

Site: Nut Bank Lane, Manchester
Date: December 2021
Planning Ref.: 130641/FO/2021
Subject: Additional Risk Assessment



1 Introduction

LK Consult (LKC) has been retained by R&M Developments Ltd to carry out an additional risk assessment for the development of a single dwelling at Nut Bank Lane, Manchester, M9 6BH.

The following report has been undertaken for the site:

- Desk Study & Phase 1 Preliminary Risk Assessment by MRH Geotechnical (ref: 2122-0001-DS, May 2021).

The report recommended gas monitoring given the presence of gas sources in the general area and that it would be prudent to carry out soil sampling given the proposed residential development. It should also be noted the report includes a larger area than the study site (approximately 6,200m²).

Notwithstanding the above, the planning decision notice included the following condition only:

13) When the development commences, the development shall be carried out in accordance with the previously agreed Remediation Strategy and a Completion/Verification Report shall be submitted to and approved in writing by the City Council as local planning authority.

In the event that ground contamination, groundwater contamination and/or ground gas, not previously identified, are found to be present on the site at any time before the development is occupied, then development shall cease and/or the development shall not be occupied until, a report outlining what measures, if any, are required to remediate the land (the Revised Remediation Strategy) is submitted to and approved in writing by the City Council as local planning authority and the development shall be carried out in accordance with the Revised Remediation Strategy, which shall take precedence over any Remediation Strategy or earlier Revised Remediation Strategy.

LKC clarified with Manchester City Council Environmental Protection (MCC) that the above condition is Part b) of the standard condition and Part a) requiring a site investigation was requested but not enacted by Planning. Therefore, no agreed Remediation Strategy has been provided.

Therefore, LKC considered that a further desk-based assessment of the gas sources coupled with intrusive works was required in order to carry out an assessment of potential pollutant linkages relating to gas risk to the development. This approach was broadly acceptable to MCC. In addition, it was agreed with MCC that the topsoil at the site proposed for re-use should be subject to confirmatory testing.

Details of the above risk assessments are provided in the following Sections.

2 SITE DETAILS

The development site is located to the north east of Nut Bank Lane, Manchester and centred around NGR 386427E 404461N. The site area is approximately 1,700m².

The proposed development comprises a two-storey dwelling with a detached garage, extensive driveway and a garden around to the north, west and southern elevations.

Site location and proposed development plans are provided in Appendix A.

3 SITE INSPECTION

LKC carried out an inspection of the site on 19th October 2021. At the time of the visit the topsoil had been cleared from the site and stockpiled to the south east, save for a small area on the south western site boundary.

The proposed driveway area had been capped with planings to protect the clay surface soils.

The exposed sites soil comprised a light orange brown sandy clay. Standing water was visible across the site. Photographs are shown in Plate 3-1:

	
View NW along SW site boundary.	View SW from the SE corner of the proposed dwelling. Natural strata and standing water.
	
View S from NW site boundary. Natural strata visible.	Reduced level on NW site boundary. Shows former depth of topsoil on to natural sandy clay strata. Standing water visible.

	
Topsoil stockpiled off site to the S. Pending reuse on site.	No visual evidence of anthropogenic inclusions.

During the site inspection LKC excavated 3no. trial pits (ref. TP1 to TP3) across the site. the sampling locations are provided in Appendix A and the trial pit logs are provided in Appendix B.

These encountered silty sandy clay, becoming less sandy with depth. No evidence of visual or olfactory evidence of contamination or evidence of anthropogenic inclusions was noted.

4 LKC GAS RISK ASSESSMENT

Environmental Setting

BGS mapping indicates the site is underlain by Till (Diamicton) superficial deposits and Lower Coal Measures (undifferentiated) bedrock. The site is located c. 170m north east of an Environment Agency (EA) notified landfill site known at Symond Road Landfill.

Plate 4-1 includes data from BGS WMS mapping showing the location of historical BGS boreholes and from EA WMS mapping showing the boundary of the Symond Road Landfill (purple hatching).



Plate 4-1: Site location with BGS Boreholes and EA landfill site.

A BGS borehole located c. 50m, south east of the site (SD80SE197) is described in the MRH report. This identified made ground to 1.0mbgl, silty CLAY to 1.2mbgl and granular material to >3.0mbgl.

A borehole present between the site and Symond Road Landfill (SD80SE126) encountered CLAY to 4.2mbgl (with fibrous organic material) over granular material to >8.2mbgl and CLAY proven to >15mbgl.

Boreholes SD80SE201, SD80SE203 and SD80SE202 within the landfill polygon encountered natural strata only. These boreholes date from c. 1981 and would suggest that no putrescible waste materials were present in this area at this time. Borehole logs are provided in Appendix C.

Other boreholes across this site are indicated as “confidential”. This is probably because they were procured by MCC in support of their planning application to develop the site for housing (See below). LKC noted on previous projects that MCC procured boreholes supplied to the BGS on a “quid pro quo” basis are usually listed by the BGS as confidential.

Planning approval decision notices dated back to 2001 and 2002 for the recent housing development on the Symond Road Landfill site available on the Planning Portal include conditions requiring a landfill gas risk assessment. Aerial photography suggests development was occurring in 2003. From this LKC assume that any landfill material along the flanks of the M60 would be placed post 1981 and would have been carried out under a Waste Licence or exemption. The housing development would have been completed under the available landfill gas criteria available at that time and given it is relatively recent it would be unlikely that gassing materials would have been permitted to remain in place, from a contamination perspective and also likely from a geotechnical perspective.

A review of historical mapping suggests the landfill site was formerly allotment gardens and some levelling may have occurred at the extreme southern tip. Historical landfill boundaries are often transposed from historical planning records and could overestimate the area of tipping. For example the landfill boundary may reflect an ownership boundary rather than an area of tipping.

On this basis LKC consider it is unlikely the Symond Road Landfill is a source of significant hazardous gas to the site.

Sources, Pathways and Receptors

Following a review of the available information LKC have identified the following potential sources of gas (within 250m of the site):

Lower Coal Measures strata	A fault is present c. 70m east which appears to curtail shallow workings. The MGH report refers to a Coal Authority report which indicates no coal mining has occurred below the site. Therefore, the coal measures strata below the site are not considered a viable source of gas to the site.
Symond Road landfill site	Located c. 170m south west (based upon Environment Agency WMS Data). LKC noted that this area has been partly redeveloped for housing and partly for construction of the M60. Not considered a viable source of hazardous gas to the site.

Adjacent menage	The menage to the north of the site is at a slightly higher level. The developer built the menage and noted it was created by terracing the existing site soils. On this basis LKC do not consider this is a viable source of hazardous gas.
-----------------	--

Potential Receptors comprise:

- Buildings, services.
- Human Health – future residents.

Potential Pathways may comprise:

- Inhalation of gas.
- Explosion of flammable gas.
- Migration through potential pathways.

With regards to any migration pathways, the superficial Till deposits and coal measures bedrock are likely to be of low permeability. The BGS logs between the notified landfill site and the study site indicate the presence of clay layers, albeit granular deposits were noted in the BGS borehole 45m south. In addition, trial pits excavated by LKC onsite suggest the presence of clay deposits within the proposed foundation depth (upper 1.5mbgl).

LKC Gas Conceptual Model

The LKC preliminary contamination conceptual model for hazardous and ground gas using contaminant-pathway-receptor linkages based on guidance in LCRM¹ summarised in Table 4-2 below.

The aim of the LKC conceptual model is to provide a preliminary assessment of the likelihood of a pollutant linkage for each potential combination of contaminant, pathway and receptor. A conceptual model can be used to make an informed decision on the contamination risks associated with the site and determine what site investigation work is required.

