



Rochdale Road, Manchester

Remediation Strategy

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Waterman Infrastructure & Environment Limited

Trinity House, John Dalton Street, Manchester, M2 6HY
www.watermangroup.com

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This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS OHSAS 18001:2007)

Issue	Date	Prepared by	Checked by	Approved by
Third	January 2023	Paul Latta Principal Consultant 	Andy Mould Principal Consultant 	Rachael Tempest Associate Director 

Comments

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Contents

Executive Summary

1. Introduction	1
1.1 Objectives	1
1.2 Proposed Development	1
1.3 Regulatory Status and Consultations.....	1
1.4 Previous Investigations	2
1.5 Constraints	2
2. Background Information	4
2.1 Site Location & Description	4
2.2 Site Investigation Summary	4
2.2.1 Soil Contamination	4
Hydrocarbons	4
Asbestos	8
2.2.2 Controlled Waters	8
Groundwater	8
2.3 Ground Gas.....	9
3. Final Conceptual Model	10
3.1 Contamination Source	10
3.1.1 Primary Source	10
3.1.2 Secondary Source.....	10
3.2 Potential Pathways.....	10
3.3 Potential Receptors.....	10
4. Remediation Strategy	14
4.1 Key Items	14
4.2 Licences, Consents and Regulatory Approval	14
4.3 Site Attendance/ Watching Brief	14
4.4 Ongoing Monitoring for Unforeseen Conditions.....	15
4.5 Site Clearance.....	15
4.6 Further Investigation to Confirm Extent of Subterranean Structures and Voids.....	15
4.7 Borehole Decommissioning	15
4.8 Site-Won Material Re-Use	16
4.9 Engineered Cover System for Gardens and Soft Landscaped Areas	17
Topsoil / Subsoil	17
No-Dig Layer	17
Verification of Cover System	17
Validation Chemical Testing	17

4.10	Vapour Membranes in Future Built Development.....	18
4.11	Asbestos Risk Management Plan	19
4.12	Asbestos Discovery Plan	19
4.13	Materials Management	19
	Materials Management Plan.....	19
	Recycled Aggregates	20
4.14	Disposal of Contaminated or Unsuitable Material.....	20
	Non-Hazardous Wastes.....	21
	Hazardous Wastes	21
4.15	Stockpiles	21
4.16	Imported Materials	22
	Primary Aggregate.....	22
4.17	Buried Services	22
4.18	Management of Shallow Groundwater.....	23
4.19	Protection of Workers and the General Public.....	23
4.20	General Site Activities	23
	Spillages	23
	Fuel Storage	24
5.	Validation Reporting Requirements	25
6.	Recommendations	27

Tables

Table 1:	Previous Reports Relating to the Site	2
Table 2:	Summary of visual and or olfactory evidence of contamination (Soils)	5
Table 3:	Summary of visual and or olfactory evidence of contamination (Groundwater Strikes) ..	5
Table 4:	Summary of ACMs encountered	5
Table 5:	Identified Ground Contamination above Residential (without homegrown produce) GAC	6
Table 6:	Identified Asbestos within Made Ground	8
Table 7:	Groundwater Exceedances of EQS	8
Table 8:	Final Conceptual Model	12

Appendices

Appendix A Site Plans

Appendix B Chemical Criteria for Imported Aggregates Subsoil and Topsoil

Appendix C Chemical Criteria for Re-used Soils & Aggregates

1. Introduction

1.1 Objectives

Waterman Infrastructure & Environment Limited (WIE) was instructed by McGoff Construction Limited to provide a Remediation Strategy for the proposed redevelopment at Rochdale Road, Manchester.

The objective of this strategy is to set out the remediation activities required to allow the Site to be suitable for its intended use as a residential development. In addition to this strategy, a contractor's Method Statement should be developed, indicating how the remediation and materials management tasks will be undertaken.

The remediation activities outlined in this document are likely to be notifiable under the Construction (Design & Management) Regulations 2015. The required risk assessments and method statements should be copied to the Principal Designer for approval prior to works commencing on site.

This strategy relates to the subject site only and has been prepared for the exclusive use of McGoff Construction Limited for the purpose of assisting in mitigating the potential risks to sensitive receptors associated with ground contamination identified during the site investigation undertaken at the Site.

This report is a third issue report, prepared following additional Client comments.

1.2 Proposed Development

The proposed development is defined as follows:

'The Erection of a part 11, part 13 storey building to form residential apartments (Use Class C3a) together with the erection of two blocks of 3 storey duplexes (Use Class C3a) to form 237 residential homes in total with associated commercial floor (Use Class E) (132 sqm), basement car parking, landscaping and public realm, and associated engineering and infrastructure works following demolition of existing buildings and structures'.

The consented development Drawings are presented in Appendix A.

1.3 Regulatory Status and Consultations

The Rochdale Road Site was granted planning consent by Manchester City Council in February 2022 (Ref. 131708/FO/2021), with a number of planning conditions. Planning condition 7 relates to ground contamination, as follows:

'7) a) Notwithstanding the Phase 1, Geo-Environmental Site Assessment, Ep3, Reference: 12-922-R1, dated December 2018 and the preliminary risk assessment, prior to the commencement of the development the following information should be submitted for approval in writing by the City Council, as Local Planning Authority:

- Intrusive investigation assessment;*
- Updated final risk assessment;*
- Remediation Strategy.*

In the event of the Preliminary Risk Assessment identifying risks which in the written opinion of the Local Planning Authority require further investigation, the development shall not commence until a

scheme for the investigation of the site and the identification of remediation measures (the Site Investigation Proposal) has been submitted to and approved in writing by the City Council as local planning authority.

The measures for investigating the site identified in the Site Investigation Proposal shall be carried out, before the development commences and a report prepared outlining what measures, if any, are required to remediate the land (the Site Investigation Report and/or Remediation Strategy) which shall be submitted to and approved in writing by the City Council as local planning authority.

b) When the development commences, the development shall be carried out in accordance with the previously agreed Remediation Strategy and a Completion/Verification Report shall be submitted to and approved in writing by the City Council as local planning authority prior to the first occupation of the residential element of the scheme.

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

A Generic Quantitative Risk Assessment Report (Ref. WIE19453-100-R-2.2.1-GQRA) has been prepared to date and sets out the contaminated land situation at the Site. This Remediation Strategy Report has been prepared in support of the previously prepared GQRA in pursuit of discharge of planning condition 7a).

1.4 Previous Investigations

The previous reports upon which this strategy is based are presented in Table 1.

Table 1: Previous Reports Relating to the Site

Title	Author	Date	Reference
Phase 1 Geo-Environmental Site Assessment	E3P	12/2018	12-922-R1
Site Investigation Proposal	Waterman	September 2022	WIE19453-100-TN-1.2.1-GI Scope
Generic Quantitative Risk Assessment	Waterman	December 2022	WIE19453-100-R-2.2.1-GQRA

1.5 Constraints

This Remediation Strategy was undertaken in accordance with the scope agreed between Waterman and McGoff Construction Limited, as documented in Waterman's fee letter (Ref WIE19453-100-F-220803-RT Fee, dated 4th August 2022), and with Waterman's standard Terms of Appointment. The benefit of this report is made to McGoff Construction Limited.

The information contained in this report is based on a review of available information, consultation with the regulatory authorities and observations made on site.

Waterman has endeavoured to assess all information provided to them during this investigation but makes no guarantees or warranties as to the accuracy or completeness of this information.

2. Background Information

2.1 Site Location & Description

The Site comprises an irregular shaped parcel of land located to the east of Manchester City Centre, centred at National Grid Reference 384710, 399150. The Site extends to approximately 0.50 hectares and is bound by commercial units to the north, commercial units, car parking and Rochdale Road to the east, commercial units and Rochdale Road to the south and residential units and the Marble Arch Inn to the west.

The Site is currently occupied by a car park, a Car Tyre depot, a repair garage and a sales forecourt. Subterranean structures (tunnels and voids) associated with the former use of the site as a gas works are known to be present beneath the existing hardstanding and buildings.

2.2 Site Investigation Summary

A ground investigation was completed at the Site between 26th October and 19th November 2022 to provide information on the extent, nature and severity of contamination at the Site and to derive representative geotechnical parameters of soil and rock for foundation and road design. The ground investigation scope of works comprised the following:

- 7 No. cable percussive boreholes to depths of between 10mbgl and rockhead (between 15.0m and 26.0mbgl);
- 4 No. rotary cored follow-on boreholes to gain a suitable 10m rock core;
- 5 No. Window sample probeholes to a maximum depth of 3.4mbgl;
- 19 No. trial pits to a maximum depth of 4.20mbgl; and,
- 6 No. hand pits to a maximum depth of 1.2mbgl.
- 4No. further trial pits (TP120 to TP123) to depths of between 0.50mbgl and 2.80mbgl.

Representative soil samples were collected and submitted for laboratory analysis as part of the ground investigation, together with groundwater sampling on one occasion and two of six rounds ground gas monitoring.

Full details of ground investigation activities completed at the Site are set out in the December 2022 Generic Quantitative Risk Assessment report.

2.2.1 Soil Contamination

Hydrocarbons

Visual and olfactory evidence of contamination was recorded at a number of locations across the Site, as summarised in the Table below.

Table 2: Summary of visual and or olfactory evidence of contamination (Soils)

Exploratory Hole I.D.	Depth (mbgl)	Observation	PID Reading (ppm)
BH107	1 - 7	No observations	51, 32.7, 13.5, 7.6, 2.9, 2.5
BH105	5.0 - 7.0	Strong hydrocarbon odour from 5.0mbgl	9.80, 5.2, 22.4
BH104	5.8	Strong hydrocarbon odour	11.8, 40.7, 1.4, 3.6, 21.6
BH103	6.5	Strong hydrocarbon odour	3.1, 180, 6.4, 3.2, 16.9
BH102	5.8	Strong hydrocarbon odour	21.4, 17.7, 15.5, 8.7
TP116	1.0 – 3.0	No observations	18.1, 7.2, 3.4
WS102	0.3	No observations	4.6
WS104	0.8	No observations	3.8
TP113 & TP121	GL to base	Blue green clayey sandy gravels – gas works waste	0.7 & 9

In addition, evidence of hydrocarbon contamination was recorded within groundwater encountered during the investigation, as summarised below.

