

MANCHESTER COLLEGE CAMPUS

REMEDIATION STRATEGY

Job Number: CLR 19 1016

Date: January 2020

Client: Wilmott Dixon Construction Ltd



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LK Remediate Ltd

Document Verification

Site Address	Great Ducie Street, Strangeways, Manchester, M3 1FF.		
Job Number	CLR 19 1016		
Report Title	Remediation Strategy		
Date Issued	January 2020	Document Ref.	CLR 19 1016/PD06012020
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1 INTRODUCTION

1.1 Background

LK Remediate (LKR) has been commissioned by Willmott Dixon Construction Ltd to provide a Remediation Strategy for the Manchester College Campus development at the former Boddingtons Brewery Site (planning reference 124995/FO/2019).

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.

The site is approximately 0.95ha and centred on NGR 383838E 399191N. The planning application is for the erection of a five storey educational building with associated access, servicing, landscaping, public realm and other associated works following removal of a car park.

1.2 Previous Reports

The following reports have previously been undertaken on the site and should be read in conjunction with this Remediation Strategy:

- » "Former Boddingtons Brewery Phase 1 Geo-Environmental Desk Study" undertaken by Capita (reference CS/084037-P1DS Revision 01, dated November 2015).
- » "Ground Investigation Report – Manchester College" undertaken by AECOM (reference PR385460_002, dated September 2019).

1.3 Summary of Previous Work

The site history, site description and environmental setting is described in the Capita report and pertinent information is summarised below:

- » The majority of the site housed a brewery and printworks from earliest historical mapping c. 1848 onwards. Mapping shows a number of tanks, boilers and abstraction wells on site. Surrounding areas comprise typical industrial landuses (print works, cotton works, hat works, iron works, etc) throughout the history of the site. The site has been cleared and has been in use as a car park from c. 2010.
- » Regional geological mapping indicates superficial deposits of the Glacial Till are present beneath the site and classed as a Secondary A Aquifer. The bedrock deposits of the Chester Pebble Beds are classed as a Principal Aquifer.
- » The nearest surface water feature is the culverted Strangeways Brook, approximately 20m to the south.
- » The nearest recorded landfill site is 234m west of the site.
- » The desk study report includes a summary of previous intrusive investigations undertaken at the site. The report summarises that there were no laboratory soil data above the assessment criteria and the gas monitoring (albeit only one visit) did not indicate any elevated levels of ground gases or flow.

The Capita desk study report concludes there is a '*low to moderate*' risk from active pollutant linkages and site investigation was recommended.

Geo-environmental site investigation work was undertaken by AECOM and included a geophysical survey, 12no. boreholes with rotary coring and dynamic sampling (reference BH101-BH111 and BH109A), 22no. trial pits (reference TP101-TP109 and TP201-213), four trial trenches (TT101-TT104), and concrete cores of the retaining wall.

The geophysical survey infers several conclusions and specifically states that the geophysical data are “are suggestive of a highly complex sub-surface”. Pertinent points are summarised below:

- Presence of infilled basements and dividing walls in several areas of the site.
- “Obvious” structural remains associated with the former boiler house, chimney and gas store in the form of concrete slabs and dividing walls are noted. Data indicates multiple layers of slabs (basement floors?). The footings for the former chimney stack appear to remain in-situ.
- “Significant magnetic anomalies” under and close to the electrical substation and caustic storage areas in the north and possible former gas oil storage tank.
- Some evidence for a deeply buried reinforced concrete slab to the east of the boiler house.

Areas of ‘anomalies’ appear to have been targeted during the intrusive investigation works, however it is considered that further sub-surface structures not identified during the investigation may be present.

The site investigation included in-situ geotechnical testing as well as geotechnical laboratory analysis. Chemical laboratory analysis was undertaken on soil samples collected from investigation locations.

Boreholes were installed with monitoring wells to allow groundwater sampling and gas monitoring to be undertaken. Eight groundwater samples were collected and two gas monitoring visits were undertaken.

Ground conditions encountered during the investigation comprised made ground deposits up to 3.3mbgl. Made ground comprised cohesive and granular deposits and significant amounts of buried relict structures associated with the former site use and comprised concrete floor slabs, brick walls, etc.

Natural superficial deposits were encountered across the site and comprised cohesive and granular alluvial deposits and glacial till. Weathered sandstone deposits were encountered at depths of 3.8-5.2mbgl.

