

MMU Science & Engineering, Manchester

Remediation Strategy

Curtins Ref: 069656-CUR-00-XX-RP-GE-003

Revision: P02

Issue Date: 02 August 2021

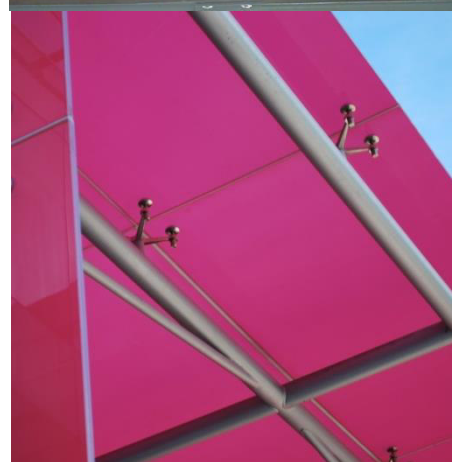
Client Name: Bowmer & Kirkland

Client Address: North West Regional Office, 1st Floor, Altitude, Atlas Business Park, Manchester, M22 5PR

Site Address: Manchester Metropolitan University, John Dalton Building, Chester Street, Manchester, M1 5GD

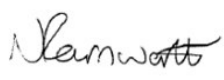
Curtins
Merchant Exchange
17-19 Whitworth Street West
Manchester, M1 5WG
Tel: 0161 236 2394
www.curtins.com

STRUCTURES • TRANSPORT PLANNING • ENVIRONMENTAL • CIVILS & INFRASTRUCTURE • EXPERT ADVICE • SUSTAINABILITY • STAKEHOLDER ENGAGEMENT
Birmingham • Bristol • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham



Rev	Description	Issued by	Checked	Date
P01	Interim Report	NF	RA	03/11/2021
P02	Updated Following Post Demo SI	NF	RA	02/08/2021

This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins Limited with respect to the information contained in the report will not extend to any third party.

Author	Signature	Date
Niall Farnworth BSc (Hons) MCIWEM Senior Geo-Environmental Engineer		02 August 2021

Reviewed & Authorised	Signature	Date
R Allen BSc (Hons) MSc FGS MCIWEM C.WEM CEng Principal Engineer		02 August 2021

Table of Contents

1.0	Introduction	1
1.1	Particular Requirements of the Remediation Strategy	1
1.2	Definitions	1
1.3	References	2
2.0	Post Demolition Investigation	3
2.1	Soil Logging and Sampling	3
3.0	Ground Conditions	5
3.1	Made Ground	5
3.2	Superficial Deposits	6
3.3	Bedrock Deposits	6
3.4	Groundwater Levels	7
3.5	Contamination Concentrations	7
3.5.1	Soils	7
3.5.2	Groundwater	8
3.6	Contamination Reported by Demolition/Earthworks Contractor	8
3.7	Water Supply Pipe Assessment	9
3.8	Ground Gas Risk Assessment	9
3.9	Materials Management	10
2.8.1	Re-use of Site Soils	10
2.8.2	Material Classification	10
4.0	Relevant Pollutant Linkages	12
5.0	Remedial Works	13
5.1	Remedial Action 1 – Contamination and Asbestos Management During Construction	13
5.2	Remedial Action 2 – Engineered Capping	15
5.3	Remedial Action 3 – Use of Suitable Water Supply Pipes	16
6.0	Engineered Capping Specification	17
6.1	Sourcing of Materials	17

6.2	Imported Topsoil.....	17
6.3	Imported Subsoil	17
6.4	Chemical Composition of Soils	18
6.5	Verification and Validation of Capping/Growing Media.....	19
6.0	Strategy for Handling Potentially Contaminated Soils and Contaminative Incidents on Site.....	20
6.1	Unexpected Contamination	20
6.2	Contaminative Incidents.....	20
7.0	Verification, Validation and Reporting	22
8.0	References	23

Appendices

Appendix A	- Drawings
Appendix B	- Exploratory Hole Logs
Appendix C	- Photographic Records
Appendix D	- Chemical Laboratory Analysis
Appendix E	- Chemical Acceptability Thresholds

1.0 Introduction

This Remediation Strategy has been prepared by Curtins for Bowmer & Kirkland (the Client) to provide guidance with respect to land remediation requirements for a site at Manchester Metropolitan University's campus in Manchester to be developed for a Science & Engineering building. The site is located off Chester Street, approximately centred on National Grid Reference 384130, 397240.

Development proposals comprise demolition of existing buildings within the site, and construction of the new 7 storey Science and Engineering Building with vehicular access from Chester Street, landscaping and public realm works, and servicing facilities.

The site location plan and current development plans for which can be referred to within Appendix A.

This report has been compiled following various stages of pre demolition and post demolition intrusive investigations undertaken across the site by Curtins.

1.1 Particular Requirements of the Remediation Strategy

The Remediation Strategy is to account for the following;

- A description of the materials likely to be encountered by the developer and their sub-contractors;
- Proposals for excavations with respect to the materials likely to be encountered;
- Any action required to reduce the risk from contaminants on the development site (soil, liquid and gas);
- Any action required to reduce the risk from contaminants entering water supply pipes;
- Advice on the thickness and quality of any cover to soft landscaped areas of the development; and
- Advice on the verification and validation of the cover layer including a regime for sampling and chemical analysis of sub-soil material.

Reference should also be made to Curtins previous reports Phase 1 Preliminary Site Assessment & Phase 2 Site Investigation Reports (Ref. 1 & 2).

1.2 Definitions

In this document the following definitions apply,

Contractor Refers to the appointed contractor responsible for undertaking the remediation works.

Site Manager Refers to a representative of the appointed contractor resident on site.

Engineer Refers to a suitably qualified representative from Curtins, who would not normally be resident on site.

1.3 References

The Remediation Strategy has been prepared with reference to the following previous geo-environmental reports for the site:

Reference 1: Curtins (2018) *Phase 1 Preliminary Risk Assessment, MMU Science and Engineering* (ref. 1338B-CUR-ZZ-RP-C-000001).

Reference 2: Curtins (2020) *Phase 2 Ground Investigation, MMU Science & Engineering, Manchester* (ref. 069656-CUR-00-XX-RP-GE-002-P05).

The Phase 2 report referenced above recommended post demolition investigation beneath the John Dalton West building which previously occupied a significant portion of the site. The post demolition investigation has subsequently been completed in April 2021 and is reported on herein.

2.0 Post Demolition Investigation

The Phase 2 Ground Investigation Report (Ref. 2) recommended post-demolition investigation should be undertaken to characterise the ground conditions beneath the JD West building which previously occupied a significant proportion of the site. The scope of works is summarised in Table 2.0.

Table 2.0 – Scope of Post-Demolition Investigation Undertaken

Exploratory Hole Type	Exploratory Hole Reference	Exploratory Hole Depth (m bgl)	Rationale
Machine Excavated Trial Pits	TP1001 TP1002 TP1003 TP1004	2.90 2.40 1.70 1.70	- Confirm shallow ground conditions; - Collect soil samples for chemical testing; - TP1001 advanced in the location 'tank 2' was found due to report of possible contamination when excavating (see Section 3.6).

The Exploratory Hole Location Plan is included in Appendix A.

The Exploratory Hole Logs are included in Appendix B and the ground conditions encountered are summarised in Section 3.0 together with the ground conditions previously encountered in previous phases of ground investigation.

2.1 Soil Logging and Sampling

Exploratory borehole arisings were logged on site by a qualified Engineer. All exploratory holes were logged in accordance with the requirements of BS5930:2015 (Ref. 7) including recording observed visual and olfactory indications of contamination.

Seven environmental soil samples were placed in laboratory provided containers and stored in cool boxes prior to being transported to the nominated laboratory under the laboratory's chain of custody documentation. The laboratory selected by Curtins for chemical analysis was Envirolab (UKAS and MCERTS accredited). Four samples were obtained from made ground soils, two samples from natural soils, one sample was obtained of possible Asbestos Containing Material (ACM) Debris identified in a stockpile of materials excavated from around where 'tank 2' had been found.

Six soil samples were subject to the testing suite detailed in Table 2.1 whilst the seventh sample was solely screened for asbestos followed by bulk fibre quantification.

Table 2.1 – Environmental Chemistry Analysis Suite: Soils

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen, pH, 2;1 Water Soluble Sulphate & Soil Organic Matter (SOM)	-
	Arsenic, Chromium, Chromium VI, Copper, Lead, Selenium, Zinc, Nickel	5 mg/kg
	Boron (water soluble)	1 mg/kg

Suite Ref.	Analyte	LOD
	Cadmium	0.5 mg/kg
	Mercury	0.1 mg/kg
	Cyanide (total)	10 mg/kg
	Phenols (screen)	1 mg/kg
	PAHs (USEPA 16)	0.1 mg/kg
	TPH (Aro/Alk Split)	0.01 to 0.1 mg/kg

Laboratory test results (ref. 21/03780) are included in Appendix D and reviewed in Section 3.5. No samples were recorded as deviating.

3.0 Ground Conditions

The following ground conditions section has been summarised based on the Curtins Phase 2 Report (Ref. 2) and the additional phase of post demolition in April 2021 not previously reported on.

Borehole and trial pit locations are shown on Curtins drawings ref. 069656-CUR-00-XX-DR-GE-002-V02, 069656-CUR-00-XX-DR-GE-003-V02 and 069656-CUR-00-XX-DR-GE-003-V03 contained within *Appendix A*.

During demolition works the contractor also reported the discovery of two underground storage tanks, as further discussed in Section 3.6.

3.1 Made Ground

Made Ground was encountered from ground levels to depths of 0.20m to 3.20m bgl. It typically comprised Asphalt overlying Made Ground of Sand overlying Made Ground of Clay in pre demolition investigations. In post demolition investigation hardstanding was not encountered and variable cohesive and granular made ground encountered underlying.

The granular Made Ground was encountered within all the exploratory holes at 0.10 – 2.75m bgl; typically comprising reddish brown to black clayey gravelly Sand, brown to black slightly clayey slightly sandy fine to coarse Gravel and brown to black fine to coarse Sand and Gravel. Gravel is angular to subrounded, fine to coarse of various lithologies including coal, ash/clinker, brick, concrete, asphalt, ash, sandstone and mudstone.

Granular brown and grey sandy gravel of crushed demolition rubble including brick was encountered from surface to 0.3m and 0.3m bgl respectively in TP1002 and TP1003. Brown gravelly sand was also encountered in TP1004 from surface to 0.30m bgl.

Cohesive Made Ground was encountered within TP1001, WS02, WS03, WS04, BH01, BH04 and BH05 at 0.45m – 3.20m bgl, typically underlying granular material and comprising soft to stiff greyish brown very sandy, slightly to very gravelly Clay with a low to medium cobble content of brick. Gravel is angular to subrounded, fine to coarse of various lithologies including brick, concrete, slate, tile, ceramic, coal, sandstone and mudstone. Cohesive made ground was encountered from surface in TP1001 to a depth of 2.75m bgl. TP1001 was undertaken close to where a tank had been encountered and removed by the demolition contractor and hence these materials are considered to have been recently disturbed.

WS01 was terminated at 0.80m bgl due to a brick obstruction and BH03 was terminated at 1.80m bgl due to obstructions, likely brick or concrete. WS102, WS103 and WS103A were terminated due to a concrete slab, encountered from depths of 0.20 – 0.70m bgl. TP1001 encountered a brick obstruction at 2.75m bgl comprising layer brick cobbles/possible relic structure.

3.2 Superficial Deposits

Natural superficial strata deposits comprised Glacial Till encountered from depths of 0.30m to 3.20m to a proven depth of 12.00m to 17.00m bgl and generally consisted of Clay underlain by Sands and Gravels however in post demolition trial pits TP1002 and TP1004 sand was encountered overlying cohesive deposits.

The cohesive deposits generally comprised firm to very stiff brown to greyish brown, slightly to very sandy, slightly gravelly Clay. Gravel is subangular to subrounded, fine to coarse of various lithologies including sandstone, mudstone, coal and quartzite and cobbles of sandstone. The Clay was typically recorded to depths up to 12.00m bgl.

The deeper granular deposits encountered within the majority of exploratory holes generally comprised loose to very dense, brown to grey clayey, slightly to very gravelly fine to coarse Sand and reddish brown to brown medium dense to very dense fine to coarse Sand & Gravel. Gravel is subangular to sub rounded fine to medium of various lithologies including sandstone, mudstone and quartzite. This deeper granular material was encountered from 10.80m and 12.00m bgl to a maximum depth of 12.00m to 17.00 m bgl.

Shallow granular material encountered in TP1002 and TP1004 comprised of medium dense light brown very gravelly sand with medium cobbles content. This material was encountered from 0.30m to a maximum depth of 3.00m bgl. It was described as possibly worked in TP1004 due to the identification of rare brick fragments.

3.3 Bedrock Deposits

Sandstone bedrock was encountered within Cable Percussive (with Rotary cored follow on) Boreholes from depths of 12.50m to 17.00m bgl to borehole completion depth (22.00 – 31.50m bgl).

The bedrock was recorded as extremely weak to weak, moderate reddish-brown slightly silty fine to medium grained Sandstone. Occasional to rare fine to medium grained gravel of sandstone, siltstone, quartzite and dark reddish-brown mudstone. Fractures (0 – 25 degrees) are extremely closely to medium spaced, open to incipient, smooth planar and sand coated. Some assumed zones of core loss were recorded, and non-intact zones recovered as very sandy gravel.

In BH102, mudstone was encountered from 18.78m to 20.85m and from 21.49m to 25.36m, generally described as extremely weak to very weak reddish brown thinly laminated Mudstone with occasional widely spaced thin laminations of fine-grained sandstone. Discontinuities identified are incipient fractures, extremely closely spaced to closely spaced, 0 – 10 degrees, planar and fractures very closely spaced to widely spaced 0 – 10 degrees, planar, smooth.