Each linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552².

In order to assess the potential risk for each pollutant linkage, an assessment of the magnitude of the potential consequence (severity) of the risk occurring and the magnitude of the probability (likelihood) of the risk occurring has been considered and classified. This is based on the guidance provided in CIRIA C552 and further details including a risk matrix is provided in Appendix D.

Where the risk falls into the moderate/low risk, LKC will undertake an assessment to establish what category the pollutant linkage will fall into (i.e. moderate or low risk will be chosen).

¹ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

² CIRIA (2001). "Contaminated land risk assessment: A guide to good practice". C552.

Linkage	Pathway	Receptor	Contaminant	Probability	Consequence	Risk	Assessment
PL1	– Inhalation of gas. – Migration through permeable strata and preferential pathways. – Explosion in confined spaces (methane only).	– Future residents. – Buildings.	– Carbon dioxide and methane (hazardous gas)	Unlikely	Severe	Moderate / Low	– Notified landfill site c. 170m SW; however, no evidence of significant putrescible material or viable source of gas. Shallow clay proven beneath the site and in the surrounding area between the site and the landfill will impede lateral migration of any hazardous gas into the site. Therefore, low risk assumed. – Recommendation: No remediation necessary.
			– Carbon Dioxide and Methane (ground gas – Coal Measures Strata)	Unlikely	Severe	Moderate / Low	– Shallow coal mining has not occurred below the site. Shallow clay proven beneath the site will impede upward migration of any ground gas. Therefore, low risk assumed. – Recommendation: No remediation necessary.

Table 4-2: Hazardous and ground gas conceptual model.

5 SOIL RISK ASSESSMENT

5.1 Soil Sampling

LKC attended site on 3rd December 2021 and collected 3no. samples from the topsoil stockpile sourced from site.

Sampling was carried out in accordance with Composite soil samples of approximately 500g were recovered in amber jars, amber vials for volatile analysis and plastic tubs. All the samples were labelled and stored in cool boxes prior to being collected by courier at the end of the day for delivery to the Chemtest laboratory in Newmarket. If collection was not possible the same day, then samples were stored in the sample storage fridge at the LK Group offices below 4°C. Samples were tracked using appropriate Chain of Custody forms provided by Chemtest. All followed standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation³ and sampling from stockpiles⁴.

Given the absence of any visual or olfactory evidence of contamination or anthropogenic inclusions the topsoil samples were subjected to the following general contamination analytical suite:

- Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, zinc, selenium, nickel, vanadium, mercury, speciated PAH, boron, cyanide (free and total), total phenol, TPH CWG, BTEX, pH, soluble sulphate, asbestos and SOM.

One of the samples was also further tested for the following parameters as a level of conservatism:

- Boron, cyanide (free and total), total phenol, speciated banded petroleum hydrocarbons (TPH CWG), BTEX and MTBE.

LKC considered 3no. samples was appropriate given the appearance of the topsoil and the absence of a potential contamination source.

Certificates of Analysis are provided in Appendix E.

³ EA (2000). "Technical Aspects Of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

⁴ ISO (2006): "Soil Quality -Sampling – Guidance on Sampling of Stockpiles". ISO 10381-8:2006(E).

5.2 Soil Risk Assessment

With regards to the soil risk assessment LKC will use the following hierarchy:

- Category 4 Screening Levels (C4SLs).
- LQM Suitable 4 Use Levels (S4ULs).

C4SLs were published in 2013^{5,6}. The change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))⁷ used to generate Soil Guideline Values (SGVs) to 'low' (referred to as Lowest Level of Toxicological Concern (LLTCs)). The policy companion document and supporting letter by Defra, dated 3rd September 2014, states that C4SLs '*could be used under the planning regime, as well as within Part 2A*'. Based on these comments LKC considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

Where no C4SLs have been generated LKC will use the LQM S4ULs⁸. Similar assumptions and land uses to C4SLs have been used. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions^{9,10,11,12}.

LKC consider the main risk drivers for PAHs are benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P possibly being a carcinogen and most toxic of the PAHs^{13,14} and naphthalene the most volatile and soluble¹⁵. The new C4SLs indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible¹⁶. For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)¹⁷ and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

The proposed development is for a residential house with gardens, therefore the assessment criteria for 'residential with plant uptake' has been used.

All criteria have been generated using the CLEA V1.06 model¹⁸ based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

⁵ Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."

⁶ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

⁷ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

⁸ LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."

⁹ EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.

¹⁰ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

¹¹ EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.

¹² EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.

¹³ EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.

¹⁴ USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."

¹⁵ EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5-079/TR1.

¹⁶ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

¹⁷ HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.

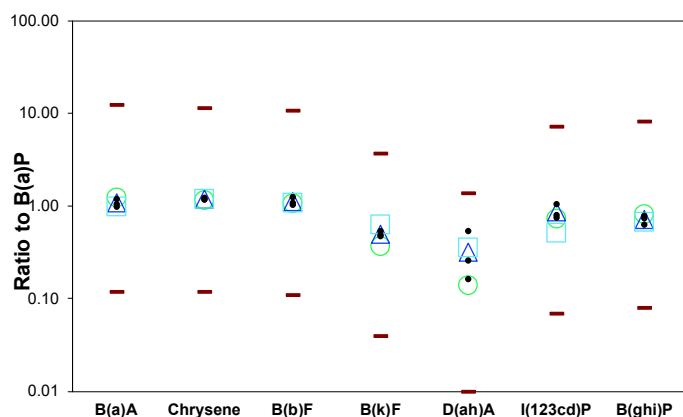
¹⁸ EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.

A summary of the generic assessment criteria is provided in Appendix F.

B(a)P as Surrogate Marker

Based on the above assumption for PAHs, LKC undertook an assessment of the data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAHs as per HPA and CL:AIRE guidelines. The primary toxicological study related to Culp *et al.*¹⁹, which was based on coal tar mixtures (>80,000mg/kg of total PAHs) fed in food to mice over a two-year carcinogenicity study.

Graph 5-1 summarises the study site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the HPA document.



Graph 5-1: The ratio of PAH to B(a)P in soil for all available data at the site based on 3 samples (where values were >LOD to allow the calculation of a ratio).

Notes:

B(a)P = Benzo(a)pyrene; D(ah)A = Dibenzo(ah)anthracene; B(a)A = Benzo(a)anthracene; B(b)F = Benzo(b)fluoranthene; B(k)F = benzo(k)fluoranthene; I(123cd)P = Indeno(123cd)pyrene; B(ghi)P = Benzo(ghi)perylene
 ● = Ratio to B(a)P for all data ○ = Mean ratio to B(a)P for Culp data △ = Mean ratio to B(a)P from all data at the site
 □ = Mean ratio to B(a)P for UK data presented by HPA ■ = Upper and Lower limits (order of magnitude from Culp data)

All the data points that could be used to calculate ratios fall inside the upper or lower limits.

Based on this distribution of data LKC considers B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

Results have been compared to the relevant assessment criteria and no elevated contaminants were identified.

Therefore the topsoil is suitable for use in the proposed development.

¹⁹ Culp, S; Gaylor, D; Sheldon, W; Goldstein, L and Beland, F (1998). "A Comparison of Tumours Induced by Coal Tar and Benzo-a-pyrene in a 2-Year Bioassay." *Carcinogenesis*. Vol 19, no. 1, pp. 117-124.

6 CONCLUSIONS

Following a site strip of the topsoil, the site is underlain by a light brown sandy silty CLAY with sand content decreasing with depth. No visual or olfactory evidence of contamination was noted in the site soils or stockpiled topsoil. Therefore, no viable soil contamination source was identified.