Competent sandstone bedrock was encountered at depth ranges of 3.8-8.0mbgl.

Groundwater strikes were encountered in each of the boreholes within the sandstone at depths of 8-11mbgl. One groundwater strike was encountered in glacial till at 3mbgl. Subsequent groundwater level measurements were between 4.32-6.21mbgl (23.96-25.19mAOD). General groundwater inferred flow direction was towards the River Irwell to the north of the site.

During the site investigation, visual and olfactory evidence of contamination were noted. The AECOM report states:

“Concrete was identified down to 0.44m (unproven) at three locations, WC101, WC102 and WC103 in the south east corner of the site. Made ground was identified at all other locations with inclusions of concrete, brick, metal glass, ceramic, plastic, rebar, timber, cloth, clinker, ash, metal cables, rubber, tarmacadam, breeze blocks.

Borehole logs record a ‘very mild hydrocarbon odour from 3.4 – 3.55m’ in made ground at BH105. Gravel was of brick, sandstone limestone. No other olfactory evidence was recorded.

A total of 15 samples were screened with a photoionisation detector (PID) and recorded on the borehole logs. All PID readings were <0 ppm.”

Soil laboratory chemical analysis results were compared to Generic Assessment Criteria (GAC) for a commercial landuse scenario. Of the 28no. soil samples collected, elevated

PAHs were identified in one sample (TP103 – which is outside the planning boundary) and seven samples identified asbestos containing material (a mixture of loose fibres and cement at concentration of <0.001- 0.008%).

Nine soil leachate samples and eight groundwater samples were undertaken. Leachate analysis indicated elevated metals (Cu, Pb, Ni, V, and Zn) and elevated Cu was identified in six of the groundwater samples.

For the assessment of risks from ground gas, two gas monitoring visits were undertaken in installed wells with response zones within the made ground and natural strata and analysis of TOC content of 15no. made ground samples was undertaken.

The characteristic situation of the site based on TOC content in made ground was assessed using the methodology described in Table 1 of RB17¹. Using this approach, the Characteristic Situation at the site is CS1.

The gas monitoring data did not identify any elevated methane or carbon dioxide concentrations and no significant flow was recorded. A maximum GSV of 0.008l/hr was calculated and Characteristic Situation CS1 was indicated.

Depleted oxygen levels were encountered in monitoring wells and this should be considered for risk to construction workers during development.

A very low risk to human health of future site users was identified. As the site is proposed to be hardstood, no specific remediation measures were recommended.

A low to moderate risk was identified for controlled waters. No remediation was recommended given the scope of the enabling works and the proposed development (comprising hardstanding across the site).

The ground gas risk assessment indicated the site should be classified as Characteristic Situation CS1 and no specific gas protection measures were recommended.

1.4 Aims and Objectives

Based on the above, LKR and the earthworks contractor will undertake the following:

- Assess Pollutant Linkages presented by AECOM.
- 'Pre-construction' remediation and validation work.
- Watching brief and further considerations for the site.
- 'On-construction' remediation and validation recommendations.

In order to achieve the aims of the Remediation Strategy, the following objectives will be set:

- Maximise sustainability through the use re-use of existing site-won materials during ground works and development.
- Ensure that the design meets with current environmental and waste legislation.
- Use of appropriate environmental controls during the remediation and development programme.
- Segregate and stockpile differing materials for validation testing and appropriate re-use or offsite disposal.

The site remediation works will also include the treatment / removal / processing of geotechnical constraints to the proposed development including relic foundations, hardstanding, etc.

¹ Research Bulletin 17 "A Pragmatic Approach to Ground Gas Assessment" CL:AIRE (2012).

2 FURTHER ASSESSMENT OF POTENTIAL POLLUTANT LINKAGES

The assessment of the contaminant-pathway-receptor linkages is based on guidance in CLR11². 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 C552³.

Where LKR identified a low to very low risk, 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, LKR will undertake an assessment to establish what category the pollutant linkage will fall into (i.e. moderate or low risk will be chosen).

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

2.1 Pollutant Linkage 1 (Direct Contact)

Elevated PAHs were identified in shallow made ground in one location (outside the planning boundary) and asbestos was identified in seven samples during the AECOM investigation. A 'very low' risk from direct contact was identified as the report considers the development to be completely hard stood and comprise no areas of soft landscaping.