Table 3: Summary of visual and or olfactory evidence of contamination (Groundwater Strikes)

Project Stage	Location ID	Depth Groundwater Struck (mbgl)	Elevation Groundwater Struck (m AOD)	Comments
Intrusive Investigation	BH102	5.8	45.50	Strong hydrocarbon odour
	BH103	6.5	44.98	Perched groundwater – strong hydrocarbon odour
	BH104	5.8	45.61	Perched ground – strong hydrocarbon odour

Visually Identified Asbestos Containing Materials (ACMs)

Potential ACMs were recorded at a number of locations as presented in Table 4 below. The trial pits were terminated on discovery of the ACMs.

Table 4: Summary of ACMs encountered

Exploratory Hole I.D.	Depth (m bgl)	Observation
TP111	1.3	High cobble content of asbestos tiles
TP113	2.1	Asbestos tiles

The two trial pit locations are positioned centrally in the Site and adjacent to each other suggesting the asbestos tiles are potentially confined to a localised area only.

Quantitative Risk Assessment

Results of soil sampling collected during the investigation were compared to Generic Assessment Criteria for land with a proposed residential without homegrown produce end-use. Several exceedances were recorded, as summarised in Table 5.

Table 5: Identified Ground Contamination above Residential (without homegrown produce) GAC

Contaminant	Threshold Value (mg/kg)	Exploratory Holes (Depth (mbgl))	Concentration (mg/kg)
Arsenic	40	TP113 at 1.0m	79.90
Lead	310	TP108 at 4.0m	395
		TP114 at 1.0m	360
		TP113 at 1.0m	3,919
		TP115 at 2.0m	721
		TP102 at 2.0m	474
Mercury	1.20	TP113 at 1.0m	13.40
Cyanide (free)	26	TP113 at 1.0m	240.70
TPH Aromatic EC10-EC12	250	BH103 at 6.50m	347.90
		BH102 at 5.80m	352
TPH Aromatic EC16-EC21	1,900	BH102 at 5.80m	6,172
		BH103 at 6.50m	2,358
TPH Aromatic EC21-EC35	1,900	BH103 at 6.50m	3,047
		TP113 at 1.0m	2,952
		BH102 at 5.80m	7,296
Benzene	0.38	BH103 at 6.50m	4.58
Naphthalene	2.30	TP109 at 2.0m	46.64
		BH103 at 5.0m	26.03
		BH103 at 6.50m	323.10
		TP113 at 1.0m	2.74
		BH104 at 1.0m	19.67
		BH104 at 5.0m	18.27
		BH102 at 8.50m	8.50
		BH102 at 5.80m	188.91
Naphthalene	2.30	HDP102 at 0.6m	4.141
		TP109 at 2.0m	61.43
		BH103 at 5.0m	15
Beno(a)anthracene	11	BH103 at 6.50m	28
		BH104 at 1.0m	12.64
		BH102 at 5.80m	116.61
		BH102 at 5.80m	135.54
Chrysene	30	BH105 at 7.0m	929
		TP109 at 2.0m	67.94
Benzo(b)fluoranthene	3.90	TP109 at 2.0m	67.94

Contaminant	Threshold Value (mg/kg)	Exploratory Holes (Depth (mbgl))	Concentration (mg/kg)
		BH103 at 5.0m	14.44
		BH103 at 6.50m	30.59
		TP113 at 1.0m	4.48
		TP115 at 2.0m	5.35
		BH104 at 1.0m	11
		BH102 at 3.80m	5.69
		BH102 at 5.80m	115.59
		BH105 at 7.0m	6.543
Benzo(a)pyrene	3.20	TP109 at 2.0m	66.84
		BH103 at 5.0m	12.09
		BH103 at 6.50m	24.59
		TP115 at 2.0m	4.43
		BH104 at 1.0m	10.09
		BH102 at 3.80m	5.39
		BH102 at 5.80m	113.39
		HDP102 at 0.6m	6.347
Dibenzo(ah)anthracene	0.31	BH101 at 0.5m	1.55
		TP109 at 2.0m	10.97
		BH103 at 5.0m	2.40
		BH103 at 6.50m	4.63
		TP113 at 1.0m	0.55
		TP115 at 2.0m	0.76
		TP102 at 2.0m	0.44
		BH104 at 1.0m	1.70
		BH104 at 5.0m	0.41
		BH102 at 3.80m	0.78
		BH102 at 5.80m	16.70
		HDP102 at 0.6m	0.96
4-Methylphenol & 2,4-Trimethylphenol*	3.90	BH103 at 6.50m	31.33
			63.33
1,2,4-Trimethylbenzene & 1,3,5-Trimethylbenzene*	0.41	BH103 at 6.50m	41.28
			8.76
		BH102 at 5.80m	4.24
			0.63

Asbestos

Asbestos screening and quantification analysis was carried out on samples of the Made Ground. Results of the quantification are included in Table 6.

Table 6: Identified Asbestos within Made Ground

Exploratory Hole Location and depth (mbgl)	Asbestos Type	Asbestos Form	Concentration (%)
TP111 at 1.40m	Fibre Bundles	Chrysotile, Amosite & Crocidolite	0.11%
BH103 at 6.50m	Fibre Bundles	Chrysotile	0.0014%
TP114 at 1.0m	Fibre Bundles	Chrysotile	0.012%
TP113 at 1.0m	ACM Debris	Amosite & Chrysotile	1.45%
WS104 at 1.0m	unknown	Chrysotile	Trace Asbestos

2.2.2 Controlled Waters

Groundwater

The controlled waters receptors at the Site were assessed as part of the preliminary investigation as being the underlying Chester Formation Sandstone (designated as a Principal Aquifer) and the River Irk, located 193m to the north of the Site.

The ground investigation recorded a thickness of between 13.0m and 19.2m of Glacial Till between the Made Ground and the underlying Sandstone Principal Aquifer. The Glacial Till is a low permeability layer that will prevent the vertical migration of contamination from the Made Ground to the underlying Principal Aquifer. The Principal Aquifer has therefore been discounted as a key receptor at the Site due to the significant thickness of Glacial Till.

The River Irk is located 193m to the north of the Site and is considered the primary controlled waters receptor. Groundwater samples were therefore assessed against the Environment Agency (EA) derived Environmental Quality Standards (EQS) in the first instance.

Groundwater samples were collected on one occasion from the installed boreholes at the Site, which was considered sufficient to provide suitable information. The groundwater was collected from water collected within the Made Ground sitting above the Glacial Till surface. The table below presents the elevated concentrations recorded when compared to EQS Values.

Table 7: Groundwater Exceedances of EQS

Contaminant	Threshold Value (µg/l)	No. of Samples above EQS	Max. Concentration (µg/l)
Nickel	4	2 (BH103 & BH105)	9,8
2,4-Dimethylphenol	7.7	1 (BH105)	95
Naphthalene	2	1 (BH105)	62

Contaminant	Threshold Value (µg/l)	No. of Samples above EQS	Max. Concentration (µg/l)
2-Methylnaphthalene	2	1 (BH105)	25
TPH Aromatic EC10-EC12	N/A	1 (BH105)	245
TPH Aromatic EC12-EC16	N/A	2 (BH103 & BH105)	110, 580
TPH Aromatic EC16-EC21	N/A	2 (BH103 & BH105)	340, 410
TPH Aromatic EC21-EC35	N/A	2 (BH103 & BH105)	480

The groundwater samples were scheduled for a sVOC suite and a VOC suite. The majority of determinants were recorded at the laboratory detection limit.

The risk to the controlled waters receptors was deemed to be Low and no further action necessary with regard to the groundwater recorded at the Site.

2.3 Ground Gas

Two rounds of ground gas monitoring rounds have been completed at the Site to date, with a total of six rounds programmed. At this stage, based on a preliminary assessment, the ground gas regime at the Site is designated as Characteristic Situation 1 and no special ground gas precautions are required. The ground gas monitoring period remains on going and a separate letter report will be issued on completion of the ground gas monitoring period, expected January 2023.

3. Final Conceptual Model

3.1 Contamination Source

3.1.1 Primary Source

The Site currently comprises vacant land and car parking. It is considered there are no current primary sources of contamination at the Site.

3.1.2 Secondary Source

The following secondary sources require mitigation measures to be implemented at the Site:

- Diesel contamination (TPH, benzene, PAHs (including Naphthalene), trimethylbenzenes and phenols) has been recorded at depth within the Site soils. This is considered to pose an unacceptable vapour risk and remediation will be required.
- A hotspot of contamination associated with gas works waste (cyanide, TPH, PAHs, arsenic, lead and mercury) was identified in trial pits TP113 and TP121 with the location of a former tunnel. This is considered to pose an unacceptable risk via vapour, ingestion and dermal contact pathways and remediation will be required.
- Concentrations of low volatility metals and PAHs were recorded at a number of locations across the Site. A potential risk from direct contact will exist at the Site and remediation will be required to suitably manage the risk.
- Asbestos in the form of visual debris and fibres in soils have been recorded in several locations throughout the site. A potential risk from inhalation is considered to exist and remediation will be required.

3.2 Potential Pathways

The proposed development will comprise predominantly of hardstanding and building footprint, although communal garden areas and areas of publicly accessible soft landscaping will also be provided.

It is proposed to retain and re-use as much of the Made Ground as possible within the Site as a fill material, subject to confirmation of its geotechnical suitability. Consequently, in the absence of remedial measures or mitigation inherent within the development design, all potential pathways for contaminant exposure identified in Section 3.1.2 are considered to remain.

The presence of new hardstanding surfaces, building footprint and the installation of a suitable cover system within the soft landscaping areas will prevent direct contact with the underlying soils in the majority of areas. This will mitigate risks from low volatility metals, PAHs and the asbestos fibres. However, these measures will not provide adequate mitigation against the recorded vapour contamination and remedial measures in the form of vapour barriers will be required to prevent ingress of volatile contaminants into future built development.

3.3 Potential Receptors

Potential contamination receptors identified for the Site include future Site users, construction/ earthworks personnel and off-Site land users.

3.4 Final Conceptual Site Model

The final conceptual model for the Site identifying the key pollutant linkages that require addressing during the remediation works is presented in Table 9.

