



CONTAMINATION REMEDIATION STATEMENT

FOR

**HALIFAX ROAD
THURGOLAND**

ON BEHALF OF

ARNCLIFFE HOMES LTD

ARP GEOTECHNICAL LTD

CHARTERED CONSULTING ENGINEERS

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CLIENT: ARNCLIFFE HOMES LTD

JOB NUMBER: ACF/31

PROJECT: HALIFAX ROAD, THURGOLAND

REPORT TYPE: CONTAMINATION REMEDIATION STATEMENT

REPORT REFERENCE: ACF/31rem1

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ISSUE	DATE	STATUS
1	12 TH JULY 2019	V1 FINAL

1.0 Introduction

- 1.1 This document has been prepared to provide information for the Client and other interested parties, such as the Regulatory Authorities, outlining how contamination encountered on the site will be managed to ensure that the site is environmentally suitable for the intended residential use. The document should be agreed, prior to implementation, with the relevant Regulatory Authorities, usually the local Planning Authority and NHBC or other building control provider.

2.0 The Site

- 2.1 The ARP Geotechnical Ltd Stage 2 Geo-environmental Report, dated July 2019 under reference ACF/31r1, makes an assessment of contamination, along with other aspects.
- 2.2 The conceptual site model is for a residential development, including private gardens.
- 2.3 The site currently comprises two fields which are separated by a farm track. The northern field has had previous development in the west where buildings and hardstanding were present. The floor slab and foundations appeared to have been left in-situ, with the remaining structure demolished and removed off site. The southern field is undeveloped grassland. The site is bounded to the north, west and south by residential buildings and roads. Agricultural fields lie to the east of the site.
- 2.4 The geological maps show the site to be underlain by sandstone of the Penistone Flags and Undifferentiated Strata (mudstone, siltstone and sandstone) of the Pennine Lower Coal Measures Formation. A geological boundary runs through the site, with the Pennine Lower Coal Measures Formation in the southern part of the site. There are no faults shown to affect the site.
- 2.5 The site is indicated to be stable with regard to coal mining, with no further investigation of coal mining aspects required.
- 2.6 The strata beneath the site are classed as a Secondary A Aquifer. There are no sensitive groundwater abstractions within 1km of the site. The nearest downslope surface water is an unnamed tertiary stream 130m to the south. There are no sensitive surface water abstractions within 1km of the site.
- 2.7 No Radon Protection Measures are required for the proposed properties on the site. There are no historical landfills within 250m of the site. No gas protection measures are required.
- 2.8 Ordnance Survey archive maps show the southern field to be undeveloped since at least 1855. Thurgoland Farm is shown to be present in the northern field since at least 1960. Continuous residential development of the surrounding area has occurred since 1855.
- 2.9 All trial pits (except TP11 and TP12) revealed a cover of topsoil approximately 0.3m thick. TP11 and TP12 revealed a hardstanding layer of concrete and bitmac, approximately 0.3m

and 0.35m thick respectively. Made ground was encountered in TP7 below the topsoil, and comprised gravel of brick, with a high cobble content of whole bricks, to a depth of 0.7m. Beneath the made ground/topsoil, clays were present in the southern field, which graded to a gravel beneath, and in the northern field, gravelly clays and cobbles of sandstone were present, onto sandstone bedrock, with the rock being present from depths of between 0.7m and 1.3m.

- 2.10 The contamination testing revealed the topsoil in TP4 to contain elevated lead and the topsoil in TP13 to contain elevated benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(ah)anthracene, at maximum concentrations of 506mg/kg, 8.98mg/kg, 6.75mg/kg and 1.08mg/kg respectively.

3.0 Remediation Strategy

- 3.1 Based on current results, the topsoil at/around TP4, which contains elevated lead, can be used in Public Open Space (POS) areas, or taken off site. The approximate extent (based on assuming the affected material continues up to the nearest uncontaminated trial pit), is indicated on the attached plan.
- 3.2 The topsoil at/around TP13 should not be used on POS, as some PAH concentrations were above screening values for POS. The affected material will need to be taken off site. The approximate extent (based on assuming the affected material continues up to the nearest uncontaminated trial pit), is indicated on the attached plan.
- 3.3 Further grid sampling of topsoil at/around TP4, and testing for lead only, may be beneficial in identifying the extent of the affected topsoil. It is also possible that the suggested further testing (particularly at/around TP13) could reveal the original exceedances to be as a result of the presence of an atypical fragment within the sub sample taken at the laboratory, and removal may not be necessary. However, from experience of similar situations on other sites, this outcome is unusual.