The proposed development does however include some small areas of soft landscaping where soils may come into contact with future site users. No elevated PAHs were identified within the site boundary, so the risk is considered to be low and no remediation of PAHs is required.

Given positive identification of asbestos containing materials then LKR consider the probability of asbestos affecting site users as low likelihood. With a medium consequence, the risk is considered to be low/moderate and remediation is recommended in areas of soft landscaping.

LKR have utilised the Joint Industry Working Group (JIWG) Decision Support Tool for receptor risk ranking of ACM onsite. This model incorporates guidance from CL:AIRE CAR-SOIL⁴ and CIRIA C733⁵. The model outputs are presented in Appendix A.

In this model an adult with short duration exposure was assumed to be representative of likely site users. A medium respirable index was assumed based on the ACM identified onsite as per RIVM⁶. The assessment was carried out assuming 'low disturbance' during earthworks considering low concentration identified were already fibres/clumps, but potential for disturbance by receptor based on material buried at a shallow depth (i.e. under an environmental capping layer).

Additionally, for added conservatism, the model does not take into account moisture content, which can significantly reduce the potential for airborne fibre release from soil in a typical UK climate. AGS interim guidance⁷, based on work by Addison *et al*⁸, notes that the

² EA (2004). "Model Procedures for the Management of Land Contamination." R&D Publication CLR 11.

³ CIRIA (2001). "Contaminated land risk assessment: A guide to good practice". C552.

⁴ CL:AIRE (2016). "CAR-SOIL Controlled Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials" Industry Guidelines.

⁵ CIRIA (2014). "Asbestos in Soil and Made Ground: A guide to Understanding and Managing Risks." CIRIA C733.

⁶ RIVM (2003). "Assessment of the Risks of Soil Contamination with Asbestos" CIRIA C733." RIVM Report 711701034/2003.

⁷ AGS (2013). "Site Investigation Asbestos Risk Assessment." AGS Interim Guidance, Feb 2013, Ver 2.4.

⁸ Addison et al (1988). "The Release of Dispersed Asbestos Fibres from Soils." Institute of Occupational Medicine Report No. TM/88/14.

addition of 10% water to soil decreases the risk of potential fibre release by a factor of between 2 and 10.

Data from Addison et al shows that a sandy soil with Amosite fibre concentrations of 0.01%w/w when agitated in a moderately aggressive way, produced between 0.01f/ml and no recordable fibres at moisture contents of 5% and above. It should be noted that the clearance level is 0.01f/ml. The moisture content of the soil from this area was 5-21%, making fibre release unlikely.

LKR completed the risk assessment methodology using the most appropriate option based on our understanding of the conceptual site model (Appendix A) and following suitable remediation (clean capping layer and hand picking visible pieces). In instances where options did not sufficiently reflect site conditions then the 'worst case' scenario was presumed to be representative to allow a conservative assessment.

The assessment undertaken above classifies the overall risk ranking as '**very low**' based on use of a capping system in soft landscaping areas and hand picking of visible asbestos pieces.

In addition to the above, irrespective of contamination risk, the characteristics of the made ground should also be taken into account. The material should be assessed against the parameters outlined in Table 1 of BS3882 (not included within this assessment). Made ground with undesirable material (e.g. "concrete, brick, metal glass, ceramic, plastic, rebar, timber, cloth, clinker, ash, metal cables, rubber, tarmacadam, breeze blocks") was noted across the site. Irrespective of the contamination risk, this material should not be used as cover soils and it is recommended that a suitable clean cover is used in soft landscaping areas.

2.2 Pollutant Linkage 2 (Inhalation of Vapours)

No evidence of potentially volatile contaminants were identified during the investigation. No risk from vapours was noted by AECOM and therefore no remediation recommended.

Subject to a watching brief during enabling works, the probability is considered to be unlikely, with a medium consequence the risk is therefore low and LKR recommend that no remediation is required.

2.3 Pollutant Linkage 3 (Hazardous Gas)

No significant sources of ground gas were identified in the desk study and no significantly putrescible/ organic material was identified during the AECOM site investigation. A 'low risk' was identified in regards to ground gas risk. Characteristic Situation 1 was considered appropriate and therefore no remediation was recommended.