3.4 Groundwater Levels

Groundwater strikes were recorded during siteworks in TP1004, BH01, BH03A at 1.70m bgl, 10.00m and 9.50m bgl respectively.

During return monitoring, groundwater was encountered within the window sample boreholes at 1.60m – 2.14m bgl. Within the installed rotary boreholes groundwater was encountered at 3.84m to 10.40m bgl. This is considered likely represent perched groundwater in made ground and superficial deposits.

3.5 Contamination Concentrations

3.5.1 Soils

With respect to the proposed 'Commercial' end-use of the site, no exceedances were noted within recovered soil samples from pre demolition or post demolition site investigations.

All samples were screened for asbestos as part of the general soil testing suite. No suspected asbestos containing materials (ACMs) were identified in the exploratory hole logs with the exception of possible ACM identified at the time of the post demolition investigation in stockpile of materials excavated from around 'tank 2', numerous pieces were identified and a sample was obtained for testing.

Laboratory screening confirmed that asbestos was present within two of the recovered Made Ground samples from pre demolition investigation, WS03 at 0.30m and BH02 at 0.30m. Both of these locations are located on the south of the site.

Asbestos was also identified in samples obtained during the post demolition SI including the suspected ACM obtained from the onsite stockpile and from TP1001 at 1.00m on the north of the site.

Results are detailed within *Table 3.5.1* below.

Table 3.5.1 – Locations of positive asbestos identification, with asbestos quantification results

Borehole Ref.	Depth (m bgl)	Asbestos ID	Asbestos Quantification in Soil (%)	Asbestos Bulk Fibre Quantification (%)
WS03	0.30 – 0.40	Chrysotile (Loose Fibres)	0.002	-
BH02	0.30 – 0.40	Chrysotile (Loose Fibres & Loose Insulation)	0.22	-
TP1001	1.00	Chrysotile (Loose Fibres)	<0.001	-
Stockpile 1 (SP01)	Surface	Chrysotile (Cement ACM)	-	15%

TP1001 was undertaken where the soils stored in stockpile 01 were sourced following discovery of a tank. It is therefore possible that further ACMs and loose fibres may exist in this area of the site.

2.5.2 Groundwater

When compared to the UK/EU Drinking Water Standards and WHO Thresholds for TPHs, no exceedances were recorded in the two recovered groundwater samples collected which could present a risk to the underlying aquifer and Source Protection Zone (Zone III).

3.6 Contamination Reported by Demolition/Earthworks Contractor

Complete Regeneration Ltd have recently carried out demolition and enabling works at the site and reported their removal of historic underground fuel storage tanks and contamination to Curtins in April 2021 as detailed below. Tank excavation works were not witnessed by Curtins.

On Tuesday 09 March an unidentified tank was discovered under a weigh bridge at the north of site. Hereby known as 'tank 1'. Complete Regeneration report that this tank was found to be cut open and filled with concrete/sand. This tank was excavated and removed from site. No evidence of contamination was reported around the tank.

On Wednesday 10 March an unidentified tank was discovered to the south east of tank 1, hereby known as 'tank 2'. Complete Regeneration report that this tank was filled with sludge, with 'black material surrounding with surrounding decaying metal drums fragments'. The tank and surrounding material was excavated and stored on polythene with samples taken for laboratory analysis. The tank was cleaned and disposed of off-site. During the post demolition investigation Curtins engineer inspected the stockpile of excavated materials, the material comprised a dark blackish brown and brown very gravelly sand with gravel of slate, brick, wiring and metal fragments, as well as large concrete pieces stored on a polythene membrane, no free product or gross contamination was identified. Curtins recommended that the stockpile is covered to prevent leaching of contamination while awaiting disposal. Curtins engineer also identified numerous pieces of potential ACM in the stockpile, one sample was taken and sent to the laboratory for screening which confirmed the material to be chrysotile cement (see Section 3.5.1).

Additional trial pits were undertaken by Complete Regeneration in March 2021 who report 'TP8' recorded the presence of asbestos. Complete Regeneration obtained samples for laboratory analysis at AEC Ltd, report ref.J207764 enclosed in Appendix D. AEC identified the sample as containing chrysotile and crocidolite. Complete Regeneration report that this material was picked by trained operatives with dust suppression and additional PPE in place and disposed of off-site.

Complete Regeneration carried out environmental chemistry analysis on five no. samples four of which were identified samples obtained from contents of tank 2 and soils surrounding whilst a 5th was

from their TP01 at 0.50m. Samples were analysed by Element Materials Technology Laboratory report ref. 21-3782 B1, enclosed in Appendix D. Samples were analyzed for a suite of testing including heavy metals, PAHs, TPHs and PCBs. When compared against Curtins Commercial GACs where available no exceedances are recorded. Polychlorinated Biphenyl's were recorded at elevated concentrations above Soil Guidance Values for a Commercial end use in two samples obtained from around 'Tank 2' at 0.50m and at 1.00m bgl. Given this material has been excavated and removed from site to a licensed disposal facility (consignment note Ref. COMPLE/CR003) and furthermore this area will be covered by the proposed building, the risk to end users and the wider environment is considered to be Low.

Curtins carried out TP1001 at the approximate location tank 2 was excavated along with visually contaminated soils to assess if any contamination remained. No visual or olfactory evidence of hydrocarbon contamination was identified and no exceedances above commercial GACs were identified, however asbestos fibres were found (see Section 3.5.1).

Consignment notes for removal of hazardous material are available for review on request.

Complete Regeneration's photographic record of works described above with trial pit/tank location plan has been provided and is enclosed in Appendix C. Curtins Photographic record from the site visit 8th April is also enclosed in Appendix C.

3.7 Water Supply Pipe Assessment

With reference to the UKWIR Report no. 10/WM/03/21 (Ref. 5) advice is given on the appropriate materials for these ground conditions. The exact requirements are to be confirmed with the relevant utility supplier.

Based on the data collected and assessed during the February and December 2019 site investigations PE and PVC pipes are unlikely to be considered suitable for use for water supply pipes at this site due to concentrations of C5-C10, C11-20 and C21-40 mineral oils and BTEX exceeding UKWIR guidelines. Therefore, it was recommended that appropriate materials for water supply pipes would likely comprise Barrier Pipes (PE/AL/PE) with the exact requirements to be confirmed with the relevant utility supplier.

3.8 Ground Gas Risk Assessment

To characterise the site's ground gas regime and validate the qualitative assessment of ground gas risk standpipe installations were incorporated within boreholes on site. During the February 2019 ground investigation, an initial programme of six gas monitoring visits over three months were undertaken between 6th March and 13th May 2019. As part of the December 2019 GI a programme of six monitoring visits over three months was undertaken between 14th January and 8th April.

A maximum carbon dioxide (CO₂) concentration of 0.8% was recorded in WS03 and a maximum flow of 1.8l/hr was recorded. Concentrations of methane (CH₄) were recorded below the instruments limit of detection. Carbon monoxide (CO) and hydrogen sulphide (H₂s) were recorded at maximum concentrations of 3ppm and 6ppm respectively. The borehole Qhg of 0.0008 l/hr within WS03 was considered representative of the gassing regime of the site as a whole and particularly beneath the proposed building footprint, thus was adopted as the sites Gas Screening Value. The maximum carbon dioxide concentrations and respective gas screening values indicate a Gas Characterisation Situation 1 (CS1) gas regime, not requiring gas protection measures for the proposed new development.

3.9 Materials Management

2.8.1 Re-use of Site Soils

Based on the geochemical testing results presented as part of this investigation it is considered that there is no specific requirement to remove the majority of soils from site because of them presenting an unacceptable risk to human health or the environment.

Except for the material excavated from around tank 2 exhibiting elevated concentrations of PCBs and presence of ACM and around Complete Regenerations trial pit 'TP08' where extensive ACMs were noted, the re-use of site-won soils may therefore be undertaken if the following principles are met:

- i) the geotechnical suitability of the material needs to be confirmed;
- ii) the re-use of the material needs to be covered as part of the planning approval, e.g. site levels maintained within agreed limits;
- iii) the volume of the material being re-used needs to be confirmed and traceable; and
- iv) regulatory approval from the relevant authorities has been sought.

These principles are outlined within the CL:AIRE Definition of Waste Code of Practice (v2) (Ref. 21) and if and where the re-use of site-won soils is proposed as part of the development works it is recommended that a Materials Management Plan is produced in line with the Definition of Waste Code of Practice to detail and document the process.

It should be noted that asbestos containing soils may not be suitable for crushing for re-use due to the risk of fibre release and cross contamination.

2.8.2 Material Classification

Where any site soils are to be disposed of offsite guidance on the disposal of contaminated soils is provided within the following document published by the Environment Agency, the

Guidance on the Classification and Assessment of Waste Technical Guidance WM3 (1st Edition 2015) (Ref. 6).

Guidance states that the principal contractor (or any other sub-contractor undertaking excavations) should, in conjunction with the proposed disposal facility, use where possible the relevant environmental chemistry analyses results to classify any surplus material identified for offsite disposal. However, it should be noted that this information is for guidance only and material identified for disposal should be tested and assessed in accordance with WM3 to enable classification during the works.

An initial assessment for the waste classification of the shallow and deeper Made Ground soils encountered onsite has been carried out as part of the Phase 2 (Ref.2) through a comparison of the soil testing results against the Tier 1 Thresholds and using the Waste Soils Characterisation Assessment Tool, Cat-WasteSoil, developed by McArdle and Atkins. This online tool gives a rapid assessment of contaminated soils and their classification as either hazardous or non-hazardous (stable non-reactive hazardous waste) waste, it should be noted that this tool does not classify inert waste. Persistent Organic Pollutants (POP's) were not tested for as part of the investigation, however based on the Conceptual Site Model the risk of these being present on the site is considered Low.

The initial assessment revealed that of the 22 no. soils tested as part of pre demolition investigation, two samples have been identified as 'hazardous' with respect to Environment Agency waste classes, using the guidance given in WM3. WS02 at 1.2m was identified as having hazard property HP14 due to elevated concentrations of Copper and Lead; and BH02 at 0.30 – 0.40m due to concentrations of asbestos fibres greater than 0.1%. Asbestos Containing Material ACM's have also since been encountered in a stockpile of materials excavated from around Tank 2 as well in Complete Regenerations Trial Pit ref. TP8.

Asbestos Containing Material (ACM) picking may enable for disposal of some soils as non-hazardous waste.

As discussed, preliminary waste classification is undertaken to offer indicative advice with respect to disposal requirements. Landfill operators are not obliged to accept waste and, if they were to do so, may have specific requirements beyond those outlined above prior to acceptance. Landfill operators should be contacted to confirm the above classifications or otherwise.

4.0 Relevant Pollutant Linkages

A conceptual site model (CSM) for the site has been developed based on the two phases of Ground Investigations undertaken as detailed in Curtins Geo-environmental reporting (Ref.1 & 2).

The CSM details several pollutant linkages at the site, however, based on the risk assessments undertaken, the potential pollutant linkage (PPL) listed in *Table 3.0* was identified as requiring remediation to enable the safe re-development of the site. This CSM will require update following post demolition ground investigation.

Table 3.0 Potential Pollutant Linkages (Existing)

PPL	Sources	Receptor	Potential Pathway	Remediation Recommended
1	Made Ground soils containing elevated loose asbestos fibres and/or asbestos containing material	Construction Workers	Inhalation and/or ingestion with contaminants in soil and soil-derived dust from on-site Made Ground.	Appropriate PPE for construction staff and suitable asbestos management measures during construction.
2	Made Ground soils containing asbestos fibres/containing materials.	End Users	Inhalation and/or ingestion with contaminants in soil and soil-derived dust from on-site Made Ground.	Given post demolition investigation and enabling works have identified further asbestos fibres and ACM across the site It is recommended that in all soft Landscape Areas overlying Made Ground - a clean and inert growing medium of 300mm of topsoil/subsoil with underlying geotextile/break layer is provided.
3	Made Ground soils containing elevated concentrations of TPHs above UKWIR thresholds.	End Users	Chemical attack of potable water supply pipes and subsequent infiltration from contaminants on site, followed by ingestion.	Ensure appropriate water supply pipes are used, this should comprise 'barrier pipe' subject to agreement with United Utilities.

The risks to groundwater and surface waters from contamination on site and the risks from ground gas to end users were identified as Low within previous ground investigation reporting (Ref.1 & 2).

5.0 Remedial Works

With reference to the Conceptual Site Model and the potential contaminant linkages detailed in *Table 3.0* remedial actions are recommended in order for the site to be brought up to a condition that is deemed 'suitable for use';

- **Remedial Action 1:** Appropriate PPE for all construction workers and suitable asbestos management measures;
- **Remedial Action 2:** Engineered capping to serve as physical barrier between Made Ground and site surface; and
- **Remedial Action 3:** Ensure suitable water supply pipes are used on site.

It is further recommended that Curtins Engineer is contacted if any unexpected contamination/contaminative incidents are encountered during construction works or should ground conditions vary from those outlined in Section 2.0. Further advice on handling such incidents is enclosed within Section 6.0.

5.1 Remedial Action 1 – Contamination and Asbestos Management During Construction

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulation, 2015 which require the potential risk to human health and the environment from construction activities are appropriately identified and all the necessary steps taken to eliminate / manage the risk.

It has been assumed that any future construction works on site will be undertaken in compliance with these requirements to address PPL 1 (Table 3.0).

CL:AIRE have published guidance to aid in the classification of remediation works on Asbestos Containing Soils (ACS) compliant with Control of Asbestos Regulations 2012 (CAR). This is detailed in CL:AIRE (2016) 'Control of Asbestos Regulations 2012 – Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry Guidance.

