



**Castledine
Environmental**

LAND CONTAMINATION SURVEYS

Phase 2 Land Contamination Risk Assessment

for

Proposed Demolition of Existing Dwelling and Outbuildings and Erection of a Replacement Dwelling and Detached Garage

on the site of

**Little Moat, Newbold Road,
Kirkby Mallory, Leicester
LE9 7QG**

Date: February 2023

Status:

Final Report

Reference:

3424D P2 Hall – Kirkby Mallory

Date:

09/02/2023

Executive Summary

Laboratory analysis has identified a single exceedance of the Lead GAC of 200mg/kg by a reading of 263mg/kg at the location of WS04 at 01.10m depth.

No further exceedances of metals, metalloids nor PAH's nor TPH CWG have been identified nor has elevated phenol nor the presence of asbestos been detected.

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** to **MODERATE** level of risk with respect to the proposed development.

It is recommended that the source of the lead contamination (ménage material) be removed offsite and the area remediated by way of replacement with certified clean materials. Delineation sampling may reduce the amount of material to be removed offsite.

Ground gas monitoring is ongoing and a ground gas addendum will be produced following completion of the monitoring regime.

This report should be submitted to your Local Planning Authority for agreement to allow the Phase 3 Remediation Strategy and Verification Plan to be written.

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1.0 QUALITY ASSURANCE

Castledine Environmental can confirm that all reasonable efforts have been made to ensure that the information outlined within this report is accurate.

Castledine Environmental would further confirm that due care, attention and technical skill were used in the creation of this report.

For and on behalf of Castledine Environmental.

Kevin Castledine

(Director)

2.0 LIMITATIONS

The conclusions and recommendations made in this report are limited to those based on the findings of the investigation. Where comments are made based on information obtained from third parties, Castledine Environmental assumes that all third-party information is true and correct. No independent action has been undertaken to validate the findings of third parties. The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at the time.

This survey has not included asbestos within existing structures, invasive plant species, geotechnical considerations or any elements unconnected with potential ground contamination at the site. If required, such surveys should be undertaken by suitably accredited organisations.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

3.0 INTRODUCTION

Castledine Environmental have been appointed by Mr. T. J. Hall to undertake a Phase 2 investigation of a site at Little Moat (No.12 Newbold Road), Newbold Road, Kirkby Mallory, Leicestershire LE9 7QG.

A Phase 1 report was carried out by Castledine Environmental:

- Phase 1 Land Contamination Risk Assessment for site at Newbold Road, Kirkby Mallory, Leicestershire. Produced by Castledine Environmental in August of 2022 and referenced: 3338D

The report is attached as Appendix A

4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Mr. T. J. Hall and appointees for the purpose of ensuring compliance with:

- Paragraph(s) 174, 179, 183 & 184 of the National Planning Policy Framework 2021
- part C1 of the building regulations.
- Condition No.5 of the Hinckley and Bosworth planning approval reference 18/00914/FUL

5. No development shall commence on the foundations of the dwelling hereby approved until a scheme for the investigation of any potential land contamination on the site has first been submitted to and agreed in writing by the local planning authority which shall include details of how any contamination shall be dealt with and a period of implementation. The approved scheme shall be implemented in accordance with the agreed details and any remediation works so approved shall be carried out in accordance with the agreed implementation period prior to any works commencing on the foundations.

Reason: To ensure that risks from land contamination to future users of the site are minimised thus ensuring that the land is fit for purpose and to accord with Policy DM7 of the SADMP.

This report should be read in conjunction with the reports listed in section 3.0

This report may not be used or relied upon by any unauthorised third party, or for any other proposed use than that specified above, without the explicit written agreement of Castledine Environmental.

The report consists of a risk assessment in accordance with BS10175:2011+A2:2017, CLR11 “Model Procedures for the Management of Land Contamination” and LCRM “Land Contamination Risk Management”.

The objectives of the report are:-

- To assess historical activities at the site with respect to their potential impact on the site environment.
- To characterise the environmental setting of the site, identify migration pathways and vulnerable receptors for contamination originating at the site, focusing on potential soil and groundwater liabilities.
- To assess historical and current surrounding land use in relation to known or potential off site contamination issues that may impact on the subject site and
- To develop a preliminary conceptual site model (CSM).

5.0 SITE DESCRIPTION

The site is located in Kirkby Mallory, Leicestershire at National Grid Reference: 445349,301639 and is approximately 0.51ha in area.

The site is rectangular in shape and is orientated north east to south west and connected to Newbold Road to the west via a connecting access spur. The site is located in a predominantly rural area and is directly bounded by a small, fielded area with an associated dwelling and grounds beyond to the north, field beyond a hedgerow to the east, further field south and west with Newbold Road to the west and a small lake beyond this.

The site interior comprises an open plot of largely unoccupied land, save for a single, centrally located former stables. A tarmac and gravel access track leads east off Newbold Road to the main site area, terminating an expanse of gravels. Also noted here was a large heap of timber and cut vegetation. A stables were seen to be located centrally on site and orientated slightly north east to south west and constructed of timber with tiled roofing and concrete flooring. The stables possessed a central unit which appeared to be a former refrigeration unit, with traditional stabling to either side of this. To the north east of the stables lies a concrete base, likely associated with equestrian purposes; and east of the main site area a large, vegetated mound was noted. The remainder of site is occupied by grassed and gravelled areas, with a sandy area located in the north west of site and extending west offsite, which resembled a former ménage. The remaining ground conditions comprised mixed natural and anthropogenic gravels in low lying vegetation.