Two gas monitoring visits were undertaken as part of the AECOM investigation works. Another visit formed part of previous site investigation and is referenced in the Capita desk study report and did not identify any ground gases to be present beneath the site (three visits in total).

Although this does not follow C665⁹ for typical / idealised periods and frequency of monitoring for a higher gassing potential risk, based on the conceptual site model and supporting RB17 TOC assessment undertaken by AECOM, LKR consider suitable assessment has been undertaken and further monitoring is not considered necessary at this stage.

Moreover, based on the conceptual model for the site, the main potential source of ground gases is considered to be potentially putrescible material within the made ground. As

⁹ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

described in the AECOM report, the enabling works will comprise grubbing out of in-ground structures and replacing material as engineered fill. Wilson and Card *et al*¹⁰ states:

“...high concentrations of methane are normal in engineered fill containing silts or clays, and that it did not pose a hazard to structures (California Environmental Protection Agency, 2012)...methane gas testing on hundreds of earthworks projects ...found the soils in cut areas did not contain methane, but material from cuttings that was placed as engineered fill contained high concentrations of gases consistently exhibiting microbial characteristics (up to 40% methane)...the high methane poses no risk to buildings constructed on the fill.”

The proposed enabling works and ground conditions at the site are analogous with the above scenario.

Based on the findings in the AECOM report and the above, LKR are in agreement with the assessment and no further gas monitoring is recommended and no specific gas protection are required (i.e. the site should be classified as Characteristic Situation (CS1)).

2.4 Pollutant Linkage 4 (Controlled Waters)

A moderate risk to controlled waters was identified due to elevated metals concentrations in leachate samples and elevated copper in groundwater samples.

The majority of the site will be hardstood or beneath buildings, therefore surface water infiltration will be limited. Moreover, 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.

In addition, the assessment criteria are very stringent for use on a site specific basis and are for designation of the quality of the aquifer as a whole. The slightly elevated concentrations of copper observed will undergo degrees of natural attenuation within the aquifer and are not considered a significant risk.

Based on the above, LKR are in agreement that the risk to controlled waters is low and no specific remediation is required. A watching brief should be maintained during enabling works should any evidence of potentially significant mobile contamination be identified.

2.5 Summary of Recommended Remediation and Validation Work

LKR consider the remediation works may be split in to the ‘pre-construction’ (or enabling works) phase and the ‘build phase’ (i.e. during the residential development works) phase.

The following earthworks, remediation and validation required for this site are presented in Table 2-1. More detail of proposed works will be provided in the following Sections.

¹⁰ Geoff Card, GB Card and Partners; James Lucas, The Environmental Protection Group; and Steve Wilson, EPG “Technical paper: Risk and reliability in gas protection design – 20 years on” (August 2019).

Phase	Remediation Requirements	Validation Requirements
Pre-Construction	<u>Excavation, processing and stockpiling</u> This will include the grubbing out and processing of hardstanding and unsuitable material. Any oversize material, if encountered will also be processed for removal, if required. Appropriate site won material will be stockpiled for potential reuse as topsoil and subsoil. Additionally, suspect material will be quarantined for characterisation prior to possible offsite disposal.	Log of work undertaken including photographs. Re-use of material will be under U1, T5, T7 exemptions and MMP. Testing of site won/ imported soil as per Table 4-1.
	<u>Earthworks Site Inspections & Unexpected Contamination</u> A watching brief should be maintained during earthworks to confirm the ground conditions and identify any unusual ground conditions. If any visual or olfactory evidence of contamination be encountered at the site, further assessment of the material may be required.	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.
	<u>Segregation and removal of unsuitable materials</u> As part of the watching brief during earthworks, areas of unexpected contamination (including hazardous waste) and geotechnically unsuitable material will be delineated, excavated and removed following suitable testing and verification.	Log of work undertaken including photographs. Consignment notes confirming removal of unsuitable material.
Build Phase	<u>Environmental Cover System</u> Shared Landscaping: 300mm thick environmental cover system comprising: <u>Either</u> 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 200mm comprising clean inert fill and sufficient topsoil for a growing medium. <u>Or</u> geotextile membrane and at least 300mm comprising clean inert fill and sufficient topsoil for a growing medium. The subsoil layer can be replaced by additional topsoil.	Photographic evidence of natural strata. Chemical validation of imported/ site-won soils.: See Table 3-1.
	<u>United Utilities (UU) Risk Assessment</u> UU Potable Water Risk Assessment to be undertaken once the location and depth of potable water pipes are known and following completion the earthworks. Barrier pipe may be required.	To be completed following completion of the remediation earthworks.