4.0 Validation

- 4.1 To satisfy the Regulatory Authorities, verification that the above measures have been successfully implemented needs to be independently confirmed, in accordance with the guidance supplied in the document produced by the Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG): "Guidance on the Verification Requirements for Cover Systems". The measures described below will be required to ensure compliance with the document.
- 4.2 Following removal of the contaminated topsoils off site, then the surface will need to be inspected by an Engineer to confirm its removal. Sampling and testing of the underlying surface is not considered necessary, as the material is clearly identifiable from the underlying made ground or natural subsoil. The area will be photographed and all the details included within a Validation Letter Report. The disposal/transfer documents should be retained for inclusion in the Validation Report.

- 4.3 If the topsoil at/around TP4 is to be re-used on POS, confirmation will be required that the affected topsoil does not find its way onto private gardens. This can be achieved by verifying the movement of the material to form quarantined stockpiles on the POS areas, with the stockpiles then fenced off to prevent inadvertent use elsewhere. The stockpiles will either remain in situ until the latter stages of development, or used to complete the POS areas at an early stage. However, once placed, the area should be turfed as soon as possible, and trafficking by vehicles minimised until the turf is placed, to prevent cross contamination. The locations of the formed stockpiles should be recorded and photographed, and, if the material is spread, this should also be recorded.

5.0 Imported Soils

- 5.1 For any imported soils, the source will need to be confirmed, and the material tested for the attached suite of contaminants, to comply with the maximum screening values listed. The frequency of testing is given on the table below.

Material Type	Number of Samples
Topsoil or subsoil from greenfield site	Minimum 3No. or 1 per 250m ³ (whichever is greater)
Topsoil or subsoil from brownfield site	Minimum 6No. or 1 per 100m ³ (whichever is greater)

- 5.2 The material should be placed in quarantined stockpiles and once a stockpile has been approved by the Engineer, no further material should be added to the stockpile, and any further import should be stockpiled separately. Any cross contamination of materials should be avoided, and further testing carried out where any cross contamination is suspected to have occurred.
- 5.3 If space is insufficient on the site to store quarantined stockpiles, topsoil/subsoil can be placed directly into the appropriate gardens/landscape areas, but samples of each material would need to be tested by means of validation trial pits on the basis of one per four plots.
- 5.4 The results of all the laboratory analysis, excavation logs, plans, photographs, and import documents will form part of the Remediation Validation Report.
- 5.5 In order to enable the scheme to progress and sales of properties to continue throughout the construction of the development, interim Validation Reports may be prepared for specific plots, if required, showing how the contamination has been dealt with. This will enable enquiries during the sales of the properties to be satisfied. On completion of the development, the discharge of any associated planning condition may be achieved by submission of all the interim validation letters, or issuing the information as a single combined Validation Report.

6.0 Unexpected Contamination

- 6.1 Any unexpected contamination uncovered during the works shall be inspected, sampled and analysed in laboratory for the suite of determinands appended to this Remediation Statement, and compared to the maximum concentration levels listed on the enclosure. Works on the affected materials shall cease until the appraisal is complete and, if necessary, a revised Remediation Statement is to be prepared and approved by the Planning Authority before work is recommenced.