The hazardous gas sources identified in the site vicinity (Symond Road Landfill, offsite menage) are not considered a viable source of gas to the development as there is no evidence of significant putrescible material. The Coal Authority state there has been no coal mining below the site.

The underlying clay deposits will be barrier to the migration of gas into the site from offsite sources and from below the site. Therefore, LKC have not identified a viable gas risk to the site and gas protection measures are not deemed necessary.

Testing of the stockpiled topsoil indicates the soil is suitable for use in the proposed development.

Considering the following, LKC considers the relevant contaminated land conditions can be discharged by MCC:

- i) The above gas and soil risk assessments.
- ii) That it is unlikely that any further groundworks will identify any unexpected contamination (site already stripped to natural strata).
- iii) LKC understand that there are no proposals to import any soil for garden areas.

LKC recommend that a copy of this report should be forwarded to Manchester City Council in support of fully discharging Condition 13 of planning approval 130641/FO/2021.

Report Prepared By

Colin Crompton
Director

Enc:

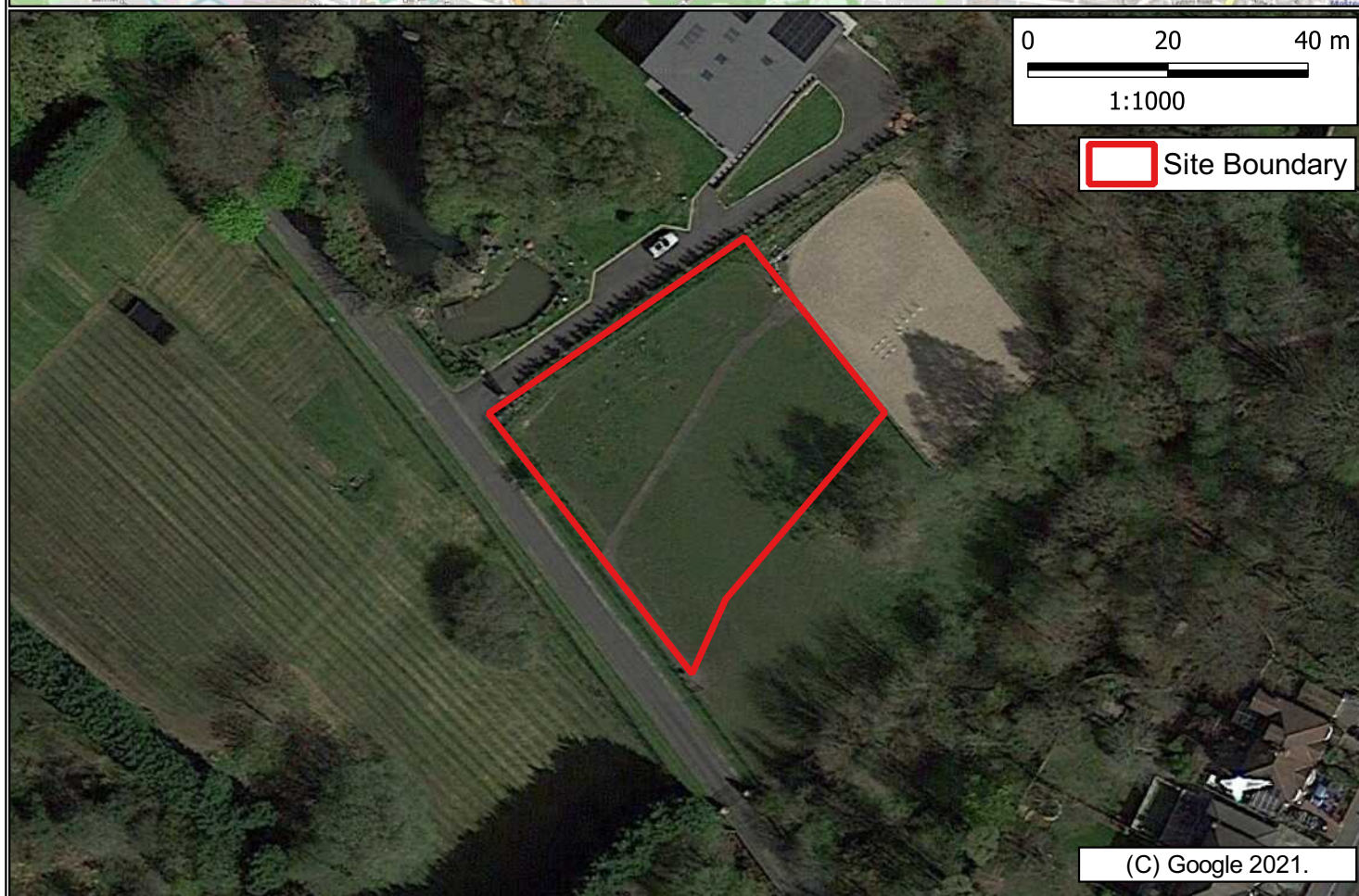
Appendix A: Site Plans
Appendix B: LKC Trial Pit Logs
Appendix C: BGS Boreholes
Appendix D: Risk Evaluation
Appendix E: Certificates of Analysis – Topsoil
Appendix F: Generic Assessment Criteria

Disclaimer

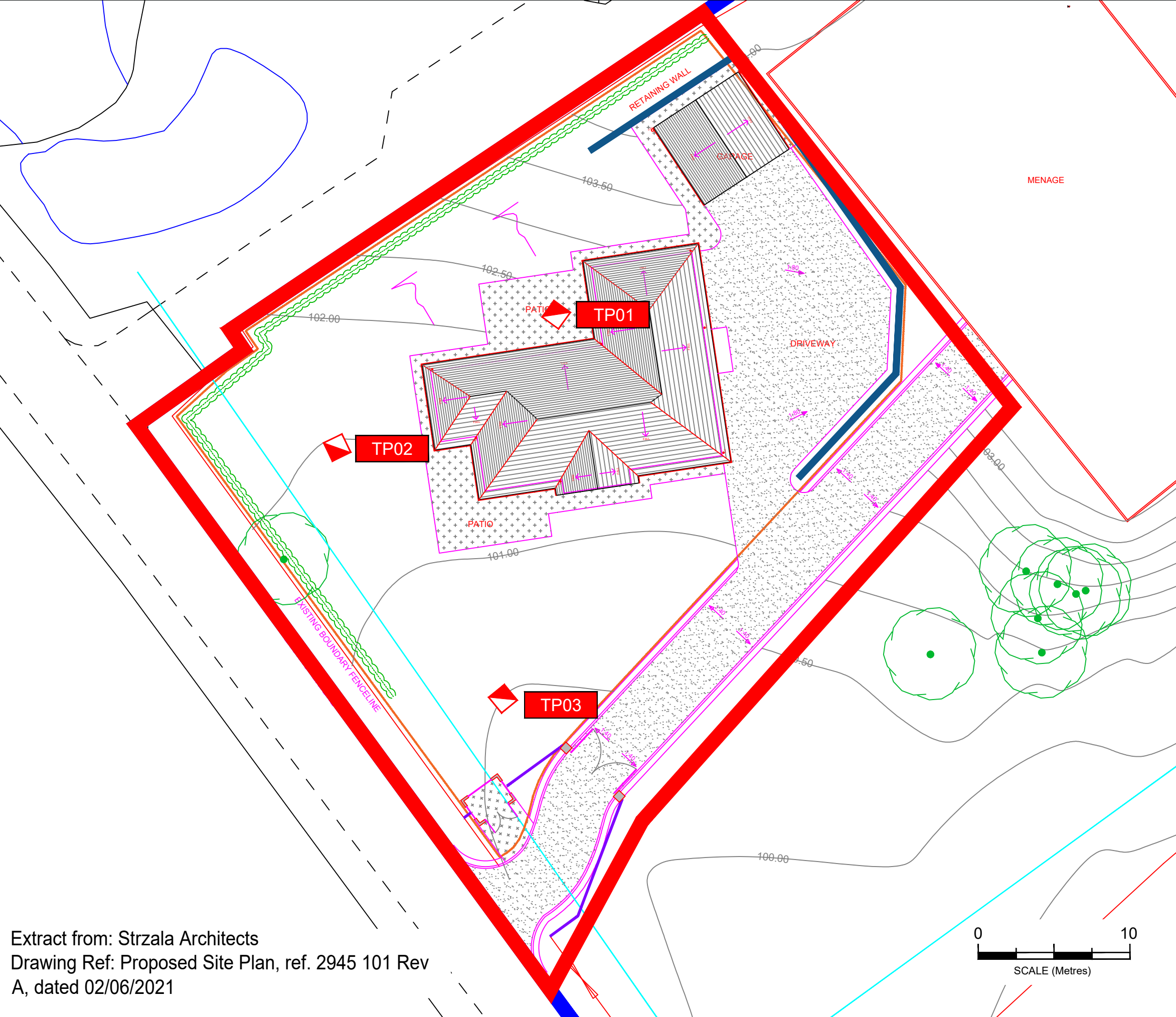
This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information. This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of

