

Knott Mill, Manchester

Contamination Risk Assessment & Remediation Strategy

Job Number: LKC 25 1247

Date: September 2025

Client: Meadway Developments



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1. Introduction

1.1. Background

LK Consult Ltd (LKC) has been commissioned to carry out a Contamination Risk Assessment and Remediation Strategy for Knott Mill, Manchester in support of a planning application to develop the site for residential use.

The following reports have been compiled for the site and should be read in conjunction with this report:

- Desk Study, undertaken by Environmental Management Solutions (EMS) (Ref: EMS/1240/Rev 0, dated February 2008). No appendices were available for this report.
- Preliminary Contaminated Land Investigation, undertaken by EMS (ref. EMS/1240b, Rev 0, dated March 2008).
- Additional Phase 2 Site Investigation Report, undertaken by The Land Consultancy Ltd (TLC), Ref. T195 SFK (TLC1143) rep AI Infill 300621, dated June 2021.

The Remediation Strategy is required to determine the work necessary in order to ensure the site is “suitable for use” for the proposed development with regards to potential contaminated land pollutant linkages.

A summary of the site details is presented in Table 1-1. The site location and proposed development are included in Appendix A.

Site Location	Triangular shape, bounded by ‘Sun House’ and Little Peter Street to the north, Commercial Street to the south-west and Constance Street to the east. Centred at approximate National Grid Reference 383430E 397430N.
Approximate Area	475m ²
Topography	28.6 metres Above Ordnance Datum (AOD). Site is approximately level.
Current Site Use	Gravel-surfaced private car park in the north-east..
Purpose of Report	Remedial recommendations and verification requirements.
Proposed Development	8no. four storey townhouses, private rooftop gardens, and underground parking. No proposed soft landscaping / gardens at ground level.

Table 1-1: Summary of site details.

This report will provide more detail on the required build phase validation work as per guidelines set out in Land Contamination Risk Management (LCRM) Stage 3 remediation and Verification¹.

1.2. Summary of Previous Findings

Table 1-2 summarises the site details, historical review, environmental settings and site reconnaissance from the EMS Desk Study. In addition, LKC have provided the following information: artificial ground, bedrock, BGS borehole log, landfills, radon, aquifers, coal mining and Unexploded Ordnance (UXO) risk.

Main Historical Features	Onsite: unspecified industrial units, unspecified works. Surrounding Area: Knot Mill (iron works, then automobile engineering works), railways, gun works, starch works, Gaythorne gas works, electrical engineering works, chemical works, printing works, corn mills, unspecified works, engineering works, garage. Tanks: 6no. above ground fuel tanks within 100m, closest heating oil 17m north-east. 5no. underground storage tanks within 100m, closest petrol tank 21m north.
Geology / Hydrogeology¹	Artificial: BGS recorded artificial on site, Made ground (undivided). Superficial: Glaciofluvial Sheet Deposits (sand and gravel) across majority of site, none recorded north-west of site. Secondary A Aquifer. Bedrock: Chester Formation (sandstone). Principal Aquifer. Abstractions: 5no. within 1000m radius, none used for potable water. Source Protection Zone (SPZ): Not within an SPZ. SPZ Zone III located c. 300m west.
BGS Borehole Log (100m radius)²	Nearest 80m south-west, SJ89NW1221: Made ground comprising brick rubble and concrete to 0.30m, made ground comprising firm orange brown sandy clay with occasional gravel and brick to 3.00m, medium dense light grey and brown slightly clayey silty sand with occasional gravel to 3.80m, red brown weathered sandstone to 4.70mbgl.
Coal mining³	Within a coal mining reporting area. Not within a Development High Risk Area.
Hydrology (100m radius)	Nearest surface water feature: River Medlock, 33m west. Grade E (poor). Bridgewater Canal, 65m west, Grade B (good). Rochdale Canal, 115m north, Grade B (good).
Landfills / Infilled ground (250m radius)	No recorded landfills. 3no. potentially infilled ground features identified: 52m west, 124m south, 161 east; all infilled prior to 1900.
Radon⁴	<1% homes above the action level. No radon protection measures required.
Unexploded Ordnance	Moderate risk.
Sensitive Land Uses	None within 1000m radius.
Site walkover (2008)	Small industrial units with an associated works yard.
Surrounding area (2008)	Multi-storey apartment blocks. Some industrial and commercial buildings. Deansgate Station within 100m of the site.

Table 1-2: Summary of site details, historical review, environmental settings and site reconnaissance.

Data sources:

1 <http://mapapps2.bgs.ac.uk/geoindex/home.html>

2 BGS GeoIndex: <https://mapapps2.bgs.ac.uk/geoindex/home.html>

3 The Mining Remediation Authority Web Mapping Services (WMS) / <http://coal.decc.gov.uk/en/coal/cms/publications/data/map/map.aspx>.

4 UK Radon <https://www.ukradon.org/information/ukmaps>

5 Zetica UXO Unexploded Bomb Risk Mapping <https://zeticauxo.com/guidance/risk-maps/>

The EMS conceptual site model identified a low to high risk for human health, a low to high risk to controlled waters, a low to moderate risk for vapours, a moderate risk for water pipes, and a moderate risk for hazardous ground gases.

Table 1-3 summarises the EMS site investigation undertaken in 2008.

Scope	3no. cable percussive boreholes (BH1-BH3) to 4.50-4.95mbgl. Soil testing only.
Made Ground	Encountered to max. 1.60m thickness, comprising stone, ash and brick 'fill' to 0.50-0.60mbgl, underlain by soft brown clayey sand to 1.60mbgl with small quantities of anthropogenic material.
Superficial	Brown slightly clayey sand, decreasing clay content with depth from 1.60mbgl, brown coarse sand with gravel from 2.40mbgl.
Bedrock	Sandstone encountered between 4.00-4.20mbgl.
Groundwater	No strikes during site investigation.

Table 1-3: Summary of ground conditions from EMS site investigation.

With the exception of the anthropogenic material encountered in the made ground, no further evidence of potential contamination was identified.

Laboratory testing indicated soil concentrations of lead and total EPH (C10-C40) were above the assessment criteria (residential land-use with plant uptake) in the made ground at c. 0.20mbgl. Using current assessment criteria, PAHs are also elevated in the made ground (BH2 0.20mbgl). The EPH contamination was considered to pose a potential risk to controlled water receptors and water pipes.

Table 1-4 summarises the 2021 TLC site investigation.

Scope	7no. trial pits (TP1-TP7). 5no. window sample boreholes (WS1-WS5). Ground gas and groundwater monitoring (6no. visits over 6 week period). Soil and leachate testing (in lieu of groundwater testing).
Made Ground	Encountered to max. 1.60-2.00m thickness, comprising reworked gravelly sand or gravelly clay, anthropogenic inclusions of tarmac, ash, cinders, coal, sandstone and occasional polythene, metal, timber, slag, pottery at shallow depths.
Superficial	Soft to firm very low to low strength clay from 1.60-2.00mbgl to >1.80-2.70mbgl. Sand or sand and gravel encountered to >3.55 -4.25mbgl. 0.40m thick layer of silt encountered at WS2.
Bedrock	Sandstone encountered from 3.55-4.25mbgl to >3.71->4.33mbgl, recovered as a dark reddish brown slightly silty SAND.
Groundwater	No strikes during site investigation. All boreholes dry during monitoring.
Obstructions	Cobbles and boulders encountered within made ground, but did not prevent progress of window sample boreholes.
Soil Exceedances	Made ground (upper c. 0.70mbgl): Lead, naphthalene, benzo(a) pyrene (used as a surrogate marker for PAHs), 1,1,1-trichloroethane, 1- and 2-methylnaphthalene, dibenzofuran, carbazole.
Leachate Exceedances	PAHs at TP3 0.30m and TP7 0.25m, aliphatic TPHs at TP7 0.25m and WS4 0.50m.
Ground Gas	Max. CO ₂ concentration: 4.6%v/v. Max CH ₄ concentration: <0.1%v/v. Max. flow: <0.1l/hr Atmospheric pressure: 1004-1019mbar. Atmospheric pressure trend: falling (2no. visits), steady (1no. visit), rising (3no. visits). Max. Gas Screening Value (GSV): 0.0046l/hr. Characteristic Situation (CS): 1.
Potable Water Pipes	Organic contaminants in shallow made ground exceed threshold for PE pipes. Barrier pipe likely to be required.

Table 1-4: Summary of ground conditions from TLC site investigation.

To address the potential vapour inhalation risk, TLC recommended the following remediation: source removal of the contamination or a hydrocarbon membrane and passively ventilated subfloor void.

1.3. Further Assessment of Pollutant Linkages

Current good practice requires that the findings from a site investigation should be evaluated on a site-specific basis, using a risk-based approach. Risk assessment involves identification and evaluation of the hazards presented by the concentrations of contaminants measured followed by an evaluation of the risks which are associated with these hazards (LCRM²). Each pollutant linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552³.

The revised contamination conceptual model is presented in Table 1-6.

Where a very low risk or low risk is identified no specific remediation is required.

Where there is a moderate / low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended. The contamination conceptual model in the TLC report has been updated to be in line with LKC current risk assessment methodology. The model is based on the contamination sources, pathways and receptors identified in the TLC and EMS reports. Additionally, as a new screening value for naphthalene was released in 2024, LKC has compared the TLC naphthalene data against the new screening value.

The conceptual model is based on the future use of the site (post development), in line with proposed development scheme.

As the proposed development is for residential dwellings without garden areas / soft landscaping on the ground floor, residential without plant uptake screening values have been utilised and are contained in Appendix B.

1.3.1. Pollutant Linkage 1 – Human Health (Direct Contact)

Elevated lead, PAHs and SVOCs were identified in the shallow made ground. As there is no soft landscaping proposed, there is no viable pollutant linkage pathway and no further assessment is required for future residents.

Consideration should be given to the potential risk for construction workers.

1.3.2. Pollutant Linkage 2 – Human Health (Inhalation of Vapours)

TLC identified elevated naphthalene, 1,1,1-trichloroethane, 1- and 2-methylnaphthalene, dibenzofuran, carbazole were identified above screening values.

CL:AIRE introduced a new Category 4 Screening Level (C4SL) for naphthalene in 2024⁴. An excerpt is provided below in Plate 1-1, and the TLC data has been re-risk assessed using the screening values for residential without homegrown produce.

Land-use	C4SLs (mg.kg ⁻¹)		
	SOM Content		
	1.0%	2.5%	6.0%
Residential with consumption of homegrown produce	15	36	85
Residential without consumption of homegrown produce	15	36	85
Allotments	65	130	200
Commercial	1,600 *	3,700 *	8,400 *
Public Open Space (residential)	11,000 *	15,000 *	17,000 *
Public Open Space (park)	800 *	1,200 *	1,900 *

N.B. These C4SLs are based on chronic risk only. For further discussion of acute risks and other factors that should be considered when using these C4SLs see Section 4.2.