Table 8: Final Conceptual Model

Source	Pathway	Receptor	Risk	Justification	Residual Risk
Human Health					
Arsenic, lead, TPH, and PAHs	Dermal contact Direct Contact with soils Inhalation of dusts	Construction worker Residential end-users	Medium	A significant thickness of Made Ground was recorded at the Site. The laboratory testing has recorded significantly elevated concentrations of arsenic, lead, TPH and PAHs across the Made Ground. These contaminants pose a risk through direct contact with the underlying Made Ground and pose an unacceptable risk to the proposed end-users. Remediation will be necessary to mitigate the potential risk to the proposed end-uses. Large sections of the site comprise building footprints or hardstanding which will prevent contact with the underlying soils. In garden areas and areas of soft landscaping a suitable engineered cover system will be necessary to prevent contact with the underlying Made Ground.	Low
Cyanide(free), Benzene, naphthalene, mercury, 1,2,4-trimethylbenzene, 1,2,5-trimethylbenzene, 4-methylphenol, 2,4-trimethylphenol	Volatilisation / Accumulation, Vapour Inhalation	Construction Workers, Residential End Users	Medium	Significantly elevated concentrations of volatile contaminants have been recorded within the Made Ground at depths ranging between 1.0m and 6.50m. Remediation will be necessary at the Site to manage the risk to the proposed end-users. It is recommended that suitable vapour membranes are incorporated into the buildings and structures at the Site. The identified hydrocarbon compounds, may pose a risk to construction workers if they come into contact with impacted soil during further earthworks, however appropriate PPE/ Respiratory Protective Equipment (RPE) will ensure they are at no unacceptable risk.	Low
Asbestos Containing Materials (ACM) within Made Ground	Fibre / Dust Inhalation	Construction Workers Residential End Users Third Party Property	Medium	Buried suspected Asbestos tiles were recorded at two locations during the ground investigation. Asbestos fibres were recorded at 5 No. locations following laboratory testing. An engineered cover system will be necessary to manage the risk to the proposed end-users from asbestos fibres within the site soils. ACM poses a risk through fibre and dust inhalation and if present may pose a risk to construction workers during any future earthworks / demolition and to adjacent third-party property should dust be generated during those works. These risks can be mitigated through the development of a detailed enabling works strategy following guidance and protocol specified within the Control of Asbestos Regulations (2012) and industry best practice as detailed in CIRIA733 (Asbestos in Soil and Made Ground: A guide to understanding	Low

Source	Pathway	Receptor	Risk	Justification	Residual Risk
risk).					
Hazardous Ground Gases					
Methane and Carbon Dioxide associated Made Ground	Inhalation Accumulation	Construction Workers Residential End Users	Low	The ground gas monitoring completed to date indicates the Site is likely to be designated as Characteristic Situation 1. To be confirmed on completion of the ground gas monitoring period	Low

4. Remediation Strategy

4.1 Key Items

- Installation of an Engineered Cover System within soft landscaping/ garden areas.
- Installation of a suitable vapour membrane within future buildings and structures.
- Re-use of Site-won made ground soils as fill material within subterranean structures and voids.
- Decommissioning of installed boreholes.
- Removal of existing foundations and other in-ground obstructions required to enable the new development.
- Preparation and implementation of an Asbestos Risk Management Plan (ARMP) and Asbestos Discovery Plan (ADP) during the earthworks and construction works to allow suitable management of ACMs and asbestos fibres.
- Preparation of a Materials Management Plan by the Contractor in accordance with the Definition of Waste Code of Practice (DoWCoP) to allow re-use of materials at the Site of origin.
- Completion of a watching brief by an Environmental Engineer during future enabling works and earthworks to identify evidence of previously unrecorded contamination.
- Installation of barrier potable water supply pipes, subject to confirmation by the local water provider; and,
- Preparation of an Environmental Management Plan (EMP).

4.2 Licences, Consents and Regulatory Approval

Based on the information contained within this Remediation Strategy the following consents and licences may be required:

- Exemption under Paragraph 19 of Environmental Permitting Regulations to allow the importation of crushed recycled aggregates, subsoil or topsoil for use at the Site.

The Contractor will be responsible for all statutory authority consents. Waste management licences, waste management exemptions and mobile treatment licences shall be registered and approved by the Regulators before start on site.

4.3 Site Attendance/ Watching Brief

The potential exists for discrete pockets of contamination to be present at the Site that have not been detected by the investigation to date. A Watching Brief should therefore be carried out by a suitably qualified Environmental Engineer during future earthworks and enabling works (including Site clearance) to ensure that any previously undiscovered contamination is identified and properly managed.

Where the Watching Brief identifies evidence of contamination, the Contractor shall allow for the necessary investigation, sampling and analysis to determine the type, extent and severity of contamination and whether it poses a risk to human health, future built development or other potentially sensitive receptors. Where unacceptable risks are identified, the Contractor shall allow for appropriate remediation or disposal.

Other items detailed within this Remediation Strategy (i.e. items outwith earthworks and enabling works) should be completed under the part-time attendance of an experienced Environmental Engineer. If onerous or extensive contamination is subsequently encountered, a full time Watching Brief may be required.

4.4 Ongoing Monitoring for Unforeseen Conditions

In the event that the Contractor (outwith periods of Site works attended by an Environmental Engineer) encounters unusual or unforeseen ground conditions or contamination, this is to be reported to the Environmental Engineer immediately. If such contamination is encountered, supplementary investigation and risk assessment may be required.

4.5 Site Clearance

The Site is to be cleared of all residual waste, debris, vegetation, shrubs, bushes and unprotected trees. Waste generated in the Site clearance is to be disposed of appropriately and in line with the contractor's waste management plan.

The Contractor shall remove all existing buildings and hardstanding surfaces to expose the underlying soils and any below ground obstructions. Once exposed, below ground obstructions shall be excavated and the walls, foundations and bases, etc. grubbed out. Materials should then be processed (sorted, screened and crushed) to allow them to be re-used as engineered fill in the Site redevelopment.

All drainage on-Site is to be traced to the Site boundary and connections to existing public sewers recorded.

Following clearance, a Site walkover shall be undertaken to inspect the exposed surfaces for visual or olfactory signs of contamination. The surface should be photographed and observations recorded.

4.6 Further Investigation to Confirm Extent of Subterranean Structures and Voids

Following site clearance, it is understood that further investigation may be carried out to confirm the nature and extent of subterranean structures and voids identified during the main investigation. The information obtained from this investigation is intended to be used to quantify the volume of Site-won and/ or imported materials required for use as backfill in order to create a suitable development platform.

Where necessary attendance by a suitably qualified Environmental Engineer may be required to ensure that any previously undiscovered contamination is identified and properly managed.

4.7 Borehole Decommissioning

Boreholes drilled within the Site during the previous and any future ground investigations shall be located and decommissioned prior to the works commencing at the Site. The methodology used to decommission the boreholes should be approved by the Environmental Engineer who should be present during the decommissioning works but should generally be in accordance with Environment Agency document 'Decommissioning Redundant Boreholes and Wells'.

4.8 Site-Won Material Re-Use

Investigation undertaken to date indicates the presence of a significant network of subterranean structures and voids below the Site. The volume of materials required to backfill these voids has not yet been fully quantified and shall be subject to further investigation (see Section 4.6); however, initial indications suggest it will be significant. The cost of importing materials to fill the voids is considered prohibitively expensive to the project and therefore the preferred approach is to maximise the use of Site-won materials, including made ground soils generated as part of the proposed basement excavations.

Whilst investigation to date has confirmed the presence of contamination within the made ground soils to date, the re-use of such materials as a backfill within the voids is considered to be acceptable for the following reasons:

- Following completion, the proposed development will comprise predominantly of building footprint and hardstanding surfacing which will act as a barrier between any contaminated made ground soils used as backfill and future Site users across much of the Site.
- In areas where soft landscaping is proposed (such as communal garden areas), an engineered and fully validated cover system is to be installed. Site-won made ground materials would be excluded for use within the cover layer, with all materials comprising imported and certified subsoil and topsoil. The engineered cover layer will therefore break pollutant linkages between future Site users in areas of soft landscaping, even where the underlying soils comprise backfilled made ground materials.
- Whilst the made ground has been confirmed as exhibiting a potential vapour risk, remedial proposals include the installation of a suitable and fully validated vapour membrane within all future buildings and structures, breaking pollutant linkages between any vapour contaminated made ground soils used as backfill and future Site users.
- The investigation to date has confirmed the presence of significant thicknesses of low permeability Glacial Till soils below the Site and risks to controlled waters receptors associated with the existing made ground have been assessed as low, with no requirement for remedial measures. Consequently, the re-use of existing made ground soils as a fill material in other areas of the Site is not considered to result in any increase of risk to controlled waters.
- Due to the contaminant concentrations recorded in the made ground soils to date, it is proposed to utilise barrier pipe for future potable water supply at the Site. As these proposals already take into account the contaminant concentrations present in the made ground, the re-use of those soils as a fill material in other areas of the Site is not considered to result in an increase of risk to the future potable water supply.
- The GQRA includes recommendations for buried concrete specification based on the contaminant concentrations present in the made ground soils. The re-use of these soils as a fill material in other areas of the Site is therefore not considered to result in an increase of risk to future buried concrete.

In addition to the above, all made ground soils proposed for re-use shall be screened and sorted to remove any items or materials that cannot be re-engineered, this making them geotechnically unsuitable. Following screening and sorting, soils shall then be subject to laboratory testing at an appropriate frequency to confirm geotechnical suitability as a general fill in accordance with the requirements of MCDHW, Volume 1, Specification for Highway Works, Series 600.

4.9 Engineered Cover System for Gardens and Soft Landscaped Areas

An engineered cover system shall be installed below all areas of proposed soft landscaping to prevent dermal contact, ingestion, external inhalation and other potential pathways associated with the Made Ground. The cover system is not required beneath areas of hardstanding such as access roads and building footprints, as the hardstanding will form a barrier to the potential contaminant linkage in these circumstances.

Topsoil / Subsoil

The soils to be used within the cover system shall be comprised of imported topsoil and subsoil. The imported soils shall be certified as suitable for use prior to being imported to the Site (as per Section 4.16) and should be from a known source (preferably natural inert). In addition to meeting set chemical criteria, cover layer materials shall be free from anthropogenic materials such as bricks, wood, concrete, glass, metal and plastic, and no visual or olfactory evidence of contamination should be present. Site-won made ground materials shall not be considered suitable for re-use within the cover layer.