Any works with asbestos containing soils are required to determine their classification in accordance with Control of Asbestos Regulations 2012. The specialist groundworks contractor is therefore to designate the works based on the investigation results but utilizing their own additional testing and delineation if they deem it to be required.

Where, from the site investigations, material are known to contain asbestos fibres good practice (JIWG Car-Soil and CAR 2012) prescribes such material to be segregated to ensure materials would not cross-contaminate other soils and to reduce the risk of further fiber release to site workers.

Table 3.5.1 in Section 3.5 above should be consulted together with Curtins Exploratory Hole Plan Drawings in *Appendix A* for the locations, depths and concentrations of asbestos was identified during Curtins Ground Investigations (Ref. 2). Section 3.6 should be consulted together with Complete Regeneration Ltd photographic records for the locations, depths and concentrations they have found asbestos during demolition/enabling works to date.

Concentrations of chrysotile asbestos fibres encountered within the Made Ground soil in WS03 and TP1001 were relatively low at 0.02% w/w and <0.001% w/w respectively. In BH02, where chrysotile loose fibres and chrysotile loose insulation asbestos containing material was encountered, a concentration of 0.22% w/w of asbestos was recorded. Bulk quantification was undertaken on the ACM sample obtained from the on-site stockpile of excavated arisings from around Tank 2 which identified that chrysotile cement to contain 15% asbestos (w/w).

Materials containing asbestos >0.1% w/w would be classed as hazardous waste.

Any fragments or asbestos containing materials where identified must be picked where possible and be kept separate in line with those from any soil arisings. This is typically carried out by picking visible fragments at the point of excavation.

On this basis, removal of ACM debris, during enabling works at the site is required.

The following steps should be taken;

1. Asbestos Management Plan to be developed by the contractor prior to works. This document will outline procedures to be undertaken during construction to ensure removal of ACM debris.
2. Visual inspection of all excavations is to be undertaken by suitably qualified and experienced asbestos professional;
3. All identified or suspected ACM debris should be removed from the site and submitted to the laboratory for testing;
4. The contractor is responsible for providing appropriate records of ACM identified, along with provision of disposal records;
5. Validation should be in the form of collating records of ACM findings (e.g. daily site log, photographs (if appropriate), along with laboratory testing and disposal records, to be included in a validation report.

It is the responsibility of the contractor to make all relevant risk assessments to protect site users and the public during construction. The asbestos management plan should detail the risk assessments

completed, mitigation to be employed as well as an assessment of the type of work i.e. notifiable, non-notifiable etc.

Existing Made Ground should not be crushed or in any way treated due to risk of asbestos fibre release. It may be possible to use Made Ground soils as general fill subject to in situ trial tests and where managed appropriately by the Method Statement compiled by the Asbestos Management Specialist.

5.2 Remedial Action 2 – Engineered Capping

The second PPL identified at the site relates to the direct contact, dermal uptake, soil and dust ingestion and inhalation of PAHs, lead and asbestos fibres in soils and soil derived dust (PPL 2, *Table 3.0*).

Hardstanding, including vehicular asphalt, pedestrian asphalt and concrete block paving are considered sufficient to break the potential contaminant linkage, PPL 2, detailed in *Table 3* and therefore no specific remediation measures, above activities required for construction, are considered necessary if and where these are installed at the site.

However, a risk remains in landscape areas of exposure to contaminated Made Ground. It is therefore recommended that verified clean capping, comprising a thickness of imported subsoil and topsoil where directly overlying the Made Ground.

Recommended remedial measures are detailed in *Table 4.2* below.

Table 4.2 Engineered Capping Details for Soft Landscaping Areas

Location	Further Remedial Measures Required ¹	Rationale
General Landscape Areas	Provision of a minimum 300 mm clean capping with underlying geotextile or break layer. The geotextile or break layer must be provided to provide a warning/prevent future excavation into contaminated soil below. The capping thickness should comprise a minimum of 150mm topsoil over resultant depth of subsoil and geotextile/break layer.	Remove potential for exposure of on-site receptors via direct contact, dermal uptake and soil and dust ingestion and inhalation.

The engineered capping must meet the specification outlined in *Section 5.0*.

5.3 Remedial Action 3 – Use of Suitable Water Supply Pipes

The third PPL identified at site relates to the risk to water pipes by chemical attack from contaminants on site which will enable infiltration of contaminated material followed by potential ingestion by the receptor (PPL 3, *Table 3.0*).

UK Water Industry Research (UKWIR) published 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' to ensure the correct materials are selected for water pipes and components to be used below ground in brownfield sites to protection quality of drinking water. An initial review of the site comparing laboratory analysis results for soils against UKWIR thresholds indicated PE & PVC are unlikely to be considered suitable materials for water supply pipes on the site.

The exact requirements should however be confirmed with the utility provider, in this case United Utilities. United Utilities have adopted the guidance to include a Risk Assessment for Water Pipes. At a minimum a desk study shall be provided within the risk assessment in accordance with the framework in Environment Agency publication 'Model Procedures for the Management of Land Contamination that sets out whether land which the pipes are to be laid may be affected by contamination.

United Utilities require the signatory of the risk assessment to be carried out under the direction of a suitably qualified person e.g. a chartered member of an appropriate professional body or a Specialist in Land Condition (SiLC).

A United Utilities risk assessment was carried out by a Curtins Engineer for the site in March 2020. The assessment recommended contaminant resistant water supply pipes in the form of 'barrier' pipes are used on site. United Utilities should be further consulted to check acceptance of this risk assessment.

6.0 Engineered Capping Specification

6.1 Sourcing of Materials

5.1.1 Off-Site Sources

It is anticipated that materials are to be imported to the site for use in constructing the growing medium in soft landscaping areas. It is strongly recommended that materials are sourced from reputable suppliers and comprise materials that have been suitably processed to produce standardised materials. It is not recommended that materials are imported directly from 'donor' development sites. Imported material will also require verification testing to ensure suitability for reuse, and it is strongly advised that the Contractor undertake their own independent verification testing if accepting material from a third party, rather than relying on supplier reports.

5.1.2 On-site Sources

Based on the findings of the Site Investigation, it is considered highly unlikely that the general shallow Made Ground could be considered 'uncontaminated' or 'clean' material for re-use as a subsoil due to the presence of asbestos fibres and other contaminants at a number of locations across the site.

6.2 Imported Topsoil

Imported Topsoil will invariably be required and should be supplied and placed in accordance with the Architects' specification but generally, all topsoil will be a minimum of 150mm thick in soft landscaped areas (as part of the 300mm overall layer thicknesses as detailed in Section 4.0).

Where topsoil is imported, it is to be 'Multipurpose' in accordance with BS 3882:2015 'Specification for Topsoil and Requirements for Use'.

The topsoil should also be confirmed to be 'suitable for use' as per the analysis outlined in *Section 5.4*.

6.3 Imported Subsoil

Where imported subsoil is required as part of the growing medium this can be cohesive or granular but should be free-draining and confirmed to be 'suitable for use' as per the analysis outlined in *Section 5.4* and compliant with the British Standard for Subsoil BS 8601:2013.

6.4 Chemical Composition of Soils

Site won and imported subsoil and topsoil should not contain concentrations of contaminants that present an unacceptable risk to the health of future site occupants.

The Contractor shall be responsible for demonstrating that both site won and imported material is 'clean' and therefore suitable for use in soft landscaping areas. This will include the recovery of samples for laboratory testing from both the material source and verification testing of material following delivery to site. The required testing frequencies for materials source types are detailed below. Other sources may be applicable, however testing frequencies shall be confirmed with the Engineer prior to acceptance.

Table 5.4a Environmental chemistry testing frequency for imported and re-used soils

Source	Testing Frequency
Imported Topsoil/Subsoil (Greenfield)	Verification: One sample every 200m ³ used (or a minimum of 3 No. samples whichever is greater) in accordance with Table 3 of Clause 5.5.3 of Planning Guidance in Relation to Ground Contamination: Guidance Note for Applicants, Developers, Land Owners and Consultants, Manchester City Council (2016). To include on site sampling not just sampling at source.
Imported Topsoil/Subsoil (Remediated/ Brownfield/Unknown)	Verification: One sample every 150m ³ used (or a minimum of 3 No. samples whichever is greater) in accordance with Table 3 of Clause 5.5.3 of Planning Guidance in Relation to Ground Contamination: Guidance Note for Applicants, Developers, Land Owners and Consultants, Manchester City Council (2016). To include on site sampling not just sampling at source.
Re-used/ Site Won Natural Soils	Verification: one sample every 150m ³ used (or a minimum of 3 No. samples whichever is greater).

The environmental chemistry testing requirements are as *Table 5.4b*. Additions to the suite and frequency of sampling maybe required based on the source of the imported materials. For example, if the imported Topsoil is not naturally sourced, e.g. recycled soil, further chemical determinants may be added to the chemical analysis suite at the discretion of the Engineer.

Table 5.4b Environmental chemistry analysis suite for imported soils.

Suite Reference	Environmental Chemistry Analysis
Greenfield or Manufactured Soils Imported to Site and Site Won Soils for Use as Clean Capping	Total metals: Arsenic, cadmium, chromium, chromium VI, lead, mercury, selenium, copper, nickel, zinc, water soluble boron; pH Soil Organic Matter Asbestos Screening Polycyclic Aromatic Hydrocarbons by GC-MS (Detection Limit 0.1mg/kg for each compound - 16 USEPA speciation)

Suite Reference	Environmental Chemistry Analysis
	Total Petrol Hydrocarbons (Full TPHCWG analysis – aromatic/aliphatic split, Detection Limit 0.01mg/kg for each banding C5 to C10 and 1mg/kg for bandings above C10)

Assessment criteria: Concentrations of the above determinants shall not exceed the '*Residential without Home Grown Produce*' screening criteria; refer to *Appendix E*.

Definition of 'clean': Where ALL concentrations are less than these values the soils shall be defined as 'clean'.

Soil organic matter (SOM): A review of the thresholds outlined may be made for specific soil sources whereby the Soil Organic Matter is proving to be routinely above 6%.

6.5 Verification and Validation of Capping/Growing Media

Confirmatory analysis outlined previously is required to verify the suitability of any imported and site won topsoil, and where required, subsoil.

Evidence that the specified depth of capping/growing media has been provided will be required including evidence of the underlying geotextile/anti-dig break layer.

Evidence should include hand excavated trial pits advanced in areas where material has been placed to prove a sufficient depth is provided and geotextile/anti-dig layer is present.

The pits shall be excavated to the base of the interface between the imported material and the geotextile/ anti dig layer.

A photographic record of the hand excavated trial pits would also be required.

6.0 Strategy for Handling Potentially Contaminated Soils and Contaminative Incidents on Site

6.1 Unexpected Contamination

In the event that material is revealed on the site of a nature that does not accord with the previously observed and recorded descriptions the following procedure is to be complied with:

- a) Cease and make safe all excavations in this location and report observations to the Site Manager.
- b) The Site Manager is to notify the Engineer.
- c) Under guidance of the Engineer take representative samples of the suspect materials and forward to a suitably accredited laboratory for analysis.
- d) Await Engineers instructions with respect to re-commencement of the works and or removal of suspect material to a suitably licensed disposal facility (following guidance outlined in *Section 6.1* above).
- e) Manchester City Council Environmental Protection Team and if relevant the Environment Agency are to be kept fully informed of any site such occurrences.

6.2 Contaminative Incidents

It is possible that some below ground features / structures exist that have not been recorded on plans and have not been encountered during the ground investigation works or demolition works. It is possible that further unknown/unrecorded substructures (e.g. fuel tanks with two already encountered) may exist which if ruptured may release materials that could contaminate the surrounding soils and groundwater (petroleum hydrocarbons, solvents, for example). In the unlikely event that this occurs an outline strategy is detailed below.

Where such a tank/pipework is damaged during excavation and the contents are released into the surrounding soil, the tank/pipework should be immediately pumped dry into another suitable container and a trench with a low permeability base formed around the tank/pipework to prevent seepage laterally and to collect the contaminant. Where groundwater is encountered in the trench, it should be pumped into a suitable container and tested for the contaminant. All soils affected shall then be tested and removed from site as appropriate.

Where the damage is caused to the underside of a tank and seepage is vertical, the contaminants may present a risk of polluting the groundwater. In this instance and subject to the findings of a risk

assessment boreholes may be required to prove and intercept the contaminant. The contaminant will then be pumped into suitable containers.

7.0 Verification, Validation and Reporting

Verification and/or Validation visits shall be undertaken by an appropriately qualified and experienced person throughout the construction phase to ensure that the requirements of this Remediation Strategy have been implemented at the site. It is anticipated records will be taken during the work as identified below:

- During groundworks should any unexpected contamination or further relic Underground Storage Tanks be encountered;
- During groundworks to demonstrate suitable contamination and asbestos management measures have been put in place by the contractor;
- During and after installation of the engineered capping layer to soft landscaped areas;
- Prior to and upon installation of suitable water supply pipes on site (barrier pipe);

All documentation pertaining to the above will be supplied to the Engineer and incorporated within a completion report.

The Completion Report will be required on completion of the works confirming that the remedial works have been completed satisfactorily.

Confirmatory analysis is required to confirm the suitability of any imported topsoil, and where required, subsoil, the results of which will be included within the Completion Report. Any additional, confirmatory testing will also be included herein.