* C4SL exceeds the CLEA calculated soil saturation concentration (76 mg kg⁻¹ for 1% SOM, 183 mg kg⁻¹ for 2.5% SOM and 432 mg kg⁻¹ for 6% SOM) – see final bullet in Section 4.2.

Plate 1-1: Excerpt from CL:AIRE C4SL: naphthalene.

The locations below in Table 1-5 exceeded the C4SL for naphthalene. As TOC was tested, the result was converted to SOM. Where no Total Organic Carbon (TOC) or Soil Organic Matter (SOM) result was available, the criteria for 1% SOM was utilised.

Sample Location / Depth (mbgl)	Contaminant	TOC (%)	SOM* (%)	Criteria (mg/kg)	Sample Result > Criteria (mg/kg)	Depth of Impacted Made Ground (mbgl)
TP5/ 0.40	Naphthalene	4.3	7.4	85	114.10	0.25-0.60
TP7 / 0.25		NT	1	15	40.62	0.15-0.45

Table 1-5: Summary of elevated naphthalene results.

Notes:

*SOM=1.72*Total Organic Carbon.

NT= Not Tested.

Only results that exceeded assessment criteria have been shown and results from all depths are noted. Results have been compared to the nearest appropriate SOM for the assessment criteria.

Elevated SVOCs/VOCs (1,1,1-trichloroethane, 1- and 2-methylnaphthalene, dibenzofuran, carbazole) were also identified at TP7 0.25mbgl.

Tarmacadam is present above the made ground impacted with high naphthalene. TLC did not encounter elevated naphthalene in deeper layers of made ground. Therefore, LKC suggest that the source of the naphthalene contamination can be attributed to the tarmacadam and likely draw down of tarmacadam fragments into the underlying made ground strata. Additionally, LKC note that the PAH concentrations for both samples listed in Table 1-5 are in the 100s of mg/kg, suggesting that coal tar is present in the tarmacadam.

The structural engineer for the development, Booth King Partnership Ltd (Booth King) have provided foundation drawings and the following commentary:

- There will be some level reduction between 0.45mbgl and-1.00mbgl to account for the below ground level car parking.

- The proposed foundations will be piled into the weathered sandstone at 3.50mbgl. Pile caps and ground beams are 0.60-1.00m thick.
- The structural engineer anticipates a 0.80mbgl cut to account for the piling mat.
- There is no habitable space on the lower ground floor – this is underground car parking. There are elevated access hallways and WC but these are to be suspended above vented void space.

Given the above, the tarmacadam will be removed together with the upper c. 0.60-1.00m of made ground affected by elevated volatile contamination during the site enabling works. The lower ground floor level will comprise ventilated voids and will be partially ventilated as it is a car park.

The probability of vapours posing a risk to site users across from the remaining site soils is considered to be unlikely. With a medium consequence, the risk is expected to be low, and no further investigation / assessment is recommended.

1.3.3. Pollutant Linkage 3 – Hazardous Ground Gas

6no. gas monitoring visits were undertaken over a 6-week period. Per Table 1-4, maximum carbon dioxide concentrations were 4.6%v/v, methane concentrations were <0.1%v/v and flow rates were <0.1l/hr. TLC calculated a GSV of 0.0046l/hr and designated the site as Characteristic Situation (CS) 1 per CIRIA C665⁵.

The gas can potentially migrate into buildings, accumulate in confined spaces, and cause explosions (methane) and asphyxiation. LKC consider the probability of carbon dioxide and methane gas affecting site users and buildings as unlikely. Assuming a severe consequence, there is a moderate / low risk. Given the minimal gas concentrations and flow, a low risk is considered most appropriate, and no remediation is required.

1.3.4. Pollutant Linkage 4 – Controlled Waters

The site is underlain by a Secondary A Aquifer in the superficial deposits and a Principal Aquifer in the bedrock. The River Medlock is located 33m west. As no groundwater was encountered during both the EMS and TLC site investigations or during the monitoring period, and the Bridgewater and Rochdale Canals are lined with puddle clay and unlikely to be in hydraulic continuity with groundwater, the River Medlock and Principal Aquifer are the primary controlled waters receptors.

As no groundwater was encountered, TLC undertook leachate testing of made ground soils. The following exceedances were identified:

- PAHs at TP3 0.30m and TP7 0.25m.
- Aliphatic TPHs at TP7 0.25m and WS4 0.50m.

LKC note that the leaching test is aggressive (de-ionised water) and is not in aqueous equilibrium (steady state) with the solid sample. This may cause rapid dissolution and overestimation of the aqueous phase concentrations compared to groundwater in contact with contaminated soils. Although dissolution may be reduced for highly hydrophobic contaminants⁶ such as B(a)P, it is likely that the initial leaching will remove the most readily available hydrocarbons and subsequent flushing would reduce the leachable concentrations⁷. Traditionally the leaching test was developed for inorganic constituents and the leaching of organics is poorly understood⁸.

TLC identified a thin layer of clay present across the site from 1.60-2.00mbgl to >1.80-2.70mbgl. The natural clay present across the site should reduce any sub-surface migration and processes including dilution, attenuation and biodegradation will reduce the concentration of contamination. Furthermore, due to the aforementioned level reduction across the site to accommodate the piling mat and piling caps, the impacted made ground is likely to be removed during the site enabling works.

Based on the above, LKC considers the probability of contaminants on site affecting the Principal Aquifer and River Medlock as unlikely. Given the medium consequence, a low risk is anticipated (Pollutant Linkage 4) and no remediation is required.

1.3.5. Pollutant Linkage 5 – Potable Water Supply Pipe

Soil results were compared to United Utilities (UU) guidelines for the selection of potable water pipes in land potentially affected by contamination. Only contaminants of concern, based on the preliminary conceptual model and ground conditions encountered, were analysed.

The following contaminants are elevated above the PE threshold:

- VOCs inc. naphthalene at TP5 0.40m and TP7 0.25m.
- Aliphatic and aromatic petroleum hydrocarbons EC10-EC16, EC 16-EC40 at TP4 0.25m and TP7 0.25m

The contamination does not appear to extend to the deeper layers of made ground. Due to the aforementioned level reduction across the site to accommodate the piling mat and piling caps, it is likely that the contaminated made ground will be removed. As new potable water pipes are placed at 0.75-1.35mbgl and the water pipes will be situated in relatively clean material.

The probability of organic contaminants affecting potable water pipes is unlikely. Given the consequence is considered to be medium, the risk (Pollutant Linkage 5) is anticipated to be low, and no remediation is likely to be required.

Once details of the pipeline location and depths are known a UU Water Pipe Risk Assessment in line with the utility provider should be undertaken to confirm the most appropriate pipework for potable water.

PL	Contaminants of Concern (source)	Pathway	Receptor	Probability	Consequence	Risk	Recommendations
1	Heavy metals (lead), PAHs, VOCs/SVOCs, TPHs (made ground)	No viable pathways (dermal contact, inhalation, ingestion).	Future site users. Offsite receptors.	-	-	-	No remediation required.
2	Volatile contaminants including naphthalene, VOCs/SVOCs (made ground)	Inhalation of vapours. Migration via permeable strata and preferential pathways.	Future site users. Offsite receptors.	Unlikely	Medium	Low	Source removal of upper 0.60-1.00mbgl of made ground undertaken during site enabling phase, ventilated voids and use of lower ground level as car parking will reduce the risk of volatiles accumulating and the risk to future receptors.
3	Hazardous / ground gas: methane, carbon dioxide (made ground, infilled features within 250m)	Migration via permeable strata and preferential pathways. Inhalation of gas. Explosion in confined spaces.	Future site users. Buildings. Offsite receptors.	Unlikely	Severe	Moderate / Low	Low CO ₂ and CH ₄ concentrations and low flow recorded during gas monitoring. Site classified as CS1. No remediation required.
3	Radon	Migration via permeable strata and preferential pathways. Exposure to radon.	Future site users. Offsite land users.	Unlikely	Medium	Low	No remediation required.
4	PAHs, TPHS (made ground)	Surface run-off. Migration via permeable strata and preferential pathways. Perched waters migration.	Groundwater Surface water	Unlikely	Medium	Low	Remediation associated with PL1 will reduce the risk.
5	VOCs, TPHS (made ground)	Permeation of pipes. Ingestion of tainted water supply.	Future site users. Water pipes.	Unlikely	Medium	Low	Remediation associated with PL1 will reduce the risk. Potable water pipe risk assessment required.

Table 1-6: Revised Contamination Conceptual Model.

2. Remediation Options Appraisal

Table 2-1 is based on the EA's⁹ option applicability matrix, with due consideration to site and project specific conditions. A qualitative assessment of cost and time scales has also been included to inform the selection of remediation options.

Method/ Technology	Remediation options	Linkage	Relative Cost	Discussion
Civil engineering	Excavation and disposal	Source removal	££££	Pros: Excavation of impacted material is quick and effective at completely removing future legacy issues. Cons: Cost of disposal of hazardous waste is prohibitive for large volumes and sustainability is considered low when sending soils to landfill.
Biological	Windrow turning.	Source removal	££	Pros: Treatment of impacted material can be done on site. Sustainable approach to retain on site. Excavation and turnover of site is already part way towards this technique. Reduced timescales, when used as part of treatment train such as with excavation and disposal and containment. Can be designed to incorporate as part of build phase programme. Cons: May not be sufficient for most grossly contaminated and less volatile fractions.
Chemical	Chemical dehalogenation, soil flushing, solvent extraction.	Source removal	££££	Pros: Treatment of impacted material can be done on site. Sustainable approach to retain on site. Cons: Economy of scale makes it expensive on relatively small volumes. Addition of chemicals to sub-surface may produce polluting by-products.
Physical	Soil Vapour Extraction	Source removal	££££	Pros: Proven technology for VOCs and petroleum hydrocarbons. Cons: Economy of scale makes it expensive on relatively small volumes. Treatment times may be uncondusive to development programme. Ground would still need full turnover.
Thermal	Incineration Thermal desorption	Source removal	££££	Pros: Now an established technique to address contaminants on site. Sustainable and relatively short treatment times. Cons: Relatively specialised techniques. Pilot / bench scale trials would be required. Prohibitively expensive for small volumes.

Table 2-1: Summary Remediation Options Appraisal for Contaminants of Concern (naphthalene and VOCs).

Following consideration of the options appraisal in Table 2-1, the most feasible remediation approach naphthalene and VOC/SVOC contamination is excavation and disposal.

It is envisaged that this remediation option will be undertaken during the site enabling works.

3. Remediation Strategy

3.1. Aims and Objectives

LKC consider the remediation works may be spilt in to the 'pre-construction' (or enabling works) phase and the 'build phase' (i.e. during the residential development works) phase.

The recommendations provided below in Table 3-1 are considered appropriate for the site based on the site investigation work undertaken. LKC consider that adequate information has been presented and do not deem further investigation works necessary.