Within soft landscaped areas, the cover layer shall comprise a minimum of 100mm topsoil underlain by 350mm subsoil but will require to take into consideration the type of vegetation proposed at the Site. Where specific vegetation requires deeper soils for growth purposes (i.e. tree pits, etc.), the cover system thickness shall be increased accordingly.

No-Dig Layer

Due to the presence of asbestos and to prevent mixing of the made ground soils within the overlying clean cover soils, a 'no-dig layer' of a minimum of 150mm should be provided at the base of the cover layer. The no-dig-layer shall be comprised of crushed materials (either imported or Site-won) and should be certified as suitable for use. It should be ensured that Site-won crushed materials are suitably handled and segregated to prevent cross contamination with made ground soils and to ensure they remain chemically 'clean' and free from asbestos fibres. In addition, a marker layer (e.g. brightly coloured mesh or geotextile) shall be provided between the cover layer soils and the underlying no-dig layer.

Verification of Cover System

Photographic evidence shall be collected from areas of soft landscaping confirming the presence and correct thickness of imported topsoil/ subsoil and the presence of the underlying marker layer and no-dig layer. Photographs will comprise a staff or tape measure placed vertically against the soil profile to show a minimum of 300mm soil has been placed above the no-dig layer.

Inspection pits should be excavated within areas of soft landscaping for verification purposes. This should be undertaken on the basis of 1 pit per 250m² of soft landscaping, with a minimum of 3 No. inspection pits.

Validation Chemical Testing

Topsoil and subsoil shall be certified as suitable for use prior to being imported to the Site and should be from a known source (preferably natural inert). Source sampling (if from a greenfield source) should be carried out at a rate of one sample per 200m³ or a minimum of three samples of soil per source, whichever is greater. If from a brownfield source, sampling should be at a rate of one sample per 50m³ or a minimum of six samples of soil per source, whichever is greater.

Samples should be submitted for the chemical analysis listed in Table B1, Appendix B and should comply with the limits in the table.

In case of sample validation failure, the contractor must devise a method of tracking materials so that the position of failed wagonloads, stockpiles and/ or deposited materials can be identified, with the failed material subsequently excavated and removed from Site.

In addition to meeting the chemical criteria discussed above, imported materials must be free from anthropogenic materials such as bricks, wood, concrete, glass, metal and plastic, and no visual or olfactory evidence of contamination should be present

4.10 Vapour Membranes in Future Built Development

Remedial actions are required in future properties at the Site to prevent ingress and accumulation of vapour. At the time of writing the scope vapour protection has not been finalised, although are anticipated to take the form of passive measures incorporating a vapour-proof membrane installed within future building foundations. The final measures selected for the Site shall be agreed in advance with Manchester City Council and their installation inspected and validated independently as per CIRIA Report C735 'Good Practice on Testing and Verification of Protection Systems for Buildings Against Hazardous Gases'. In accordance with Table A2 of CIRIA C735, verification shall include both visual inspection and an appropriate scope of integrity testing.

In line with C735, the contractor responsible for installing the vapour proof membrane should hold the following qualification and install the gas proof membrane in accordance with the manufacturer's instructions:

- CSkills Awards L2 NVQ Diploma in sub-structure work occupations (construction) – installation of gas membranes.

Operatives installing the vapour proof membrane without this qualification should have attended the CSkills installation of gas membrane sector apprenticeship and up-skilling course or equivalent scheme and be registered as working towards the L2 NVQ Diploma. Details of the contractors' qualifications should be provided in the Verification Report.

The installation contractor's method statement should be provided to Manchester City Council and agreed in writing prior to the installation of the membrane. The method statement should include measures to protect the membrane during installation and construction work and the location of service penetrations and how these will be sealed.

A supervising engineer should have a part-time presence on Site and undertake on-going inspections and monitoring against the method statement as the work progresses as part of their duties assigned under their role. The conformance of the works to the method statement should be recorded by the supervising engineer and presented within a Site Verification Report.

Verification of the correct installation of the gas/ vapour proof membrane in accordance with manufactures instructions and should be carried out by a suitably qualified third-party installer or consultant (not directly employed by the installation contractor or membrane supplier, qualifications as described above).

Inspections dates (TBC) should be set to coincide with completion of the installation of the vapour proof membrane and prior to pouring of the slab.

A minimum time between installation of the membrane and pouring the concrete slab should be

programmed by the Contractor.

In accordance with Sections 3.4.1 and 3.5.1 of CIRIA C735, a visual inspection of the vapour proof membrane should be carried out.

The visual tests for the vapour membrane will include inspection of the ground prepared for the membrane and following installation. Particular attention should be paid to edges, laps, and sealing around service entries and other designed penetrations, and the presence of holes tears or rips to the membrane. A photographic record of the inspection and repairs (if any) should be kept and presented in the Verification Report.

Integrity testing shall be undertaken to confirm that the installed membrane does not contain any defects. The type, timing and frequency of integrity testing should be agreed in advance between Manchester City Council, the installer, the integrity tester and the verifier.

The long-term management and maintenance of vapour protection measures should be included in the building's management system to manage any residual hazards.

4.11 Asbestos Risk Management Plan

Asbestos screening and quantification analysis undertaken to date has identified the presence of asbestos locally within the Made Ground soils. Guidance should be sought from the CIRIA Document 'Asbestos in Soil and Made Ground: A Guide to Understanding and Managing the Risks' for works in relation to soil excavations.

To allow the works to progress an Asbestos Risk Management Plan (ARMP) shall be prepared which will comply with the Control of Asbestos at Work Regulations (2012) for use during the earthworks and construction works. The requirement for air monitoring or similar shall be considered by ARMP.

In order to manage potential fibre release, dust suppression techniques shall be employed when excavating the Site soils.

A copy of the Asbestos Risk Management Plan, along with details and records of any mitigation measures employed at the Site shall be included within the Site verification report.

4.12 Asbestos Discovery Plan

The Contractor shall develop an Asbestos Discovery Plan to be implemented in the event of unforeseen/ previously unknown asbestos materials being encountered during the earthworks and construction works proposed at the Site.

Details of the Asbestos Discovery Plan, any positive asbestos identifications encountered during the works and the subsequent remedial activities undertaken shall be detailed in full within the Site verification report.

4.13 Materials Management

Materials Management Plan

The Contractor will maximise the opportunity for the beneficial re-use of the excavated materials where possible. In order to facilitate the re-use of materials, the work will be undertaken in accordance with the CL:AIRE Definition of Waste; Development Industry Code of Practice (DoWCoP).

The Contractor shall prepare a Materials Management Plan in accordance with the CL:AIRE DoWCoP, which will outline the excavation and re-use of materials at the Site. This document shall be reviewed by a Qualified Person and a Declaration submitted to the Environment Agency and CL:AIRE.

The Contractor shall prepare a Verification Report detailing the re-use of materials on the Site following completion of the project and submit this report to CL:AIRE.

Recycled Aggregates

Secondary aggregates generated on-Site for reuse should be either:

- Shown to have been produced in accordance with the WRAP Quality Protocol for the production of aggregates from inert waste and confirmed free of visual and olfactory evidence of contamination, including (but not limited to) the visual presence of asbestos containing materials, bituminous materials containing coal-tar, and hydrocarbon staining and odours;
- Re-used under Waste Management Licence Exemption; or
- Reused under the MMP.

Recycled aggregates generated at the Site proposed for re-use in pile mats or no-dig layers shall be sampled to confirm chemical suitability at a rate of one per 1,000m³, submitted for the chemical analysis listed in Table B2, Appendix B and should comply with the limits within.

No specific chemical testing is considered to be necessary to confirm suitability of recycled Site-won aggregates for use as a general fill within the subterranean voids for the reasons outlined within Section 4.8. However, as described in Section 4.8, criteria relating to the presence of visual or olfactory evidence of contamination remain relevant.

Recycled aggregates shall, however, be subject to appropriate geotechnical assessment and testing to confirm suitability for use as general fill (e.g. as backfill within subterranean voids). However

Where recycled aggregates are used, records shall be collected, detailing the total volume of material re-used and their location of use.

4.14 Disposal of Contaminated or Unsuitable Material

Material excavated around the hydrocarbon impacted area of the Site will not be suitable for re-use. The Contractor shall undertake analysis to confirm the waste classification of the material and identify a suitable licensed facility to accept the waste.

Copies of all relevant licences for the disposal / treatment facility will be provided prior to the waste being taken off Site. Any material exported from Site to landfill should be hauled by a registered waste carrier in accordance with the requirements of the Duty of Care Regulations and the Landfill (England & Wales) Regulations 2005.

A transfer note should be completed, signed and retained by the parties involved. The transfer note should include the volume of waste, the nature of the material and a statement of its chemical composition, details of the source and destination sites, and details of the haulier.

The removal of contaminated soils and/or solid waste will require the Contractor to make available on-Site all supporting documentation as required under:

- Part II of the Environmental Protection Act 1990.
- The Landfill (England and Wales) Regulations 2005.

- All Waste Management documentation shall be made available for inspection and auditing by the Environmental Engineer and the Regulatory authorities.
- All waste activities and Environmental Permitting activities shall be undertaken in accordance with the Environmental Permitting Regulations 2007.

Non-Hazardous Wastes

Non-hazardous wastes removed from site for disposal must:

- Be accompanied by waste transfer notes (each load).
- Comply with the permitting requirements of the receiving landfill.
- Comply with the waste acceptance criteria of the receiving landfill.
- Include a written description of any pre-treatments or processes that have been applied to the waste.
- Signed waste transfer notes and returns must be kept for a minimum of 2 years and be available for inspection by the Local Authority or the Environment Agency when asked.

Should waste soil arisings be assessed to be hazardous waste requiring treatment prior to disposal, the Contractor will carry out pre-treatment of the waste soils either on-Site (under an appropriate Environmental Permit to a methodology that is agreed with the receiving landfill operator) or off-site at a Permitted facility.

Hazardous Wastes

For Hazardous Wastes removed from site, the following additional requirements apply:

- A Hazardous Waste Consignment Note must be completed with each load;
- The waste must be taken to the receiving landfill by a registered Hazardous Waste Carrier;
- Copies of signed Consignment Notes and Consignee Returns must be kept for a minimum of 3 years at the premises that produced or stored the waste and be available for inspection by an enforcement officer from the Local Authority or Environment Agency when asked.