Table 2-1: Remediation and validation requirements.

3 PRE-CONSTRUCTION AND SITE WIDE REMEDIATION WORKS

3.1 Introduction

An outline of the proposed pre-construction and site wide remediation earthworks is given in Table 2-1. The recommended remedial works and validation works are outlined in the following Sections.

3.2 Construction Management Plan and Health and Safety

A Construction Management Plan and Method Statement should be produced which details appropriate Health and Safety measures to be employed during the site works.

Risks to site workers and adjacent receptors from contamination present in the site soils can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance¹¹) should be adopted by all workers involved with site enabling and construction works.

3.3 Asbestos in Soils Management Plan

Due to the presence of asbestos containing material, it is recommended that additional precautions are taken during site clearance, earthworks and construction in the areas of concern. The presence of asbestos in the made ground at the site presents a potential risk of generation of airborne fibres if this material is disturbed, such as for excavations to construct new foundations.

This risk can be managed by careful procedures and site monitoring to reduce the risk of airborne fibres, and it is recommended that an appropriate 'Asbestos in soils Management Strategy' is developed and adopted for all intrusive ground works which disturb the made ground in the area of concern. This should be carried out in line with CIRIA C733.

This may include asbestos awareness training for all site staff, provision of suitable personal and respiratory protective equipment and air monitoring.

With regards to cement bound asbestos, this can be handpicked, doubled bagged and disposed of appropriately to a licenced landfill. Guidance on removing asbestos cement is described in HSE (2012).

If ACM is identified in soil arisings then soil should be placed directly into covered skips and disposed of at a suitable licenced landfill, after further testing to quantify the extent of asbestos contamination of the soils. It should be considered that blue asbestos is notifiable and must be removed by a licenced contractor.

3.4 Segregation & Removal of Unsuitable Material

There is potential for some unidentified geotechnically or chemically unsuitable material (including hazardous waste) to be encountered during enabling works.

Several areas were recommended to be targeted from the geophysical survey, some of which were included in the site investigation scope. However, there is still some potential for unidentified ground conditions; including hazardous waste; to be encountered (e.g. bulk asbestos containing materials, 'magnetic anomalies', 'changes in infill', tanks, drainage, sewers, coal tar containing tarmacadam, etc).

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 (including hazardous waste) under the protocols described in the following sections.

¹¹ HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

3.5 Materials Management

Recycled aggregates will be processed in accordance with a LAPC Part B Licensed Plant and all appropriate deployment notification will be issued to the Local Authority beforehand. Materials that are recovered as recycled aggregate will be compliant with the requirements of WRAP protocol. Recycled aggregates will be reused in the construction of roads, and for the construction of building platforms, as required. Validation testing to meet the requirements will demonstrate recycled aggregates are fit for purpose and not considered waste material.

Some site generated natural soil may require excavation, stockpiling and re-use as subsoil in the lower part of the proposed clean cover system.

In addition to the above, exemptions will be registered for the site. 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 will also 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.

An appropriate permit will be required to allow processing of recycled aggregate under a T7 exemption and the deployment notification should be presented to the Local Authority prior to commencement.

Materials that are recovered under WRAP Protocol, U1, T5 or T7 exemptions will be tested to demonstrate that they are chemically and physically suitable for re-use. Validation sampling procedures are described in Section 4.4.

The types of materials and the estimated volumes to be reused on the site will be done so following submission of the proposed permits, licenses, exemptions and protocols. It is not anticipated that the volume of materials to be reused will require submission of a standalone MMP for the enabling works. The proposed site enabling works will be carried out under the supervision of a suitably qualified geo-environmental engineer. A detailed Verification Report will be submitted upon completion of the work.

Sampling of all re-used / imported material should ensure material is 'suitable for use' and should not be classified as waste (see Section 4.3).

3.6 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.

A quarantine area for suspect contaminated soils should be established on site. This should comprise a 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.

3.7 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.

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 validation report.