The evident areas of demolition on site and areas of road chippings as gravel-access routes or parking are considered potential sources of contamination. Topographically, the site is level.

Photographs of the site can be found as Appendix D of the previous report for the site.

6.0 FINDINGS IN PREVIOUS REPORT

The previous report for the site found that the site currently comprises an open plot of land that is largely unoccupied, save for a redundant stables and a concrete base. The site ground conditions comprise both anthropogenic and natural gravels, including some igneous road planings and what appears to be demolition rubbles. Historically, the site remained unoccupied from circa.1885 through until circa.1958 when a dwelling was located in the north western extent of site. Following this, the site is developed with outbuildings and a barn by circa.1959 to 2003, after which the site buildings were demolished, leaving only the stables. The various developments and demolitions of buildings on site, along with the noted ground conditions and onsite and nearby heaps are considered potential

sources of soil contamination. Additionally, the report found potentially significant sources of ground gas generation in proximity to site, including a number of large moats or ponds located approximately 85-90m north (present from circa.1959 to circa.1980 and 2001); and a historical, unlicensed landfill located 149m south west of site and accepting inert, industrial and liquid sludge wastes (in effect from circa.1951-74). As the site is located in a predominantly high permeability superficial geological formation and the moats and potentially the historical landfill are likely to be relatively shallow and located within superficial deposits, these features are considered potential sources of ground gas. Furthermore, the age since infill of the moats or ponds would indicate that - should these features be producing hazardous ground gases - the generational peak has likely not been passed at this stage. As such, the previous report for the recommended that further investigation was planned and carried out on site.

7.0 CHEMICAL ASSESSMENT CRITERIA

On establishing the presence of pollutant linkages, it is then necessary to assess whether or not any of the linkages are significant, whereby significant harm is being caused or there is significant possibility of significant harm being caused to human health or the environment. In the absence of any evidence of 'significant harm', the risks will be assessed on the basis of a 'significant possibility of significant harm' being caused. In order to initially assess the risks, appropriate Tier 1 assessment criteria are derived which represent benchmark contamination concentrations with respect to relevant receptors. Concentrations recorded in excess of these levels **may** represent a significant risk to a specific receptor when considered as part of a pollutant linkage.

7.1 HUMAN HEALTH

The Environment Agency, through its Contaminated Land Exposure Assessment (CLEA) framework, published toxicological reports (TOX) and soil guideline values (SGVs).

SGVs are science-based generic assessment criteria that indicate human health risks from long-term exposure to soil contaminants. They are set at levels where there are 'no appreciable' or 'minimal' risks to human health. For each substance, different SGVs are applicable according to land use, for example, whether residential, allotment or commercial. They have been widely seen as over precautionary and offering councils a very weak indication of whether sites represent a "significant possibility of significant harm" (SPOSH) requiring determination under the contaminated land regime.

Following publication of the revised Part IIa Statutory Guidance DEFRA has commissioned the creation of Category 4 Screening levels (C4SL's). They are set at levels where there is a "Low" risk to Human Health (i.e. higher than that of SGV's but still sufficiently low to defiantly not be "Contaminated Land" as defined by section 78A of the Environmental Protection Act 1990 as amended). The C4SL's are calculated using the CLEA model using less conservative exposure and toxicological assumptions than the SGV's. C4SL's have also been calculated for Open Space land use. LQM in association with the CIEH have produced S4UL's are reproduced with permission; Publication Number S4UL3693

The pathways considered for the standard land uses include:

- Ingestion of soils;
- Ingestion of household dust;
- Ingestion of contaminated vegetables (residential with plant uptake only);
- Ingestion of soil attached to vegetables (residential with plant uptake only);
- Dermal contact with soils;
- Dermal contact with household dust;
- Inhalation of fugitive dusts from soils;
- Inhalation of fugitive household dust;
- Inhalation of vapours in outdoor air; and
- Inhalation of vapours in buildings.

These exposure routes have been evaluated independently of one another to identify the most sensitive exposure route. The SSV adopted for a given land use scenario is the most stringent screening value of all those relevant to the site.

The current proposals are to redevelop the site for a residential use with gardens. It is considered appropriate to compare the chemical testing results to those SGVs/SSVs with the appropriate 'residential with plant uptake' settings. Selected Tier 1 Human Health Assessment Criteria Values are detailed in the following table.

8.0 SITE WORKS AND FINDINGS

8.1 FIELDWORK DATED 24/01/2023

Castledine Environmental attended site on the 24th of January 2023 with the intention of carrying out an Intrusive Phase 2 Site Investigation with environmental sampling, borehole formation and gas monitoring installations formed, to facilitate an integrated ground gas monitoring regime. To achieve this, a total of 5 No. dynamic window sampler boreholes (designated WS01 to WS05) were formed across the site. Three of the boreholes were located so as to intercept any potential ground gas migration from the offsite landfill to the south west of site (WS01 and WS02) and the offsite, infilled ponds / moats to the north east of site (WS04) to the proposed onsite dwelling. The boreholes were formed to depths of 1.50m, 2.00m, 1.70m, 4.00m and 0.90m, respectively. Additionally, a hand-excavated inspection pit (designated HP01) was formed in the south east of site – adjacent to a heap – to a depth of 0.40m. Due to the gravelly, occasionally cobbly nature of the ground conditions on site, drilling refusal was encountered at various locations and at various depths (for instance a blow count of above 50 leading to drilling refusal on a granite cobble at WS05 at 0.85m depth). Environmental samples were then taken from each locality and separate, distinct stratum. Following this, a total of 3 No. ground gas monitoring standpipes were installed within WS01, WS02 and WS04.