ARP GEOTECHNICAL LIMITED
SOIL CONTAMINANT SCREENING VALUES
RESIDENTIAL WITH HOME-GROWN PRODUCE

Determinand	S4UL (mg/kg)			C4SL (mg/kg)		
Arsenic	37			37		
Cadmium	11			22		
Chromium (trivalent)	910					
Chromium (hexavalent)	6			21		
Copper	2400					
Lead				200		
Inorganic Mercury	40					
Nickel	180					
Selenium	250					
Zinc	3700					
Acidity (pH)	*Should be Greater Than 5			*Should be Greater Than 5		
	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM
Naphthalene	2.3	5.6	13			
Acenaphthylene	170	420	920			
Acenaphthene	210	510	1,100			
Fluorene	170	400	860			
Phenanthrene	95	220	440			
Anthracene	2,400	5,400	11,000			
Fluoranthene	280	560	890			
Pyrene	620	1,200	2,000			
Benzo(a)anthracene	7.2	11	13			
Chrysene	15	22	27			
Benzo(b)fluoranthene	2.6	3.3	3.7			
Benzo(k)fluoranthene	77	93	100			
Benzo(a)pyrene	2.2	2.7	3			5
Indeno(1,2,3-cd)pyrene	27	36	41			
Dibenzo(a,h)anthracene [CLEA]	0.77	0.87	0.91			
Benzo(g,h,i)perylene	320	340	350			
Phenols	120	200	380			
Total TPH	*Above 500, speciate and compare with values below:					
C5 to C6 Aliphatic	42	78	160			
C6 to C8 Aliphatic	100	230	530			
C8 to C10 Aliphatic	27	65	150			
C10 to C12 Aliphatic	130	330	760			
C12 to C16 Aliphatic	1100	2,400	4,300			
C16 to C35 Aliphatic	65,000	92,000	110,000			
C35 TO C44 Aliphatic	65,000	92,000	110,000			
C5 to C7 Aromatic (Benzene)	70	140	300			
C7 to C8 Aromatic (Toluene)	130	290	660			
C8 to C10 Aromatic	34	83	190			
C10 to C12 Aromatic	74	180	380			
C12 to C16 Aromatic	140	330	660			
C16 to C21 Aromatic	260	540	930			
C21 TO C35 Aromatic	1100	1,500	1,700			
C35 TO C44 Aromatic	1100	1,500	1,700			
Asbestos	*Should be None Detected			*Should be None Detected		

* In House Value/Approach S4UL = Suitable 4 Use Level, CIEH/LQM 2014 C4SL = Cat 4 Screening Level, DEFRA, 2014

[CLEA] Assessment criteria derived using the CLEA tool (version 1.071) based on standard conceptual models that underpin soil guideline values

Blank cell indicates no published value or in-house value. Some values presented are above saturation limits.

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ARP GEOTECHNICAL LIMITED
SOIL CONTAMINANT SCREENING VALUES
PUBLIC OPEN SPACE NEAR RESIDENTIAL

Determinand	S4UL (mg/kg)			C4SL (mg/kg)		
Arsenic	79			79		
Cadmium	120			220		
Chromium (trivalent)	1500					
Chromium (hexavalent)	7.7			21		
Lead				630		
Inorganic Mercury	120					
Selenium	1100					
Copper	12000					
Nickel	230					
Zinc	81000					
Acidity (pH)	*Should be Greater Than 5					
	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM
Acenaphthene	15000	15000	15000			
Acenaphthylene	15000	15000	15000			
Anthracene	74000	74000	74000			
Benzo(a)anthracene	29	29	29			
Benzo(a)pyrene	5.7	5.7	5.7			10
Benzo(b)fluoranthene	7.1	7.2	7.2			
Benzo(g,h,i)perylene	640	640	640			
Benzo(k)fluoranthene	190	190	190			
Chrysene	57	57	57			
Dibenzo(a,h)anthracene	0.57	0.57	0.57			
Fluoranthene	3100	3100	3100			
Fluorene	9900	9900	9900			
Indeno(1,2,3-cd)pyrene	82	82	82			
Naphthalene	4900	4900	4900			
Phenanthrene	3100	3100	3100			
Pyrene	7400	7400	7400			
Phenols	440	690	1300			
Total TPH	*Above 3,800, speciate and compare with values below:					
C5 to C6 Aliphatic	570000	590000	600000			
C6 to C8 Aliphatic	600000	610000	620000			
C8 to C10 Aliphatic	13000	13000	13000			
C10 to C12 Aliphatic	13000	13000	13000			
C12 to C16 Aliphatic	13000	13000	13000			
C16 to C35 Aliphatic	250000	250000	250000			
C35 TO C44 Aliphatic	250000	250000	250000			
C5 to C7 Aromatic (Benzene)	56000	56000	56000			
C7 to C8 Aromatic (Toluene)	56000	56000	56000			
C8 to C10 Aromatic	5000	5000	5000			
C10 to C12 Aromatic	5000	5000	5000			
C12 to C16 Aromatic	5100	5100	5000			
C16 to C21 Aromatic	3800	3800	3800			
C21 TO C35 Aromatic	3800	3800	3800			
C35 TO C44 Aromatic	3800	3800	3800			
Asbestos	*Should be None Detected			*Should be None Detected		

* In House Value/Approach S4UL = Suitable 4 Use Level, CIEH/LQM 2014 C4SL = Cat 4 Screening Level, DEFRA, 2014

Blank cell indicates no published value or in-house value. Some values presented are above saturation limits.