the investigation, or for any works done to the garden areas following the date of inspection. Opinions on such conditions, where given, are for general guidance only. This report is prepared solely for the benefit of R&M Developments Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Appendix A – Site Plans



Client: R&M Developments Ltd				Title: Site Location & Boundary Plan		LK CONSULT	
Site: Nut Bank Lane, Manchester				Scale (see scale bar): 1:25,000 & 1:1,000 @ A4			
Job No.: LKC 21 1687	Drawn By: CC	Checked By: MT	Drawn: Dec 2021	Figure: 1	Revision:		



KEY

Site Boundary

Trial Pit (TP)

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client: R&M Developments Ltd			
Site: Nut Bank Lane, Manchester			
Title: Proposed Development & Site Investigation Location Plan			
Job No.: LKC 21 1439	Scale (See Scale Bar): 1:250 @ A3	Figure: 2	Revision:
Drawn By: CC	Checked By: MT	Drawn: Dec 2021	

Extract from: Strzala Architects
Drawing Ref: Proposed Site Plan, ref. 2945 101 Rev
A, dated 02/06/2021

Appendix B – LKC Trial Pit Logs

Excavation Method

Mechanical

Dimensions
Ground Level (mOD)
Client

R&M Developments Ltd

**Job
Number**

LKC 21 1687

Location
Dates

19/10/2021

Engineer
Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10)	Light brown slightly clayey silty SAND.		
					0.10	Soft to firm consistency light brown slightly silty slightly sandy CLAY.		
					(1.10)			
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
					1.20	Complete at 1.20m		


Remarks

Standing water at surface
Trial pit stable
Trial pit dry

Scale (approx)

1:10

Logged By

CC

Figure No.

LKC 21 1687.TP01

Excavation Method

Mechanical

Dimensions
Ground Level (mOD)
Client

R&M Developments Ltd

**Job
Number**

LKC 21 1687

Location
Dates

19/10/2021

Engineer
Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Light brown and grey slightly clayey silty SAND.		
					(0.50)			
					0.50	Brownish grey clayey silty SAND.		
					(0.40)			
					0.90	Soft to firm consistency light brown slightly silty slightly sandy CLAY.		
					(0.30)			
					1.20	Complete at 1.20m		


Remarks

Trial pit stable
Trial pit dry

Scale (approx)

1:10

Logged By

CC

Figure No.

LKC 21 1687.TP02

Excavation Method

Mechanical

Dimensions
Ground Level (mOD)
Client

R&M Developments Ltd

**Job
Number**

LKC 21 1687

Location
Dates

19/10/2021

Engineer
Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Light brown slightly clayey silty SAND.		
					(0.50)			
					0.50	Soft to firm consistency light brown slightly silty slightly sandy CLAY.		
					(0.50)			
					1.00	Complete at 1.00m		


Remarks

Standing water at surface
Trial pit stable
Trial pit dry

Scale (approx)

1:10

Logged By

CC

Figure No.

LKC 21 1687.TP03

Appendix C – BGS Boreholes

SD 80SE/201

8622 0432

Sampling		Properties		Strata				
Depth	Type	Strength kN m ²	w %	SPT N	Description	Depth	Level BM 4	Legend
0.5	D				TOPSOIL with rootlets.	G.L.	86.08	
0.5-1.0	U(15)			28		0.5	85.6	
1.2	D				Soft becoming firm light grey brown laminated silty sandy CLAY.			
1.5-2.0	U(30)	80		16		1.7	85.2	
1.9	W							
2.2	D							
2.45-2.75	DBS			3	Very loose grey silty fine occasionally medium SAND.			
2.9	D					2.9	83.2	
3.55-3.85	DBS			6				
3.9	D				Loose brown fine to coarse SAND with occasional fine to medium gravel.			
4.65-4.95	DBS			19		4.5	81.6	
5.2	D				Medium dense brown SAND with fine to medium GRAVEL.			
5.8	D				Becoming slightly clayey towards base.			
6.15-6.45				20				
6.7	D							
7.2	D							
7.65-7.95	DBS			32				
8.2	D							
8.5	D					8.5	77.6	
8.5-9.2	U(70)				Firm dark brown silty very sandy CLAY with numerous rock fragments, with bands of brown sand.			
9.2	D							
9.8	D							
					Continued over from 10.0m.	10.0	76.1	

Drilling**Ground Water**

Type	From	To	Size	Fluid	Struck	Behaviour	Sealed	Date	Hole	Cased	Water
Shell and Auger	G.L.	10.0	0.15	-				6.8.81	Nil	Nil	Nil
								6.8.81	3.9	3.2	Nil
								7.8.81	3.9	3.2	1.9

Remarks**Borehole Record**

Project North Western Road Construction Unit,
L. G. Mouchel & Partners,
M66 Manchester Outer Ring Road,
Supplementary Site Investigation Section 3

Contract 52904

exploration associates

Borehole 546
Sheet 1 of 2

② 80 SE/201

Sampling		Properties			Strata			
Depth	Type	Strength kN/m ²	w %	SPT N	Description Continued from 10.0m.	Depth	Level	Legend
10.0	D				Firm brown laminated silty CLAY with bands of brown fine sand towards base.	10.0	76.1	
10.0-10.5	U(70)							
10.7	D					10.9	75.2	
10.9	W				Loose to medium dense brown fine to medium SAND tending to medium SAND below 12.2m.			
11.2	D			13				
11.65-11.95	DBS							
12.2	D							
12.8	D				End of Borehole.			
13.15-13.45	DBS			5				
13.7	D							
14.2	D							
14.65-14.95	DBS			6	End of Borehole.	15.0	71.1	

Drilling				Ground Water							
Type	From	To	Size	Fluid	Struck	Behaviour	Sealed	Date	Hole	Cased	Water
Shell and Auger	10.0	15.0	0.15					7.8.81	12.0	11.5	-
								10.8.81	12.0	11.5	10.9
								10.8.81	15.0	14.5	13.1

Remarks Below 10.9m sand drawn into casing due to ingress of groundwater during drilling operations.											
Borehole Record					Project North Western Road Construction Unit, L. G. Mouchel & Partners, M65 Manchester Outer Ring Road, Supplementary site Investigation Section 3					Contract S2904	
exploration associates										Borehole S4R	
										Sheet 2 of 2	

8617 0438

Sampling		Properties			Strata			
Depth	Type	Strength kN m ²	w %	SPT N	Description	Depth	Level BM 5	Legend
0.4	D				1 TOPSOIL.	6.1 0.3	90.255 90.0	
1.0-1.3	B				2 Soft to firm orange brown mottled grey silty and CLAY with occasional subrounded rock fragments.	0.7	89.6	
1.30-1.35	WD				3 Light brown medium SAND.	0.9	89.4	
					4 Stiff to very stiff orange brown mottled grey silty sandy CLAY with rock fragments.			
2.2	D				5 Stiff fissured dark brown mottled grey silty sandy CLAY with rock fragments and cobbles with zones of sand. Becoming poorly laminated at 2.25m.	1.8	88.5	
3.0	D					3.0	67.3	
					Base of Pit.			

