



Contaminated Land Phase Two Intrusive Investigation for Proposed Residential Development at, Land adjacent 6 Bentley Lane, Bury, BL9 6RZ.

Prepared for

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October 2021



Summary

This report consists of a phase two intrusive investigation and proposed remediation plan for a proposed residential development on land adjacent 6 Bentley Lane, Bury, BL9 6RZ.

Following a desk study report undertaken to satisfy condition 4 of the approved planning permission a Phase II investigation has been undertaken.

The Phase I desk Study report undertaken by enviro solutions, ref: CL101, identified a potential risk of contamination on site and as such recommended an intrusive investigation of the site.

The intrusive investigations undertaken has identified some elevated levels of Lead on site. As such further remedial works are required as detailed in the report.

A proposed remediation plan has been presented.



Contents

Summary	2
Introduction	4
The Site:	4
Current Site use:	4
The Investigation.....	5
Assessment of Risk.....	6
Contaminated Soil.....	6
Contaminated Groundwater (Building Services)	6
Ground Gas	6
Proposed Remediation	7
Contaminated Soil – High Lead results	7
Potential Ground gas	7
Revised Conceptual Model	8
Conclusion.....	8
Figure 1 – Aerial Photograph	9
Figure 2 – Proposed Site Plan and Sampling Locations	10
Appendix 1 – Intrusive Investigation Soil Sampling Results.....	11
Appendix 2 – Trail Hole Records	13



Introduction

Martin Environmental Solutions has been commissioned, to carry out a phase two intrusive investigation on land adjacent 6 Bentley Lane, Bury, BL9 6RZ. This report details the work undertaken the results of the investigation.

The Site:

Site Address: Land adjacent 6 Bentley Lane, Bury, BL9 6RZ.

Grid reference: 380962; 414167

An aerial photograph of the site is included in Figure 1.

Current Site use:

The site currently consists of the garden area to 6 Bentley Lane, and consists of 0.05ha, previous the existing terrace housing continued over the site, this was demolished on site in 1987. To the rear, south of the site the area is currently being redeveloped into a large housing estate, the ground here slopes downhill away from the site has been an agricultural field while further south an industrial complex did exist. To the east are the existing residential terrace properties along Bentley Lane. To the north on the opposite side of the road, garden areas and to the west another residential property.



The Investigation

The Phase I Desk Study report identified a moderate risk of contamination existing on site from “contaminated soil”, “contaminated groundwater” (affecting building services) and “Ground Gas/Vapours”.

An intrusive investigation was planned consisting of three trail pits across the proposed garden areas. Due to access issues and a wasps nest only two sample locations were possible on the day. Figure 2 details these locations at either end of the site.

The intrusive investigation was undertaken on the 2nd August 2021. The weather at the time of the sampling was warm and dry. Samples were taken from each location and sent to i2 Analytical UK Ltd, and UKAS & Mcerts accredited Laboratory for analysis.

Samples were taken at an approx. depth of 300mm and 600mm below ground level (bgl). Trail hole 1 was extended to a depth of approx. 1300mm to undertake a surface water percolation test at the time, no ground water was identified.

Samples were tested for:

- Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Petroleum Hydrocarbons
- Asbestos

The full results are contained within Appendix 1, with photographs and trail hole details in Appendix 2. No unusual odours or discolouration were identified at the time of the investigation.

The surface of the site consists of a mixture of flower beds and concrete/stone pathways, below which a thick root system was encountered. The soil was a brown loamy soil with some grit. A few larger pebbles were found in the soil.



Assessment of Risk

Contaminated Soil

The results from the samples were compared to the soil assessment criteria for Residential with home grown produce (6% organic matter) obtained from *The LQM/CIEH S4ULs Human Health Risk Assessment*:

No asbestos was identified in any of the samples

No elevated levels of Total Petroleum Hydrocarbons or Polyaromatic Hydrocarbons were identified in any of the samples.

Slight elevated levels of lead were identified in all samples, with a higher concentration in TP1 at 300mm.

Contaminated Groundwater (Building Services)

The site slopes south away from the road to the north and trial holes were located towards the southern boundary. Excavations went down to 1300mm bgl as part of the surface water percolation tests and no ground water was identified.

It is therefore considered unlikely that any groundwater will impact upon building services, and based on the general lack of identified contamination within the soil no further measures are considered necessary.

Ground Gas

Due to the size and of the area, constraints in accessing the site with suitable equipment and the time constraints ground gas monitoring has not been undertaken.

The soil sampling has identified high organic matter within the soil with a potential to generate ground gas.

The site to the south currently being redeveloped from industrial to residential did identify some local hotspots of ground gas.



Proposed Remediation

Contaminated Soil – High Lead results

Due to the presence of high lead levels within the soil it is recommended that a clean cover system consisting of a total depth of 600mm be placed within any garden landscaped area. The impacted soils should be excavated to a depth of 600mm below garden formation level and replaced with 450mm of inert, clean (non-waste), granular subsoil and an upper layer of 150mm topsoil to act as a growing medium.