PL	Recommendation
1	No specific remediation required. Chemical testing of imported topsoil used in rooftop garden areas.
2	Source removal as part of level reduction site enabling works. Validation sampling required.
3	No remediation required.
4	No remediation required.
5	Potable water pipe assessment required. Barrier pipe unlikely to be required.

Table 3-1: LKC Remediation Recommendations.

LKC should stress that no remediation, enabling works or designing works should take place until Regulatory approval has been obtained.

The following remediation is required – further details are provided in the following sections.

- A watching brief for unexpected contamination during earthworks.
- Source removal of upper c.0.60-1.00mbgl of made ground during the site enabling works, with validation samples obtained following completion of level reduction by a suitably qualified environmental consultant and tested for naphthalene and VOCs/SVOCs.
- Nominal 150mm thickness of imported topsoil required for rooftop garden areas.
- Appropriate disposal of waste soil material to a licensed recycling facility (if required for build phase).

LKC recommend that the proposed works are prior approved by the regulators prior to the commencement of construction works.

3.2. General Site-Wide Remediation Works

3.2.1. Watching Brief for Unexpected Contamination

A watching brief will be maintained for evidence of previously unidentified contamination earthworks and development works. If evidence of contamination is identified, then works in the area will stop and LKC and the Local Authority informed.

If any unexpected contamination is encountered, LKC shall undertake further delineation works, and this may include collection of appropriate samples for laboratory analysis to further characterise the material and allow a risk assessment to be undertaken or removal of the impacted material to quarantine.

Soil samples will be taken and analysed for a suite of contaminants representative of the impacted material. To determine that significantly impacted soils have been removed, LKC shall collect verification samples from the base and sides of the excavation.

Quarantined material may be removed offsite to a licensed treatment facility, or an assessment made of its potential for treatment and / or retention on site.

3.2.2. Segregation & Removal of Unsuitable Material

There is potential for some unidentified geotechnically or chemically unsuitable material to be encountered during enabling works.

Such materials will undergo appropriate investigation and testing to ascertain their suitability for re-use, if feasible. Should material be considered either chemically or geotechnically unsuitable then this material will be removed from site under the protocols described in the following sections.

3.2.3. Materials Management

To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered.

This will allow the following to be used onsite or brought in for use onsite (refer to guidance for types of waste that can be used):

- 5,000 tonnes (c. 3,500m³) treatment of crushed concrete/stone.
- 1,000 tonnes (c. 750m³) use of non-hazardous soil.
- 5,000 tonnes (c. 3,500m³) use of clays, sand, gravel, brick, concrete, stone etc.
- 50,000 tonnes (c. 33,000m³) use of bituminous material to be used in roadways.

A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice may be required if volumes exceed exemption limits. This must be registered before material movement starts onsite.

If an MMP is required, this needs to be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no 'sham recovery'.

3.2.4. Construction Activity & Inspection

The following activities and inspections should be incorporated into the site works:

- Due to the variability of the soils at the site it is recommended that sufficient allowance is made for the inspection of formation and sub formations to foundations and pavement construction.
- Excavations where access is required should be subject to a risk assessment from a competent person and where appropriate mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97¹⁰ utilised.
- Where access to confined spaces is required appropriate mitigation measures should be addressed within the Construction Stage Health and Safety Plan

3.2.5. Control of Water

It is considered that significant de-watering is unlikely to be required across the majority of the site. No groundwater was encountered during the site investigation or monitoring, although some localised ingress of small volumes of perched groundwater should be anticipated. Most excavations will be limited to above the groundwater level.

Arrangements should be made to prevent ponding in shallow excavations; the Contractor should ensure that ground levels are of sufficient gradient to enable the collection of surface water run-off in sumps or grips. Pumping from over-excavated sumps may be required to maintain satisfactory working conditions.

Contingency arrangements to remove groundwater (including contamination groundwater if encountered) from excavations / relict structures should be allowed.

Small volumes of pumped fluids/ groundwater should be stored in appropriate, sealed tanks/containers and analysed for a range of determinants prior to disposal to suitable facility. Alternatively, a temporary discharge licence, including their requirements for treatment/ testing should be agreed with local utility providers (united utilities) prior to start on site.

3.2.6. Stockpile Management

Stockpiled material should be suitably managed. The source of each stockpile should be recorded and appropriate validation testing for the proposed re-use or potential offsite disposal should be undertaken as required. Depending on the nature of the material the potential for dust generation will be mitigated by dampening down and covering as required.

Material should be segregated by type and source. For example, construction / demolition arisings, site won subsoil, etc.

A quarantine area for suspect contaminated soils should be established on site. This should comprise an impermeable lined area with a small bund to prevent run off and to minimise the risk of contaminating other areas of the site. The material should also be covered to minimise the generation of vapours, fibres, dust and possible nuisance to adjacent receptors, and to prevent rainwater ingress which may mobilise soluble contaminants as required.

3.2.7. Disposal

Material required to be removed from site should be undertaken under an appropriate duty of care and the results of chemical analysis should be provided to a licensed landfill for confirmation of waste classification.

3.3. Pre-construction (Enabling) Works

3.3.1. Excavation of Naphthalene and VOC Impacted Made Ground

Impacted soils identified in the shallow made ground to c. 0.60-1.00mbgl will be excavated for off-site disposal.

There is no way of knowing the full extent of impacted material on site based on site investigation alone. Historical information, along with site investigation data indicate it

is mainly present within the upper layer of predominantly granular made ground where tarmacadam is present, encountered to c. 0.60mbgl.

A visual and olfactory assessment of material will be undertaken by a suitably qualified geo-environmental engineer to determine the lateral and vertical extents of the excavations. On-site screening will be undertaken using a PID.

Verification samples will be collected from the sides and base of the excavation will be collected for confirmatory laboratory analysis. Laboratory analysis will include assessment of contaminants of concern (*inter alia* naphthalene, VOCs, SVOCs and SOM).

Excavated materials will be temporarily stockpiled on site as described in site wide remediation works, confirmatory testing for waste classification and/or removal from site to a suitably licensed facility.

Samples of material earmarked for re-use will be subject to laboratory testing for contaminants of concern (as above). Suitability for use criteria is based on published GAC (Appendix B). For validation samples of remaining in-situ soil as part of the excavation, a 'residential without plant uptake' land use is considered suitable.

Additional risk assessment and generation of site-specific risk assessment may be considered suitable based on the site conditions and contamination encountered during remediation works and should be detailed in the verification report.

It is envisaged that remediation of hotspot area will be done under a 'pilot trial and small-scale remediation scheme'¹¹. If volumes exceed 1,000m³ a suitable environmental permit will be required.

Temporary stockpiles of material will be managed on site as described in sections above. Volumes for treatment and/ or disposal will be recorded and included in the verification report following completion of the remediation works.

3.4. Build Phase Remediation

3.4.1. Environmental Cover System

No specific remediation is required within the rooftop garden areas. The proposed planting is likely to necessitate nominal 150mm thickness of imported topsoil as a growing medium for the proposed planting within these areas, per NHBC recommendations. No further requirement for remediation is required.

3.4.2. Potable Water Pipes

It is recommended that the Water Pipeline Risk Assessment is provided to the water supply company once the location and depth of potable water pipes are known. Additional investigation and risk assessment may be requested.

4. Verification Plan

The Remediation Strategy as outlined above should be carried out in accordance with a Verification Plan. Land Contamination Risk Management (LCRM)¹² states.

“You will need to produce a verification plan. This will be a part of the remediation strategy. It will need to set out all of the data requirements, including compliance criteria and monitoring details. This will establish a ‘lines of evidence’ approach which will verify remediation is working or has worked.”

4.1. Pre-construction Verification

The findings of a watching brief should be provided for inclusion within the completion report. This should include any additional testing and assessment for unexpected contamination, disposal and stockpile management.

Waste records such as disposal tickets and waste carrier licences should be provided in the Site Completion Report. Photographic evidence of removal and waste removal tickets should be retained and included in the Site Completion Report.

The contractor for the site enabling works is not currently known and should be confirmed as part of validation works. The verification plan for the works is provided in Table 4-1.

Where reduced level excavations are taken to within natural strata, then this should be inspected by LKC to confirm removal of the made ground, with a full photographic record included in completion report.

Validation samples of the sides and base of the excavation should be obtained and tested per Section 3.3.1.

Activity	Responsibility	Information to be provided in Site Completion Report.
1) Excavation of made ground including tarmacadam.	Contractor / site manager to provide photographic evidence. LKC to inspect reduced levels.	Photographs.
2) Removal of made ground from site	Contractor to collate and provide Waste Transfer Notes to LKC	Copy Waste Transfer Notes.
3) Validation sampling of remaining material.	LKC to collect soil samples for chemical validation. Samples to be obtained from excavation sides and base.	Details of validation sampling, quantities required, soil risk assessment and statement of suitability.

Table 4-1: Verification of naphthalene and VOC/SVOC impacted made ground removal.

4.2. Environmental Cover Soils Verification

The contractor for the works or the source of imported topsoil is not currently known and should be confirmed as part of validation works.

The verification plan for the works is provided in Table 4-2.

Activity	Responsibility	Information to be provided in Site Completion Report.
1) Validation of imported topsoil	Contractor to identify soil sources and confirm to LKC. LKC to collect soil samples for chemical validation.	Details of validation sampling, quantities required, soil risk assessment and statement of suitability.

Table 4-2: Verification of Imported Topsoil.

Chemical validation of all imported topsoil to be used on site in rooftop garden areas should be undertaken. Imported soils should be accompanied by a certificate of analysis and source details.

It is recommended that imported soils are sampled at source prior to import to prevent cross contamination and double handling if soil fails, with confirmatory sampling undertaken on importation to site. Where this is not possible then material imported should be segregated based on source and soil type. Validation samples should be taken prior to placement in the rooftop gardens to ensure suitability for use and following placement in gardens to ensure absence of cross contamination and ultimate suitability for use.

A summary of the required imported material sampling requirements is presented in Table 4-3, based on MCC 'Guidelines to Developer' (2021)¹³.

Material Type	Source	Suite of Analysis	Sampling Rate (min. 3 per source)		
			Garden	Landscape	Other *
Topsoil	Greenfield	Suite A	200m ³	200m ³	200m ³
	Remediated Site-won /	Suite A / B dependent upon original SI	100m ³	150m ³	200m ³
	Brownfield Unknown /	Suite B	50m ³	150m ³	200m ³

Table 4-3: Sampling Requirements for Imported Topsoil.

Notes:

Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

*Other assumed to be stone / 6F2 / mass fill etc.

Any soil with visual or olfactory evidence of hydrocarbons should be rejected.

It should be ensured that the matrix of imported topsoil is suitable as a growing medium in line with BS3882¹⁴. Topsoil shall be free of weeds, roots or perennial weeds, pests, diseases, debris, tree roots, sticks, subsoil and foreign matter and shall be capable of being broken down to a fine tilth. LKC advise this information is provided by the supplier before material is imported onto site.