Groundwater & Support

Ingress Very slight seepages at 0.57m and 1.05m. Steady to rapid ingress at 2.25m and

Behaviour

Pumping Details

Nil

Support Systems Nil
Pit sides unstable on A and C Planes.

Excavation

Plant

Massey Ferguson

Area

1.0 x 3.0m

Date

21.9.81

Contract

S2904

Trial Pit

547

Sheet

1 of 1

GL	A	B	C
1	2		
2	4		
3	5		
4			
5			
6			
7			

Orientation



Remarks

Brown medium SAND - slightly carbonaceous with rapid ingresses resulting in the sand being washed out from 1.1 to 1.8 in A Plane and 1.9 to 3.0 in C plane.

Trial Pit - Record

Project

North Western Road Construction Unit,
L. G. Mouchel & Partners,
M66 Manchester Outer Ring Road,
Supplementary Site Investigation Section

exploration associates

Location M66 - MAIN S.I. - SECTION B

Record of Borehole No. 861

SHEET 1 of 2

Client L.G. MOUCHEL AND PARTNERS

Type of boring PERCUSSIVE

8627 0435

Job No. 830762

Ground level 85.21m O.D.

Diameter / 200mm to 15.00m

Casing / 205mm to 12.00m

Daily Progress	Ground water levels	Depth of casing	Samples			S c a l e	Strata		Description of strata	C o m p o s i t i o n	Thickness
			Depth	No.	Type		Depth	Reduced level			
10.10.80			0.40	1	D	0.40	84.81	GRASS AND TOPSOIL		0.40	
			0.50 - 0.95	2	U(14)						
			0.95 - 1.10	3	D						
1.10	DRY	1.10						Soft to firm grey/red brown mottled sandy silty CLAY with a trace of fibrous organic material		1.75	
15.10.80	DRY	1.10	1.25	4	D						
	V180		1.50 - 1.95	5	U(29)						
			1.95 - 2.10	6	D			...becoming very sandy with silt and occasional fine coal fragments		0.20	
			2.15	7	D						
			2.20 - 2.65	8	U(50)						
			2.65 - 2.80	9	D	2.15	83.06	Firm dark grey silty CLAY with a trace of fibrous organic material		0.20	
			2.90	10	D	2.35	82.86	Firm grey silty CLAY with layers of orange brown silty sand and pockets of yellow brown silt			
			3.20 - 3.65	11	U(98)						
			3.70	12	D					1.85	
	V180		4.00	13	D						
	V190		4.20 - 4.65	14	S(13)						
			4.20 - 4.70	15	B	4.20	81.01	Medium dense pinkish brown silty fine SAND with occasional fine coal fragments and gravel		4.00	
			4.95	16	D						
			5.20 - 5.65	17	S(14)						
			5.20 - 5.70	18	B			...with a layer of orange brown silty fine sand			
			6.20	19	D						
			6.70 - 7.15	20	S(18)						
			6.70 - 7.20	21	B						
			7.70	22	D						
			8.20	23	D						
			8.30 - 8.75	24	U(91)	8.20	77.01	Soft to firm brown silty CLAY with a little yellow brown silt		0.40	
	V250		8.75 - 8.90	25	D						
			9.25	26	D						
			9.40 - 9.85	27	U(90)	9.25	75.96	Grey brown fine SAND with very occasional gravel and fine coal fragments		0.65	
			9.70	28	W						
			9.85 - 10.00	32	D						
						10.00	73.21	Firm grey brown laminated sandy silty CLAY with laminations of sand, silt, small pockets of white silt and occasional pebbles		0.75	

Key U.... U102(No. of blows to drive tube) D.... disturbed jar sample B.... disturbed bulk sample W.... water sample S().. standard penetration test C().. cone penetration test (33).. number of blows (N' value) W.... groundwater encountered W.... groundwater level after 20 mins	Remarks Water struck at: (m) 1.50 3.95 Piezometer installed at 7.50m	Continued/... Rose to: (m) - 3.80 Sealed off at: (m) 2.50 4.50
--	---	---

**GROUND
ENGINEERING
LIMITED**

SHEET 2 of 2

Type of boring PERCUSSIVE

Casing / 203mm to 12.00m

**GROUND
ENGINEERING
LIMITED**

Appendix D – Risk Evaluation

Risk Evaluation

The method for risk evaluation is a qualitative method of interpreting the output from the risk estimation stage of the assessment, based on CIRIA 552¹. It involves the classification of the:

- Magnitude of the potential consequence (severity) of the risk occurring (Table A).
- Magnitude of the probability (likelihood) of the risk occurring (Table B).

Consequence (Severity)		
Classification	Definition	Example
Severe	- Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. - Short term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. - Catastrophic damage to buildings/properties. - A short term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definition of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	- High concentrations of cyanide on the surface of an informal recreation area. - Major spillage of contaminants from site into controlled waters. - Explosion, causing building collapse (can also equate to short term human health risk if buildings are occupied).
Medium	- Chronic damage to Human Health ('significant harm' as defined in DETR, 2000). - Pollution of sensitive water resources (note Water Resources Act contains no scope for considering significance of pollution). - A significant change in a particular ecosystem, or organism forming part of such ecosystem.	- Concentrations of a contaminant from site exceed generic, or site specific assessment criteria. - Leaching of contaminants from a site to a major or minor aquifer (Principal and Secondary). - Death of a species within a designated nature reserve.
Mild	- Pollution of non-sensitive water resources. - Significant damage to crops, buildings, structures and services ('significant harm' as defined in DETR, 2000). - Damage to sensitive buildings / structures / services or the environment.	- Pollution of non-classified groundwater. - Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	- Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. - Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.). - Easily repairable damage to buildings, structures and services.	- The presence of contaminants at such concentrations that protective equipment is required during site works. - The loss of plants in a landscaping scheme. - Discoloration of concrete.

Table A: Classification of consequence.

Probability (Likelihood)	
Classification	Definition
High likelihood	- There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	- There is a pollutant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. - Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	- There is a pollutant linkage and circumstances are possible under which an event could occur. - However it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	- There is a pollutant linkage but circumstances are such that it is improbable that an event would occur in the very long term.

Table B: Classification of probability.

¹ CIRIA (2001). "Contaminated Land Risk Assessment: A Guide to Good Practice". C552.

These classifications are then compared to indicate the risk presented by each pollutant linkage (Table C). It is important that this classification is only applied where there is a possibility (which can range from high likelihood to unlikely) of a pollutant linkage existing.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table C: Comparison of consequence against probability.

Once the risk has been determined the corresponding action can be assessed (Table D).

Risk	Action Required
Very High Risk	- 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 already undertaken) and remediation are likely to be required.
High Risk	- 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	- 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	- 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	- 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.

Table D: Description of the classification and likely action required.