8.2 GROUND CONDITIONS ENCOUNTERED

The ground conditions on site can be broadly summarised as made ground of varying depths and compositions overlying natural deposits consisting largely of gravel deposits held in very sandy, clayey matrices.

8.2.1 MADE GROUND

Made ground was encountered at surface level at WS01, WS02, WS03 to depths of 0.30m, 0.50m and 0.45m, respectively. The materials here comprised dark brown, clayey, sandy Gravels consisting of igneous road planings / spoil (used for access-forming purposes on site), brick fragments and quartzite, sandstone and mixed natural lithologies (also noted elsewhere and at depth on site). Additional glass and plastic was noted at WS02. At WS04 a Sand Made Ground was noted from surface level to a depth of 0.20m and consisting of coarse sands and plastic fragments, used to form a ménage for equestrian purposes. Beneath this to a depth of 0.40m, further similar sandy made ground deposits were noted, however with no plastic fragments noted and this is likely the subbase for the ménage itself.

8.2.2 TOPSOIL / MADE GROUND

The remaining made ground deposits onsite were encountered at WS05 and HP01 and comprised subrounded to rounded, fine to coarse gravels of mixed natural lithologies held in a very sandy, clayey matrix. The materials were logged as Topsoil / Made ground due to the lack of clear anthropogenic materials and at WS05 were located atop deposits considered to be reworked natural deposits, with drilling refusing on a granite cobble at 0.85m depth.

8.2.3 REWORKED NATURAL DEPOSITS

At WS05 beneath Topsoil / Made Ground deposits a light brown, very sandy, slightly clayey, subrounded to rounded, fine to coarse Gravel of mixed natural lithologies was noted to a depth of 0.90m. Whilst these deposits resembled those encountered elsewhere on site, the material was logged as reworked natural deposits due to drilling refusal on an intact, non-local granite cobble at 0.85m depth – indicating a potential reworking of the materials here.

8.2.4 NATURAL DEPOSITS

Natural deposits were encountered at all 5 No. WS locations and at the single HP location. The deposits were broadly similar across the site and largely comprised subrounded to rounded, fine to coarse gravels of mixed natural lithologies held in variations of a very sandy to very clayey matrix. Additional lenses of gravelly sand were also noted at WS02, WS03 and WS04 with a lens of gravelly Clay noted at WS03. Due to the high natural gravel and occasional cobble content of the natural deposits, drilling was difficult and drilling refusal (blow counts of 50) was encountered at all WS locations at various depths. The shallowest refusal was noted at WS05 at 0.90m on a sandstone cobble and the greatest depth was achieved at WS04, with the drilling refusing in a gravel layer at 4.00m depth. The natural deposits encountered during the site works tally well with the known superficial geology in the area (Glaciofluvial Deposits - mostly coarse-grained sediments such as sands and gravels with some finer-grained layers such as clays and silts with possible lenses of silt, clay or organic material). The underlying bedrock deposits (Gunthorpe Mudstone Member) is not considered to have been encountered during the drilling works. Superficial deposits in the local area are likely to be of significant depth, due to the known history of gravel extraction in the local area.

8.3 SAMPLE RESULTS

Sample results have been compared with generic screening criteria (GAC). Sample results are attached as Appendix E.

Metals and Semi Metals - Residential with Plant Uptake (1% SOM):

Determinant	Units	Accreditation	S4UL	Highest Value	Location of Highest value	Exceedance? Y/N
Arsenic	(mg/kg)	MCERTS	37	18	WS01 0.60m	N
Cadmium	(mg/kg)	MCERTS	11	0.3	WS03 0.30m	N
Chromium (total)	(mg/kg)	UKAS	910	44	WS01 0.10m	N
Copper	(mg/kg)	MCERTS	2400	1226	WS04 0.10m	N
Lead	(mg/kg)	MCERTS	200	263	WS04 0.10m	Y
Mercury	(mg/kg)	UKAS	1.2	<0.5	All	N
Nickel	(mg/kg)	MCERTS	180	19	WS01 0.60m	N
Zinc	(mg/kg)	MCERTS	3700	124	WS03 0.30m	N
Selenium	(mg/kg)	MCERTS	250	2.8	WS01 0.60m	N
Total Phenols	(mg/kg)	MCERTS	280	<0.5	All	N
Chromium (Hexavalent)	(mg/kg)	U	6	<1	All	N
pH	pH units	MCERTS	-	6.1-7.3	WS05-WS01	-
Asbestos	-	-	-	NAD	All Tested	N

Non-Metals - Residential with Plant Uptake (1% SOM):

Determinant	Units	Accreditation	S4UL	Highest Value	Location of Highest value	Exceedance? Y/N
Acenaphthene	(mg/kg)	UKAS	210	<0.02	All	N
Acenaphthylene	(mg/kg)	UKAS	170	0.03	WS01 0.10m & WS04 0.25m	N
Anthracene	(mg/kg)	MCERTS	2400	0.06	WS01 0.10m & WS04 0.25m	N
Benzo(a)anthracene	(mg/kg)	MCERTS	7.2	0.21	WS01 0.10m & WS04 0.25m	N
Benzo(a)pyrene	(mg/kg)	MCERTS	2.2	0.62	WS04 0.25m	N
Benzo(b)fluoranthene	(mg/kg)	MCERTS	2.6	0.64	WS04 0.25m	N
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	320	0.36	WS04 0.25m	N
Benzo (k) fluoranthene	(mg/kg)	MCERTS	77	0.17	WS04 0.25m	N
Chrysene	(mg/kg)	MCERTS	15	0.26	WS01 0.10m	N
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	0.24	0.11	WS04 0.25m	N
Fluoranthene	(mg/kg)	MCERTS	280	0.44	WS01 0.10m	N
Fluorene	(mg/kg)	MCERTS	170	0.03	WS01 0.10m	N
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	27	0.43	WS04 0.25m	N
Naphthalene	(mg/kg)	MCERTS	2.3	<0.02	All	N
Phenanthrene	(mg/kg)	MCERTS	95	0.35	WS01 0.10m	N
Pyrene	(mg/kg)	MCERTS	620	0.35	WS01 0.10m	N
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	NC	3.41	WS04 0.25m	-