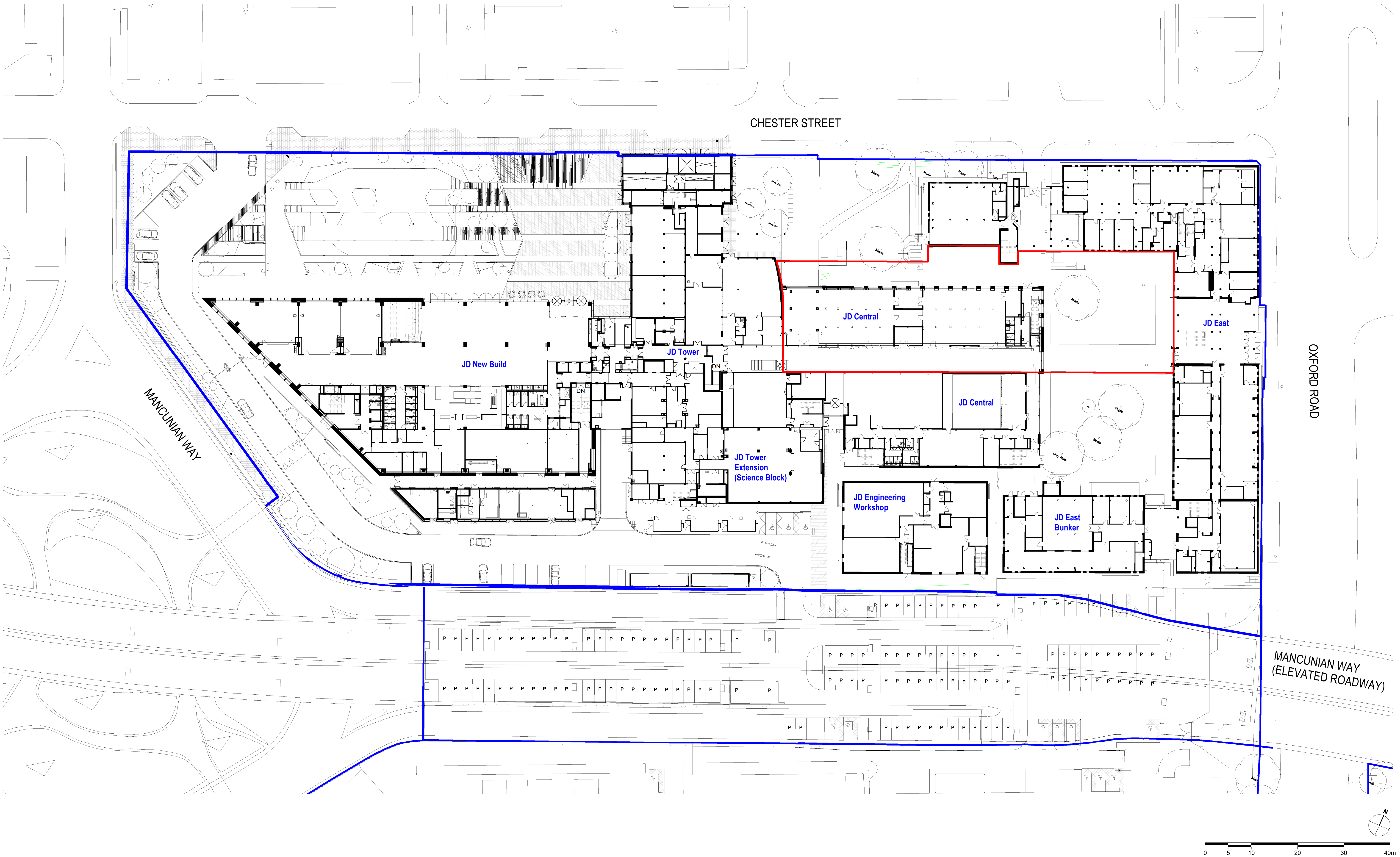
Validation through hand excavated trial pits with photographic record will all be included within the Completion Report to confirm the provision of a requisite depth of clean capping/growing media.

8.0 References

1. Curtins (2018) Phase 1 Preliminary Risk Assessment, MMU Science and Engineering (ref. 1338B-CUR-ZZ-RP-C-000001).
2. Curtins (2020) *Phase 2 Ground Investigation, MMU Science & Engineering, Manchester* – ref. 069656-CUR-00-XX-RP-GE-002-P05.
3. Contaminated Land: Applications in Real Environments (CL:AIRE) *The Definition of Waste: Development Industry Code of Practice. Version 2*; March 2011.
4. Environment Agency. *Guidance on the Classification and Assessment of Waste Technical Guidance WM3 (1st Edition)*. 2015.
5. UK Water Industry Research (2010) Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (report no. 10/WM/03/21).
6. Environment Agency (2015) *Guidance on the Classification and Assessment of Waste Technical Guidance WM3 (1st edition)*.

Appendix A – Drawings

- BDP (2020) Proposed Site Plan 1-500 RIBA Stage 2 (drawing ref. 1338B-BDP-YY-00-DR-A-200005 P01)
- Curtins (2020) Exploratory Hole Location Plan West (drawing ref. 069656-CUR-00-XX-DR-GE-002-V02)
- Curtins (2020) Exploratory Hole Location Plan East (drawing ref. 069656-CUR-00-XX-DR-GE-003-V03)
- Curtins (2021) Post Demolition Exploratory Hole Location Plan (drawing ref. 069656-CUR-00-XX-DR-GE-002-V02)



BUILDING DESIGN PARTNERSHIP SHALL HAVE NO RESPONSIBILITY FOR ANY USE MADE OF THIS DOCUMENT OTHER THAN FOR THAT WHICH IT WAS PREPARED AND ISSUED.

ALL DIMENSIONS SHOULD BE CHECKED ON SITE.

DO NOT SCALE FROM THIS DRAWING.

ANY DRAWING ERRORS OR DIVERGENCIES SHOULD BE BROUGHT TO THE ATTENTION OF BUILDING DESIGN PARTNERSHIP AT THE ADDRESS SHOWN BELOW.

DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE FOLLOWING BEFORE WORK COMMENCES.

- THE CDM DESIGN ISSUES REGISTER
- THE BOP RISK SERIES OF DRAWINGS
- THE PROJECT CDM RISK REGISTER

NOTES

Site Location & Ownership

— Application Site Boundary
— Adjacent Sites in Ownership of Applicant

Blue lines confirming legal boundaries provided by Manchester Metropolitan University on 03/01/2019

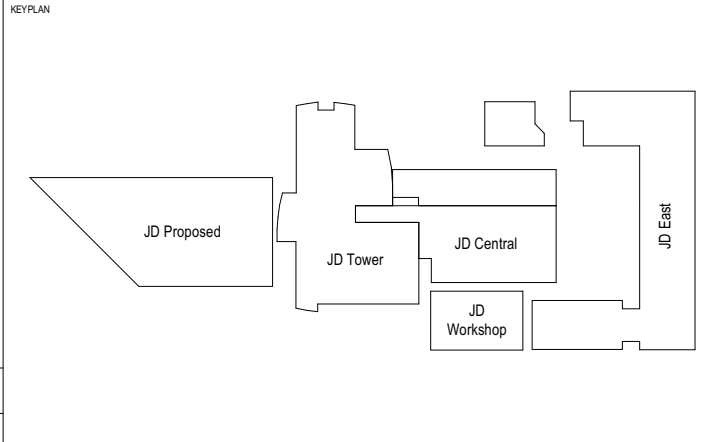
Landscape configuration is indicative. Refer to separate Landscape Architects' Information

REVISION	DESCRIPTION	DRAWN	CHECKED	DATE

REVISION	DESCRIPTION	DRAWN	CHECKED	DATE

REVISION	DESCRIPTION	DRAWN	CHECKED	DATE
P01	Planning Issue			19.08.20

REVISION	DESCRIPTION	DRAWN	CHECKED	DATE



GLUE

Manchester Metropolitan University

11 Ducie Street
PO Box 85
Piccadilly Basin
Manchester
M60 3JA
United Kingdom

T +44 (0)161 828 2200
www.bdp.com

BDP.

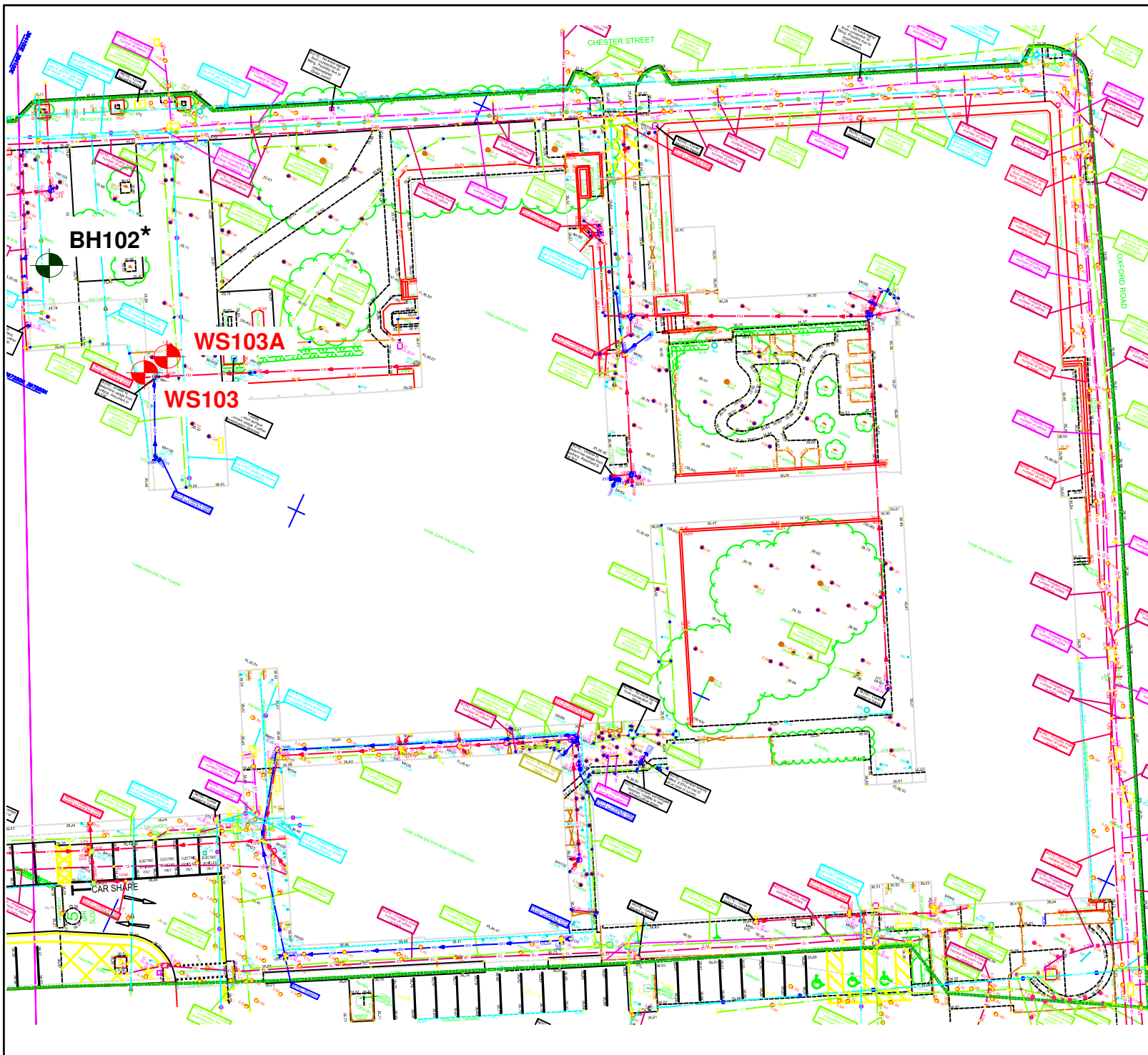
PROJECT TITLE
Science and Engineering Building

BDP JOB NUMBER	PROJECT CLASSIFICATION	RELIABILITY
P2008524	Commercial In Confidence	As indicated

DRAWING TITLE
Site Plan - Proposed

DATE FIRST ISSUED	REVISION
19.08.20	P01

DRAWING NO.
1338B-BDP-YY-GF-DR-A-200005



Window Sample Borehole



Cable Percussive with Rotary
Core follow on Borehole

Rev:	Description:	Date:	By:	Chkd:
------	--------------	-------	-----	-------



Curtins Consulting Ltd,
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
t: 0161 236 2394
e: manchester@curtins.com
www.curtins.com

Structures - Civils - Environmental - Infrastructure - Transport Planning - Sustainability - Expert Advisory Services
Birmingham - Bristol - Cardiff - Douglas - Edinburgh - Kendal - Leeds - Liverpool - London - Manchester - Nottingham

Status:

INFORMATION

Project:

MMU Science and Engineering

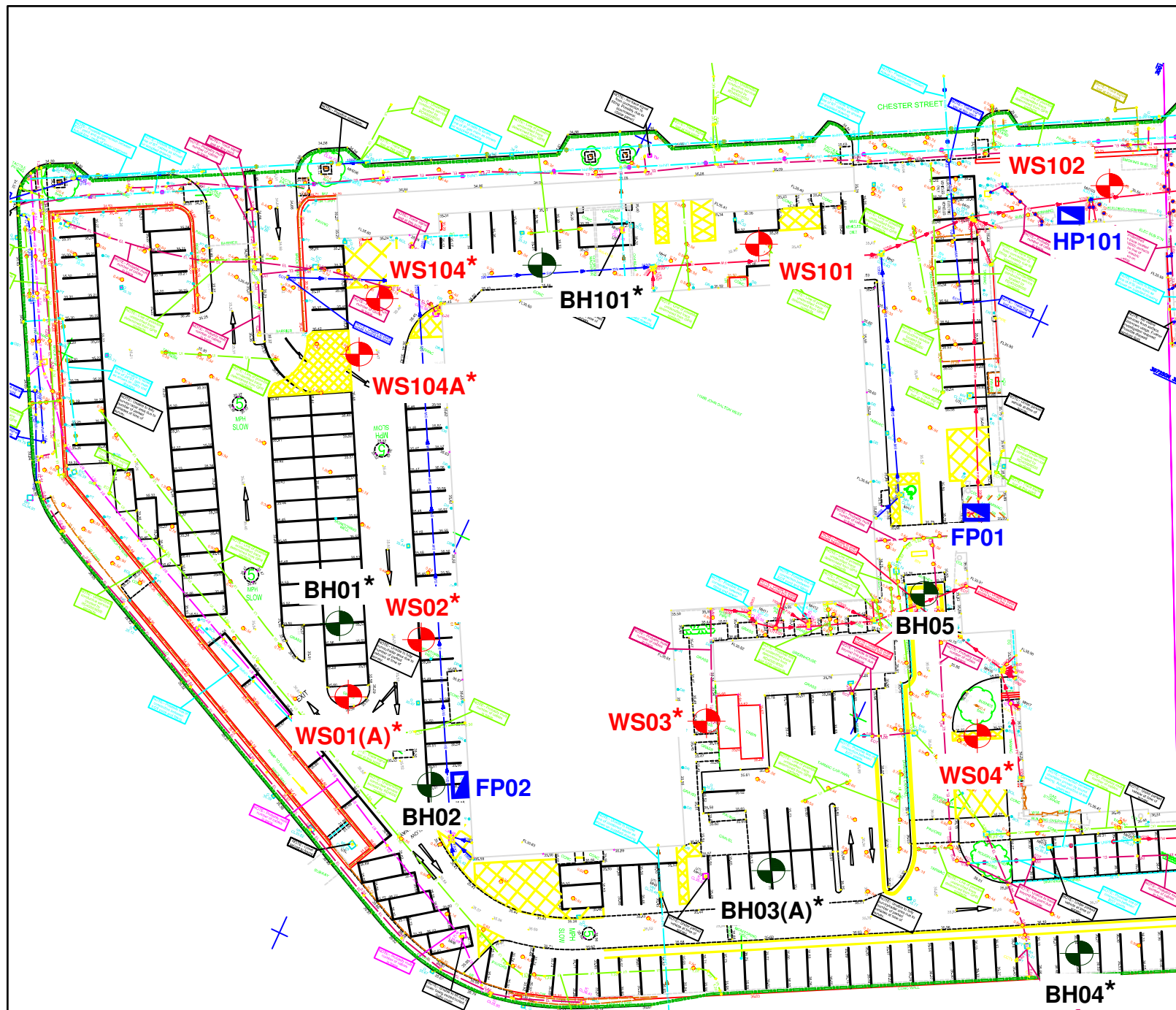
Drg Title:

Exploratory Hole Location Plan East

Scale:	Size:	First Issue:	Drawn:	Checked:
NTS	A3	22/01/20	ZH	JJ

Drg No:	Rev:
069656-CUR-00-XX-DR-GE-003	V03

© This drawing is the copyright of Curtins Consulting Ltd



-  Window Sample Borehole
-  Cable Percussive with Rotary Core follow on Borehole
-  Hand Excavated Foundation Pit
- * Denotes borehole installed

Rev:	Description:	Date:	By:	Chkd:
------	--------------	-------	-----	-------



Curtins Consulting Ltd,
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
t: 0161 236 2394
e: manchester@curtins.com
www.curtins.com

Structures - Civils - Environmental - Infrastructure - Transport Planning - Sustainability - Expert Advisory Services
Birmingham - Bristol - Cardiff - Douglas - Edinburgh - Kendal - Leeds - Liverpool - London - Manchester - Nottingham

Status:

INFORMATION

Project:

MMU Science and Engineering

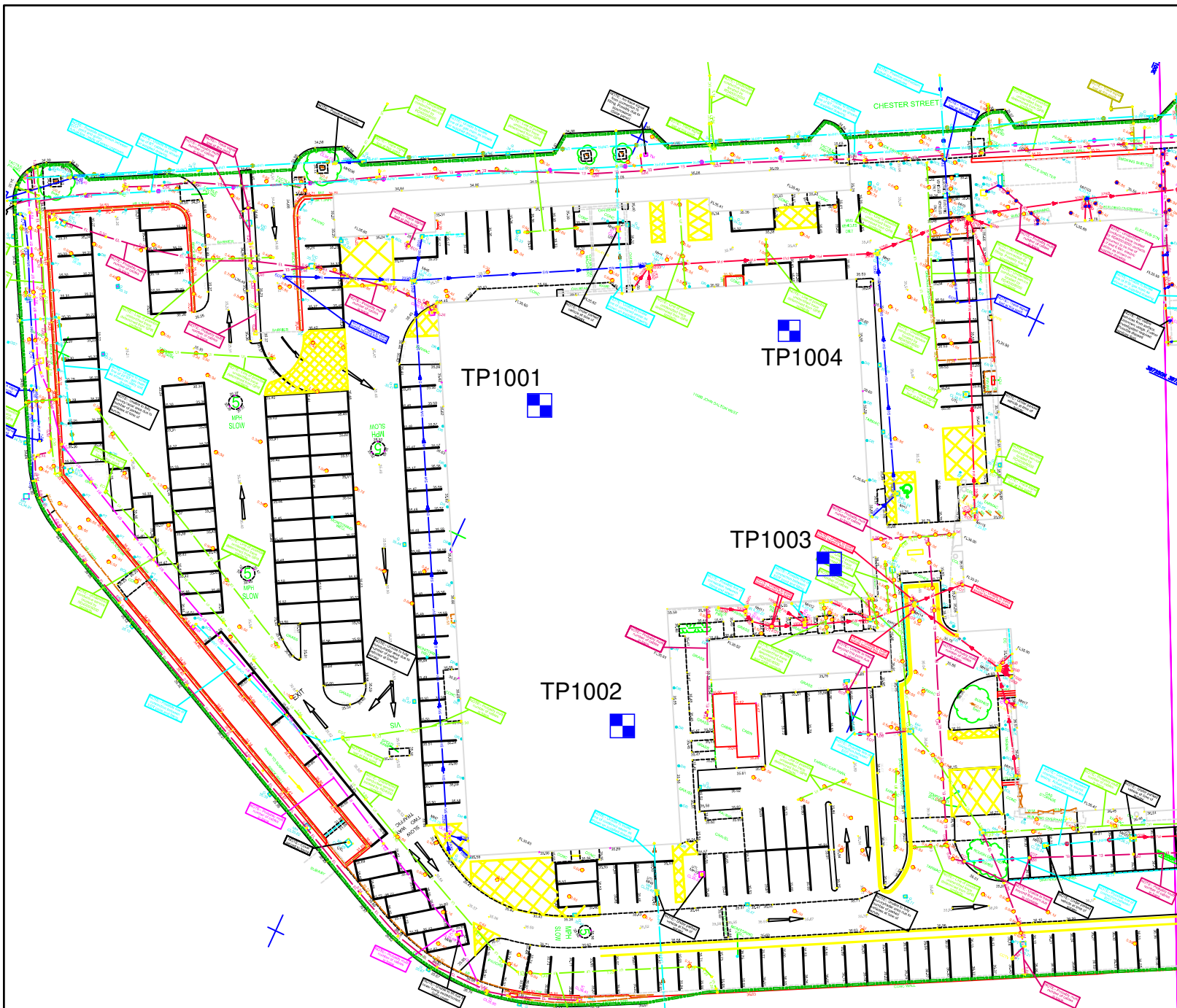
Drg Title:

Exploratory Hole Location Plan West

Scale:	Size:	First Issue:	Drawn:	Checked:
NTS	A3	22/01/20	ZH	JJ

Drg No:	Rev:
069656-CUR-00-XX-DR-GE-002	V02

© This drawing is the copyright of Curtins Consulting Ltd



MACHINE EXCAVATED TRIAL PITS

Rev:	Description:	Date:	By:	Chkd:
------	--------------	-------	-----	-------



Curtins Consulting Ltd,
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
t: 0161 236 2394
e: manchester@curtins.com
www.curtins.com

Structures - Civils - Environmental - Infrastructure - Transport Planning - Sustainability - Expert Advisory Services
Birmingham - Bristol - Cardiff - Douglas - Edinburgh - Kendal - Leeds - Liverpool - London - Manchester - Nottingham

Status:

INFORMATION

Project:

MMU Science and Engineering

Drg Title:

Proposed Post-Demolition
Exploratory Hole Location Plan

Scale:	Size:	First Issue:	Drawn:	Checked:
NTS	A3	09/04/21	ZH	NF

Drg No:	Rev:
069656-CUR-00-XX-DR-GE-004	V02

© This drawing is the copyright of Curtins Consulting Ltd

Appendix B – Exploratory Hole Logs

- Post Demolition Investigation TP1001-TP1004



Trial Pit Log

Trialpit No

TP1001

Sheet 1 of 1

Project Name: MMU Science & Engineering Building
Post Demo GIProject No.
B069656.005Co-ords: -
Level:Date
08/04/2021

Location: Manchester

Dimensions
(m):Depth
2.90Scale
1:20Logged
NF

Client: B&K

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	1.00	ES					MADE GROUND: Dark brown and brown gravelly slightly sandy CLAY with high cobble content. Gravel is fine to coarse angular to sub-rounded including brick, concrete, cermaics, glass. Cobbles include brick and concrete. Brown sandy clay nodules from 1.90m.	1
	2.70	ES		2.75			MADE GROUND: Layered brick COBBLES. Relic Structure.	2
				2.90			End of pit at 2.90 m	3
								4

Remarks: Situated where tank 2 was previously found and removed along with extent of visually contaminated soils. No visual of olfactory evidence of hydrocarbon contamination identified in trial pit. No groundwater encountered.

Stability: Stable.





Trial Pit Log

Trialpit No

TP1002

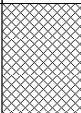
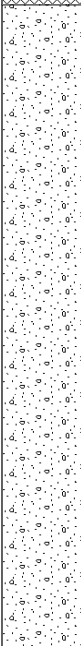
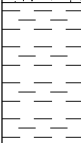
Sheet 1 of 1

Project Name: MMU Science & Engineering Building
Post Demo GIProject No.
B069656.005Co-ords: -
Level:Date
08/04/2021

Location: Manchester

Dimensions
(m):Depth
2.40Scale
1:20Logged
NF

Client: B&K

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.30			MADE GROUND: Brown and grey sandy GRAVEL. Gravel is fine to coarse angular to sub-rounded including brick. (Crushed demo rubble).	
	1.50	ES					Medium dense light brown very gravelly fine to coarse SAND with medium cobbles content. Gravel is fine to coarse rounded to sub-rounded of mixed lithologies including sandstone. Cobbles are rounded.	1
				2.00			Stiff greyish brown CLAY, occasional fine gravel including mudstone and coal.	2
				2.40			End of pit at 2.40 m	
								3
								4

Remarks: No visual or olfactory evidence of gross contamination identified. No groundwater encountered.

Stability: Stable.





Trial Pit Log

Trialpit No

TP1003

Sheet 1 of 1

Project Name: MMU Science & Engineering Building
Post Demo GIProject No.
B069656.005Co-ords: -
Level:Date
08/04/2021

Location: Manchester

Dimensions
(m):Depth
1.70Scale
1:20Logged
NF

Client: B&K

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	1.00	ES		0.10			MADE GROUND: Brown and grey sandy GRAVEL. Gravel is fine to coarse angular to sub-rounded including brick. (Crushed demo rubble). MADE GROUND: Brown clayey gravelly SAND with medium cobble content. Gravel is fine to coarse angular to sub-rounded including brick, concrete, cermaics, plastics, metal, wiring, rare timber. Cobbles include brick and concrete.	1
	1.50	ES		1.30			Stiff greyish brown CLAY, occasional fine gravel including mudstone and coal.	2
				1.70			End of pit at 1.70 m	3
								4

Remarks: No visual or olfactory evidence of gross contamination identified. No groundwater encountered.

Stability: Stable.





Trial Pit Log

Trialpit No

TP1004

Sheet 1 of 1

Project Name: MMU Science & Engineering Building
Post Demo GIProject No.
B069656.005Co-ords: -
Level:Date
08/04/2021

Location: Manchester

Dimensions
(m):Depth
1.70Scale
1:20Logged
NF

Client: B&K

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
▼	0.25	ES		0.30			MADE GROUND: Brown gravelly SAND with low cobble content. Gravel is fine to coarse angular to sub-rounded including brick, concrete, re-bar. Cobbles are angular flagstones.	
				1.00			Medium dense light brown very gravelly fine to coarse SAND with medium cobble content. Gravel is fine to coarse rounded to sub-rounded of mixed lithologies including sandstone, rare brick. Cobbles are rounded. Possibly REWORKED GROUND.	
				1.70			Stiff greyish brown CLAY, occasional fine gravel including mudstone and coal.	1
							End of pit at 1.70 m	2
								3
								4

Remarks: No visual or olfactory evidence of gross contamination identified. Groundwater seepage at 1.70m bgl on completion of trial pit.

Stability: Stable.



Appendix C – Photographic Records

- Curtins Records

Client Name: B&K	Project Name: MMU Science & Engineering	Project No: 069656
Photos Ref. TP1001 & TP1002		Date: 08/04/2021
  		
  		

Client Name: B&K	Project Name: MMU Science & Engineering	Project No: 069656
Photos Ref. TP1003 & TP1004		Date: 08/04/2021
		
		

Client Name: B&K	Project Name: MMU Science & Engineering	Project No: 069656
Photos Ref. Stockpiled Arisings from around Tank 2		Date: 08/04/2021
		

- Complete Regeneration's Photographic Records Provided to Curtins

[illegible]

Tank 1



Tank 2 & Surrounding Soils



Appendix D- Chemical Laboratory Analysis

- Envirolab Report Ref. 21/03780 (Carried out as during Curtins Post Demo SI).
- Element Materials Technology Laboratory Ref. 21/3782 (Carried out by Complete Regeneration Ltd during Demo/Enabling Works).
- AEC Report Ref. J207764 (Carried out by Complete Regeneration Ltd during Demo/Enabling Works).