Where LKC identified a low to very low risk either limited intrusive investigation work, a watching brief (during construction work) or no investigation work will be recommended. This will be dependent on the nature of the site and the proposed development.

Where the risk falls into the moderate/low risk, LKC will undertake an assessment to establish what category the pollutant linkage will fall into (i.e. moderate or low risk will be chosen).

Where LKC identifies a moderate or higher risk intrusive work or precautionary remedial measures will be recommended.

Appendix E – Certificates of Analysis – Topsoil



Final Report

Report No.: 21-42896-1
Initial Date of Issue: 10-Dec-2021
Client LK Consult
Client Address: Unit 29 Eton Business Park
Eton Hill Road
Radcliffe
Manchester
Lancashire
M26 2ZS
Contact(s): Colin Crompton
Project LKC 21 1687 Nut Bank Lane, Alkrinton

Quotation No.:		Date Received:	06-Dec-2021
Order No.:	739863	Date Instructed:	06-Dec-2021
No. of Samples:	3		
Turnaround (Wkdays):	5	Results Due:	10-Dec-2021
Date Approved:	10-Dec-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: LKC 21 1687 Nut Bank Lane, Alkrinton

Client: LK Consult	Chemtest Job No.:				21-42896	21-42896	21-42896
Quotation No.:	Chemtest Sample ID.:				1333887	1333888	1333889
Order No.: 739863	Client Sample Ref.:				ES	ES	ES
	Client Sample ID.:				Topsoil 1	Topsoil 2	Topsoil 3
	Sample Type:				SOIL	SOIL	SOIL
	Date Sampled:				03-Dec-2021	03-Dec-2021	03-Dec-2021
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	16	24	20
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Roots	Stones	Roots
Soil Texture	N	2040		N/A	Sand	Sand	Loam
Chromatogram (TPH)	N			N/A	See Attached		
pH	M	2010		4.0	6.4	6.5	6.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40		
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.012	< 0.010
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50		
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50		
Arsenic	M	2450	mg/kg	1.0	16	28	17
Cadmium	M	2450	mg/kg	0.10	0.27	0.23	0.18
Chromium	M	2450	mg/kg	1.0	18	24	17
Copper	M	2450	mg/kg	0.50	36	48	41
Mercury	M	2450	mg/kg	0.10	0.32	0.29	0.27
Nickel	M	2450	mg/kg	0.50	17	17	16
Lead	M	2450	mg/kg	0.50	80	69	84
Selenium	M	2450	mg/kg	0.20	0.57	0.48	0.65
Vanadium	U	2450	mg/kg	5.0	29	27	27
Zinc	M	2450	mg/kg	0.50	69	64	61
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	9.1	4.0	7.9
Diesel Present	N	2670		N/A	False		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0		
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0		
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0		
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0		
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0		
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0		
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0		

Results - Soil

Project: LKC 21 1687 Nut Bank Lane, Alkrinton

Client: LK Consult	Chemtest Job No.:				21-42896	21-42896	21-42896
Quotation No.:	Chemtest Sample ID.:				1333887	1333888	1333889
Order No.: 739863	Client Sample Ref.:				ES	ES	ES
	Client Sample ID.:				Topsoil 1	Topsoil 2	Topsoil 3
	Sample Type:				SOIL	SOIL	SOIL
	Date Sampled:				03-Dec-2021	03-Dec-2021	03-Dec-2021
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0		
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10		
Benzene	M	2760	µg/kg	1.0	< 1.0		
Toluene	M	2760	µg/kg	1.0	< 1.0		
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0		
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0		
o-Xylene	M	2760	µg/kg	1.0	< 1.0		
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0		
Naphthalene	M	2800	mg/kg	0.10	0.34	0.44	0.61
Acenaphthylene	N	2800	mg/kg	0.10	0.11	0.10	0.10
Acenaphthene	M	2800	mg/kg	0.10	0.25	0.27	0.25
Fluorene	M	2800	mg/kg	0.10	0.17	0.14	0.15
Phenanthrene	M	2800	mg/kg	0.10	1.2	1.5	1.3
Anthracene	M	2800	mg/kg	0.10	0.33	0.37	0.32
Fluoranthene	M	2800	mg/kg	0.10	1.9	2.4	2.2
Pyrene	M	2800	mg/kg	0.10	1.7	2.1	2.1
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.94	1.2	1.1
Chrysene	M	2800	mg/kg	0.10	1.1	1.2	1.3
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.92	1.1	1.4
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.42	0.54	0.54
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.88	1.0	1.1
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.93	0.81	0.83
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.48	0.26	0.18
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.70	0.75	0.70
Total Of 16 PAH's	N	2800	mg/kg	2.0	12	14	14
Total Phenols	M	2920	mg/kg	0.10	< 0.10		

TPH Chromatogram on Soil Sample: 1333887

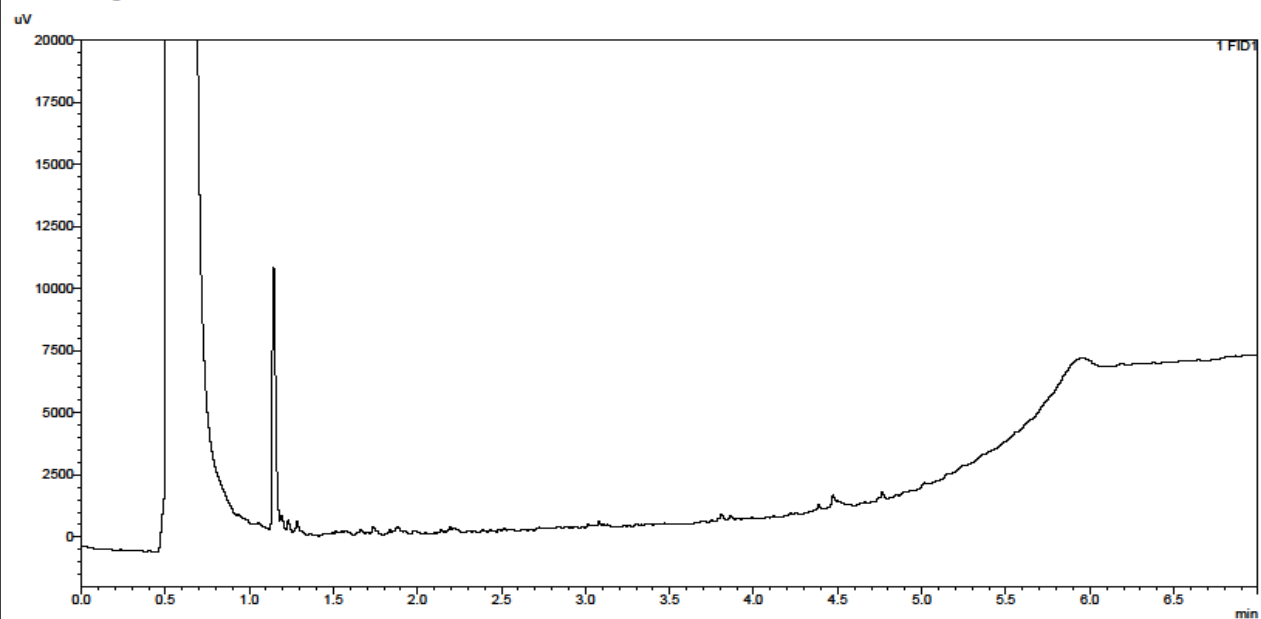
<Sample Information>

Sample Name : 1329313 21-41857
Data Filename : 2021-12-02_02122021_1329313 21-41857_059.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 30
Date Acquired : 02/12/2021 20:37:57
Date Processed : 02/12/2021



