The results relate only to the sample received.

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

End of Report