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/03780
Issue Number: 1
Date: 22 April, 2021

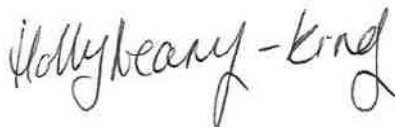
Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Niall Farnworth
Project Name: MMU Science & Engineering Building
Project Ref: B069656
Order No: TBC
Date Samples Received: 12/04/21
Date Instructions Received: 12/04/21
Date Analysis Completed: 21/04/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 21/03780

Client Project Name: MMU Science & Engineering Building

Client Project Ref: B069656

Lab Sample ID	21/03780/1	21/03780/2	21/03780/3	21/03780/4	21/03780/5	21/03780/6	21/03780/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	TP1001	TP1001	TP1002	TP1003	TP1003	TP1004	SP01			
Depth to Top	1.00	2.70	1.50	1.00	1.50	0.25				
Depth To Bottom										
Date Sampled	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid - Fragment / Tile			
Sample Matrix Code	6A	4AB	1A	1AE	6A	4AB	8			
% Stones >10mm _A	<0.1	8.6	31.5	25.7	<0.1	10.6	-	% w/w	0.1	A-T-044
pH _D ^{M#}	9.04	8.43	8.34	8.87	8.20	8.78	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.25	0.52	0.08	0.67	0.02	0.16	-	g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1	<1	<1	-	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	2.6	4.0	0.3	1.1	1.2	1.7	-	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	13	63	5	2	<1	3	-	mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	2.9	<1.0	<1.0	<1.0	<1.0	-	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.2	1.5	0.9	<0.5	1.1	0.8	-	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	744	76	10	12	23	14	-	mg/kg	1	A-T-024s
Chromium _D ^{M#}	49	23	8	20	34	11	-	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	-	mg/kg	1	A-T-040s
Lead _D ^{M#}	209	332	7	18	11	19	-	mg/kg	1	A-T-024s
Mercury _D	1.14	1.77	<0.17	0.25	<0.17	<0.17	-	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	22	26	11	8	36	14	-	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	2	<1	<1	<1	<1	-	mg/kg	1	A-T-024s
Zinc _D ^{M#}	119	202	25	32	64	30	-	mg/kg	5	A-T-024s

Envirolab Job Number: 21/03780

Client Project Name: MMU Science & Engineering Building

Client Project Ref: B069656

Lab Sample ID	21/03780/1	21/03780/2	21/03780/3	21/03780/4	21/03780/5	21/03780/6	21/03780/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	TP1001	TP1001	TP1002	TP1003	TP1003	TP1004	SP01			
Depth to Top	1.00	2.70	1.50	1.00	1.50	0.25				
Depth To Bottom										
Date Sampled	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid - Fragment / Tile			
Sample Matrix Code	6A	4AB	1A	1AE	6A	4AB	8			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	Chrysotile	NAD	NAD	NAD	NAD	NAD	-			A-T-045
Asbestos Matrix (microscope) _D	Loose Fibres	-	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A	N/A	-			A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) _D	<0.001	-	-	-	-	-	-	% w/w	0.001	A-T-054
Bulk Fibre ID (inc. matrix) [^]										
Bulk Fibre Identification _D [#]	-	-	-	-	-	-	Chrysotile			A-T-045
Bulk Fibre Identification Matrix (visual) _D	-	-	-	-	-	-	Cement			A-T-045
Bulk Fibre Identification - Suitable for Water Absorption Test?	-	-	-	-	-	-	Yes			
Bulk Fibre Quantification % Asbestos in ACM										
Bulk Fibre - % Asbestos in ACM (HSG264) _D	-	-	-	-	-	-	15	% w/w	0.001	A-T-054

Envirolab Job Number: 21/03780

Client Project Name: MMU Science & Engineering Building

Client Project Ref: B069656

Lab Sample ID	21/03780/1	21/03780/2	21/03780/3	21/03780/4	21/03780/5	21/03780/6	21/03780/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	TP1001	TP1001	TP1002	TP1003	TP1003	TP1004	SP01			
Depth to Top	1.00	2.70	1.50	1.00	1.50	0.25				
Depth To Bottom										
Date Sampled	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid - Fragment / Tile			
Sample Matrix Code	6A	4AB	1A	1AE	6A	4AB	8			
PAH-16MS										
Acenaphthene _A ^{M#}	1.12	0.45	<0.01	<0.01	<0.01	0.20	-	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.09	0.07	<0.01	<0.01	<0.01	0.03	-	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	1.57	0.96	<0.02	<0.02	<0.02	0.34	-	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	3.47	2.02	<0.04	<0.04	<0.04	0.69	-	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	3.35	1.92	<0.04	0.05	<0.04	0.74	-	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	3.52	2.07	<0.05	<0.05	<0.05	0.66	-	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	1.57	0.86	<0.05	<0.05	<0.05	0.35	-	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	1.25	0.73	<0.07	<0.07	<0.07	0.31	-	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	3.74	2.35	<0.06	0.07	<0.06	0.82	-	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.39	0.22	<0.04	<0.04	<0.04	0.07	-	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	8.99	4.57	<0.08	0.09	<0.08	1.66	-	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.90	0.55	<0.01	<0.01	<0.01	0.14	-	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	1.81	0.99	<0.03	<0.03	<0.03	0.40	-	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.68	1.84	<0.03	<0.03	<0.03	0.18	-	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	6.77	4.71	<0.03	0.07	<0.03	1.35	-	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	8.10	4.31	<0.07	0.09	<0.07	1.53	-	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	47.3	28.6	<0.08	0.37	<0.08	9.47	-	mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/03780

Client Project Name: MMU Science & Engineering Building

Client Project Ref: B069656

Lab Sample ID	21/03780/1	21/03780/2	21/03780/3	21/03780/4	21/03780/5	21/03780/6	21/03780/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	TP1001	TP1001	TP1002	TP1003	TP1003	TP1004	SP01			
Depth to Top	1.00	2.70	1.50	1.00	1.50	0.25				
Depth To Bottom										
Date Sampled	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21	08-Apr-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Solid - Fragment / Tile			
Sample Matrix Code	6A	4AB	1A	1AE	6A	4AB	8			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	1	2	<1	<1	<1	<1	-	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	6	2	<1	<1	<1	<1	-	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	20	5	<1	<1	1	<1	-	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	9	6	<1	2	1	2	-	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	46	32	<1	12	4	8	-	mg/kg	1	A-T-055s
Total Aliphatics _A	82	47	<1	15	6	11	-	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	2	3	<1	<1	1	2	-	mg/kg	1	A-T-055s
Aro >C10-C12 _A	4	2	<1	<1	<1	<1	-	mg/kg	1	A-T-055s
Aro >C12-C16 _A	20	14	<1	2	3	3	-	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	53	54	<1	7	4	9	-	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	170	192	<1	15	11	30	-	mg/kg	1	A-T-055s
Total Aromatics _A	248	265	<1	26	19	44	-	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	330	312	<1	41	25	55	-	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 1155µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	21/03780
Project:	MMU Science & Engineering Building	Date Received:	12/04/2021 (am)
Clients Project No:	B069656	Cool Box Temperatures (°C):	0.3

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Complete Regeneration
40 Holmehead Road
Glasgow
G44 3AR



Attention :	Angus Kean
Date :	22nd March, 2021
Your reference :	MMU,B+K
Our reference :	Test Report 21/3782 Batch 1
Location :	MMU-Bowmer+Kirkland
Date samples received :	16th March, 2021
Status :	Final report
Issue :	1

Six samples were received for analysis on 16th March, 2021 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

A handwritten signature in black ink, appearing to read 'B. Leslie'.

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Complete Regeneration
Reference: MMU,B+K
Location: MMU-Bowmer+Kirkland
Contact: Angus Kean
EMT Job No: 21/3782

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	10-11	12-14						Please see attached notes for all abbreviations and acronyms		
Sample ID	TANK 2 SAMPLE 1	TANK 2 SAMPLE 2	TANK 2 SAMPLE 3	TANK 2 INTERNAL	TP1								
Depth	0.50	0.75	1.00		0.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J	V J T								
Sample Date	15/03/2021 14:00	15/03/2021 14:00	15/03/2021 14:00	15/03/2021 14:00	15/03/2021 14:00								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	16/03/2021	16/03/2021	16/03/2021	16/03/2021	16/03/2021						LOD/LOR	Units	Method No.
Arsenic #	29.5	22.5	25.6	28.0	42.3						<0.5	mg/kg	TM30/PM15
Cadmium #	0.6	<0.1	0.4	6.0	0.2						<0.1	mg/kg	TM30/PM15
Chromium #	93.0	92.3	70.7	21.9	83.4						<0.5	mg/kg	TM30/PM15
Copper #	248 ^{AB}	158	203	117	222 ^{AB}						<1	mg/kg	TM30/PM15
Lead #	1042	426	1223	190	1053						<5	mg/kg	TM30/PM15
Mercury #	1.0	0.9	0.8	<0.1	1.6						<0.1	mg/kg	TM30/PM15
Nickel #	42.0	32.4	33.4	73.4	30.1						<0.7	mg/kg	TM30/PM15
Total Sulphate as SO ₄ #	7457	2699	4700	691	24000 ^{AB}						<50	mg/kg	TM50/PM29
Zinc #	675	248	534	6765 ^{AB}	260						<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.40 ^{AD}	0.23	0.34	<0.04	4.08 ^{AD}						<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.30 ^{AD}	0.17	0.26	<0.03	0.46 ^{AD}						<0.03	mg/kg	TM4/PM8
Acenaphthene #	0.62 ^{AD}	0.39	0.57	<0.05	4.42 ^{AD}						<0.05	mg/kg	TM4/PM8
Fluorene #	<0.40 ^{AD}	0.23	0.34	<0.04	2.98 ^{AD}						<0.04	mg/kg	TM4/PM8
Phenanthrene #	6.10 ^{AD}	3.41	5.65	<0.03	47.34 ^{AD}						<0.03	mg/kg	TM4/PM8
Anthracene #	1.22 ^{AD}	0.86	1.40	<0.04	10.31 ^{AD}						<0.04	mg/kg	TM4/PM8
Fluoranthene #	14.07 ^{AD}	7.45	12.82	0.11	60.37 ^{AD}						<0.03	mg/kg	TM4/PM8
Pyrene #	12.44 ^{AD}	6.59	11.05	0.11	48.80 ^{AD}						<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	6.27 ^{AD}	3.35	5.65	<0.06	25.60 ^{AD}						<0.06	mg/kg	TM4/PM8
Chrysene #	7.65 ^{AD}	3.70	6.53	0.05	26.76 ^{AD}						<0.02	mg/kg	TM4/PM8
Benzo(b)fluoranthene #	12.18 ^{AD}	6.73	11.30	<0.07	41.93 ^{AD}						<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	6.36 ^{AD}	3.61	5.99	<0.04	21.56 ^{AD}						<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	4.17 ^{AD}	2.38	3.95	<0.04	12.98 ^{AD}						<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.99 ^{AD}	0.50	0.92	<0.04	3.17 ^{AD}						<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	4.48 ^{AD}	2.46	4.09	<0.04	14.11 ^{AD}						<0.04	mg/kg	TM4/PM8
Coronene	0.83 ^{AD}	0.39	0.73	<0.04	2.11 ^{AD}						<0.04	mg/kg	TM4/PM8
PAH 16 Total	76.6 ^{AD}	42.1	70.9	<0.6	324.9 ^{AD}						<0.6	mg/kg	TM4/PM8
PAH 17 Total	77.38 ^{AD}	42.45	71.59	<0.64	326.98 ^{AD}						<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	8.77 ^{AD}	4.85	8.14	<0.05	30.19 ^{AD}						<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	3.41 ^{AD}	1.88	3.16	<0.02	11.74 ^{AD}						<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	92 ^{AD}	100	99	105	96 ^{AD}						<0	%	TM4/PM8
EPH >C10-C25 (EH_1D_Total) #	661	411	298	331	1229						<10	mg/kg	TM5/PM8
EPH >C25-C40 (EH_1D_Total) #	907	536	572	251	1322						<10	mg/kg	TM5/PM8
EPH >C10-C40 (EH_1D_Total) #	1568	947	870	582	2551						<20	mg/kg	TM5/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	269 ^{AA}	85	864 ^{AC}	318	87						<30	mg/kg	TM5/PM8/PM16
GRO (>C6-C8) (HS_1D_Total) #	<100	<100 ^{SV}	<100 ^{SV}	98450 ^{SV}	<100						<100	ug/kg	TM36/PM12
GRO (>C8-C10) (HS_1D_Total) #	<100	<100 ^{SV}	<100 ^{SV}	162645 ^{SV}	129						<100	ug/kg	TM36/PM12
GRO (>C6-C10) (HS_1D_Total) #	<100	<100 ^{SV}	<100 ^{SV}	261095 ^{SV}	129						<100	ug/kg	TM36/PM12
MTBE #	<5	<5 ^{SV}	<5 ^{SV}	1193 ^{SV}	<5						<5	ug/kg	TM36/PM12
Benzene #	<5	<5 ^{SV}	<5 ^{SV}	35 ^{SV}	<5						<5	ug/kg	TM36/PM12
Toluene #	<5	<5 ^{SV}	<5 ^{SV}	<5 ^{SV}	<5						<5	ug/kg	TM36/PM12

Element Materials Technology

Client Name: Complete Regeneration
Reference: MMU,B+K
Location: MMU-Bowmer+Kirkland
Contact: Angus Kean
EMT Job No: 21/3782