TPH CWG – Residential with Plant Uptake (1% SOM)

Determinant	S4UL (mg/kg)	Highest Value (mg/kg)	Location of Highest value	Exceedance? Y/N
Aliphatic				
EC 5-6	42	<0.1	All	N
EC >6-8	100	<0.1	All	N
EC >8-10	27	<0.1	All	N
EC >10-12	130	<6	All	N
EC >12-16	1100	<6	All	N
EC >16-35	65000	<15	All	N
EC >35-44	65000	<10	All	N
Aromatic				
EC 5-7 (Benzene)	70	<0.01	All	N
EC >7-8 (Toluene)	130	<0.01	All	N
EC >8-10	34	<0.01	All	N
EC >10-12	74	<10	All	N
EC >12-16	140	<10	All	N
EC >16-21	260	<1	All	N
EC >21-35	1100	<1	All	N
EC >35-44	1100	<1	All	N

8.4 ANALYSIS OF RESULTS

Laboratory analysis has identified a single exceedance of the Lead GAC of 200mg/kg by a reading of 263mg/kg at the location of WS04 at 01.10m depth.

No further exceedances of metals, metalloids nor PAH's nor TPH CWG have been identified nor has elevated phenol nor the presence of asbestos been detected.

Sample results are attached as Appendix E.

TABLE 1 SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Consequence	Risk	Possible Mitigation
Contaminated Soils (<i>lead hotspot</i>)	Direct Ingestion & Direct Contact	Site Workers (<i>during site works, excavations, eating & drinking</i>)	Lw	Md	M/L	Site workers to wear appropriate PPE for health and safety reasons. Following site investigation confirmation, the considered usage of PPE and adherence to relevant HSE guidance will mitigate this risk to LOW.
Contaminated Soils (<i>lead hotspot</i>)	Inhalation of Dust, Dry Arisings	(<i>during site works, excavations, eating & drinking</i>)	Lw	Md	M/L	
Contaminated Soils (<i>lead hotspot</i>)	Plant Uptake & Direct Ingestion & Direct Contact	End Users (<i>residents, children, visitors, service personnel</i>)	Lw	Md	M/L	
Contaminated Soils (<i>lead hotspot</i>)	Inhalation of Dust	End Users (<i>residents, children, visitors, service personnel</i>)	Lw	Md	M/L	Laboratory analysis has identified a single exceedance of the Lead GAC of 200mg/kg by a reading of 263mg/kg at the location of WS04 at 01.10m depth. No further exceedances of metals, metalloids nor PAH's nor TPH CWG have been identified nor has elevated phenol nor the presence of asbestos been detected – as such, it is recommended that the source be removed offsite and remediation of the ménage area be planned and carried out (removal of present material and replacement with min.600mm of certified clean material or emplacement of hardstanding atop area).
Contaminated Soils (<i>lead hotspot</i>)	Plant Uptake & Direct Ingestion & Direct Contact	Flora and Fauna (<i>on and offsite</i>)	Lw	Md	M/L	
Contaminated Soils (<i>lead hotspot</i>)	Vertical and lateral migration	Controlled Waters (<i>Secondary A & B Aquifers, nearby ponds</i>)	UI	Md	L	
Contaminated Soils (<i>lead hotspot</i>)	Direct contact (<i>no elevated PAH nor TPH CWG contamination identified</i>)	Services (<i>pipe degradation and leaching</i>)	UI	Md	L	
Ground Gases (Methane and CO ₂) (<i>historical landfill approx.149m SW & large, backfilled ponds approx.90m N</i>)	Vertical and lateral migration (<i>high permeability superficial deposits – potential pathway</i>)	Site Workers & Excavations, End Users & Building Envelope (<i>ingress and build up</i>)	UI	Sv	M/L	Potential sources of ground gas generation identified and site is located in predominantly high superficial geology – Ground gas monitoring is ongoing and a gas addendum will be produced following completion of monitoring regime.
Volatile and Semi-volatile Organic Compounds (<i>no significant potential sources identified, investigated during site works – no presence of hydrocarbons</i>)	Vertical and lateral migration	Site Workers & Excavations, End Users & Building Envelope (<i>ingress and build up</i>)	UI	Md	L	No significant potential sources identified during report, ground conditions and potential contamination investigated as part of Phase 2 Works)
Radon	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	The site is not located in a Radon Affected Area.

KEY: Probability of pollutant linkage Hi = Highly likely, Li = Likely, Lw = Low Likelihood, UI = Unlikely
Consequence Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor,
Overall Risk VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

Based on the preliminary CSM for the site, an environmental risk assessment has been undertaken. A simple matrix can provide a consistent basis for decision making. It should be used with caution, recognising the over-simplification that it will normally represent. The probability and consequences are defined according to parameters relevant to the situation; the boundaries of risk acceptability (and tolerability, where relevant) indicated on the matrix provided in Table 2, can be tailored to the factors influencing the significance of the risk. Individual situations are mapped onto the matrix to provide a ready and consistent indication of their acceptability or tolerability.