Chemtest

<Chromatogram>



TPH Interpretation

Job	Sample	Matrix	Location	Sample Ref	Sample ID	Sample Depth (m)	Gasoline / Diesel Present	TPH Interpretation
21-42896	1333887	S		ES	Topsoil 1		No	N/A

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenzo[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

Appendix F – Generic Assessment Criteria

CATEGORY 4 SCREENING LEVELS

Substance	Residential (with home- grown produce)	Residential (without home- grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37 mg/kg	40 mg/kg	49 mg/kg	640 mg/kg	79 mg/kg	170 mg/kg
Benzene	0.87 mg/kg	3.3 mg/kg	0.18 mg/kg	98 mg/kg	140 mg/kg	230 mg/kg
Benzo(a)pyrene	5.0 mg/kg	5.3 mg/kg	5.7 mg/kg	77 mg/kg	10 mg/kg	21 mg/kg
Cadmium	22 mg/kg	150 mg/kg	3.9 mg/kg	410 mg/kg	220 mg/kg	880 mg/kg
Chromium VI	21 mg/kg	21 mg/kg	170 mg/kg	49 mg/kg	21 mg/kg	250 mg/kg
Lead	200 mg/kg	310 mg/kg	80 mg/kg	2300 mg/kg	630 mg/kg	1300 mg/kg

Tetrachlorethene (PCE) – 1% SOM	0.31 mg/kg	0.32 mg/kg	2.0 mg/kg	24 mg/kg	3,200 mg/kg	1,400 mg/kg
Tetrachlorethene (PCE) – 2.5% SOM	0.70 mg/kg	0.71 mg/kg	4.8 mg/kg	55 mg/kg	3,300 mg/kg	1,900 mg/kg
Tetrachlorethene (PCE) – 6% SOM	1.6 mg/kg	1.6 mg/kg	11 mg/kg	130 mg/kg	3,400 mg/kg	2,500 mg/kg
Trichlorethene (TCE) – 1% SOM	0.0093 mg/kg	0.0097 mg/kg	0.032 mg/kg	0.73 mg/kg	76 mg/kg	41 mg/kg
Trichlorethene (TCE) – 2.5% SOM	0.020 mg/kg	0.020 mg/kg	0.072 mg/kg	1.5 mg/kg	78 mg/kg	54 mg/kg
Trichlorethene (TCE) – 6% SOM	0.043 mg/kg	0.045 mg/kg	0.16 mg/kg	3.4 mg/kg	79 mg/kg	69 mg/kg
Vinyl Chloride (VC) – 1%SOM	0.0064 mg/kg	0.015 mg/kg	0.0017 mg/kg	1.1 mg/kg	7.8 mg/kg	18 mg/kg
Vinyl Chloride (VC) – 2.5%SOM	0.010 mg/kg	0.019 mg/kg	0.0031 mg/kg	1.4 mg/kg	7.8 mg/kg	19 mg/kg
Vinyl Chloride (VC) – 6%SOM	0.017 mg/kg	0.029 mg/kg	0.0058 mg/kg	2.2 mg/kg	7.8 mg/kg	19 mg/kg

Summary Table for the Generic Assessment Criteria for Human Health Risk Assessment Land Quality Management (LQM) S4ULs.

All GAC are based on sandy
loam soils with a pH 7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Metals	Inorganic Arsenic	6%	37	40	43	640	79	170
	Beryllium	6%	1.7	1.7	35	12	2.2	63
	Boron	6%	290	11,000	45	240,000	21,000	46,000
	Cadmium	6%	11	85	1.9	190	120	532
	Chromium (III)	6%	910	910	18,000	8,600	1,500	33,000
	Chromium (VI)	6%	6.0	6.0	1.8	33	7.7	220
	Copper	6%	2,400	7,100	520	68,000	12,000	44,000
	Elemental Mercury	6%	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}
	Inorganic Mercury	6%	40	56	19	1,100	120	240
	Methylmercury	6%	11	15	6.0	320	40	68
	Nickel (update 2015)	6%	126	181	53	983	231	804
	Selenium	6%	250	430	88	12,000	1,100	1,800
	Vanadium	6%	410	1,200	91	9,000	2,000	5,000
Zinc	6%	3,700	40,000	620	730,000	81,000	170,000	
BTEX Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90
		2.5%	0.17	0.70	0.034	47	72	100
		6%	0.37	1.4	0.075	90	73	110
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}

NOTES

^{sol} / ^{vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000
		2.5%	5,400	35,000	950	540,000	74,000	150,000
		6%	11,000	37,000	2,200	540,000	74,000	150,000
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49
		2.5%	11	14	6.5	170	29	56
		6%	13	15	13	180	29	62
	Benzo(a)pyrene (only)	1%	2.2	3.2	0.97	35	5.7	11
		2.5%	2.7	3.2	2.0	35	5.7	12
		6%	3.0	3.2	3.5	36	5.7	13
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13
		2.5%	3.3	4.0	2.1	44	7.2	15
		6%	3.7	4.0	3.9	45	7.2	16
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400
		2.5%	340	360	470	4,000	640	1,500
		6%	350	360	640	4,000	640	1,600
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370
		2.5%	93	110	75	1,200	190	410
		6%	100	110	130	1,200	190	440
	Chrysene	1%	15	30	4.1	350	57	93
		2.5%	22	31	9.4	350	57	110
		6%	27	32	19	350	57	120
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3
		6%	0.3	0.32	0.43	3.6	0.58	1.4
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300
		2.5%	560	1,600	130	23,000	3,100	6,300
		6%	890	1,600	290	23,000	3,100	6,400
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150
		2.5%	36	46	21	510	82	170
		6%	41	46	39	510	82	180
	Naphthalene	1%	2.3 ^f	2.3 ^f	4.1 ^f	190 ^f (76.4) ^{sol}	4,900 ^f	1,200 ^f (76.4) ^{sol}
		2.5%	5.6 ^f	5.6 ^f	10 ^f	460 ^f (183) ^{sol}	4,900 ^f	1,900 ^f (183) ^{sol}
		6%	13 ^f	13 ^f	24 ^f	1,100 ^f (432) ^{sol}	4,900 ^f	3,000
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200
		2.5%	220	1,500	38	22,000	3,100	6,200
		6%	440	1,500	90	22,000	3,100	6,300
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000
		2.5%	1,200	3,800	270	54,000	7,400	15,000
		6%	2,000	3,800	620	54,000	7,400	15,000
Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4	
	2.5%	0.98	1.2	0.67	15	2.2	4.7	
	6%	1.1	1.2	1.2	15	2.2	4.8	

NOTES

^{Sol / vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^f = naphthalene is based on comparison of inhalation exposure with TDI_{Inhal} for localised effect.

All GAC are based on sandy loam soils with a pH 7.