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ARP GEOTECHNICAL LTD
Chartered Consulting Engineers

CONTROLLED WATERS SCREENING VALUES

Determinand	Screening Value for Potable Use * (µg/l)		Screening Value for Environment # (µg/l)	
Arsenic	10		50	
Aluminium			200	
Boron	1000		2000	
Cadmium	5		0.08-0.25	
Chromium (total)	50		4.7	
Copper	2000		1-28	
Iron	200		1000 (pH >7)	
Lead	10		7.2	
Mercury	1		0.05	
Nickel	20		20	
Selenium	10		-	
Zinc	5000		8-125	
Chloride	250,000		250,000	
Nitrate	50,000		-	
Sulphate	250,000		400,000	
pH	6.5-10		6-9	
Anthracene	-		0.1	
Benzo(a)pyrene	0.01		0.05	
Benzo(b)fluoranthene	Sum (4) <0.1		Sum (2) <0.03	
Benzo(k)fluoranthene				
Benzo(g,h,i)perylene			Sum (2) <0.002	
Indeno(1,2,3-c,d)pyrene				
Fluoranthene	-		0.1	
Naphthalene	-		2.4	
Phenols	0.5 (BWR)		7.7	
Benzene	1		10	
Toluene	700 (WHO)		50	
Ethylbenzene	300 (WHO)		-	
Xylene	30 (WHO)		30	
Total TPH	-		200 (SWAD)	
Suspended Solids (mg/l)	-		25 (WFD)	
Dissolved Oxygen (mg/l)	-		7 (WFD)	
Biological Oxygen Demand (mg/l)	High 4 (WFD UKTAG)	Good 5 (WFD UKTAG)	Moderate 6.5 (WFD UKTAG)	Poor 9 (WFD UKTAG)
Methylene Blue Activated Substances (mg/l)			>/=0.3	
Total Coliforms (cfu/100ml)	0 (EUCD)		500/10000 (BWD)	
Faecal Coliforms (cfu/100ml)	0 (EUCD)		100/2000 (BWD)	
E. Coli (cfu/250ml)	0 (EUCD)			
Enterococci (cfu/250ml)	0 (EUCD)			

March 2018

Sources, unless indicated otherwise above:

* = UK Drinking Water Standards (DWS).

= Environmental Quality Standards (EQS), hardness dependent where range shown.

WHO = World Health Organisation Drinking Water.

BWR = Bathing Water (Classification) Regulations 1991.

SWAD = Surface Water (Abstraction for Drinking Water) (Classification) Regulations 1996.

EPF = EU Standard for the Protection of Fisheries (Freshwater) (Water Framework Directive, [2000/60/EC]).

BWD = European Commission Bathing Water Directive (2006/7/EC) (STANDARD: Guideline /Mandatory).

EUCD = European Union Council Directive 98/83/SE on quality of water for human consumption.

WFD UKTAG = Water Framework Directive United Kingdom Technical Advisory Group (Nov. 2013, updated Jan. 2014)



Worst case extent of topsoil at/around TP13 with elevated PAHs. Take off site



Worst case extent of topsoil at/around TP4 with elevated lead. Take off site or use on POS

NOTE: Further sampling and testing may allow reductions of the affected areas.

Key



0m 30m

Approximate Scale

1 Proposed Site Plan



HALIFAX RD THURGOLAND
SCHEDULE OF UNITS

B1 BURCH (165) = 2
MB MULBERRY (882) = 6
WN WENTWORTH (1425) = 4
BD BRIDDALE (1148) = 3
L LINTON (1139) = 10

TOTAL 25 UNITS



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Project

HALIFAX ROAD,
THURGOLAND

Client

ARNcliffe HOMES LTD

Title

REMEDICATION PLAN

Date

JULY 2019

Drawn

AH

Scale

AS SHOWN

Job No.

ACF/31