TABLE 2 RISK CLASSIFICATION MATRIX

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High (Hi)	Very high risk	High risk	Moderate Risk	Moderate/ Low Risk
	Likely (Li)	High risk	Moderate Risk	Moderate/ Low Risk	Low Risk
	Low Likelihood (Lw)	Moderate Risk	Moderate/ Low Risk	Low Risk	Very Low Risk
	Unlikely (UI)	Moderate/ Low Risk	Low Risk	Very Low Risk	Very Low Risk

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring. The risk evaluations for each plausible pollutant linkage are given in the last three columns of Table 1.

TABLE 3 CLASSIFICATION OF RISK

Very high risk (Vh)	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk (Hi)	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer term.
Moderate risk (Md)	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk (Lw)	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk (VI)	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

9.0 REVISED ENVIRONMENTAL RISK ASSESSMENT

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** to **MODERATE** level of risk with respect to the proposed development.

It is recommended that the source of the lead contamination (ménage material) be removed offsite and the area remediated by way of replacement with certified clean materials. Delineation sampling may reduce the amount of material to be removed offsite.

Ground gas monitoring is ongoing and a ground gas addendum will be produced following completion of the monitoring regime.

This report should be submitted to your Local Planning Authority for agreement to allow the Phase 3 Remediation Strategy and Verification Plan to be written.

10.0 SUMMARY OF RISKS**10.1.1 SOIL CONTAMINATION**

Laboratory analysis has identified a single exceedance of the Lead GAC of 200mg/kg by a reading of 263mg/kg at the location of WS04 at 01.10m depth.

No further exceedances of metals, metalloids nor PAH's nor TPH CWG have been identified nor has elevated phenol nor the presence of asbestos been detected.

10.1.2 GROUND GASSES AND VAPOURS

Ground gas monitoring is ongoing and a ground gas addendum will be produced following completion of the monitoring regime.

11.0 RECOMMENDATIONS

It is recommended that the source of the lead contamination (ménage material) be removed offsite and the area remediated by way of replacement with certified clean materials.

12.0 FURTHER ENVIRONMENTAL INVESTIGATION

Delineation sampling may reduce the amount of material to be removed offsite.

13.0 REMEDIATION STRATEGY AND VERIFICATION PLAN

When this report has been agreed with your Local Planning Authority, a Phase 3 Remediation Strategy and Verification Plan would need to be produced.

14.0 REFERENCES**14.1 LEGISLATION AND REGULATIONS****14.1.1 ACTS**

- [1]. Environmental Protection Act 1990, Part IIA: inserted by Environment Act 1995, Section 57. See Environment Act 1995 for text of Part IIA.

14.1.2 PLANNING REGULATIONS

- [2]. The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI1999/No.293
- [3]. The Town and Country Planning (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2000 SI2000/No.2867

14.1.3 CONTAMINATED LAND REGULATIONS

- [4]. The Contaminated Land (England) Regulations 2000. SI2000/No.227
- [5]. The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663
- [6]. The Contaminated Land (England) Regulations 2006 SI2006/No.1380

14.2 STATUTORY GUIDANCE

- [7]. Department of Environment, Food and Rural Affairs. 2012. *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*. Department of Environment, Food and Rural Affairs
- [8]. Communities and local Government, 2012: National Planning Policy Framework.

14.3 BRITISH STANDARDS

- [9]. BS 5930:2015 Code of practice for site investigations

[10]. BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice

[11]. BS 8485:2015+A1:2019 BS 8485 - 2015 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

[12]. BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

14.4 NON STATUTORY TECHNICAL GUIDANCE

14.4.1 ENVIRONMENT AGENCY

[13]. Cassella Stranger, 2002. Model Procedures for the Management of Contaminated Land, Contaminated Land Report (CLR) 11, Department for Environment, Food, and Rural Affairs.

14.4.2 CIRIA PUBLICATIONS

[14]. Wilson, S., Oliver, S., Mallett, H., Hutchings, H., and Card, G.. 2007, *C 665 Assessing risks posed by hazardous ground gases to buildings* London: Construction Industry Research and Information Association

14.4.3 CL:AIRE

[15]. Card G, Wilson S, Mortimer S. 2012. *A Pragmatic Approach to Ground Gas Risk Assessment*. CL:AIRE Research Bulletin RB17. CL:AIRE, London, UK. ISSN 2047- 6450 (Online)