LQM Generic Assessment Criteria (mg/kg) Dry weight soil

Contaminant	SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Aliphatic							
EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304) ^{sol}	95,000 (304) ^{sol}
EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}
EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}
EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}
EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}
EC>16-35	1%	65,000 (8.48) ^{f, sol}	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f
EC>35-44	1%	65,000 (8.48) ^{f, sol}	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f
Aliphatic							
EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}
EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}
EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}
EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}
EC>12-16	2.5%	2,400 (59) ^{sol}	2,400 (59) ^{sol}	13,000	82,000 (59) ^{sol}	13,000	25,000 (59) ^{sol}
EC>16-35	2.5%	92,000 (21) ^{f, sol}	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f
EC>35-44	2.5%	92,000 (21) ^{f, sol}	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f
Aliphatic							
EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}
EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}
EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}
EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}
EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}
EC>16-35	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f
EC>35-44	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f
Aromatic							
EC5-7(benzene as non-threshold)	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}
EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
EC>16-21	1%	260 ^f	1,900 ^f	46 ^f	28,000 ^f	3,800 ^f	7,600 ^f
EC>21-35	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>35-44	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f
Aromatic							
EC5-7(benzene as non-threshold)	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}
EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}
EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}
EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}
EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
EC>16-21	2.5%	540 ^f	1,900 ^f	110 ^f	28,000 ^f	3,800 ^f	7,700 ^f
EC>21-35	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>35-44	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f
Aromatic							
EC5-7(benzene as non-threshold)	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}
EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}
EC>10-12	6%	380	1,200	74	34,000 (2,150) ^{sol}	5,000	10,000
EC>12-16	6%	660	2,500	130	38,000	5,100	10,000
EC>16-21	6%	930 ^f	1,900 ^f	260 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>21-35	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f
EC>35-44	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f
Aliphatic +Aromatic >EC44	1%	1,600 ^f	1,900 ^f	1,200 ^f	28,000 ^f	3,800 ^f	7,800 ^f
	2.5%	1,800 ^f	1,900 ^f	2,100 ^f	28,000 ^f	3,800 ^f	7,800 ^f
	6%	1,900 ^f	1,900 ^f	3,000 ^f	28,000 ^f	3,800 ^f	7,900 ^f

NOTES

Sol / vap = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	7.1E-03	9.2E-03	4.6E-03	0.67	29	21
		2.5%	1.1E-02	1.3E-02	8.3E-03	0.97	29	24
		6%	1.9E-02	2.3E-02	1.6E-02	1.7	29	28
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) ^{vap}
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) ^{vap}
		6%	39	40	240	3,000	140,000	100,000 (6,392) ^{vap}
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800
		2.5%	3.4	8.0	0.89	550	1,400	2,100
		6%	7.5	17	2.0	1,100	1,400	2,300
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500
		2.5%	2.8	3.5	1.9	250	1,400	1,800
		6%	6.4	8.2	4.4	560	1,400	2,100
	Tetrachloroethene (PCE)	1%	0.18	0.18	0.65	19	1,400	810 (424) ^{sol}
		2.5%	0.39	0.40	1.5	42	1,400	1,100 (951) ^{sol}
		6%	0.90	0.92	3.6	95	1,400	1,500
	Tetrachloromethane (carbon tetrachloride)	1%	2.6E-02	2.6E-02	0.45	2.9	890	190
		2.5%	5.6E-02	5.6E-02	1.0	6.3	920	270
		6%	0.13	0.13	2.4	14	950	400
	Trichloroethene (TCE)	1%	1.6E-02	1.7E-02	4.1E-02	1.2	120	70
		2.5%	3.4E-02	3.6E-02	9.1E-02	2.6	120	91
		6%	7.5E-02	8.0E-02	0.21	5.7	120	120
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600
		2.5%	1.7	2.1	0.83	170	2,500	2,800
		6%	3.4	4.2	1.7	350	2,500	3,100
	Chloroethene (vinyl chloride)	1%	6.4E-04	7.7E-04	5.5E-04	5.9E-02	3.5	4.8
		2.5%	8.7E-04	1.0E-03	1.0E-03	7.7E-02	3.5	5.0
		6%	1.4E-03	1.5E-03	1.8E-03	0.12	3.5	5.4
	2,4,6-Trinitrotoluene (TNT)	1%	1.6	65	0.24	1,000	130	260
		2.5%	3.7	66	0.58	1,000	130	270
		6%	8.1	66	1.4	1,000	130	270
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) ^{sol}
		2.5%	250	13,000	38	210,000	26,000	51,000
		6%	540	13,000	85	210,000	27,000	53,000
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) ^{vap}
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) ^{vap}
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) ^{vap}
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30
		2.5%	6.6	7.4	6.1	170	18	31
		6%	7.1	7.5	9.8	170	18	31
	Dieldrin	1%	0.97	7.0	0.17	170	18	30
		2.5%	2.0	7.3	0.41	170	18	30
		6%	3.5	7.4	0.96	170	18	31
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300
		2.5%	7.8	620	1.2	9,400	1,200	2,400
		6%	17.4	620	2.7	9,400	1,200	2,400
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26
		6%	0.14	6.6	2.2E-02	140	16	27
	Endosulfanns (2 isomers)	1%	7.4	160 (3.0E-03) ^{vap}	1.2	5,600 (3.0E-03) ^{vap}	1,200	2,300
		2.5%	18	280 (7.0E-03) ^{vap}	2.9	7,400 (7.0E-03) ^{vap}	1,200	2,400
		6%	41	410 (1.6E-02) ^{vap}	6.8	8,400 (1.6E-02) ^{vap}	1,200	2,500
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15
		2.5%	0.2	3.8	3.2E-02	65	8.1	15
		6%	0.46	3.8	7.7E-02	65	8.1	16

NOTES

Sol / vap = solubility / vapour limit (potentially use if free product identified, although highly conservative).

All GAC are based on
sandy loam soils with a pH
7.

LQM Generic Assessment Criteria (mg/kg) Dry weight soil

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) ^{sol}
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) ^{sol}
		6%	2.4	2.4	32	290	14,000	2,900
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) ^{sol}	90,000	24,000 (571) ^{sol}
		2.5%	55	57	230	4,800 (1,370) ^{sol}	95,000	36,000 (1,370) ^{sol}
		6%	130	130	540	11,000 (3,240) ^{sol}	98,000	51,000 (3,270) ^{sol}
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) ^{vap}
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) ^{vap}
		6%	15	15	320	1,300	19,000	4,000 (1,880) ^{vap}
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) ^{vap}	78	110 (39) ^{vap}
		2.5%	1.6	1.9	0.90	120 (98.1) ^{vap}	79	120
		6%	3.7	4.3	2.2	240 (235) ^{vap}	79	130
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) ^{sol}	100	190
		2.5%	12	30	3.1	770 (107) ^{sol}	100	190
		6%	22	38	7.0	830	100	190
	Hexachlorobenzene	1%	1.8 (0.20) ^{vap}	4.1 (0.20) ^{vap}	0.47	110 (0.20) ^{vap}	16	30
		2.5%	3.3 (0.50) ^{vap}	5.7 (0.50) ^{vap}	1.1	120	16	30
		6%	4.9	6.7 (1.2) ^{vap}	2.5	120	16	30
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^g	94	0.13 ^g	3,500	620	1,100
		2.5%	2.0	150	0.30	4,000	620	1,100
		6%	4.5	210	0.70	4,300	620	1,100
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110
		2.5%	0.52	29	8.0E-02	400	60	120
		6%	1.2	31	0.19	400	60	120
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300
		2.5%	0.29	0.29	10	22	11,000	1,900
		6%	0.62	0.62	23	47	11,000	2,700
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48
		2.5%	0.7	0.78	0.61	66	25	50
		6%	1.6	1.8	1.4	120	25	51
	Phenol	1%	280	750	66	760 ^{dir} (31,000)	760 ^{dir} (11,000)	760 ^{dir} (8,600)
		2.5%	550	1,300	140	1,500 ^{dir} (35,000)	1,500 ^{dir} (11,000)	1,500 ^{dir} (9,700)
		6%	1,100	2,300	280	3,200 ^{dir} (37,000)	3,200 ^{dir} (11,000)	3,200 ^{dir} (11,000)

NOTES

^{Sol / vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^{dir} = S4uls based on threshold protective of direct skin contact with phenol (brackets long term exposure for illustration purposes).

^g = derived based on 2,3,4,6-tetrachlorophenol.