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

[illegible]

Mass of sample taken (kg)	-	Moisture Content Ratio (%) =	23.6
Mass of dry sample (kg) =	0.09	Dry Matter Content Ratio (%) =	80.9
Particle Size <4mm =	>95%		
EMT Job No	21/3782	Landfill Waste Acceptance Criteria Limits	
Sample No	3		
Client Sample No	TANK 2 SAMPLE 1		
Depth/Other	0.50		
Sample Date	15/03/2021 14:00		
Batch No	1		
Solid Waste Analysis		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non- Hazardous Landfill
Total Organic Carbon (%)	8.75	3	5
Loss on Ignition (%)	8.3	-	10
Sum of BTEX (mg/kg)	<0.025	6	-
Sum of 7 PCBs (mg/kg)	1.533	1	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)	269	500	-
PAH Sum of 17(mg/kg)	77.38	100	-
pH (pH Units)	7.99	-	>6
ANC to pH 7 (mol/kg)	NDP	-	to be evaluated
ANC to pH 4 (mol/kg)	1.04	-	to be evaluated
Eluate Analysis	10:1 conc ⁿ leached		Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg
	C ₁₀ mg/l	A ₁₀ mg/kg	
Arsenic	0.0040	0.040	0.5
Barium	0.032	0.32	20
Cadmium	<0.0005	<0.005	0.04
Chromium	0.0089	0.089	0.5
Copper	0.008	0.08	2
Mercury	<0.001	<0.01	0.01
Molybdenum	0.006	0.06	0.5
Nickel	<0.002	<0.02	0.4
Lead	<0.005	<0.05	0.5
Antimony	0.003	0.03	0.06
Selenium	<0.003	<0.03	0.1
Zinc	0.004	0.04	4
Chloride	1.4	14	800
Fluoride	0.4	4	10
Sulphate as SO ₄	790.2	7904	1000
Total Dissolved Solids	1176	11763	4000
Phenol	<0.01	<0.1	1
Dissolved Organic Carbon	4	40	500

Mass of sample taken (kg)	-	Moisture Content Ratio (%) =	22.8
Mass of dry sample (kg) =	0.09	Dry Matter Content Ratio (%) =	81.4
Particle Size <4mm =	>95%		
EMT Job No	21/3782	Landfill Waste Acceptance Criteria Limits	
Sample No	6		
Client Sample No	TANK 2 SAMPLE 2		
Depth/Other	0.75		
Sample Date	15/03/2021 14:00		
Batch No	1		
Solid Waste Analysis		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non- Hazardous Landfill
Total Organic Carbon (%)	7.54	3	5
Loss on Ignition (%)	6.6	-	10
Sum of BTEX (mg/kg)	<0.025	6	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)	85	500	-
PAH Sum of 17(mg/kg)	42.45	100	-
pH (pH Units)	8.07	-	>6
ANC to pH 7 (mol/kg)	NDP	-	to be evaluated
ANC to pH 4 (mol/kg)	0.71	-	to be evaluated
Eluate Analysis	10:1 conc ⁿ leached		Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg
	C ₁₀ mg/l	A ₁₀ mg/kg	
Arsenic	0.0074	0.074	0.5
Barium	0.029	0.29	20
Cadmium	<0.0005	<0.005	0.04
Chromium	0.0058	0.058	0.5
Copper	0.010	0.10	2
Mercury	<0.001	<0.01	0.01
Molybdenum	0.006	0.06	0.5
Nickel	<0.002	<0.02	0.4
Lead	<0.005	<0.05	0.5
Antimony	<0.002	<0.02	0.06
Selenium	0.003	<0.03	0.1
Zinc	0.004	0.04	4
Chloride	0.7	7	800
Fluoride	0.3	<3	10
Sulphate as SO ₄	846.0	8455	1000
Total Dissolved Solids	1348	13473	4000
Phenol	<0.01	<0.1	1
Dissolved Organic Carbon	5	50	500

Mass of sample taken (kg)	-	Moisture Content Ratio (%) =	26.0
Mass of dry sample (kg) =	0.09	Dry Matter Content Ratio (%) =	79.3
Particle Size <4mm =	>95%		
EMT Job No	21/3782	Landfill Waste Acceptance Criteria Limits	
Sample No	9		
Client Sample No	TANK 2 SAMPLE 3		
Depth/Other	1.00		
Sample Date	15/03/2021 14:00		
Batch No	1		
Solid Waste Analysis		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non- Hazardous Landfill
Total Organic Carbon (%)	12.67	3	5
Loss on Ignition (%)	9.1	-	10
Sum of BTEX (mg/kg)	<0.025	6	-
Sum of 7 PCBs (mg/kg)	0.586	1	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)	864	500	-
PAH Sum of 17(mg/kg)	71.59	100	-
pH (pH Units)	8.32	-	>6
ANC to pH 7 (mol/kg)	NDP	-	to be evaluated
ANC to pH 4 (mol/kg)	0.76	-	to be evaluated
Eluate Analysis	10:1 conc ⁿ leached		Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg
	C ₁₀ mg/l	A ₁₀ mg/kg	
Arsenic	0.0068	0.068	0.5
Barium	0.034	0.34	20
Cadmium	<0.0005	<0.005	0.04
Chromium	0.0035	0.035	0.5
Copper	0.008	0.08	2
Mercury	<0.001	<0.01	0.01
Molybdenum	0.006	0.06	0.5
Nickel	<0.002	<0.02	0.4
Lead	<0.005	<0.05	0.5
Antimony	<0.002	<0.02	0.06
Selenium	<0.003	<0.03	0.1
Zinc	0.003	0.03	4
Chloride	1.8	18	800
Fluoride	0.4	4	10
Sulphate as SO ₄	934.2	9346	1000
Total Dissolved Solids	1502	15027	4000
Phenol	<0.01	<0.1	1
Dissolved Organic Carbon	6	60	500

Mass of sample taken (kg)	-	Moisture Content Ratio (%) =	119.6
Mass of dry sample (kg) =	0.09	Dry Matter Content Ratio (%) =	45.5
Particle Size <4mm =	>95%		
EMT Job No	21/3782	Landfill Waste Acceptance Criteria Limits	
Sample No	11		
Client Sample No	TANK 2 INTERNAL		
Depth/Other			
Sample Date	15/03/2021 14:00		
Batch No	1		
Solid Waste Analysis		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non- Hazardous Landfill
Total Organic Carbon (%)	0.69	3	5
Loss on Ignition (%)	5.7	-	10
Sum of BTEX (mg/kg)	7.740	6	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)	318	500	-
PAH Sum of 17(mg/kg)	<0.64	100	-
pH (pH Units)	8.36	-	>6
ANC to pH 7 (mol/kg)	NDP	-	to be evaluated
ANC to pH 4 (mol/kg)	0.36	-	to be evaluated
Eluate Analysis	10:1 conc ⁿ leached		Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg
	C ₁₀ mg/l	A ₁₀ mg/kg	
Arsenic	0.0277	0.277	0.5
Barium	0.188	1.88	20
Cadmium	<0.0005	<0.005	0.04
Chromium	<0.0015	<0.015	0.5
Copper	<0.007	<0.07	2
Mercury	<0.001	<0.01	0.01
Molybdenum	<0.002	<0.02	0.5
Nickel	0.005	0.05	0.4
Lead	<0.005	<0.05	0.5
Antimony	<0.002	<0.02	0.06
Selenium	<0.003	<0.03	0.1
Zinc	0.012	0.12	4
Chloride	4.5	45	800
Fluoride	<0.3	<3	10
Sulphate as SO ₄	10.0	100	1000
Total Dissolved Solids	94	940	4000
Phenol	<0.01	<0.1	1
Dissolved Organic Carbon	3	30	500

Mass of sample taken (kg)		-	Moisture Content Ratio (%) =		23.7		
Mass of dry sample (kg) =		0.09	Dry Matter Content Ratio (%) =		80.8		
Particle Size <4mm =		>95%					
EMT Job No		21/3782			Landfill Waste Acceptance Criteria Limits		
Sample No		14					
Client Sample No		TP1			Inert Waste Landfill Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill Hazardous Waste Landfill		
Depth/Other		0.50					
Sample Date		15/03/2021 14:00					
Batch No		1					
Solid Waste Analysis							
Total Organic Carbon (%)		7.84			3	5	6
Loss on Ignition (%)		7.7			-	-	10
Sum of BTEX (mg/kg)		0.040			6	-	-
Sum of 7 PCBs (mg/kg)		<0.035			1	-	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)		87			500	-	-
PAH Sum of 17(mg/kg)		326.98			100	-	-
pH (pH Units)		7.94			-	>6	-
ANC to pH 7 (mol/kg)		NDP			-	to be evaluated	to be evaluated
ANC to pH 4 (mol/kg)		1.58			-	to be evaluated	to be evaluated
Eluate Analysis	10:1 conc ⁿ leached		Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg				
	C ₁₀	A ₁₀					
	mg/l	mg/kg					
	mg/kg						
Arsenic	0.0025	0.025	0.5	2	25		
Barium	0.027	0.27	20	100	300		
Cadmium	<0.0005	<0.005	0.04	1	5		
Chromium	0.0071	0.071	0.5	10	70		
Copper	0.007	0.07	2	50	100		
Mercury	<0.001	<0.01	0.01	0.2	2		
Molybdenum	0.010	0.10	0.5	10	30		
Nickel	<0.002	<0.02	0.4	10	40		
Lead	0.005	0.05	0.5	10	50		
Antimony	<0.002	<0.02	0.06	0.7	5		
Selenium	<0.003	<0.03	0.1	0.5	7		
Zinc	0.006	0.06	4	50	200		
Chloride	0.7	7	800	15000	25000		
Fluoride	<0.3	<3	10	150	500		
Sulphate as SO4	779.5	7798	1000	20000	50000		
Total Dissolved Solids	1242	12425	4000	60000	100000		
Phenol	<0.01	<0.1	1	-	-		
Dissolved Organic Carbon	5	50	500	800	1000		

Matrix : Solid

9 of 16

Client Name: Complete Regeneration

Reference: MMU,B+K

Location: MMU-Bowmer+Kirkland

Contact: Angus Kean

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 21/3782

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x3 Dilution

AB	x5 Dilution
AC	x6 Dilution
AD	x10 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics extracted.
#2	EU_Total but with fatty acids extracted.
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 21/3782

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GC/FID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GC/FID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.			AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM22	Modified BS1377-3:1990 Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (35C-440C). On request modified ASTM D2974-00 LOI (105C-440C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes

EMT Job No: 21/3782

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM77	Modified DDCEN/TS method 15364:2006. Determination of Acid Neutralization Capacity by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	No

EMT Job No: 21/3782

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	



CERTIFICATE OF BULK FIBRE ANALYSIS

PROJECT REF: J207764

CERT NO.: J207764

CUSTOMER: Complete Regeneration (private customer)

DATE RECEIVED: 12.03.21

DETAILS: Unit 2
Hanover Street North
Manchester
M34 5HW

DATE ANALYSED: 15.03.21

DATE REPORTED: 15.03.21
(Verbal)

DATE REPORTED: 15.03.21
(Document)

SITE DETAILS: MMU Chester Road,

SAMPLED BY: Complete Regeneration (private customer)

Sample No.	Sample Location	Sample Description	Sample Comments	Asbestos Type(s)
BS084739	1 - Below ground - Slab **	Grey/brown fragments	-	Chrysotile Crocidolite

Comments:

UKAS accredited for identification and site sampling. All analysis in accordance with HSG248 - Asbestos: The analysts' guide for sampling, analysis and clearance procedures 2005 and AEC 2 - Procedures manual for asbestos bulk sampling and identification of asbestos fibres.

Descriptions marked '**' in this report/certificate denote information supplied by the customer. AEC cannot take responsibility for the accuracy and representative nature of samples taken by customers. All sample location information given by AEC within the report is the opinion of the surveyor. Sample comments that are FFP = Fine fibres present, 'but too thin to identify' or FFP/AL = Fine fibres present, asbestos like 'but too thin to identify'. Trace = one or two fibres only were identified. This report shall not be reproduced, except in full, without approval of the laboratory, to provide assurance that parts of the report are not taken out of context.

Asbestos types: Chrysotile = white asbestos; † = Asbestos Amosite = brown asbestos; Crocidolite = blue asbestos;
Tremolite; Actinolite; Anthophyllite; NAD = No Asbestos Detected.

Signed:

Print:

Steve Cassidy

Position

Lab Analyst

Date:

15.03.21

Analysis completed at Manchester Laboratory.

Authorised on behalf of Airborne Environmental Consultants Ltd.