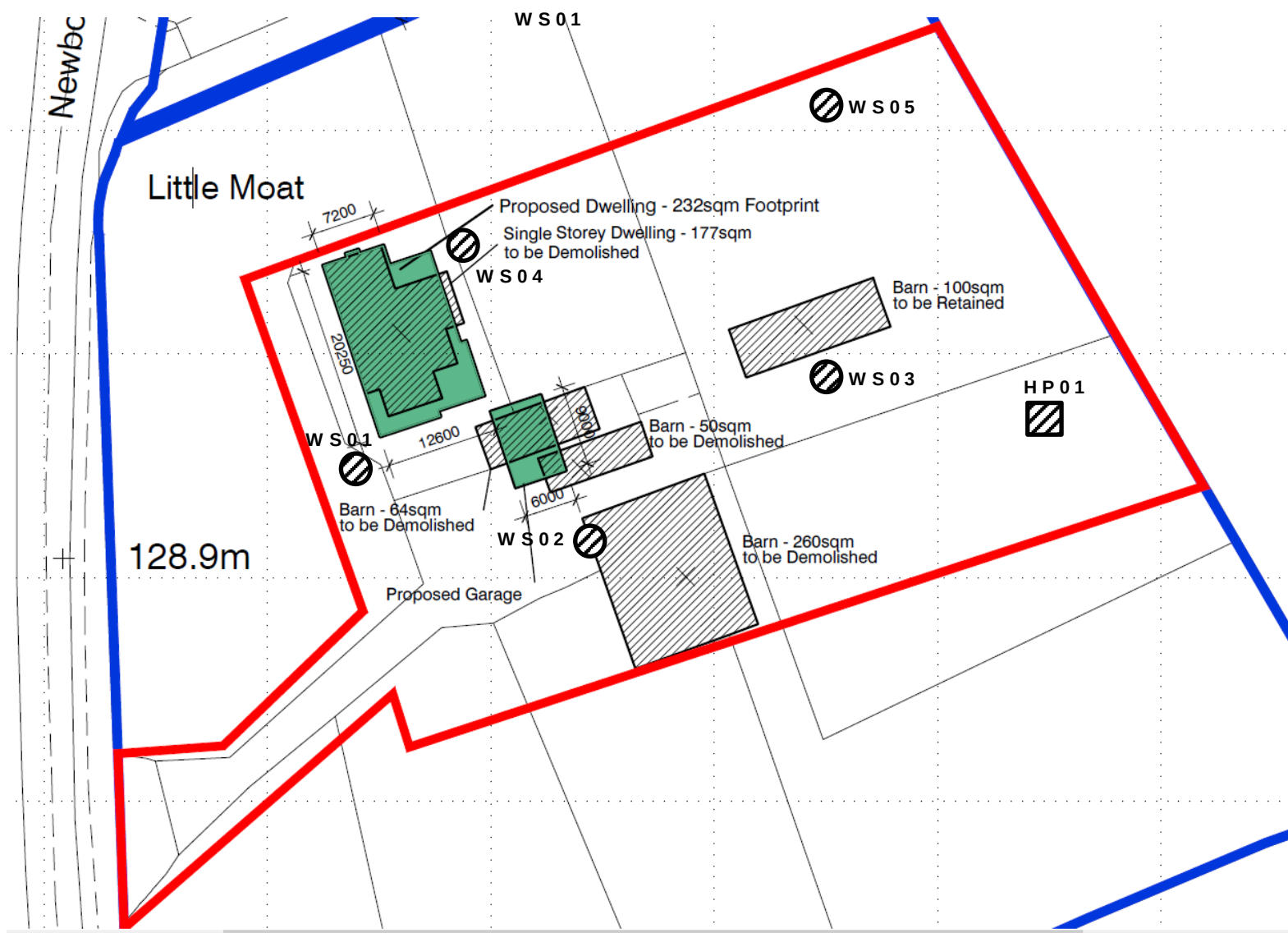
15.0 APPENDICES

APPENDIX A PHASE 1 REPORT

APPENDIX B

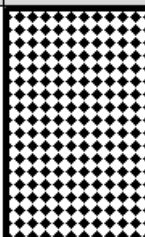
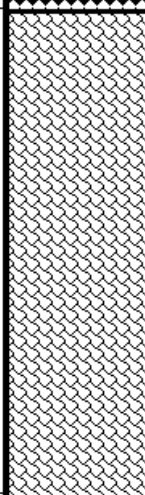
SITE PLAN

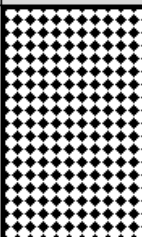
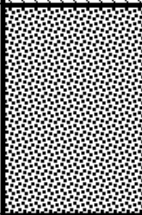
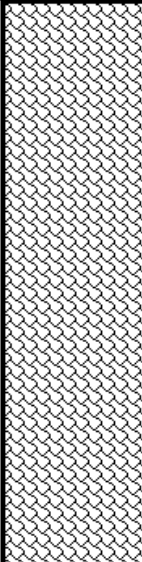
INCLUDING TRIAL PIT LOCATIONS



APPENDIX C

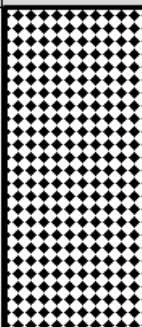
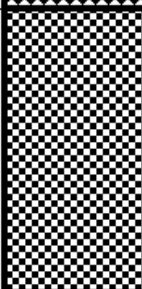
WS & HP LOGS

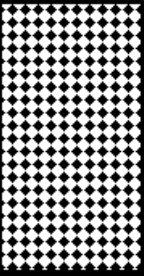
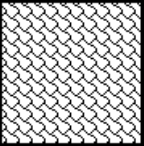
Project.		Little Moat, No.12 Newbold Rd, Kirkby Mallory		WS			
				WS01			
Client.		Mr. T. J. Hall		Date			
				24/01/2023			
Method.				Project Reference.			
Dynamic window-sampler rig				3424D			
GW	Install	Depth (m)	Description of Strata	Legend	Samples		
					Type	Depth (m)	
						From	To
No GW encountered during drilling works.		0.30	Dark brown very gravelly, clayey, sandy MADE GROUND with gravel sized fragments of subangular to subrounded, fine to coarse of igneous road planings, quartzite, brick, sandstone and rootlets.		ES01	0.10	0.15
		1.50	Light brown very sandy, slightly clayey subrounded to rounded, fine to coarse GRAVEL of mixed natural lithologies.		ES02	0.60	0.65
Blows			Key			 Castledine Environmental LAND CONTAMINATION SURVEYS	
1m:7,10,11,12,12,13			Logged By	Scale	Sheet		
1.5m:7,11,12,12,13,13			DW	Not to Scale	1 of 1		
Refusal							