Testing of the soil undertaken to confirm its suitability will be required and depending on its source should be tested at a minimum rate of:

Source	Sampling Rate
Greenfield	1:200m ³
Brownfield	1:50m ³

Sampling analysis may be undertaken by the supplier of the material.

A verification report will be required to verify the depth of the imported material across the site.

Potential Ground gas

It is recommended that a gas protective membrane is included within the construction of the properties to prevent the migration of any gases into the proposed dwellings.



Revised Conceptual Model

Source	Pathway	Receptor	Risk	Proposed Remediation
High Lead levels in soil	Ingestion	Future Site users, construction workers	Medium	Provide 600mm capping layer to garden areas.
Contaminated groundwater	Direct contact,	Buildings / Services	Low – No ground water encounter down to 1300mm bgl	N/A
Ground gas	Inhalation, ingress into buildings	Future site users	Medium	Ground gas protection membrane

Conclusion

As a result of the intrusive investigation undertaken elevated levels of lead have been identified which poses a potential risk to future site users.

Remediation measures in the form of a clean cover layer of 600mm depth within the garden amenity areas has been recommended.

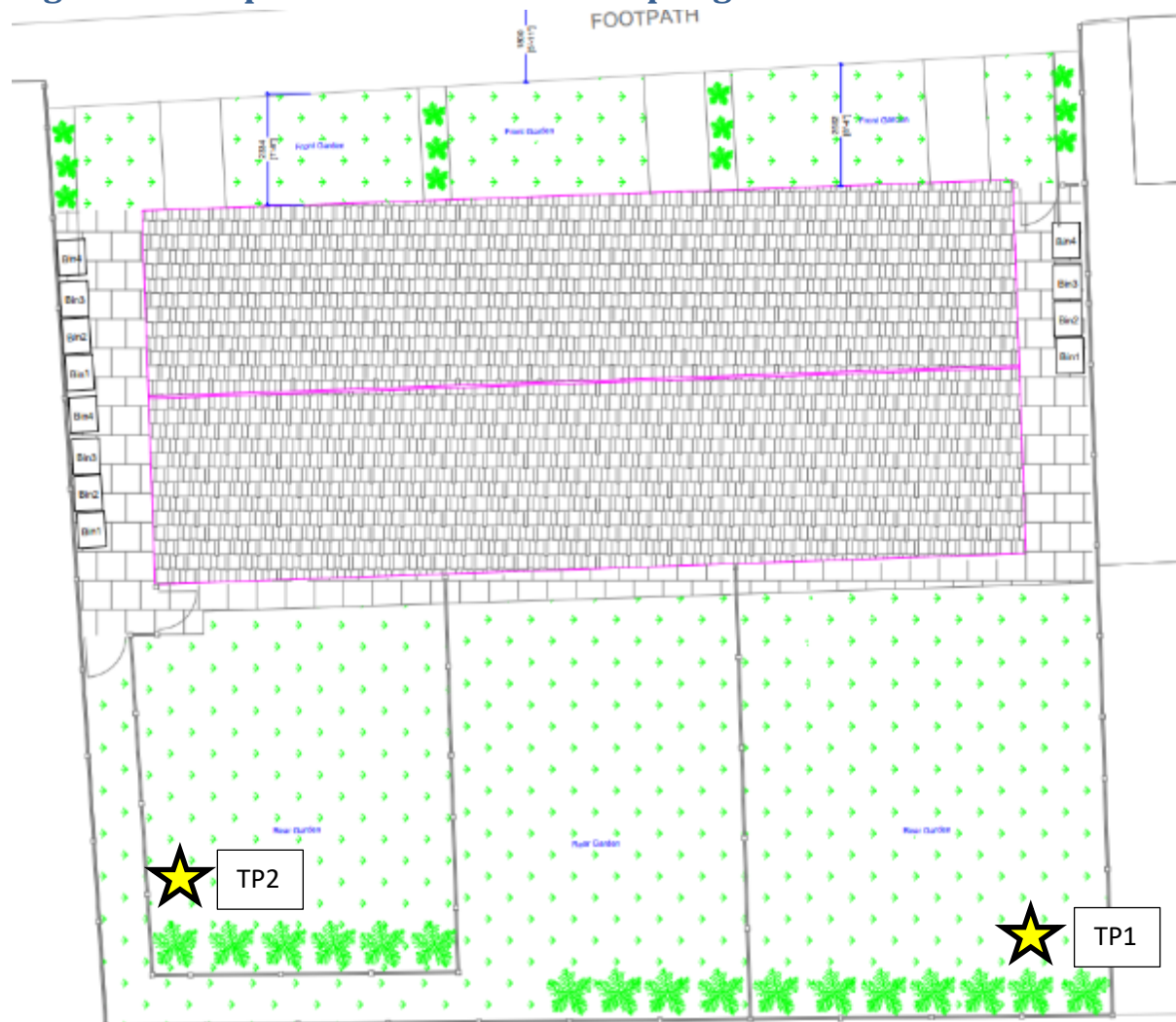
Additionally, it is recommended that a gas protection membrane is installed within the dwellings to prevent any potential ground gas from entering the properties.