4.15 Stockpiles

The generation of stockpiles of excavated material will be minimised as far as is reasonably practical. Any soils that are stockpiled will be managed in a controlled manner, with different material types segregated and clearly labelled.

The Contractor will employ a system to track the material and stockpiles; from the creation of the stockpile through to the final destination of the material. The Contractor will maintain a log on Site of the material/stockpile tracking system. The log will incorporate reference to validation testing where required.

Each stockpile will be identified according to assumed or confirmed categorisation, source, type and deposition date, and details of any chemical analyses. Stockpiles will be physically separated to avoid cross contamination and temporary road access provided for placement and loading. Stockpiles will be positioned on impervious surfaces to collect drainage and prevent loss of entrained water and leachate to ground, the Contractor will ensure that runoff from stockpiles is minimised and controlled such that it cannot enter local drains or impact the vicinity of the stockpile.

Mitigation measures should be employed to minimise wind whip from stockpiled materials. The Contractor will determine the methods for appropriate handling and storage of materials which may include damping down and covering of stockpiles where necessary.

All excavation arisings will either: be loaded directly into lorries for further sorting and segregation in other areas of the Site; moved directly to the required location; and/ or stockpiled in a methodical order for future reuse. Each stockpile should be identified according to assumed or confirmed categorisation, source, type and deposition date, and details of any chemical analyses.

Full records of the quantities of disposed materials and the receiving facilities will be kept during the works. In addition, consignment notes for the materials will be collated. A summary of all material types, volumes removed from the Site, receiving facilities/sites and Duty of Care documentation will be provided within the Validation Report.

The works will be carried out and comply with all current applicable standards, codes, regulations, planning conditions, guidance notes, legislation and health and safety conditions.

4.16 Imported Materials

Topsoil and subsoil shall be imported to Site for use within the engineered cover layers required in soft landscaped areas. It is also possible that aggregates shall be imported for use as general fill or in the creation of pile mats. As such, all materials imported onto the Site shall be subject to the following sampling regime to ensure suitability for the proposed end-use.

Representative analytical records of all imported materials shall be provided by the Contractor to the Environmental Engineer for their prior approval. Samples shall be taken of imported materials at source for analysis and the results used to confirm the acceptability of the material before importation to Site.

The Environmental Engineer shall visually inspect imported materials. Material determined to be unsuitable by the Environmental Engineer shall not be used by the contractor.

UKAS and MCerts accredited laboratories shall be used for the chemical analysis of soils as required.

Primary Aggregate

Primary aggregates imported to Site should be supported by quarry certificates to demonstrate suitability for use.

Recycled Aggregates

Imported aggregates should be subject to chemical testing on a rate of 1 sample per 1,000m³ to confirm the materials are suitable for use at the Site. The aggregates should be subject to testing for the suites included in Appendix C.

Topsoil /Subsoil

Please refer to Section 4.9 for the testing regime necessary for topsoil and subsoil.

4.17 Buried Services

Clean service corridors should be provided for all new underground services to separate services from residual contamination in soils and groundwater.

The Waterman GQRA report included chemical testing to determine the design class for buried concrete at the Site. The tests were undertaken in accordance with BRE Special Digest No.1 – Concrete in Aggressive Ground (3rd Edition, 2005) and the design sulphate and aggressive chemical environment for concrete (ACEC) classification for concrete was determined as follows:

- Concrete in contact with granular Made Ground: DS1 AC1.
- Concrete in contact with cohesive Made Ground: DS1 AC1.
- Concrete in contact with Boulder Clay: DS3 AC3.
- Concrete in contact with Sand (Glacial Till): DS1 AC1.

Drinking water supply pipes should be resistant to the ground conditions present and should meet the requirements of the relevant local water authority. Given the contamination encountered and the brownfield nature of the Site, barrier pipes are likely to be required to provide sufficient protection for the supply of drinking water, subject to approval

Consultation with the relevant water authority should be undertaken prior to installation of the water supply pipes to ensure the materials proposed for use will form an effective barrier to ground contamination identified at the Site.

4.18 Management of Shallow Groundwater

Groundwater encountered during the works will need to be managed in a controlled manner. Any shallow groundwater that requires pumping from excavations should be disposed to sewers, subject to approval from the statutory undertaker or tankered for removal off-site at an appropriately licensed facility.

All correspondence pertaining to any discharge consents, pumping and/ or treatment and disposal from the Site of contaminated groundwater should be retained and included in the verification report. This should include volumes of groundwater discharged from Site, either to sewer or by tanker.

4.19 Protection of Workers and the General Public

Works shall take place in accordance with the Control of Asbestos Regulation (CAR) 2012 and the Confined Spaces Regulations 1997. The Construction (Design and Management) Regulation 2015 (CDM 2015) will also apply to the works.

The health and safety of all construction workers should be managed appropriately during the works providing appropriate welfare facilities, decontamination facilities and personal protective equipment (PPE) commensurate with the contaminants present on the Site and the activities being undertaken.

In conjunction with this Remediation Strategy, it is recommended that the Contractor prepare an Environmental Management Plan (EMP) for implementation throughout the development works. The CEMP should detail measures to be undertaken to protect Site users, the general public and other relevant environmental receptors during construction.

4.20 General Site Activities

Spillages

Any relevant preventative and/ or protective measures for each activity to be undertaken where a risk of spillage is present shall be put in place. It is expected that these measures would be specific to that

activity and location, and details of the measures to be undertaken should be included in the method statement. All the adequate equipment (in good order and repair), material (relevant and in sufficient quantities) and personnel (sufficient number and suitably trained) available at the relevant locations would be required. When required, the full spill kit must be present at the location where the work is being undertaken.

A spill response procedure shall be in place for the duration of the works. A method statement detailing this procedure shall be provided prior to the works taking place. Evidence shall be provided that all staff have been briefed and trained in the spill response procedure.

Fuel Storage

Fuel storage shall be in accordance with the Control of Pollution (Oil Storage Regulations) (England) 2001. Refuelling shall be undertaken at a fixed suitable location and shall take place entirely within an area lined with a membrane or placed on a concrete surface of sufficient quality to prevent impact to the underlying strata.

Bulk storage of fuel shall only be permitted in double skinned tanks (integrally bunded). Tanks should be placed in a prepared bunded area to be 110% volume of the tank lined with an appropriately impermeable membrane. Double skinned tanks without an alarm or method of monitoring the voids between the tanks and outer skin shall not be permitted to be used during the works. Drip trays shall be utilised and absorbent granules and spill kits shall be utilised to deal with any minor spillage.

Fuel supply tanks shall be kept under lock and key with access to the tank(s) controlled by the Site manager or other appointed person. Automatic fuel filling nozzles shall not be permitted for use onsite. All necessary facilities to contain fuel spillages shall be provided.

5. Validation Reporting Requirements

During the development works the Contractor shall provide copies of all factual records, test results, inspections, surveys or other information as requested by Waterman which may be required to complete a Validation Report. These may include:

- Records and reports of any ground investigations carried out to further inform the remediation strategy for the Site (i.e. investigations to determine extent of subterranean structures and voids);
- Details of the vapour protection measures installed at the Site. This should include:
 - Drawings confirming the construction detail of building floor slabs and minimal penetrations.
 - Confirmation of the suitable qualifications and experience of the workforce that carried out installation of the vapour proof membrane through the provision of qualification certificate or registration details.
 - Technical datasheets of the membrane used.
 - Inspections records of the vapour membrane and any ventilation systems.
 - Records of integrity testing carried out on the vapour membrane following installation.
 - Confirmation from Building Control Officer/ Approved Inspector that the vapour protection meets Building Regulations.
- Details of any unforeseen contamination encountered during the works (including any addendum remedial method statements prepared), associated correspondence with regulators and subsequent remedial actions.
- Details of any tanks or other unexpected infrastructure encountered during the works and subsequent remedial actions.
- Details of the Materials Management Plan implemented at the Site.
- Details of any asbestos containing materials (ACMs) encountered, including volumes removed from Site and duty of care records. Records should be kept of known residual ACMs remaining in-situ, including type, condition, and locations.
- Results of any asbestos air testing undertaken.
- Copies of duty of care waste transfer notes and/or hazardous waste consignment notes and chain of custody documents relating to the disposal of soils, groundwater and asbestos containing materials from the Site, including any correspondence with regulators. Volumes of materials removed from the Site should be calculated and recorded.
- Records of known residual ACMs remaining in-situ. Including type, condition, and location.
- Copies of all environmental monitoring, including boundary monitoring and asbestos in air monitoring.
- Delivery records and visual confirmation of all materials used in the works.
- The location and volume of soils and recovered secondary aggregates retained on-Site, including records under the relevant protocols for their reuse.
- The source of any imported materials, associated chemical test results, volumes of imported materials and locations they have been placed on-Site.
- Confirmation of cover system in soft landscaping areas to include correct volume of chemical testing results, inspection pits completed to confirm thickness and presence of marker layer.

- Photographic confirmation of no-dig layer in gardens and areas of soft landscaping.
- Plans showing extent of cover system used in gardens and soft landscaped areas.
- Evidence of correct water pipe materials selection to include product datasheet and photographs. Confirmation that services are provided with clean corridors should also be provided.
- Contractor's daily and weekly records of work completed.
- Monitoring well decommissioning records. This should include details of the grouting methodology used and a photographic record of the works undertaken.
- Relevant approvals from Manchester City Council, the Environment Agency and the local water authority for the works carried out.

On satisfactory completion of the remediation works and following receipt of a complete set of the required information (examples of which are detailed above) Waterman will produce a verification report, which is subject to the approval in writing of the local planning authority.

6. Recommendations

It is recommended that the following items are completed:

- This Remediation Strategy should be submitted to Manchester City Council in pursuit of discharge of planning condition 7 (a) of application reference 131708/FO/2021; and,
- Following implementation of the remediation works at the Site, a Remediation Verification Report should be submitted to Manchester City Council in pursuit of discharge of planning condition 7 (b) of application reference 131708/FO/2021.

GLOSSARY

For the purpose of this report, the following terms and definitions apply (see BS 10175:2001).