Project.		Little Moat, No.12 Newbold Rd, Kirkby Mallory		WS			
				WS02			
Client.		Mr. T. J. Hall		Date			
				24/01/2023			
Method.				Project Reference.			
		Dynamic window-sampler rig		3424D			
GW	Install	Depth (m)	Description of Strata	Legend	Samples		
					Type	Depth (m)	
						From	To
No GW encountered during drilling works.		0.50	Dark brown very gravelly, very clayey, sandy MADE GROUND with gravel sized fragments of subangular to subrounded, fine to coarse of igneous road planings, quartzite, glass, brick, plastic, concrete and rootlets.		ES01	0.20	0.25
		0.60	Brown clayey, sandy angular to subrounded, fine to coarse GRAVEL of mixed natural lithologies.				
		1.00	Light brown very gravelly, slightly clayey coarse SAND gravel is subrounded to rounded, fine to medium of sandstone and mixed natural lithologies.		ES02	0.80	0.85
		2.00	Orangish brown very clayey, subrounded to rounded, fine to coarse GRAVEL of mixed natural lithologies (drilling refusal at this depth on cobble)				
Remarks			Key			 Castledine Environmental LAND CONTAMINATION SURVEYS	
2m:7,10,12,12,13,13			Logged By	Scale	Sheet		
Refusal			DW	Not to Scale	1 of 1		

Project.	Little Moat, No.12 Newbold Rd, Kirkby Mallory			WS		
				WS03		
Client.	Mr. T. J. Hall			Date		
				24/01/2023		
Method.				Project Reference.		
Dynamic window-sampler rig				3424D		
Groundwater	Depth (m)	Description of Strata	Legend	Samples		
				Type	Depth (m) From To	
No GW encountered	0.45	Dark brown very clayey, gravelly, sandy MADE GROUND with gravel sized fragments of angular to subrounded, fine to coarse of igneous road planings, sandstone, quartzite and rare brick.		ES01	0.30	0.35
	1.50	Light brown very sandy, gravelly CLAY , gravel is subrounded to rounded, fine to medium of coarse-grained sandstone and mixed natural lithologies.		ES02	0.60	0.65
	1.70	Reddish brown very gravelly coarse SAND , gravel is angular to subrounded, fine to coarse of quartzite and mixed natural lithologies.				
Remarks		Key			 Castledine Environmental LAND CONTAMINATION SURVEYS	
Refusal at 1.70m depth – blows >50		Logged By	Scale	Sheet		
		DW	Not to Scale	1 of 1		

Project.	Little Moat, No.12 Newbold Rd, Kirkby Mallory			WS				
				WS04				
Client.	Mr. T. J. Hall			Date				
				24/01/2023				
Method.				Project Reference.				
Dynamic window-sampler rig				3424D				
GW	Install	Depth (m)	Description of Strata	Legend	Samples			
					Type	Depth (m)		
						From	To	
GW encountered at 2m depth.		0.20	Light brown very sandy MADE GROUND comprised of ménage coarse sands and plastic fragments.		ES01	0.10	0.15	
		0.40	Light brown very sandy MADE GROUND comprised of ménage coarse sands.		ES02	0.25	0.30	
		1.30	Orange, brown to cream slightly clayey coarse SAND .					
		3.00	Reddish brown clayey, slightly gravelly SAND , gravel is surrounded to rounded, fine to medium of mixed natural lithologies.					
		4.00	Brown very clayey, sandy, subrounded to rounded, fine to coarse GRAVEL of mixed natural lithologies.					
Remarks			Key			 Castledine Environmental LAND CONTAMINATION SURVEYS		
1.5m P			Logged By	Scale	Sheet			
1.5m S			DW	Not to Scale	1 of 1			

Project.	Little Moat, No.12 Newbold Rd, Kirkby Mallory			WS		
				WS05		
Client.	Mr. T. J. Hall			Date		
				24/01/2023		
Method.				Project Reference.		
Dynamic window-sampler rig				3424D		
Groundwater	Depth (m)	Description of Strata	Legend	Samples		
				Type	Depth (m)	
					From	To
No GW encountered.	0.50	Dark brown very sandy, clayey, slightly gravelly TOPSOIL / MADE GROUND with gravel sized fragments of subrounded to rounded, fine to medium of mixed natural lithologies.		ES01	0.10	0.15
	0.90	Light brown very sandy, clayey, gravelly REWORKED NATURAL DEPOSITS comprising subrounded to rounded, fine to coarse gravels of mixed natural lithologies and a cobble sized granite fragment (REFUSAL)				
Remarks		Key				
Refusal at 0.90m depth on granite cobble (Blows >50)		Logged By		Scale	Sheet	
		DW		Not to Scale	1 of 1	
 Castledine Environmental LAND CONTAMINATION SURVEYS						

Project.	Little Moat, No.12 Newbold Rd, Kirkby Mallory			HP		
				HP01		
Client.	Mr. T. J. Hall			Date		
				24/01/2023		
Method.				Project Reference.		
Dynamic window-sampler rig				3424D		
Groundwater	Depth (m)	Description of Strata	Legend	Samples		
				Type	Depth (m) From To	
No GW encountered.	0.30	Dark brown very sandy, very gravelly, clayey TOPSOIL / MADE GROUND with gravel sized fragments of subrounded to rounded, fine to medium of mixed natural lithologies.		ES01	0.20	0.25
	0.40	Light brown very sandy, slightly clayey subrounded to rounded, fine to coarse and occasionally cobble GRAVEL of mixed natural lithologies.				
Remarks		Key			 Castledine Environmental LAND CONTAMINATION SURVEYS	
HP adjacent to heap		Logged By	Scale	Sheet		
		DW	Not to Scale	1 of 1		