Soils to be used in private gardens will be compared against residential with plant uptake criteria.

Remedial target criteria are presented in Appendix B.

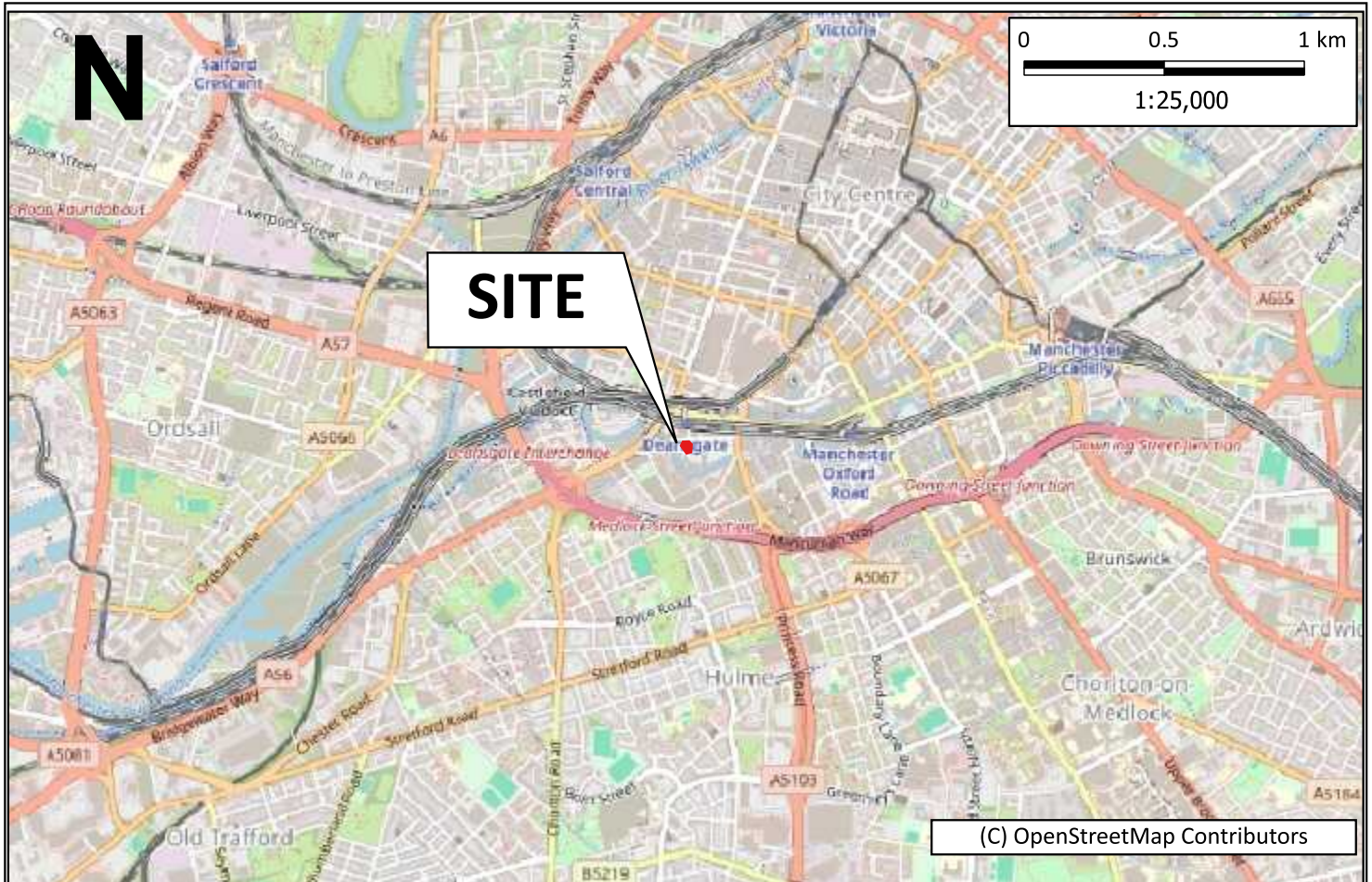
4.3. Verification of Potable Water Pipes

Confirmation of the findings of the water pipeline assessment should be obtained. Validation of pipeline installation should include delivery notes of pipe materials, photographs of installed pipe and confirmation of connections.

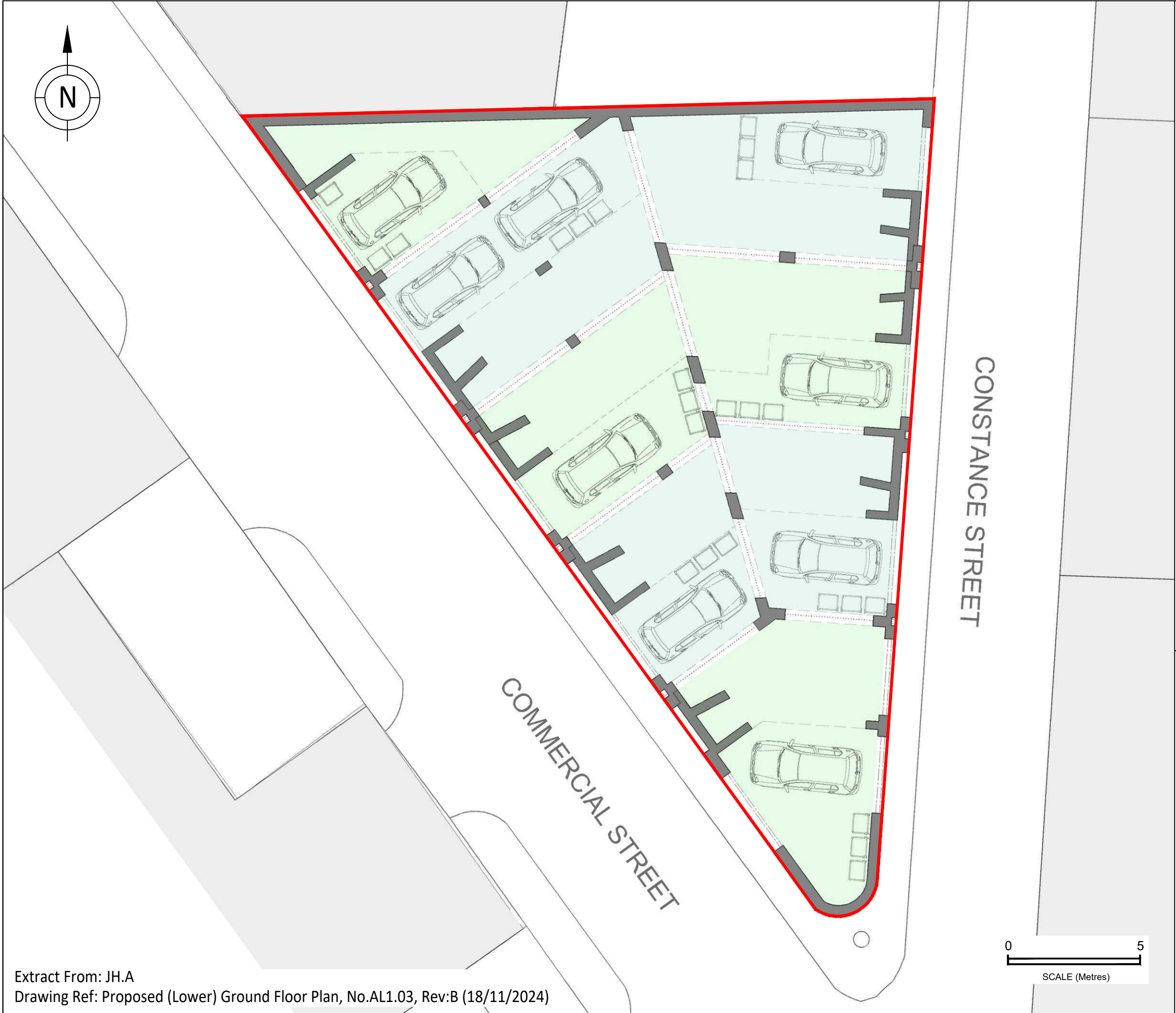
4.4. Site Completion Report

All remediation and validation work should be documented in a Site Completion Report. The Site Completion Report will allow discharge of relevant planning conditions.

Appendix A - Drawings



Client: Meadway Developments				Title: Site Location & Boundary Plan		 LK CONSULT
Site: Knott Hill, Manchester				Scale (see scale bar): 1:25,000 & 1 1:500 @ A4		
Job No.: LKC251247	Drawn By: LGD	Checked By: CC	Drawn: June 2025	Figure: 1		
				Revision:		



KEY

 Site Boundary

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.



LK CONSULT

Client: Meadway Developments			
Site: Knott Mill, Manchester			
Title: Proposed Development Plan (Lower Ground Floor Plan)			
Job No.: LKC251247	Scale (See Scale Bar): See Scale Bar	Figure: 2a	Revision:
Drawn By: AC	Checked By: EK	Drawn: Sep 2025	

Extract From: JH.A
Drawing Ref: Proposed (Lower) Ground Floor Plan, No.AL1.03, Rev:B (18/11/2024)