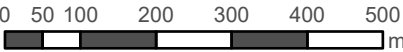
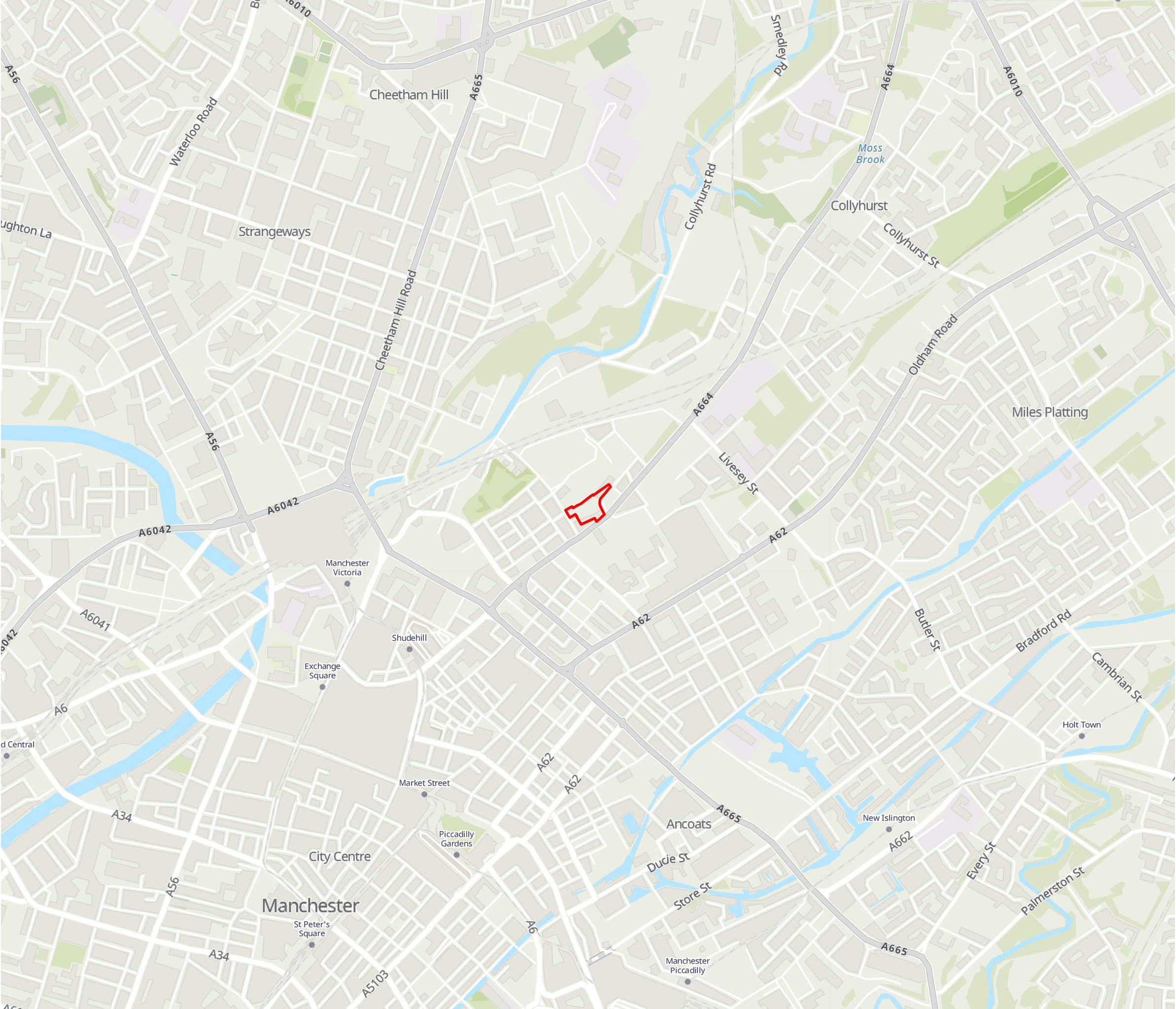
Accuracy	Level of agreement between true value and observed value.
Conceptual Exposure model	Textual and or schematic hypothesis of the nature and sources of contamination, potential migration pathways (including description of the ground and groundwater) and potential receptors, developed on the basis of the information from the preliminary investigation and refined during subsequent phases of investigation and which is an essential part of the risk assessment process. Note 1: The conceptual exposure model is initially derived from the information obtained by the preliminary investigation. This conceptual model is used to focus subsequent investigations, where these are considered to be necessary, in order to meet the objectives of the investigations and the risk assessment. The results of the field investigation can provide additional data that can be used to further refine the conceptual model.
Contamination	Presence of a substance which is in, on or under land, and which has <u>the potential</u> to cause significant harm or to cause significant pollution of controlled water. Note 1: There is no assumption in this definition that harm results from the presence of the contamination. Note 2: Naturally enhanced concentrations of harmful substances can fall within this definition of contamination. Note 3: Contamination may relate to soils, groundwater or ground gas.
Controlled water	Inland freshwater (any lake, pond or watercourse above the freshwater limit), water contained in underground strata and any coastal water between the limit of highest tide or the freshwater line to the three mile limit of territorial waters. Note 1: See Section 104 of The Water Resources Act 1991.
Harm	Adverse effect on the health of living organisms, or other interference with ecological systems of which they form part, and, in the case humans, including property.
Hazard	Inherently dangerous quality of a substance, procedure or event.
Pathway	Mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor.
Precision	Level of agreement within a series of measurements of a parameter.
Receptor	Persons, living organisms, ecological systems, controlled water, atmosphere, structures and utilities that could be adversely affected by the contaminant(s).
Risk	Probability of the occurrence, magnitude and consequences of an unwanted adverse effect on a receptor.
Risk assessment	Process of establishing, to the extent possible, the existence, nature and significance of risk.
Sampling	Methods and techniques used to obtain a representative sample of the material under investigation.
Soil	Upper layer of the earth's crust composed of mineral parts, organic substance, water, air and living matter. Note 1: In accordance with BS 10175:2001 the term soil has the meaning ascribed to it through general use in civil engineering and includes topsoil and subsoil; deposits such as clays, silt, sand, gravel, cobbles, boulders and organic deposits such as peat; and material of natural or human origin (e.g. fills and deposited wastes). The term embraces all components of soil, including mineral matter, organic matter, soil gas and moisture, and living organisms.
Source	Location from which contamination is, or was, derived. Note 1: This could be the location of the highest soil or groundwater concentration of the contaminant(s).
Uncertainty	Parameter, associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurement.

APPENDICES

Appendix A Site Plans

- Site Location Plan (Ref. WIE19453-100_GIS_GI_1A)
- Soil Exceedances Plan (Ref. 19453-100-WIE-ZZ-XX-DR-V-80-004/P01)
- General Arrangement Drawing PLANIT I.E (Ref. 2624-PLA-XX-XX-DR-L-0002/S1/P06)
- Jon Matthew Architects Elevation AA (Ref. 136-JMA-MP-S-E-A-042200/C)

Site Location



Project Details WIE19453-100: Rochdale Road

Figure Title Figure 1: Site Location Plan

Figure Ref WIE19453-100_GIS_GI_1A

Date November 2022

File Location \\waterman-consulting.com\legacyfile\MR_WIEL\Projects\WIE19453\100\9_GIS\WIE

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This drawing should not be scaled. Dimensions to be verified on site. Any discrepancies should be referred to the Engineer prior to work being put in hand.

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GENERAL NOTES

- SITE BOUNDARY
- ✱ WS101 WINDOW SAMPLE LOCATIONS
- ✱ BH101 15-20M CABLE PERCUSSIVE BOREHOLES WITH FOLLOW ON 10M ROTARY CORING
- ✱ TP111 TRIAL PITS TO ESTABLISH EXISTING FOUNDATION ARRANGEMENTS
- ✱ HDP101 HAND DUG PIT LOCATIONS (POSITIONED ON SITE, NOT SURVEYED)
- ▨ EXPLORATORY HOLE LOCATIONS WITHIN BUILDING WERE POSITIONED ONSITE, NOT SURVEYED
- SOIL EXCEEDANCES

TP113 @ 1.0m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Arsenic	40	79.9
Lead	310	3919
Mercury	1.2	13.4
Cyanide (free)	26	240.7
TPH Aromatic EC21-EC35	-	2952
Naphthalene	2.3	2.74
Benzo(b)fluoranthene	3.9	4.48
Dibenzo(ah)anthracene	0.31	0.55

TP109 @ 2.0m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Naphthalene	2.3	46.64
Benzo(a)anthracene	11	61.43
Benzo(b)fluoranthene	3.9	67.94
Benzo(a)pyrene	3.2	66.84
Dibenzo(ah)anthracene	0.31	10.97

HDP102 @ 0.6m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Naphthalene	2.3	4.141
Benzo(a)pyrene	3.2	6.347
Dibenzo(ah)anthracene	0.31	0.96

BH102 @ 3.8m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Benzo(b)fluoranthene	3.9	5.69
Benzo(a)pyrene	3.2	5.39
Dibenzo(ah)anthracene	0.31	0.78

BH102 @ 5.8m		
TPH Aromatic EC10-EC12	250	352
TPH Aromatic EC16-EC21	1900	6172
TPH Aromatic EC21-EC35	-	7296
Naphthalene	2.3	188.91
Benzo(a)anthracene	11	116.61
Chrysene	30	135.54
Benzo(b)fluoranthene	3.9	115.59
Benzo(a)pyrene	3.2	113.39
Dibenzo(ah)anthracene	0.31	16.7
1,2,4-Trimethylbenzene & 1,3,5-Trimethylbenzene*	0.41	4.24
1,2,4-Trimethylbenzene & 1,3,5-Trimethylbenzene*	0.41	0.63

BH102 @ 8.50m		
Naphthalene	2.3	8.5

BH103 @ 5.0m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Naphthalene	2.3	26.03
Benzo(a)anthracene	11	15
Benzo(b)fluoranthene	3.9	14.44
Benzo(a)pyrene	3.2	12.09
Dibenzo(ah)anthracene	0.31	2.4