3.8 Watching Brief / Unexpected or Gross Contamination

A watching brief will be maintained for evidence of contamination (including asbestos containing material) during the remediation earthworks and development works.

If evidence of contamination is identified, then works in the area will stop pending further sampling and assessment and the Local Authority will be informed.

Delineation works will be undertaken, 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.

If obvious gross contamination is encountered, then impacted soils will be carefully excavated and quarantined (See Section 3.6) pending further testing and assessment.

Soil samples will be taken and analysed for a suite of contaminants, including *inter alia* heavy metals, Soil Organic Matter, VOCs, SVOCs, BTEX, TPHCWG and asbestos. Soil samples should represent the impacted material. In order to determine that significantly impacted soils have been removed, verification samples will be collected 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.

3.9 Processing of In-Ground Structures, Hardstanding and Oversize

In-ground structures such as relic foundations, relic slabs and hardstanding will be grubbed out and, along with any oversize material from the made ground, subjected to segregation, stockpiling and reuse or removal from site as above, as required.

These works will have suitable control measures to prevent the release of dust.

4 ON-CONSTRUCTION PHASE REMEDIATION WORKS

4.1 Introduction

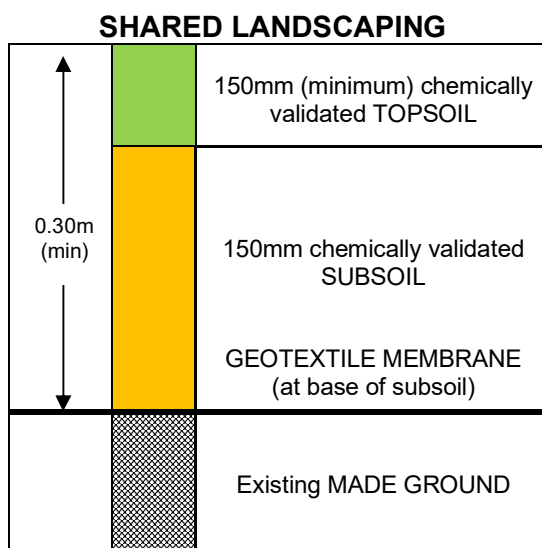
The scope of the on-construction remedial works will comprise the following:

- Validation of any imported material required to raise levels;
- Validation of subsoil and topsoil used in areas of soft landscaping;
- Inspection of environmental cover system thickness and construction;
- United Utilities risk assessment for potable water pipes and installation of barrier pipes, as required.

Further details are given in the following Sections. LKR recommend that the proposed works are prior approved by the regulators (and United Utilities, as required) prior to the commencement of construction works.

4.2 Environmental Cover Layer to Soft Landscaping Areas

An environmental cover layer is required in all soft landscaping areas. A cover layer should comprise a depth of at least 300mm in shared landscaping areas. A typical construction detail is provided below (the subsoil layer can be omitted in favour using topsoil):



4.3 Validation of Subsoil and Topsoil

Chemical validation of all site won and any imported soils and any recycled stone to be used on site in soft landscaping and/ or infrastructure should be undertaken. Imported soils should be accompanied by a certificate of analysis and source details.

A summary of the required site won / imported material sampling requirements are presented in Table 4-1.

Ideally, the material should be sampled at source to prevent double handling if soil fails, with confirmatory sampling undertaken on importation to site. However, where this is not possible then material imported should be segregated based on source and soil type with validation samples taken prior to placement in soft landscaped areas to ensure suitability for use.

Material Type	Source	Suite of Analysis	Sampling Rate*
Gardens	Greenfield	Suite A	1 sample per 200m ³
	Brownfield or Unknown	Suite B	1 sample per 50m ³
Soft landscaping	Greenfield	Suite A	1 sample per 200m ³
	Brownfield / Unknown	Suite B	1 sample per 150m ³
Physical Stone Break Layer	First Generation i.e. quarried sand (subsoil) or stone (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / screened)	Suite B	1 sample per 200m ³

Table 4-1: Recommended validation sampling requirements.

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.

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

In addition, it should be ensured that the matrix of the topsoil is suitable as a growing medium and no undesirable material is present (in line with BS3882¹²). This is outside the scope of this report.