KEY

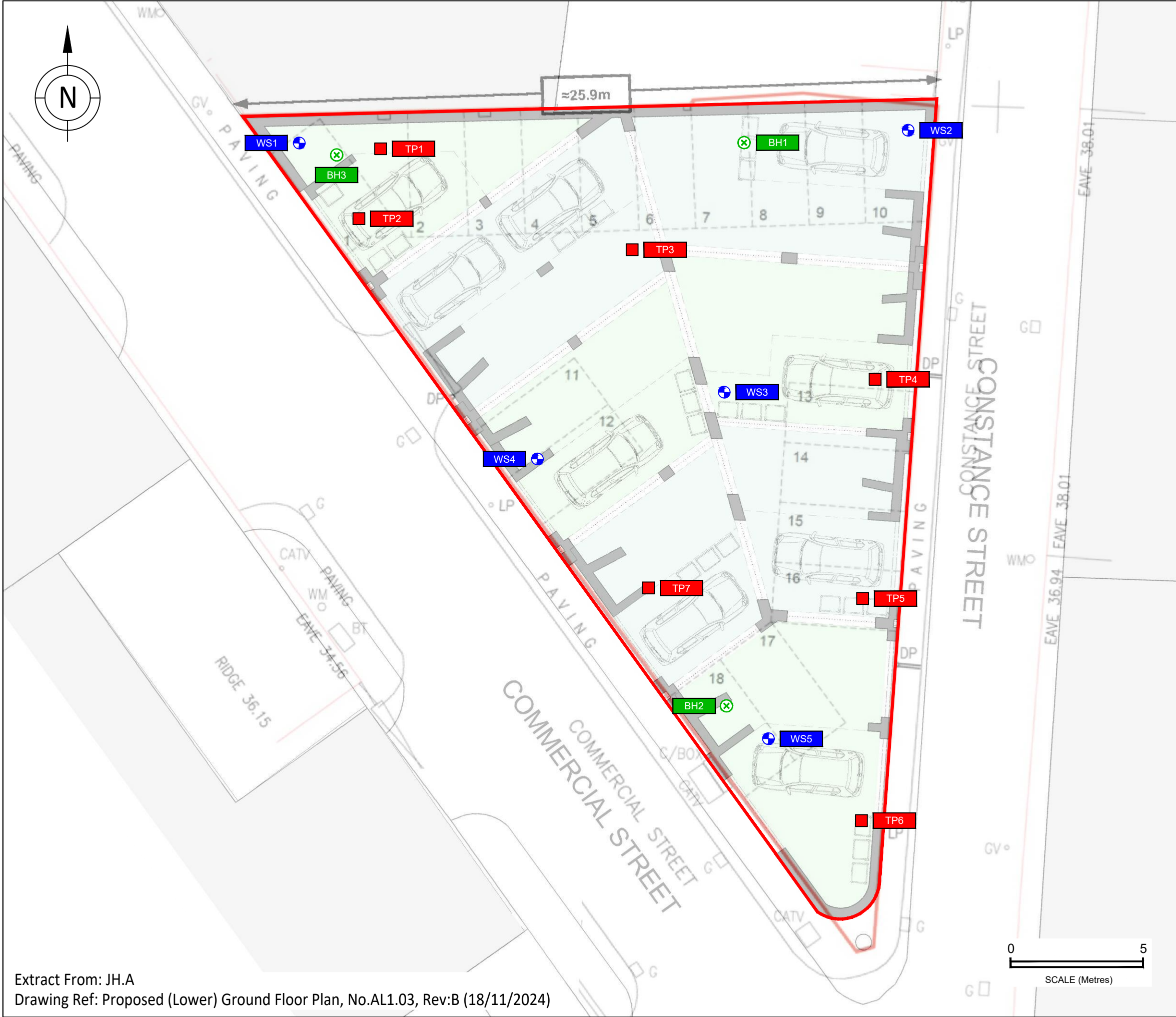
Site Boundary

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.



LK CONSULT

Client: Meadway Developments			
Site: Knott Mill, Manchester			
Title: Proposed Development Plan (Upper Ground Floor Plan)			
Job No.: LKC251247	Scale (See Scale Bar): See Scale Bar	Figure: 2b	Revision:
Drawn By: AC	Checked By: EK	Drawn: Sep 2025	



KEY

- Site Boundary
- Windowless Sample Borehole (WS)
(The Land Consultancy - 2021)
- Machine Excavated Trial Pit (TP)
(The Land Consultancy - 2021)
- Cable Percussive Borehole (CP)
(Environmental Management Solutions Ltd - 2008)

ADDITIONAL MAP OVERLAY:

Extract from: The Land Consultancy Limited
Drawing Ref: Existing Site Plan Displaying Exploratory Hole Locations, No.TLC1143/02 (15/06/2021)

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.

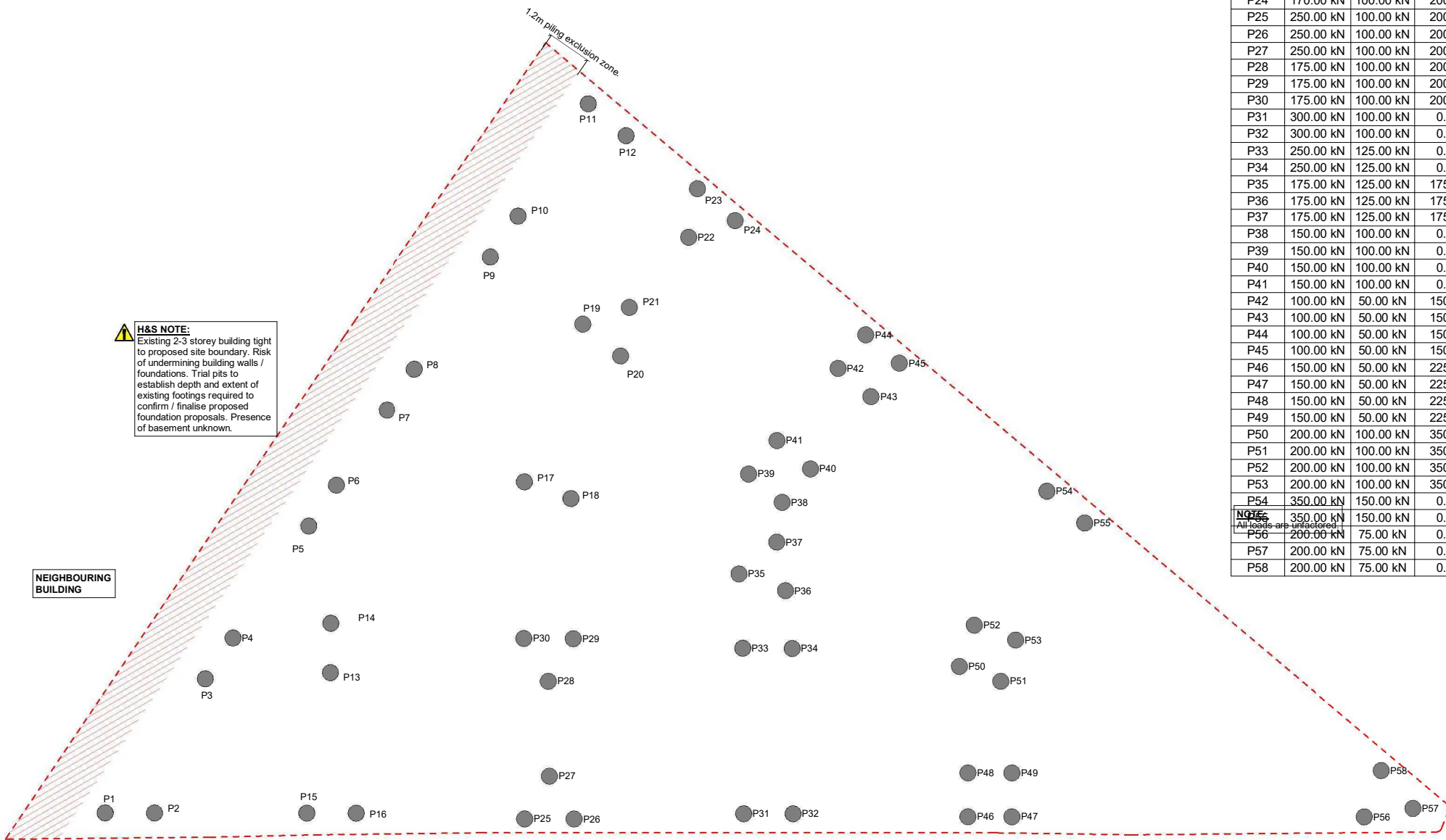
Client: **Meadway Developments**

Site: **Knott Mill, Manchester**

Title: **Site Investigation Location Plan
(Lower Ground Floor Plan)**

Job No.: LKC251247	Scale (See Scale Bar): See Scale Bar	Figure: 3	Revision:
Drawn By: AC	Checked By: EK	Drawn: Sep 2025	

Extract From: JH.A
Drawing Ref: Proposed (Lower) Ground Floor Plan, No.AL1.03, Rev:B (18/11/2024)



Pile Schedule							
Pile Ref.	Vertical			Horizontal			Cut Off Level (m)
	Dead Load (kN)	Live Load (kN)	Horizontal Load (kN)	Gkh (kN)	Qkh, Imposed (kN)	Wh, Wind (kN)	
P1	200.00 kN	125.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.15
P2	200.00 kN	125.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.15
P3	140.00 kN	50.00 kN	100.00 kN	0.00 kN	0.00 kN	75.00 kN	27.15
P4	140.00 kN	50.00 kN	100.00 kN	0.00 kN	0.00 kN	75.00 kN	27.15
P5	175.00 kN	75.00 kN	0.00 kN	0.00 kN	0.00 kN	75.00 kN	27.15
P6	175.00 kN	75.00 kN	0.00 kN	0.00 kN	0.00 kN	75.00 kN	27.15
P7	250.00 kN	100.00 kN	125.00 kN	0.00 kN	0.00 kN	75.00 kN	27.65
P8	250.00 kN	100.00 kN	125.00 kN	0.00 kN	0.00 kN	75.00 kN	27.65
P9	300.00 kN	125.00 kN	125.00 kN	0.00 kN	0.00 kN	15.00 kN	27.65
P10	300.00 kN	125.00 kN	125.00 kN	0.00 kN	0.00 kN	15.00 kN	27.65
P11	175.00 kN	50.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.65
P12	175.00 kN	50.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.65
P13	250.00 kN	150.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN	27.15
P14	250.00 kN	150.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN	27.15
P15	300.00 kN	125.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.15
P16	300.00 kN	125.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.15
P17	250.00 kN	150.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN	27.65
P18	250.00 kN	150.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN	27.65
P19	250.00 kN	125.00 kN	0.00 kN	0.00 kN	0.00 kN	75.00 kN	27.65
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P34	250.00 kN	125.00 kN	0.00 kN	0.00 kN	0.00 kN	0.00 kN	27.15
P35	175.00 kN	125.00 kN	175.00 kN	0.00 kN	0.00 kN	75.00 kN	27.15
P36	175.00 kN	125.00 kN	175.00 kN	0.00 kN	0.00 kN	75.00 kN	27.15
P37	175.00 kN	125.00 kN	175.00 kN	0.00 kN	0.00 kN	75.00 kN	27.15
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P43	100.00 kN	50.00 kN	150.00 kN	0.00 kN	0.00 kN	50.00 kN	27.50
P44	100.00 kN	50.00 kN	150.00 kN	0.00 kN	0.00 kN	50.00 kN	27.50
P45	100.00 kN	50.00 kN	150.00 kN	0.00 kN	0.00 kN	50.00 kN	27.50
P46	150.00 kN	50.00 kN	225.00 kN	0.00 kN	0.00 kN	75.00 kN	27.15
P47	150.00 kN	50.00 kN	225.00 kN	0.00 kN	0.00 kN	75.00 kN	27.15
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P55	350.00 kN	150.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.15
P56	200.00 kN	75.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.15
P57	200.00 kN	75.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.15
P58	200.00 kN	75.00 kN	0.00 kN	0.00 kN	0.00 kN	15.00 kN	27.15

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C, Contractual - Approved for stage completion.
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S0 - WIP
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A1, An, etc. (where "n" relates to the project stage)
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NOTE:
All piles to be 7 meters in length with a 2.5m socket into bedrock. Pile cut levels are based on 100mm projection into pile caps.

KEY:

Denotes site boundary location.

Denotes concrete pile locations.