The above remediation works will ensure that the Source-Pathway-Receptor pollutant linkages are broken and the site is safe for the intended future use.

Figure 1 – Aerial Photograph



Figure 2 – Proposed Site Plan and Sampling Locations



Appendix 1 – Intrusive Investigation Soil Sampling Results

Anal+A1:A48ytical Report Number: 21-91115								
Project / Site name: Bentley Lane								
Lab Sample Number					1962819	1962820	1962821	1962822
Sample Reference					TP1a	TP1b	TP3a	TP3b
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)					0.30	0.60	0.30	0.60
Date Sampled					02/08/2021	02/08/2021	02/08/2021	02/08/2021
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	Criterion				
Stone Content	%	0.1	NONE		< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE		20	12	13	12
Total mass of sample received	kg	0.001	NONE		1.0	1.0	1.0	1.0
Asbestos in Soil	Type	N/A	ISO 17025	None	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
Organic Matter (automated)	%	0.1	MCERTS		9.9	7.2	-	5.3
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	440	< 0.05	< 0.05	0.36	0.29
Acenaphthylene	mg/kg	0.05	MCERTS	920	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	1100	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	860	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	440	1.6	0.47	0.80	0.53
Anthracene	mg/kg	0.05	MCERTS	11000	0.44	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	890	3.1	0.98	1.3	1.0
Pyrene	mg/kg	0.05	MCERTS	2000	3.0	1.1	1.5	1.2
Benzo(a)anthracene	mg/kg	0.05	MCERTS	13	1.9	0.66	1.0	0.73
Chrysene	mg/kg	0.05	MCERTS	27	2.0	0.71	1.1	0.80
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.7	2.2	0.77	1.1	0.97
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	100	0.72	0.32	0.85	0.73
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3	2.0	0.75	1.3	0.99
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	41	0.91	0.36	0.63	0.55
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.3	0.28	< 0.05	0.15	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	350	1.1	0.50	0.74	0.77
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS		19.3	6.64	10.7	8.57
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	37	32	27	43	27
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	11	1.9	< 0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	9910	27	20	17	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	2400	110	73	52	84
Lead (aqua regia extractable)	mg/kg	1	MCERTS	200	800	210	340	300
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	40	1.1	< 0.3	0.9	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	180	49	23	23	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	250	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	300	430	230	82	180



Petroleum Hydrocarbons								
TPH6 - Aliphatic (C6 - C8)	mg/kg	0.001	MCERTS	530	< 0.001	< 0.001	< 0.001	< 0.001
TPH6 - Aliphatic (C8 - C10)	mg/kg	0.001	MCERTS	150	< 0.001	< 0.001	< 0.001	< 0.001
TPH6 - Aliphatic (C10 - C12)	mg/kg	1	MCERTS	760	< 1.0	< 1.0	< 1.0	< 1.0
TPH6 - Aliphatic (C12 - C16)	mg/kg	2	MCERTS	4300	< 2.0	< 2.0	< 2.0	< 2.0
TPH6 - Aliphatic (C16 - C21)	mg/kg	8	MCERTS	110000	< 8.0	< 8.0	< 8.0	< 8.0
TPH6 - Aliphatic (C21 - C35)	mg/kg	8	MCERTS	110000	< 8.0	< 8.0	< 8.0	< 8.0
TPH6 - Aliphatic (C6 - C35)	mg/kg	10	NONE		< 10	< 10	< 10	< 10
TPH6 - Aromatic (C6 - C8)	mg/kg	0.001	NONE		< 0.001	< 0.001	< 0.001	< 0.001
TPH6 - Aromatic (C8 - C10)	mg/kg	0.001	MCERTS	190	< 0.001	< 0.001	< 0.001	< 0.001
TPH6 - Aromatic (C10 - C12)	mg/kg	1	MCERTS	380	< 1.0	< 1.0	< 1.0	< 1.0
TPH6 - Aromatic (C12 - C16)	mg/kg	2	MCERTS	660	4.4	< 2.0	< 2.0	< 2.0
TPH6 - Aromatic (C16 - C21)	mg/kg	10	MCERTS	930	< 10	< 10	< 10	< 10
TPH6 - Aromatic (C21 - C35)	mg/kg	10	MCERTS	1700	24	15	21	18
TPH6 - Aromatic (C6 - C35)	mg/kg	10	NONE		29	15	21	18

Appendix 2 – Trail Hole Records

Trail Pit 1a – South East 330mm bgl



Trail pit 1 Log

0.00-0.05m	- concrete flag path, carpet
0.05-0.31m	- roots, brown loam soil, small stones and grit
0.31-0.60m	- (less) roots, brown loam soil, small stones and grit
0.60-1.3m	- Brown loam soil, some stone

Trail pit 1B – 600mm bgl





Trail pit 1 – excavation to 1.3m



Trail Hole 2 southwest – 2a 300mm bgl



Trail hole 2b – 600mm