BH103 @ 6.5m		
TPH Aromatic EC10-EC12	250	347.9
TPH Aromatic EC16-EC21	1900	2358
TPH Aromatic EC21-EC35	-	3047
Benzene	0.38	4.58
Naphthalene	2.3	323.1
Benzo(a)anthracene	11	28
Benzo(b)fluoranthene	3.9	30.59
Benzo(a)pyrene	3.2	24.59
Dibenzo(ah)anthracene	0.31	4.63
4-Methylphenol & 2,4-Trimethylphenol*	3.9	31.33
4-Methylphenol & 2,4-Trimethylphenol*	3.9	63.33
1,2,4-Trimethylbenzene & 1,3,5-Trimethylbenzene*	0.41	41.28
1,2,4-Trimethylbenzene & 1,3,5-Trimethylbenzene*	0.41	8.76

BH101 @ 0.5m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Dibenzo(ah)anthracene	0.31	1.55

TP108 @ 4.0m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Lead	310	395

TP114 @ 1.0m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Lead	310	360

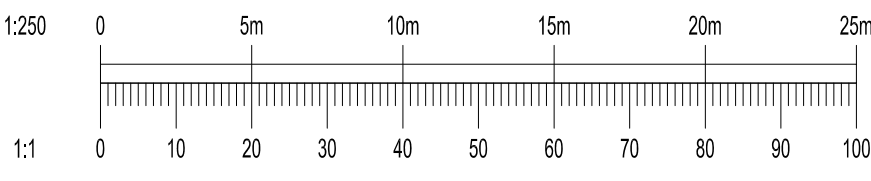
BH105 @ 7.0m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Chrysene	30	929
Benzo(b)fluoranthene	3.9	6.543

TP102 @ 2.0m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Lead	310	474
Dibenzo(ah)anthracene	0.31	0.44

TP115 @ 2.0m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Lead	310	721
Benzo(b)fluoranthene	3.9	5.35
Benzo(a)pyrene	3.2	4.43
Dibenzo(ah)anthracene	0.31	0.76

BH104 @ 1.0m		
Contaminant	Threshold Value (mg/kg)	Concentration (mg/kg)
Naphthalene	2.3	19.67
Benzo(a)anthracene	11	12.64
Benzo(b)fluoranthene	3.9	11
Benzo(a)pyrene	3.2	10.09
Dibenzo(ah)anthracene	0.31	1.7

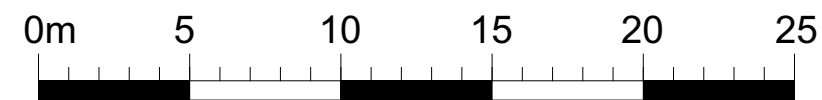
BH104 @ 5.0m		
Naphthalene	2.3	18.27
Dibenzo(ah)anthracene	0.31	0.41



P01	S0	22.11.22	AS BUILT ISSUE	DC	RT
Status	Date	Description	By	Chk	

Amendments	
Project	ROCHDALE ROAD
Title	SOIL EXCEEDANCE PLAN
Client	

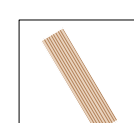
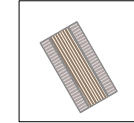
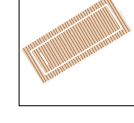
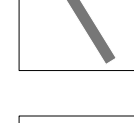
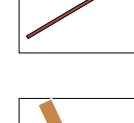
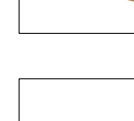
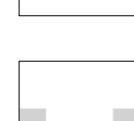
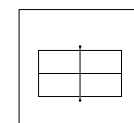
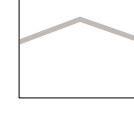
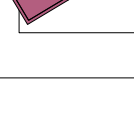
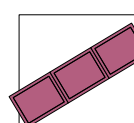
	
6th Floor, Trinity Court 16 John Dalton Street Manchester M2 6HY t 0161 839 8392 mail@watermangroup.com www.watermangroup.com	
Status	AS BUILT
Designed By	RT Director Waterman Ref WIE19453-100
Drawn By	DC Date NOVEMBER 2022 Scales @ A1 1:250
Project - Originator - Volume - Level - Type - Role - Number Revision	
19453-100-WIE-ZZ-XX-DR-V-80-004 P01	



Key

- **Mulbury Planning Application Boundary**
- **Natural Stone Paving Mix 1**
To public realm & shared community space
Type: Portuguese granite
Colour: TBC
Finish: TBC
Supplier: Hardscape or similar approved
Note: allow for galvanised 3x150mm exccell edge
- **Clay Paving Mix 2**
To match adjacent MCR site (H3 material) pedestrian areas throughout the site.
Type: Clay Paving
Colour: Various to complement architectural material palette
Finish: TBC
Supplier: Hardscape or similar approved
Note: allow for galvanised 3x150mm exccell edge
- **Clay Paving Mix 3**
To private garden space
Type: Neland Clay Paving
Colour: TBC
Finish: TBC
Supplier: Hardscape or similar approved
Note: allow for galvanised 3x150mm exccell edge
- **Green gap concrete paving**
To Residential spaces
Type: Concrete
Colour: TBC
Finish: TBC
Supplier: Hardscape or similar approved
Note: allow for galvanised 3x150mm exccell edge
- **Granite Planks**
To Residential spaces
Type: Portuguese granite
Colour: TBC
Finish: TBC
Supplier: Hardscape or similar approved
- **Natural Stone Paving**
Type: Yorkstone
To match approved MCR site Gould street highway paving
Size, colour finish, to MCC standard detail
Note: allow for 125x255mm kerb edge

FURNITURE & STRUCTURES

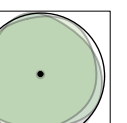
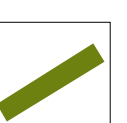
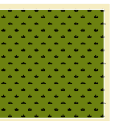
- **Seating Edge**
To Courtyards
Timber top corten frame
- **Picnic Table**
Timber top picnic table with powdercoated galvanised frame
- **Tiered Seating Feature**
Timber seating with integrated tree, details tbc
- **1.8m Rimini Galvanised Steel Fence**
details tbc
- **Retaining Structure**
Existing To Gould street & 87 Rochdale Road
- **1.1m Rimini Galvanised Steel Balustrade**
To private spaces, details tbc
- **Timber play feature**
To community shared spaces, details tbc
- **Proposed 1.1m wall with 500mm railing**
Brickwork finish to match building facade
- **1.5m Pillar Wall**
To courtyard edge
details tbc
- **Chess Board - Play**
To courtyard edge
- **Table tennis**
To courtyard edge
- **Planting Screen**
2.5m high Galvanised steel planting screen to courtyard
finish: tbc
- **Cycle Stands**
10no. Sheffield cycle stands to external spaces
- **Bin Store**
Controlled accessed 3 No. 1100L & 1no.240L bins to town house & duplex's

THIS DRAWING IS COPYRIGHT PROTECTED AND MAY NOT BE REPRODUCED IN WHOLE OR PART WITHOUT WRITTEN AUTHORITY FROM THE OWNER.

- NOTES:
- Do not scale from this drawing.
 - Always work to noted dimensions.
 - All dimensions are in millimetres unless otherwise stated.
 - All setting out, levels and dimensions to be agreed on site.
 - The dimensions of all materials must be checked on site before being laid out.
 - This drawing must be read with the relevant specification clauses and detail drawings.
 - Order of construction and setting out to be agreed on site.

NOTE:
General Arrangement drawing to be read in conjunction with drawings:
2624-PLA-XX-XX-DR-L-1001
2624-PLA-XX-XX-DR-L-1002
2624-PLA-XX-XX-DR-L-2000
2624-PLA-XX-XX-DR-L-3000

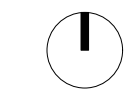
SOFTWORKS

- **Trees**
A combination of single & multi-stem trees. Refer to drawing 2426-PLA-XX-XX-DR-L-2000 for specification.
- **Clipped Instant Hedge**
To private garden boundaries
Size: 800mmW x 1200mmH approx.
Refer to drawing 2426-PLA-XX-XX-DR-L-2000 for specification.
- **Ornamental Shrub and Herbaceous Planting**
Biodiversity rich planting. Refer to drawing 2426-PLA-XX-XX-DR-L-2000 for specification.
- **Marginal Ornamental Planting**
To swales / rain gardens Refer to drawing 2426-PLA-XX-XX-DR-L-2000 for specification.
- **Lawn**
Medallion turf
Supplier: Rolawn or similar approved
- **Planting Bed**
450mm high timber planter, planting to residential community choice

S1-P06	06-12-21	Bin storage and boundary update	AS	KR
S1-P05	11-11-21	Updated boundary	AS	KR
S1-P04	01-09-21	Planning Issue	AS	KR
S1-P03	02-08-21	Draft Planning	AS	KR
S1-P02	20-07-21	For information	AS	KR
S1-P01	27-05-21	For coordination	AS	KR

Revision	Date	Description	Drawn	Apprvd.
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**Planit I.E. Limited**
E: info@planit-ie.com W: planit-ie.com
MANCHESTER
2 Back Grafton St., Altrincham, WA14 1DY
T: 0161 928 9281

**LEEDS**
No.1 Aire Street, Leeds Station, Leeds, LS1 4PR
T: 0113 824 6413
LIVERPOOL
Tempest 5.3, 12 Tithebarn Street, Liverpool, L2 2DT
T: 0151 363 1230
LONDON
Unit 6 Waterside, 44-48 Wharf Road, London, N1 7UX
T: 0207 253 5678
STANDISH
Standish Gatehouse, Stonehouse, Gloucestershire, GL10 3BZ
T: 0145 360 7080

Client **Portwood Development Ltd**

Project **87 Rochdale Road**

Drg Title **General Arrangement**

Created on	Created by	Approved by
02.08.21	AS	KR

Scale	Size	Workstage
1:250	A1	RIBA Stage 2

Drg No.	Suitability	Revision
2624-PLA-XX-XX-DR-L-0002	S1	P06



Appendix B Chemical Criteria for Imported Aggregates Subsoil and Topsoil

Table B: Chemical Test Criteria - Imported Material (topsoil/subsoil and recycled aggregate)