Appendix E- Chemical Acceptability Thresholds

- Residential Without Homegrown Produce

Adopted Soil Generic Assessment Criteria
Sandy loam with 6% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 21	6 21	1.8 170	33 49	7.7 21	220 250
Lead	200	310	80	2,300	630	1,300
Mercury (<i>elemental</i>)	1	1	26	26	16	26⁽⁸⁾ [30]
Mercury (<i>inorganic</i>)	170	240	80	3600	120	240
Nickel	130⁽¹⁰⁾	180⁽¹⁰⁾	53⁽¹¹⁾	980⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 79	170 170
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
<i>Aliphatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅₋₅ - EC ₆	160	160	3900	12000	600000	180000
EC ₅₋₆ - EC ₈	530	530	13000	40000	620000	320000
EC ₅₋₈ - EC ₁₀	150	150	1700	11000	13000	21000
EC ₁₀₋₁₀ - EC ₁₂	760	770	7300	47000	13000	24000
EC ₁₂₋₁₂ - EC ₁₆	4300	4400	13000	90000	13000	26000
EC ₅₋₁₆ - EC ₃₅	110000	110000	270000	1800000	250000	490000
EC ₃₅₋₃₅ - EC ₄₄	110000	110000	270000	1800000	250000	490000
<i>Aromatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅₋₅ - EC ₇	300	1400	57	86000	56000	92000
EC ₅₋₇ - EC ₈	660	3900	120	180000	56000	100000
EC ₅₋₈ - EC ₁₀	190	270	51	17000	5000	9300
EC ₁₀₋₁₀ - EC ₁₂	380	1200	74	34000	5000	10000
EC ₁₂₋₁₂ - EC ₁₆	660	2500	130	38000	5000	10000
EC ₅₋₁₆ - EC ₂₁	930	1900	260	28000	3800	7800
EC ₂₁₋₂₁ - EC ₃₅	1700	1900	1600	28000	3800	7900
EC ₃₅₋₃₅ - EC ₄₄	1700	1900	1600	28000	3800	7900
Aliph + Arom EC >44-70	1900	1900	3000	28000	3800	7900
Aromatic						
Benzene	0.33 0.87	1.0 3.3	0.07 0.18	95 98	73 140	110 230
Ethyl benzene	350	840	90	2800⁽⁸⁾ [66000]	2800⁽⁸⁾ [25000]	2800⁽⁸⁾ [27000]
Toluene	610	2700	120	4400⁽⁸⁾ [190000]	4400⁽⁸⁾ [56000]	4400⁽⁸⁾ [100000]
Xylene ⁽⁹⁾	230	290	160	2600⁽⁸⁾ [32000]	2600⁽⁸⁾ [43000]	2600⁽⁸⁾ [31000]
Phenol	420	520	280	3200⁽¹⁴⁾ (38000)	3200⁽¹⁴⁾ (10000)	3200⁽¹⁴⁾ (9300)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	13	13	24	1100	4900	3000
Acenaphthylene	920	6000	160	100000	15000	30000
Acenaphthene	1100	6000	200	100000	15000	30000
Fluorene	860	4500	160	71000	9900	20000
Phenanthrene	440	1500	90	23000	3100	6300
Anthracene	11000	37000	2200	540000	74000	150000
Fluoranthene	890	1600	290	23000	3100	6400
Pyrene	2000	3800	620	54000	7400	15000
Benz(a)anthracene	13	15	13	180	29	62
Chrysene	27	32	19	350	57	120
Benzo(b)fluoranthene	3.7	4.0	3.9	45	7.2	16.0
Benzo(k)fluoranthene	100	110	130	1200	190	440
Benzo(a)pyrene	3.0 5.0	3.2 5.3	3.5 5.7	36 77	5.7 10	13 21
Indeno(123cd)pyrene	41	46	39	510	82	180
Dibenzo(ah)anthracene	0.3	0.32	0.43	3.6	0.58	1.4
Benzo(ghi)perylene	350	360	640	4000	640	1600
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.0014	0.0015	0.0018	0.12	3.5	5.4
Trichloroethene (TCE)	0.075	0.08	0.21	5.7	120	120
1,1,1,2 Tetrachlorethane	6.4	8.2	4.4	560	1400	2100
Tetrachlorethane (PCE)	0.90	0.92	3.6	95	1400	1500
1,1,1 Trichlorethane	39	40	240	3000	140000	100000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs**
- Soil organic matter (SOM) is assumed to be 6% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
- Lowest of o-, m- and p-xylene
- Based on comparison of inhalation exposure with inhalation TDI
- Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 2.5% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 <u>21</u>	6 <u>21</u>	1.8 <u>170</u>	33 <u>49</u>	7.7 <u>21</u>	220 <u>250</u>
Lead	<u>200</u>	<u>310</u>	<u>80</u>	<u>2,300</u>	<u>630</u>	<u>1,300</u>
Mercury (elemental)	1	1	26	26	16	26 ⁽⁸⁾ [30]
Mercury (inorganic)	170	240	80	3600	120	240
Nickel	130 ⁽¹⁰⁾	180 ⁽¹⁰⁾	53 ⁽¹¹⁾	980 ⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 <u>79</u>	170 <u>170</u>
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
<i>Aliphatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅ - EC ₆	78	78	1700	5900	590000	130000
EC ₆ - EC ₈	230	230	5600	17000	610000	220000
EC ₈ - EC ₁₀	65	65	770	4800	13000	18000
EC ₁₀ - EC ₁₂	330	330	4400	23000	13000	23000
EC ₁₂ - EC ₁₆	2400	2400	13000	82000	13000	25000
EC ₁₆ - EC ₃₅	92000	92000	270000	1700000	250000	480000
EC ₃₅ - EC ₄₄	92000	92000	270000	1700000	250000	480000
<i>Aromatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅ - EC ₇	140	690	27	46000	56000	84000
EC ₇ - EC ₈	290	1800	51	110000	56000	95000
EC ₈ - EC ₁₀	83	110	21	8100	5000	8500
EC ₁₀ - EC ₁₂	180	590	31	28000	5000	9700
EC ₁₂ - EC ₁₆	330	2300	57	37000	5100	10000
EC ₁₆ - EC ₂₁	540	1900	110	28000	3800	7700
EC ₂₁ - EC ₃₅	1500	1900	820	28000	3800	7800
EC ₃₅ - EC ₄₄	1500	1900	820	28000	3800	7800
Aliph + Arom EC >44-70	1800	1900	2100	28000	3800	7800
<i>Aromatic</i>						
Benzene	0.16	0.49	0.035	50	72	100
Ethyl benzene	150	380	39	1200⁽⁸⁾ [35000]	1200⁽⁸⁾ [24000]	1200⁽⁸⁾ [22000]
Toluene	270	1300	51	1900⁽⁸⁾ [110000]	1900⁽⁸⁾ [56000]	1900⁽⁸⁾ [95000]
Xylene ⁽⁹⁾	98	120	70	1200⁽⁸⁾ [14000]	1200⁽⁸⁾ [42000]	1200⁽⁸⁾ [23000]
Phenol	290	420	140	1500⁽¹⁴⁾ (35000)	1500⁽¹⁴⁾ (10000)	1500⁽¹⁴⁾ (8300)
<i>Polycyclic Aromatic Hydrocarbons (PAH)</i>						
Naphthalene	5.6	5.6	10	460	4900	1900
Acenaphthylene	420	4600	69	97000	15000	30000
Acenaphthene	510	4700	85	97000	15000	30000
Fluorene	400	3800	67	68000	9900	20000
Phenanthrene	220	1500	38	22000	3100	6200
Anthracene	5400	35000	950	540000	74000	150000
Fluoranthene	560	1600	130	23000	3100	6300
Pyrene	1200	3800	270	54000	7400	15000
Benz(a)anthracene	11	14	6.5	170	29	56
Chrysene	22	31	9.4	350	57	110
Benzo(b)fluoranthene	3.3	4.0	2.1	44	7.2	15
Benzo(k)fluoranthene	93	110	75	1200	190	410
Benzo(a)pyrene	2.7	3.2	2	35	5.7	12
Indeno(123cd)pyrene	36	46	21	510	82	170
Dibenzo(ah)anthracene	0.28	0.32	0.27	3.6	0.57	1.3
Benzo(ghi)perylene	340	360	470	4000	640	1500
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.00087	0.001	0.001	0.077	3.5	5
Trichloroethene (TCE)	0.034	0.036	0.091	2.6	120	91
1,1,1,2 Tetrachlorethane	2.8	3.5	1.9	250	1400	1800
Tetrachlorethane (PCE)	0.39	0.4	1.5	42	1400	1100
1,1,1 Trichlorethane	18	18	110	1300	140000	76000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs
- Soil organic matter (SOM) is assumed to be 2.5% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
- Lowest of o-, m- and p-xylene
- Based on comparison of inhalation exposure with inhalation TDI
- Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 1% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 21	6 21	1.8 170	33 49	7.7 21	220 250
Lead	200	310	80	2,300	630	1,300
Mercury (<i>elemental</i>)	1	1	26	26	16	26⁽⁸⁾ [30]
Mercury (<i>inorganic</i>)	170	240	80	3600	120	240
Nickel	130 ⁽¹⁰⁾	180 ⁽¹⁰⁾	53 ⁽¹¹⁾	980 ⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 79	170 170
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
Aliphatic risk banded hydrocarbons - TPHCWG method						
EC ₅₋₅ - EC ₆	42	42	730	3200	570000	95000
EC ₆₋₆ - EC ₈	100	100	2300	7800	600000	150000
EC ₈₋₈ - EC ₁₀	27	27	320	2000	13000	14000
EC ₁₀₋₁₀ - EC ₁₂	130	130	2200	9700	13000	21000
EC ₁₂₋₁₂ - EC ₁₆	1100	1100	11000	59000	13000	25000
EC ₁₆₋₁₆ - EC ₃₅	65000	65000	260000	1600000	250000	450000
EC ₃₅₋₃₅ - EC ₄₄	65000	65000	260000	1600000	250000	450000
Aromatic risk banded hydrocarbons - TPHCWG method						
EC ₅₋₅ - EC ₇	70	370	13	26000	56000	76000
EC ₇₋₇ - EC ₈	130	860	22	56000	56000	87000
EC ₈₋₈ - EC ₁₀	34	47	8.6	3500	5000	7200
EC ₁₀₋₁₀ - EC ₁₂	74	250	13	16000	5000	9200
EC ₁₂₋₁₂ - EC ₁₆	140	1800	23	36000	5100	10000
EC ₁₆₋₁₆ - EC ₂₁	260	1900	46	28000	3800	7600
EC ₂₁₋₂₁ - EC ₃₅	1100	1900	370	28000	3800	7800
EC ₃₅₋₃₅ - EC ₄₄	1100	1900	370	28000	3800	7800
Aliph + Arom EC >44-70	1600	1900	1200	28000	3800	7800
Aromatic						
Benzene	0.08	0.3	0.017	28	72	90
Ethyl benzene	65	170	16	520⁽⁸⁾ [17000]	520⁽⁸⁾ [24000]	520⁽⁸⁾ [17000]
Toluene	120	610	22	860⁽⁸⁾ [59000]	860⁽⁸⁾ [56000]	860⁽⁸⁾ [87000]
Xylene ⁽⁹⁾	41	53	28	480⁽⁸⁾ [69000]	480⁽⁸⁾ [41000]	480⁽⁸⁾ [17000]
Phenol	180	310	66	760⁽¹⁴⁾ (31000)	760⁽¹⁴⁾ (10000)	760⁽¹⁴⁾ (7600)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	2.3	2.3	4.1	190	4900	1200
Acenaphthylene	170	2900	28	83000	15000	29000
Acenaphthene	210	3000	34	84000	15000	29000
Fluorene	170	2800	27	63000	9900	20000
Phenanthrene	95	1300	15	22000	3100	6200
Anthracene	2400	31000	380	520000	74000	150000
Fluoranthene	280	1500	52	23000	3100	6300
Pyrene	620	3700	110	54000	7400	15000
Benz(a)anthracene	7.2	11	2.9	170	29	49
Chrysene	15	30	4.1	350	57	93
Benzo(b)fluoranthene	2.6	3.9	0.99	44	7.1	13
Benzo(k)fluoranthene	77	110	37	1200	190	370
Benzo(a)pyrene	2.2	3.2	0.97	35	5.7	11
Indeno(123cd)pyrene	27	45	9.5	500	82	150
Dibenzo(ah)anthracene	0.24	0.31	0.14	3.5	0.57	1.1
Benzo(ghi)perylene	320	360	290	3900	640	1400
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.00064	0.00077	0.00055	0.059	3.5	4.8
Trichloroethene (TCE)	0.016	0.017	0.041	1.2	120	70
1,1,1,2 Tetrachlorethane	1.2	1.5	0.79	110	1400	1500
Tetrachlorethane (PCE)	0.18	0.18	0.65	19	1400	810
1,1,1 Trichlorethane	8.8	9	48	660	140000	57000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs
- Soil organic matter (SOM) is assumed to be 1% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
- Lowest of o-, m- and p-xylene
- Based on comparison of inhalation exposure with inhalation TDI
- Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable

Our Locations

Birmingham

2 The Wharf
Bridge Street
Birmingham
B1 2JS
T. 0121 643 4694
birmingham@curtins.com

Bristol

Quayside
40-58 Hotwell Road
Bristol
BS8 4UQ
T. 0117 302 7560
bristol@curtins.com

Cambridge

50 Cambridge Place
Cambridge
CB2 1NS
T. 01223 631 799
cambridge@curtins.com

Cardiff

3 Cwrt-y-Parc
Earlswood Road
Cardiff
CF14 5GH
T. 029 2068 0900
cardiff@curtins.com

Douglas

Varley House
29-31 Duke Street
Douglas
Isle of Man
IM1 2AZ
T. 01624 624 585
douglas@curtins.com

Dublin

11 Pembroke Lane
Dublin 2
Ireland
D02 CX82
T. 00353 1 507 9447
dublin@curtins.com

Edinburgh

1a Belford Road
Edinburgh
EH4 3BL
T. 0131 225 2175
edinburgh@curtins.com

Glasgow

Queens House
29 St Vincent Place
Glasgow
G1 2DT
T. 0141 319 8777
glasgow@curtins.com

Kendal

Units 24 & 25 Riverside Place
K Village
Kendal
LA9 7FH
T. 01539 724 823
kendal@curtins.com

Leeds

Rose Wharf
Ground Floor
Leeds
L29 8EE
T. 0113 274 8509
leeds@curtins.com

Liverpool

51-55 Tithebarn Street
Liverpool
L2 2SB
T. 0151 726 2000
liverpool@curtins.com

London

40 Compton Street
London
EC1V 0BD
T. 020 7324 2240
london@curtins.com

Manchester

Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG
T. 0161 236 2394
manchester@curtins.com

Nottingham

56 The Ropewalk
Nottingham
NG1 5DW
T. 0115 941 5551
nottingham@curtins.com