P01	06.08.25	Preliminary Issue	JDE
REV.	DATE	REVISION DETAILS	INITIALS
CURRENT DRAWING REVISION CHECKED BY LH			
CURRENT DRAWING REVISION APPROVED BY LH			
DRAWING STATUS: S1		PROJECT STAGE: STAGE 2	

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RAMSBOTTOM

MANCHESTER

EDINBURGH

Tel: 01706 822 022

Tel: 0161 694 7087

Tel: 0131 229 1547

PROJECT:

Knott Mill Townhouses, Manchester

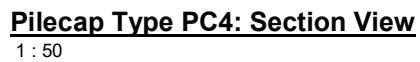
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Piling GA

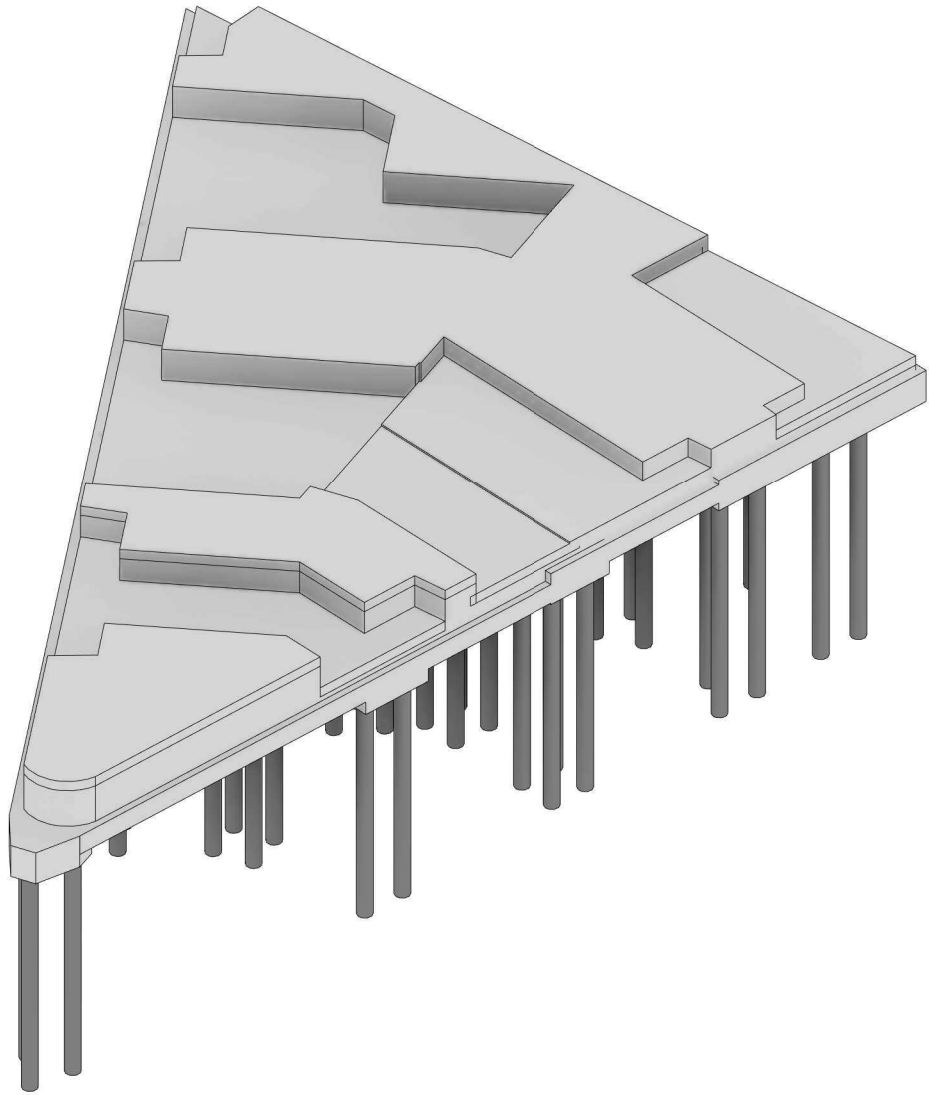
SCALE (A1)	AUTHOR	DATE	REVISION	BKPL No.
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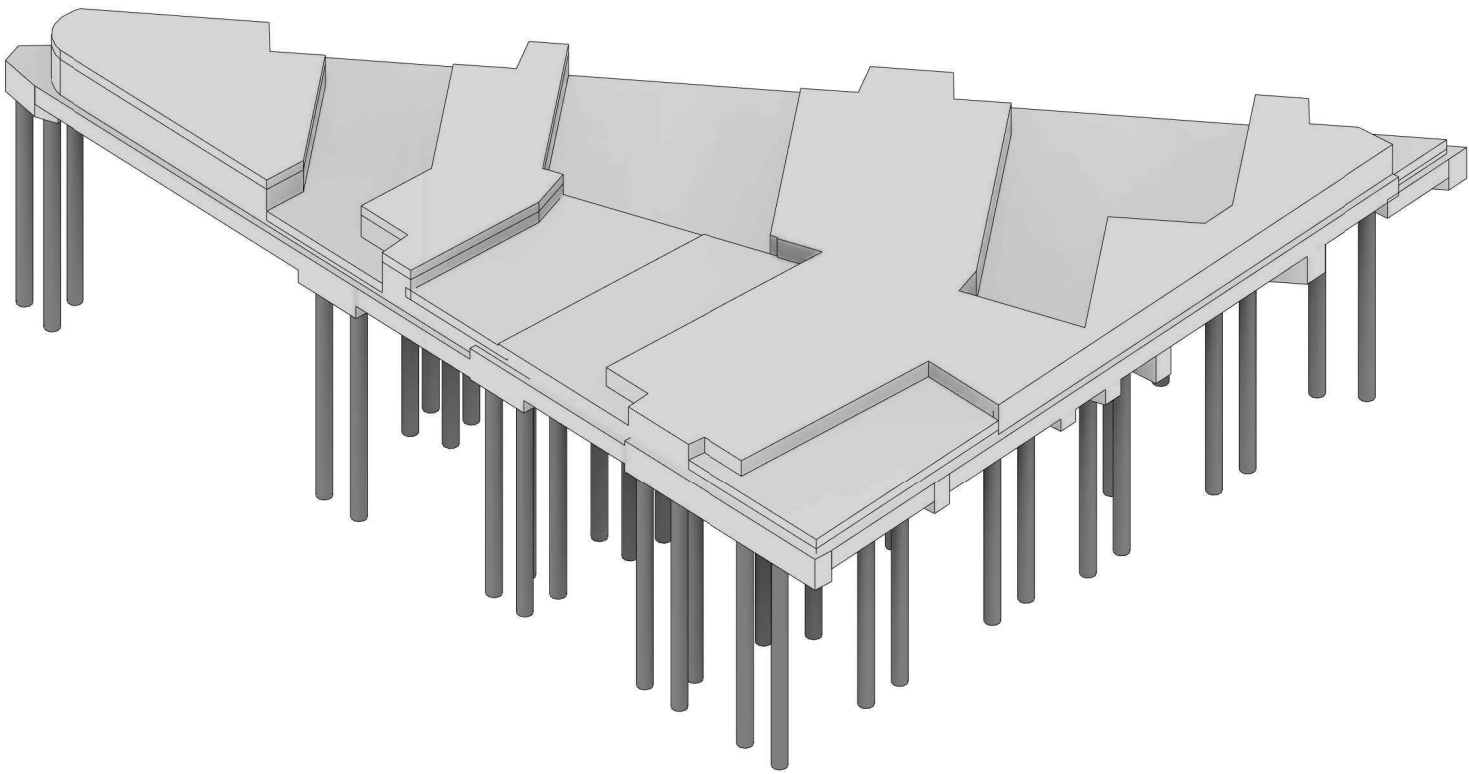
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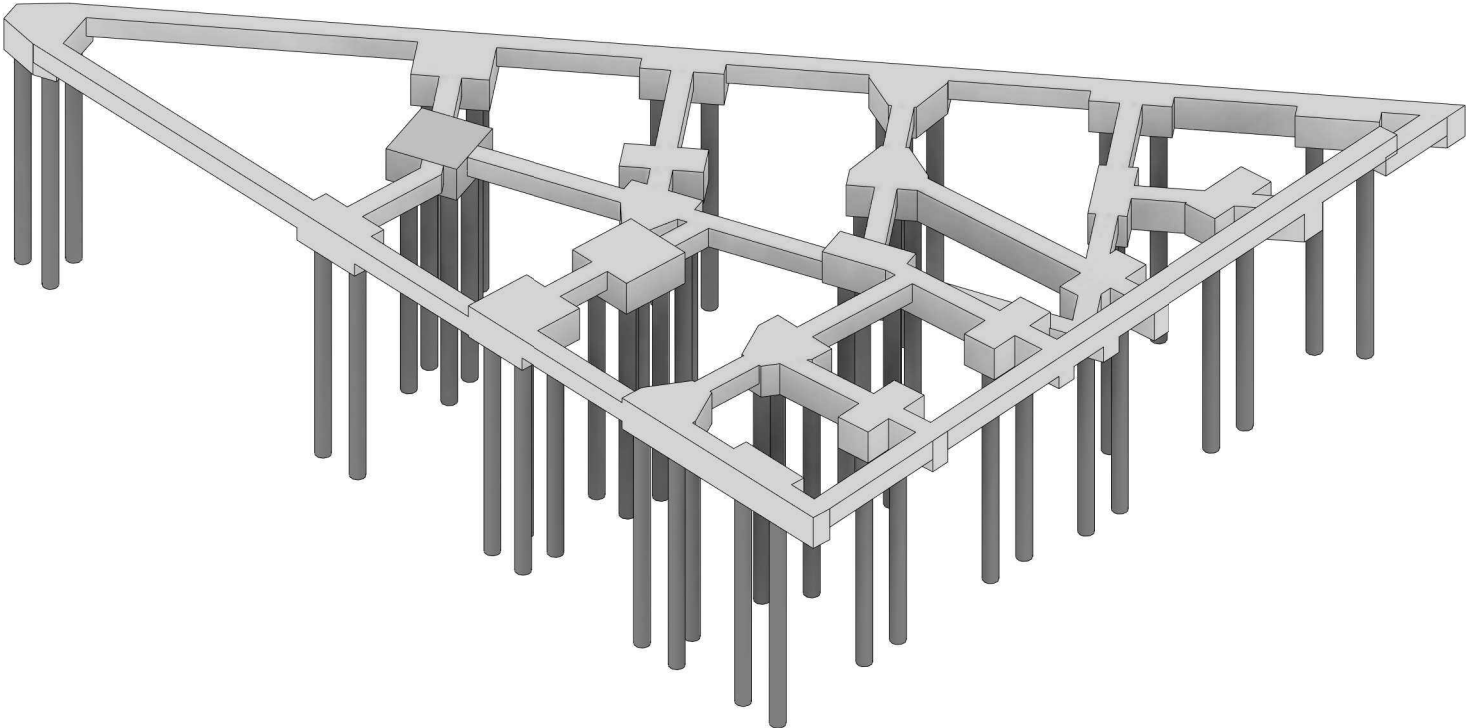
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| PROJECT: | | | | |
| Knott Mill Townhouses,
Manchester | | | | |
| TITLE: | | | | |
| Foundations GA | | | | |
| SCALE (A1)
As
indicated | AUTHOR
JDE | DATE
Aug' 25 | REVISION
P01 | BKPL No.
15606 |
| DRAWING REF: | | | | |
| 15606-BKP-V1-XX-DR-S-0100 | | | | |