4.3.1 Generic Assessment Criteria - Soil

Remedial targets for soil re-used on site will be based upon the following hierarchy:

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

C4SLs were published in 2013^{13,14}. The contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))¹⁵ 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 LKR considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

Where no C4SLs have been generated LKR will use the LQM S4ULs¹⁶. 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^{17,18,19,20}.

The proposed development is for an adult educational building, therefore as a conservative measure, the POS(resi) assessment criteria shall be used for imported or re-used material.

¹² BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.

¹³ Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."

¹⁴ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

¹⁵ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

¹⁶ LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."

¹⁷ EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.

¹⁸ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

¹⁹ EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.

²⁰ EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.

4.4 Potable Water Supply Pipes

A UU risk assessment should be completed once the remediation earthworks have been completed and once the pipe routes and depths are known. Additional sampling may be required following reduced levels and confirmation of pipeline routes.

In the event that barrier pipe is required then the risk assessment should be approved by UU prior to any installation works. Pipework should be installed in trenches back filled with first generation materials (if installed within made ground).

For the purposes of the build phase validation report (if barrier pipe is required), a works notice, delivery notes indicating the source of the first generation backfill material and photographic evidence of this material in the trenches should be collated along with photographs illustrating the installation of barrier pipe.

4.5 Reports

4.5.1 Validation Report

A validation report detailing the remediation works will be produced which will include:

- » Documentary evidence of materials removed from site (such as disposal tickets).
- » Watching brief for contamination during development works detailing any unexpected contamination and any further assessment and mitigation steps undertaken.
- » Validation of environmental cover system.
- » Installation of the correct water pipe specification.
- » Validation testing of any site won or imported material at an appropriate rate, as required.

The aim of the validation report will be to demonstrate to the Local Authority that the site has been suitably remediated to the extent that the site is suitable for its proposed residential end use and, in accordance with the National Planning Policy Framework (NPPF)²¹:

- » The site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;
- » After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and,
- » Adequate site investigation information, prepared by a competent person, is presented.

²¹ DCL (2012). "National Planning Policy Framework." Department of Communities and Local Government. March 2012.

APPENDIX A

JIWG ASSESSMENT

Decision Support Tool for Receptor Risk Ranking

Stage 1		Score
Hazard Identification		
Select ACM type (run model for each type to generate 'Worst Case' output)	Free dispersed fibres/fibre bundles	2
Extent of degradation of ACMs	Degraded (Significant degradation in ACM; material has lost its basic integrity)	3
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not firmly linked in a matrix	2
Distribution of Visible Asbestos Across Affected Area	Occasional/random occurrences of visible contamination by ACMs	1
Asbestos fibre type	Chrysotile alone	0
Sub-total		8
Hazard ranking		Low

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool.
It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.



Stage 2		Score
Emission Factors		
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Very Low quantities - 0.001 to 0.01 %wt/wt	1
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Medium	3
Activity type and effect on deterioration of ACMs	Low disturbance, minimal deterioration expected	2
Best description of primary host material matrix	Made Ground - Recycled Aggregate, Track Ballast	4
Sub-total		10
Exposure ranking		Medium

Stage 3			
Pathway and Receptor Sensitivity		Score	
Receptor category	Public open space or building	No score required	
Age of Receptor	Adult (>24 and <60)	1	
Duration of exposure/site occupancy	<1 hour in any week (e.g. short duration work or equivalent infrequent exposure event when exposure aggregated over 1 yr)	0	
Receptor ranking		1	Very Low
Combined hazard, exposure and receptor ranking			Low
Pathway: Distance of Receptor from Source	In or within 10m of area of disturbance	4	
Pathway: Depth to impacted material	Material buried at shallow depth, potential to be disturbed by excavation	C	
Pathway ranking		4C	Low
Overall ranking			Very Low



Joint Industry Working Group
Asbestos in Soil and Construction & Demolition Materials

Project Reference	CLR 19 1016
Site Name	Manchester College Campus
Client	Willmott Dixon Construction Ltd
Run by	PD
Date	07-Jan-20
Reviewed by	DA
Characterisation of scenario being evaluated	made ground with low quantities of asbestos containing material beneath 300mm capping layer (including geomembrane) in soft landscaping areas.
Interpretation of scenario ranking by DST	

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- » Geotechnical
- » Contaminated Land
- » Flood Risk and Drainage
- » Asbestos
- » Invasive Species
- » Land Remediation
- » Project Management
- » Land Drilling