Determinand	Dry Soil		Source
	units	Maximum Acceptable Concentration	
Asbestos	%	Natural Materials – None visible and none detected Recycled Aggregate - <0.001% and none visible	Waterman in house criteria
Metals			
Arsenic	mg/kg	40	LQM S4ULs 2015
Antimony	mg/kg	550	CL:AIRE 2009
Barium	mg/kg	542	Non-hazardous waste threshold for Barium Chromate
Beryllium	mg/kg	1.7	LQM S4ULs 2015
Boron (Water Soluble)	mg/kg	107	Non-hazardous waste threshold for Boron Tribromide
Cadmium	mg/kg	85	LQM S4ULs 2015
Chromium (Total)	mg/kg	684	Non-hazardous waste threshold for Chromium III compounds
Chromium (VI)	mg/kg	6	LQM S4ULs 2015
Copper	mg/kg	200	BS3882: 2015 (Soil pH >7.0)
Lead	mg/kg	310	DEFRA C4SLs
Mercury	mg/kg	1.2	LQM S4ULs 2015
Molybdenum	mg/kg	670	CL:AIRE 2009
Nickel	mg/kg	110	BS3882: 2015 (Soil pH >7.0)
Selenium	mg/kg	430	LQM S4ULs 2015
Vanadium	mg/kg	1,200	LQM S4ULs 2015
Zinc	mg/kg	300	BS3882: 2015 (Soil pH >7.0)
TPH			
Total of TPH-CWG (C5-C44) not to exceed 500mg/kg (inert WAC threshold for mineral oil C10-C40) and TPH-CWG not to exceed the following:			
Aliphatic EC5 - EC6	mg/kg	42	LQM S4ULs 2015
Aliphatic EC6 - EC8	mg/kg	100	LQM S4ULs 2015
Aliphatic EC8-EC10	mg/kg	27	LQM S4ULs 2015
Aliphatic EC10-EC12	mg/kg	130	LQM S4ULs 2015
Aliphatic EC12-EC16	mg/kg	500	Inert WAC for mineral oil C10-C40
Aliphatic EC16-EC21	mg/kg	500	Inert WAC for mineral oil C10-C40

Determinand	Dry Soil		Source
	units	Maximum Acceptable Concentration	
Aliphatic EC21-EC35	mg/kg	500	Inert WAC for mineral oil C10-C40
Aliphatic EC35-EC44	mg/kg	500	Inert WAC for mineral oil C10-C40
Aromatic C5-C7	mg/kg	370	LQM S4ULs 2015
Aromatic C7-C8	mg/kg	500	Inert WAC for mineral oil C10-C40
Aromatic C8-C10	mg/kg	47	LQM S4ULs 2015
Aromatic C10-C12	mg/kg	250	LQM S4ULs 2015
Aromatic C12-C16	mg/kg	500	Inert WAC for mineral oil C10-C40
Aromatic C16-C21	mg/kg	500	Inert WAC for mineral oil C10-C40
Aromatic C21-C35	mg/kg	500	Inert WAC for mineral oil C10-C40
Aromatic C35-C44	mg/kg	500	Inert WAC for mineral oil C10-C40
BTEX			
Sum of BTEX not to exceed 6mg/kg (inert WAC threshold for BTEX) and individual compounds not to exceed the following:			
Benzene	mg/kg	0.38	LQM S4ULs 2015
Toluene	mg/kg	6	Inert WAC for BTEX
Ethyl Benzene	mg/kg	6	Inert WAC for BTEX
Xylene - m	mg/kg	6	Inert WAC for BTEX
Xylene - o	mg/kg	6	Inert WAC for BTEX
Xylene - p	mg/kg	6	Inert WAC for BTEX
PAH			
Sum of PAHs (16) not to exceed 100mg/kg (inert WAC threshold for PAHs) and speciated PAHs not to exceed the following:			
Naphthalene	mg/kg	2.3	LQM S4ULs 2015
Acenaphthylene	mg/kg	100	Inert WAC for PAHs
Acenaphthene	mg/kg	100	Inert WAC for PAHs
Fluorene	mg/kg	100	Inert WAC for PAHs
Phenanthrene	mg/kg	100	Inert WAC for PAHs
Anthracene	mg/kg	100	Inert WAC for PAHs
Fluoranthene	mg/kg	100	Inert WAC for PAHs
Pyrene	mg/kg	100	Inert WAC for PAHs
Benzo(a)anthracene	mg/kg	11	LQM S4ULs 2015
Chrysene	mg/kg	30	LQM S4ULs 2015
Benzo(b)fluoranthene	mg/kg	3.9	LQM S4ULs 2015

Determinand	Dry Soil		Source
	units	Maximum Acceptable Concentration	
Benzo(k)fluoranthene	mg/kg	100	Inert WAC for PAHs
Benzo(a)pyrene	mg/kg	3.2	LQM S4ULs 2015
Indeno(1,2,3-cd)pyrene	mg/kg	45	LQM S4ULs 2015
Di-benzo(a.h.)anthracene	mg/kg	0.31	LQM S4ULs 2015
Benzo(g,h,i.) Perylene	mg/kg	100	Inert WAC for PAHs
Other Organics/Inorganics			
Sum of 7 Congener PCBs	mg/kg	1	Inert WAC for PCBs (Sum of 7 Congeners)
Total Cyanide	mg/kg	26	Waterman GAC - CLEA v1.06 (free cyanide)
Total Phenols	mg/kg	750	LQM S4ULs 2015

LQM S4ULs 2015 and DEFRA C4SLs values are based on residential (without plant uptake) soils with 1% soil organic matter.

Note: In addition to meeting the chemical criteria discussed above, imported materials must be free from anthropogenic materials such as bricks, wood, concrete, glass, metal and plastic, and no visual or olfactory evidence of contamination should be present.

Appendix C Chemical Criteria for Re-used Soils & Aggregates

Table B: Chemical Test Criteria – soils and aggregates for re-use

Determinand	Dry Soil		Source
	units	Maximum Acceptable Concentration	
Metals			
Arsenic	mg/kg	40	DEFRA C4SLs
Barium	mg/kg	1300	LQM S4ULs 2015
Beryllium	mg/kg	1.7	LQM S4ULs 2015
Boron (Water Soluble)	mg/kg	11,000	LQM S4ULs 2015
Cadmium	mg/kg	150	DEFRA C4SLs
Chromium (Total)	mg/kg	910	LQM S4ULs 2015
Chromium (VI)	mg/kg	21	DEFRA C4SLs
Copper	mg/kg	7100	LQM S4ULs 2015
Lead	mg/kg	310	DEFRA C4SLs
Mercury	mg/kg	1.2	LQM S4ULs 2015
Nickel	mg/kg	180	LQM S4ULs 2015
Selenium	mg/kg	430	LQM S4ULs 2015
Vanadium	mg/kg	1,200	LQM S4ULs 2015
Zinc	mg/kg	40,000	LQM S4ULs 2015
TPH			
Total of TPH-CWG (C5-C44) not to exceed 500mg/kg (inert WAC threshold for mineral oil C10-C40) and TPH-CWG not to exceed the following:			
Aliphatic EC5 - EC6	mg/kg	42	LQM S4ULs 2015
Aliphatic EC6 - EC8	mg/kg	100	LQM S4ULs 2015
Aliphatic EC8-EC10	mg/kg	27	LQM S4ULs 2015
Aliphatic EC10-EC12	mg/kg	130	LQM S4ULs 2015
Aliphatic EC12-EC16	mg/kg	1100	LQM S4ULs 2015
Aliphatic EC16-EC21	mg/kg	65,000	LQM S4ULs 2015
Aliphatic EC21-EC35	mg/kg	65,000	LQM S4ULs 2015
Aliphatic EC35-EC44	mg/kg	65,000	LQM S4ULs 2015
Aromatic C5-C7	mg/kg	370	LQM S4ULs 2015
Aromatic C7-C8	mg/kg	500	LQM S4ULs 2015
Aromatic C8-C10	mg/kg	47	LQM S4ULs 2015
Aromatic C10-C12	mg/kg	250	LQM S4ULs 2015
Aromatic C12-C16	mg/kg	1,800	LQM S4ULs 2015

Determinand	Dry Soil		Source
	units	Maximum Acceptable Concentration	
Aromatic C16-C21	mg/kg	1,900	LQM S4ULs 2015
Aromatic C21-C35	mg/kg	1,900	LQM S4ULs 2015
Aromatic C35-C44	mg/kg	1,900	LQM S4ULs 2015
BTEX			
Sum of BTEX not to exceed 6mg/kg (inert WAC threshold for BTEX) and individual compounds not to exceed the following:			
Benzene	mg/kg	0.38	LQM S4ULs 2015
Toluene	mg/kg	880	LQM S4ULs 2015
Ethyl Benzene	mg/kg	83	LQM S4ULs 2015
Xylene - m	mg/kg	82	LQM S4ULs 2015
Xylene – o/p	mg/kg	88	LQM S4ULs 2015
PAH			
Sum of PAHs (16) not to exceed 100mg/kg (inert WAC threshold for PAHs) and speciated PAHs not to exceed the following:			
Naphthalene	mg/kg	2.3	LQM S4ULs 2015
Acenaphthylene	mg/kg	2,900	LQM S4ULs 2015
Acenaphthene	mg/kg	3,000	LQM S4ULs 2015
Fluorene	mg/kg	2,800	LQM S4ULs 2015
Phenanthrene	mg/kg	1,300	LQM S4ULs 2015
Anthracene	mg/kg	31,000	LQM S4ULs 2015
Fluoranthene	mg/kg	1,500	LQM S4ULs 2015
Pyrene	mg/kg	3,700	LQM S4ULs 2015
Benzo(a)anthracene	mg/kg	11	LQM S4ULs 2015
Chrysene	mg/kg	30	LQM S4ULs 2015
Benzo(b)fluoranthene	mg/kg	3.9	LQM S4ULs 2015
Benzo(k)fluoranthene	mg/kg	100	LQM S4ULs 2015
Benzo(a)pyrene	mg/kg	3.2	LQM S4ULs 2015
Indeno(1,2,3-cd)pyrene	mg/kg	45	LQM S4ULs 2015
Di-benzo(a,h.)anthracene	mg/kg	0.31	LQM S4ULs 2015
Benzo(g,h,i.) Perylene	mg/kg	360	LQM S4ULs 2015
Other Organics/Inorganics			
Total Cyanide	mg/kg	26	Waterman GAC - CLEA v1.06 (free cyanide)

Determinand	Dry Soil		Source
	units	Maximum Acceptable Concentration	
Total Phenols	mg/kg	750	LQM S4ULs 2015

LQM S4ULs 2015 and DEFRA C4SLs values are based on residential (without plant uptake) soils with 1% soil organic matter.

These criteria relate to materials to be re-used beneath the cover system only.

UK and Ireland Office Locations