APPENDIX D

WS & HP PHOTOGRAPHS



WS Photographs

Photo No.1: WS01 arisings located in the far west of site



Address: Newbold Rd, Kirkby Mallory

Client: Mr. T. J. Hall

Photo No.2: WS01 arisings





WS Photographs

Photo No.3: WS02 located centrally in southern extent of site



Address: Newbold Rd, Kirkby Mallory
Client: Mr. T. J. Hall

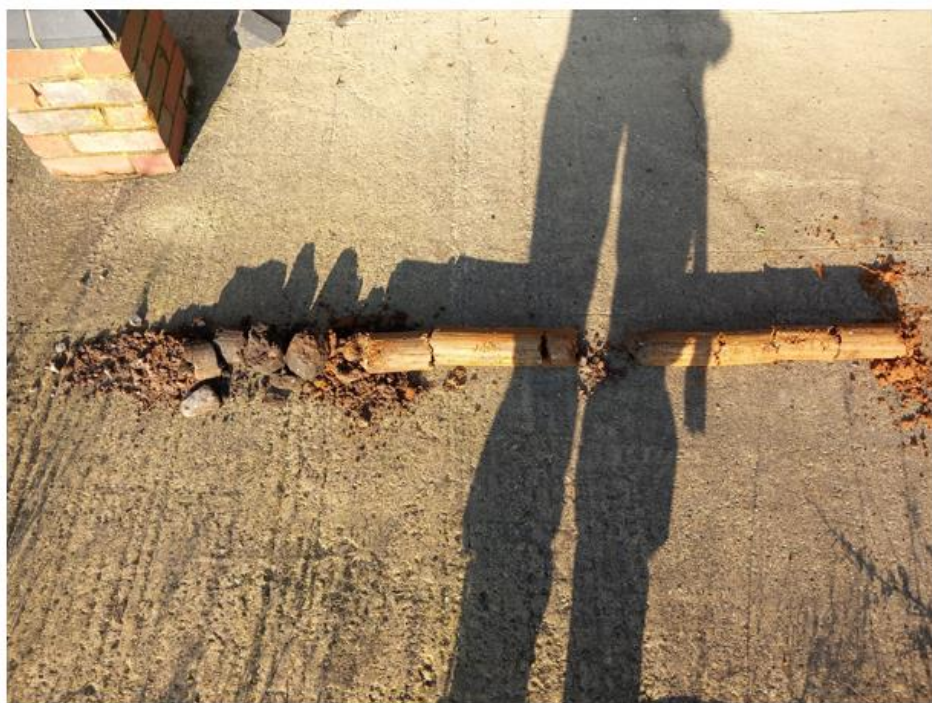
Photo No.4: WS02 arisings





WS Photographs

Photo No.5: WS03 located just south of the timber stables



Address: Newbold Rd, Kirkby Mallory

Client: Mr. T. J. Hall

Photo No.6: WS03 full run showing made ground materials (bottom of photo) leading into natural deposits (top)





WS Photographs

Address: Newbold Rd, Kirkby Mallory

Client: Mr. T. J. Hall

Photo No.7: WS04 located in the ménage area in NW of site



Photo No.8: WS04 arisings





WS Photographs

Photo No.9: WS05 located in the NE of site and showing the inspection pit (drilling refused here on sandstone cobble)



Address: Newbold Rd, Kirkby Mallory

Client: Mr. T. J. Hall

Photo No.10: Natural arisings from WS05 inspection pit





HP Photographs

Photo No.11: HP01 located in the SE of site adjacent to heap



Address: Newbold Rd, Kirkby Mallory

Client: Mr. T. J. Hall

Photo No.12: HP01 pit sides and base showing natural, mixed lithology gravels held in a sandy, clayey matrix



APPENDIX E

TEST RESULTS

- Found as separate PDF

APPENDIX F**WATCHING BRIEF**

It remains possible that previously unexpected soil conditions may be encountered during the construction process. Examples may include oily pockets within the soil, potential for asbestos containing materials, black ashy materials, soils exhibiting strong odours, brightly coloured materials, and former demolition materials.

Should previously undiscovered contamination be encountered during the demolition/construction of the new buildings the following course of action should be adhered to:

1. The ground workers should report any suspected contamination immediately to the Client's site supervisor. The supervisor should contact the Client or their appointed agent who will in turn contact Castledine Environmental to request an engineer to visit the site to assess the extent of the 'contamination'.
2. Castledine Environmental shall make records of their inspection, and pass details of these to the Local Authority.
3. Where the conditions revealed differ from those previously anticipated, the Castledine Environmental shall take samples as deemed appropriate to be dispatched for appropriate chemical testing.
4. Depending on the results of the testing either:
 - a. no further work will be required;
 - b. a further detailed risk assessment will be required; and/or
 - c. Localised specific remedial measures will be necessary.Appraisal criteria will vary depending on the nature of the assessment.
5. The results of any such testing will be sent to the Local Authority Pollution Control Section, Local Authority development control section, and the appointed building inspector. If remediation is required, the LA/Building inspector will be informed of the date and time of the proposed works.

6. Remediation will be undertaken in accordance with a method statement submitted for approval. The works shall be supervised where necessary by Castledine Environmental who shall provide a Verification Report for the Local Authorities.
7. A copy of the discovery strategy should be lodged on site and provisions made to ensure that all workers are made aware of their responsibility to observe, report and act on any potentially suspicious or contaminated materials they may encounter.