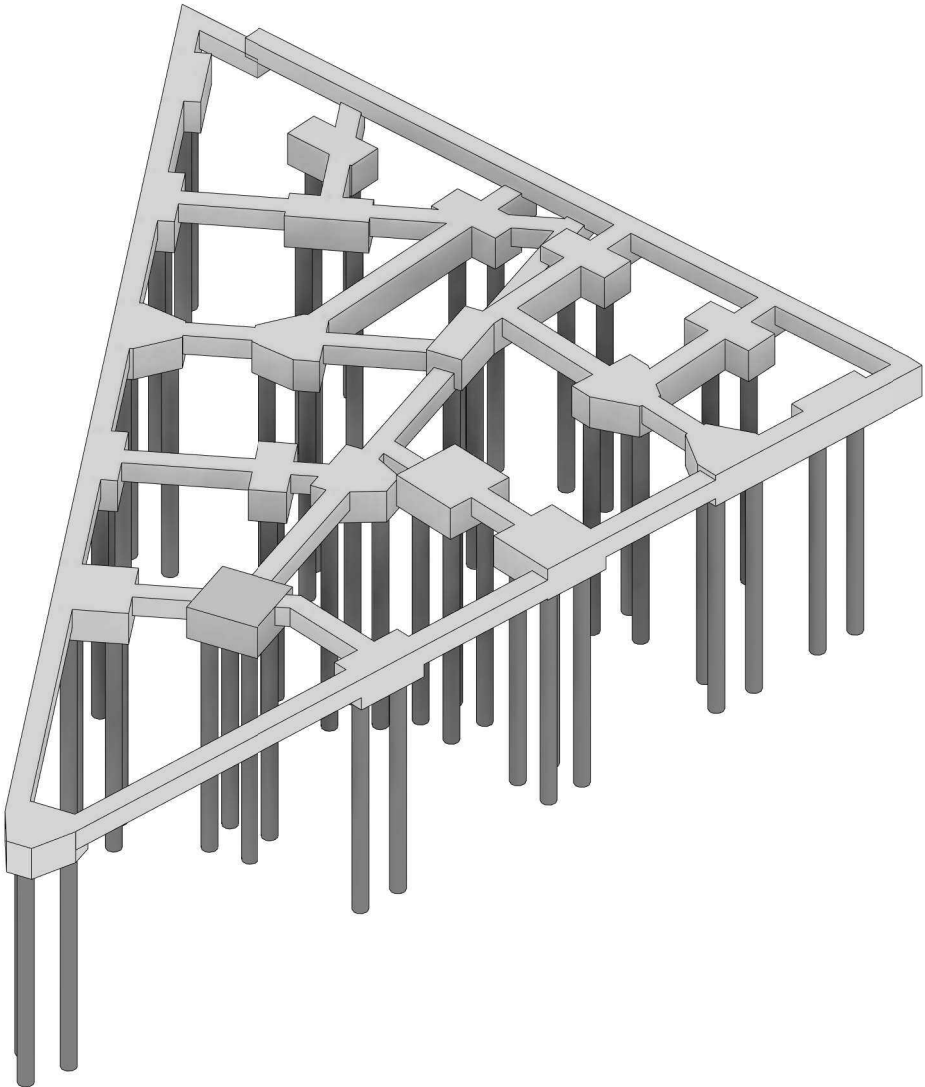
3D Slabs & Foundations View 1



3D Slabs & Foundations View 2



3D Pilecaps & Ground Beams View 1



3D Pilecaps & Ground Beams View 2

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P01	06.08.25	Preliminary Issue		JDE
REV.	DATE	REVISION DETAILS		INITIALS
CURRENT DRAWING REVISION CHECKED BY				LH
CURRENT DRAWING REVISION APPROVED BY				LH
DRAWING STATUS:		PROJECT STAGE:		
S1		STAGE 2		

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RAMSBOTTOM

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Tel: 01706 822 022

Tel: 0161 694 7087

Tel: 0131 229 1547

PROJECT: Knott Mill Townhouses, Manchester				
TITLE: 3D Views				
SCALE (A1)	AUTHOR	DATE	REVISION	BKPL No.
	JDE	Aug '25	P01	15606
DRAWING REF: 15606-BKP-V1-XX-DR-S-0600				

Appendix B – Remediation Target Criteria

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}	Source
Metals	Inorganic Arsenic	N/A	37	40	49	640	79	168	DEFRA C4SL
	Beryllium	N/A	1.7	1.7	35	12	2.2	63	LQM S4UL
	Boron	N/A	290	11,000	45	240,000	21,000	46,000	LQM S4UL
	Cadmium	N/A	26	149	4.9	410	220	880	DEFRA C4SL
	Chromium (III)	N/A	910	910	18,000	8,600	1,500	33,000	LQM S4UL
	Chromium (VI)	N/A	21.0	21.0	170.0	49	23.0	250	DEFRA C4SL
	Copper	N/A	2,400	7,100	520	68,000	12,000	44,000	LQM S4UL
	Lead	N/A	200	310	80	2,330	630	1,300	DEFRA C4SL
	Elemental Mercury	N/A	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}	LQM S4UL
	Inorganic Mercury	N/A	40	56	19	1,100	120	240	LQM S4UL
	Methylmercury	N/A	11	15	6.0	320	40	68	LQM S4UL
	Nickel	N/A	130	180	53	980	230	800	LQM S4UL
	Selenium	N/A	250	430	88	12,000	1,100	1,800	LQM S4UL
Polycyclic Aromatic Hydrocarbons (PAHs)	Vanadium	N/A	410	1,200	91	9,000	2,000	5,000	LQM S4UL
	Zinc	N/A	3,700	40,000	620	730,000	81,000	170,000	LQM S4UL
	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000	LQM S4UL
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000	LQM S4UL
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000	LQM S4UL
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000	LQM S4UL
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000	LQM S4UL
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000	LQM S4UL
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000	LQM S4UL
		2.5%	5,400	35,000	950	540,000	74,000	150,000	LQM S4UL
		6%	11,000	37,000	2,200	540,000	74,000	150,000	LQM S4UL
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49	LQM S4UL
		2.5%	11	14	6.5	170	29	56	LQM S4UL
		6%	13	15	13	180	29	62	LQM S4UL
	Benzo(a)pyrene (only)	1%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
		2.5%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
		6%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
	Benzo(a)pyrene (surrogate marker Coal Tar)	1%	0.8	1.2	0.32	15	2.2	4	LQM S4UL
		2.5%	1.0	1.2	0.67	15	2.2	5	LQM S4UL
		6%	1.1	1.2	1.20	15	2.2	5	LQM S4UL
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13	LQM S4UL
		2.5%	3.3	4.0	2.1	44	7.2	15	LQM S4UL
		6%	3.7	4.0	3.9	45	7.2	16	LQM S4UL
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400	LQM S4UL
		2.5%	340	360	470	4,000	640	1,500	LQM S4UL
		6%	350	360	640	4,000	640	1,600	LQM S4UL
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370	LQM S4UL
		2.5%	93	110	75	1,200	190	410	LQM S4UL
		6%	100	110	130	1,200	190	440	LQM S4UL
	Chrysene	1%	15	30	4.1	350	57	93	LQM S4UL
		2.5%	22	31	9.4	350	57	110	LQM S4UL
		6%	27	32	19	350	57	120	LQM S4UL
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1	LQM S4UL
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3	LQM S4UL
		6%	0.3	0.32	0.43	3.6	0.58	1.4	LQM S4UL
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300	LQM S4UL
		2.5%	560	1,600	130	23,000	3,100	6,300	LQM S4UL
		6%	890	1,600	290	23,000	3,100	6,400	LQM S4UL
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000	LQM S4UL
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000	LQM S4UL
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000	LQM S4UL
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150	LQM S4UL
		2.5%	36	46	21	510	82	170	LQM S4UL
		6%	41	46	39	510	82	180	LQM S4UL
	Naphthalene	1%	15	15	65	1600 f	11000 f	800 f	C4SL
		2.5%	36	36	130	3700 f	15000 f	1200 f	C4SL
		6%	85	85	200	8400 f	17000 f	1900 f	C4SL
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200	LQM S4UL
		2.5%	220	1,500	38	22,000	3,100	6,200	LQM S4UL
		6%	440	1,500	90	22,000	3,100	6,300	LQM S4UL
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000	LQM S4UL
		2.5%	1,200	3,800	270	54,000	7,400	15,000	LQM S4UL
		6%	2,000	3,800	620	54,000	7,400	15,000	LQM S4UL
	Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4	LQM S4UL
		2.5%	0.98	1.2	0.67	15	2.2	4.7	LQM S4UL
		6%	1.1	1.2	1.2	15	2.2	4.8	LQM S4UL

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}	Source
BTEx Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90	LQM S4UL
		2.5%	0.17	0.70	0.034	47	72	100	LQM S4UL
		6%	0.37	1.4	0.075	90	73	110	LQM S4UL
		6%	0.87	3.3	0.180	98	140	230	C4SL
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}	LQM S4UL
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}	LQM S4UL
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}	LQM S4UL
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}	LQM S4UL
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}	LQM S4UL
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}	LQM S4UL
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}	LQM S4UL
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}	LQM S4UL
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}	LQM S4UL
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}	LQM S4UL
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}	LQM S4UL
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}	LQM S4UL
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}	LQM S4UL
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}	LQM S4UL
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}	LQM S4UL
Petroleum Hydrocarbons	Aliphatic								
	EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304) ^{sol}	95,000 (304) ^{sol}	LQM S4UL
	EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}	LQM S4UL
	EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}	LQM S4UL
	EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}	LQM S4UL
	EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}	LQM S4UL
	EC>16-35	1%	65,000 (8.48)	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f	LQM S4UL
	EC>35-44	1%	65,000 (8.48)	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f	LQM S4UL
	Aliphatic								
	EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}	LQM S4UL
	EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}	LQM S4UL
	EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}	LQM S4UL
	EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}	LQM S4UL
	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}	LQM S4UL
	EC>16-35	2.5%	92,000 (21)	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f	LQM S4UL
	EC>35-44	2.5%	92,000 (21)	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f	LQM S4UL
	Aliphatic								
	EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}	LQM S4UL
	EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}	LQM S4UL
	EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}	LQM S4UL
	EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}	LQM S4UL
	EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}	LQM S4UL
	EC>16-35	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f	LQM S4UL
	EC>35-44	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}	LQM S4UL
	EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}	LQM S4UL
	EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}	LQM S4UL
	EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}	LQM S4UL
	EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000	LQM S4UL
	EC>16-21	1%	260 ^f	1,900 ^f	46 ^f	28,000 ^f	3,800 ^f	7,600 ^f	LQM S4UL
	EC>21-35	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	EC>35-44	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}	LQM S4UL
	EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}	LQM S4UL
	EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}	LQM S4UL
	EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}	LQM S4UL
	EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000	LQM S4UL
	EC>16-21	2.5%	540 ^f	1,900 ^f	110 ^f	28,000 ^f	3,800 ^f	7,700 ^f	LQM S4UL
	EC>21-35	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	EC>35-44	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}	LQM S4UL
	EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}	LQM S4UL
	EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}	LQM S4UL
	EC>10-12	6%	380	1,200	4	34,000 (2,150) ^{sol}	5,000	10,000	LQM S4UL
	EC>12-16	6%	660	2,500	130	38,000	5,100	10,000	LQM S4UL
	EC>16-21	6%	930 ^f	1,900 ^f	260 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	EC>21-35	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f	LQM S4UL
	EC>35-44	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f	LQM S4UL
	Aliphatic +Aromatic >EC44	1%	1,600 ^f	1,900 ^f	1,200 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
		2.5%	1,800 ^f	1,900 ^f	2,100 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
		6%	1,900 ^f	1,900 ^f	3,000 ^f	28,000 ^f	3,800 ^f	7,900 ^f	LQM S4UL

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}	Source
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	0.11	0.16	0.05	12.0	300	300	DEFRA C4SL
		2.5%	0.18	0.24	0.10	17.0	310	330	DEFRA C4SL
		6%	0.31	0.41	0.19	29.0	310	330	DEFRA C4SL
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) ^{vap}	LQM S4UL
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) ^{vap}	LQM S4UL
		6%	39	40	240	3,000	140,000	100,000 (6,392)	LQM S4UL
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800	LQM S4UL
		2.5%	3.4	8.0	0.89	550	1,400	2,100	LQM S4UL
		6%	7.5	17	2.0	1,100	1,400	2,300	LQM S4UL
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500	LQM S4UL
		2.5%	2.8	3.5	1.9	250	1,400	1,800	LQM S4UL
		6%	6.4	8.2	4.4	560	1,400	2,100	LQM S4UL
	Tetrachloroethene (PCE)	1%	0.31	0.32	2.00	24	3,200	1400	DEFRA C4SL
		2.5%	0.70	0.71	4.8	55	3,300	1900	DEFRA C4SL
		6%	1.60	1.60	11.0	130	3,400	2,500	DEFRA C4SL
	Tetrachloromethane (carbon tetrachloride)	1%	0.03	0.03	0.45	2.9	890	190	LQM S4UL
		2.5%	0.06	0.06	1.0	6.3	920	270	LQM S4UL
		6%	0.13	0.13	2.4	14	950	400	LQM S4UL
	Trichloroethene (TCE)	1%	0.009	0.010	0.032	0.7	76.0	41.0	DEFRA C4SL
		2.5%	0.020	0.020	0.072	1.5	78.0	51.0	DEFRA C4SL
		6%	0.043	0.045	0.160	3.4	79.0	69.0	DEFRA C4SL
	cis 1,2-dichloroethene	1%	0.46	0.50	0.890	38	3,800	2,000	DEFRA C4SL
		2.5%	0.78	0.84	1.70	64	3,800	2,400	DEFRA C4SL
		6%	1.50	1.60	3.60	120	3,900	3,100	DEFRA C4SL
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600	LQM S4UL
		2.5%	1.7	2.1	0.83	170	2,500	2,800	LQM S4UL
		6%	3.4	4.2	1.7	350	2,500	3,100	LQM S4UL
	Trans-1,2 Dichloroethene	1%	0.9	0.9	3.7	69	13,000	5,600	DEFRA C4SL
		2.5%	1.6	1.7	7.5	120	13,000	7,000	DEFRA C4SL
		6%	3.3	3.4	16.0	260	13,000	9,100	DEFRA C4SL
	Chloroethene (vinyl chloride)	1%	0.006	0.015	0.0017	1.1E+00	7.8	18.0	DEFRA C4SL
		2.5%	0.010	0.019	0.0031	1.4E+00	7.8	19.0	DEFRA C4SL
		6%	0.017	0.029	0.0058	2.20	7.8	19.0	DEFRA C4SL
	2,4,6-Trinitrotoluene (TNT)	1%	1.6	65	0.24	1,000	130	260	LQM S4UL
		2.5%	3.7	66	0.58	1,000	130	270	LQM S4UL
		6%	8.1	66	1.4	1,000	130	270	LQM S4UL
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) ^{sol}	LQM S4UL
		2.5%	250	13,000	38	210,000	26,000	51,000	LQM S4UL
		6%	540	13,000	85	210,000	27,000	53,000	LQM S4UL
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) ^{vap}	LQM S4UL
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) ^{vap}	LQM S4UL
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) ^{vap}	LQM S4UL
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30	LQM S4UL
		2.5%	6.6	7.4	6.1	170	18	31	LQM S4UL
		6%	7.1	7.5	9.8	170	18	31	LQM S4UL
	Dieldrin	1%	0.97	7.0	0.17	170	18	30	LQM S4UL
		2.5%	2.0	7.3	0.41	170	18	30	LQM S4UL
		6%	3.5	7.4	0.96	170	18	31	LQM S4UL
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300	LQM S4UL
		2.5%	7.8	620	1.2	9,400	1,200	2,400	LQM S4UL
		6%	17.4	620	2.7	9,400	1,200	2,400	LQM S4UL
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26	LQM S4UL
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26	LQM S4UL
		6%	0.14	6.6	2.2E-02	140	16	27	LQM S4UL
	Endosulfanns (2 isomers)	1%	7.4	160 (3.0E-03) ^{vap}	1.2	5,600 (3.0E-03) ^{vap}	1,200	2,300	LQM S4UL
		2.5%	18	280 (7.0E-03) ^{vap}	2.9	7,400 (7.0E-03) ^{vap}	1,200	2,400	LQM S4UL
		6%	41	410 (1.6E-02) ^{vap}	6.8	8,400 (1.6E-02) ^{vap}	1,200	2,500	LQM S4UL
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15	LQM S4UL
		2.5%	0.2	3.8	3.2E-02	65	8.1	15	LQM S4UL
		6%	0.46	3.8	7.7E-02	65	8.1	16	LQM S4UL
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) ^{sol}	LQM S4UL
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) ^{sol}	LQM S4UL
		6%	2.4	2.4	32	290	14,000	2,900	LQM S4UL
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) ^{sol}	90,000	24,000 (571) ^{sol}	LQM S4UL
		2.5%	55	57	230	4,800 (1,370) ^{sol}	95,000	36,000 (1,370) ^{sol}	LQM S4UL
		6%	130	130	540	11,000 (3,240) ^{sol}	98,000	51,000 (3,270) ^{sol}	LQM S4UL
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) ^{vap}	LQM S4UL
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) ^{vap}	LQM S4UL
		6%	15	15	320	1,300	19,000	4,000 (1,880) ^{vap}	LQM S4UL
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) ^{vap}	78	110 (39) ^{vap}	LQM S4UL
		2.5%	1.6	1.9	0.90	120 (98.1) ^{vap}	79	120	LQM S4UL
		6%	3.7	4.3	2.2	240 (235) ^{vap}	79	130	LQM S4UL
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) ^{sol}	100	190	LQM S4UL
		2.5%	12	30	3.1	770 (107) ^{sol}	100	190	LQM S4UL
		6%	22	38	7.0	830	100	190	LQM S4UL
	Hexachlorobenzene	1%	1.8 (0.20) ^{vap}	4.1 (0.20) ^{vap}	0.47	110 (0.20) ^{vap}	16	30	LQM S4UL
		2.5%	3.3 (0.50) ^{vap}	5.7 (0.50) ^{vap}	1.1	120	16	30	LQM S4UL
		6%	4.9	6.7 (1.2) ^{vap}	2.5	120	16	30	LQM S4UL

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}	Source
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^g	94	0.13 ^g	3,500	620	1,100	LQM S4UL
		2.5%	2.0	150	0.30	4,000	620	1,100	LQM S4UL
		6%	4.5	210	0.70	4,300	620	1,100	LQM S4UL
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110	LQM S4UL
		2.5%	0.52	29	8.0E-02	400	60	120	LQM S4UL
		6%	1.2	31	0.19	400	60	120	LQM S4UL
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300	LQM S4UL
		2.5%	0.29	0.29	10	22	11,000	1,900	LQM S4UL
		6%	0.62	0.62	23	47	11,000	2,700	LQM S4UL
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48	LQM S4UL
		2.5%	0.7	0.78	0.61	66	25	50	LQM S4UL
		6%	1.6	1.8	1.4	120	25	51	LQM S4UL
	Phenol	1%	120	440 (460)	23	440 ^{dir} (26,000)	440 ^{dir} (10,000)	440 ^{dir} (7,600)	LQM S4UL
		2.5%	200	690	42	690 ^{dir} (30,000)	690 ^{dir} (10,000)	690 ^{dir} (8,300)	LQM S4UL
		6%	380	1,200	83	1,300 ^{dir} (34,000)	1,300 ^{dir} (10,000)	1,300 ^{dir} (9,300)	LQM S4UL

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
f = oral, dermal and inhalation exposures compared to oral HCV
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-tetrachlorophenol

Appendix C - References

¹<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm/lcrm-stage-3-remediation-and-verification>

² Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

³ CIRIA (2001). "Contaminated Land Risk Assessment: A Guide to Good Practice". C552.

⁴ CL:AIRE (2024). Category 4 Screening Levels: Naphthalene. CL:AIRE, Reading.

⁵ CIRIA, December 2007, "Assessing risks posed by hazardous ground gases to buildings", C665.

⁶ Environment Agency, 2006, "Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination".

⁷ Environment Agency, 2006, "Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination".

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¹⁰ CIRIA R97. "Trenching Practice 2nd Edition". CIRIA 1983.

¹¹ <https://www.gov.uk/government/publications/land-contamination-pilot-trials-and-small-scale-remediation-schemes-rps-215/land-contamination-pilot-trials-and-small-scale-remediation-schemes-rps-215>

¹²<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm/lcrm-stage-3-remediation-and-verification>

¹³ Yorkshire and Lincolnshire Pollution Advisory Group, June 2021, "Verification Requirements for Cover Systems: Technical Guidance for Developers, Landowners and Consultants", Version 4.1.

¹⁴ The British Standards Institution (BSI Standards), April 2015, "Specification for topsoil", BS 3882:2015 - TC.

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