BROWNFIELD SOLUTIONS LTD

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

DOMIS CONSTRUCTION LTD

BRWRY, Manchester

Remedial Strategy

JEM/C5313/12035 Rev A

June 2023

www.brownfield-solutions.com

EXECUTIVE SUMMARY OF REMEDIAL PROPOSALS	
Remedial Requirements	**Verification Requirements**
Removal of all hardstanding, floor slabs basement structures, relic foundations etc across the site alongside removal of existing drainage runs.	Crush materials destined for re-use to meet chemical criteria as per Appendix A.
It is recommended within the UXO report that there should be an Unexploded Ordnance (UXO) Specialist Presence on site to support shallow intrusive works. Probing likely to be required for pile locations.	Confirmation that no UXO encountered during construction works, or if encountered measures taken to mitigate risk.
Excavation, screening and engineering / re-use of soils to an appropriate specification. Over excavation of service runs, if required, and installation of "protectaline" (or similar) barrier pipelines.	Materials destined for re-use to meet chemical criteria as per Appendix A. Photographic evidence of service run installation, if over excavation undertaken/required.
Installation of clean cover system which should comprise (top down): • 150mm "clean" validated topsoil; over • 300mm "clean" validated subsoil; over • Warning barrier membrane/geotextile. Elsewhere hardstanding will break the pathway to site end users/ human health. For areas of proposed trees, a tree pit will need to be excavated and additional subsoil provided above the hard dig layer / membrane. The above is subject to agreement with the local authority, and requirements should be confirmed at the earliest opportunity.	Imported topsoil and subsoil, and any materials re-used requiring chemical testing as per Appendix A. Thickness of clean cover system requires validation.
On completion of the above follow final verification reporting requirements.	Final verification and reporting to include (but not limited to): • The size and extent of the remedial excavations (lateral extent and depth plotted on suitable plans). • Photographic evidence of ventilation / expanding foam in service entries. • Any treatment undertaken. • All sampling locations and test results. • All the material imported to the site (including volume, source and chemical composition). • All the material exported from the site (including volume, destination and chemical composition). • Clean cover thickness validation records. • Discharge of any groundwater.

This executive summary should be read in conjunction with the full report, reference JEM/C5313/12035 Rev A,and not as a standalone document.

PROJECT QUALITY CONTROL DATA SHEET

Site Name:	BRWRY, Manchester		
Document Name:	Remedial Strategy		
Reference:	JEM/C5313/12035 Rev A		
Status:	-	28/04/2023	Original.
	A	07/06/2023	Update after revised gas risk assessment.

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DRAWINGS		
Drawing Number	**Rev**	**Title**
A2943 200	R16	Dutton Street Floor Plan
BRW-REN-ZZ-00-DR-S-01-01100	P01	Site Wide Ground Floor Plan
C5313/01	-	Site Location Plan
C5313/03	-	Exploratory Hole Location Plan
C5313/04	-	Site Area Plan
C5313/05	-	Depth to Bedrock Plan (m AOD)
C5313/06	-	Depth of Made Ground Plan (m)

APPENDICIES	
Appendix	**Title**
Appendix A	Chemical Specification for Soils
Appendix B	BSL Guidance -Re-use of Waste and Disposal

1.0 INTRODUCTION

1.1 Context

This Remedial Strategy has been produced by Brownfield Solutions Limited (BSL) for Domis Construction Ltd on a site off Dutton Street, Manchester, M3 1LD (known as BRWRY) and has been completed in general accordance with the following guidance:

- Environment Agency guidance - Land Contamination: Risk Management (LCRM).
- BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites.

1.2 Background and Scope

This Remedial Strategy is to set out how the remediation of the site will be undertaken and how the works will be validated. The document explains how the works will be permitted under current regulatory regimes and has been produced to address condition 7a of Manchester City Council Planning Permissions reference 118831/FO/2018.

The scope of work for this document comprises a summary of the ground model, summaries of the of risk assessments carried out, a remedial options appraisal (LCRM Stage 2), Remedial Strategy (LCRM stage 3) implementation details and any validation requirements.

Note that geotechnical aspects are not specifically addressed within this document as it seeks to meet the requirements set out within LCRM. Geotechnical aspects should be considered within a Geotechnical Design Report in accordance with Eurocode 7 or a suitable site-specific Earthworks Strategy.

1.3 Proposed Development

The proposed development is the erection of two buildings (a part 17, part 12 storey building and a part 26, part 23 storey building) to form 556 residential units (Use Class C3a) together with the creation of 3490 sqm of commercial floor space (Use Classes A1, A2, A3, B1 and D1) with associated landscaping, access and other associated works, as shown on drawing refs. A2943 200 and BRW-REN-ZZ-00-DR-S-01100-P01 provided to BSL by the client.

Condition 7a relating to the Site Investigation Proposal details the following:

"Notwithstanding the phase 1 desk based ground conditions report prepared by Wardell Armstrong stamped as received by the City Council, as Local Planning Authority, on the 19 January 2018, (a) before each relevant phase of development as detailed in Condition 2 hereby approved commences, the following information shall be submitted for approval in writing by the City Council, as Local Planning Authority:

- *Submission of detailed site investigation proposals.*
- *Submission of details of liaison with a UXO specialist to complete a detailed threat assessment of the risk of UXO prior to any intrusive site investigation works and site development.*
- *Submission of an updated site investigation and risk assessment report.*
- *Asbestos management report.*
- *Submission of a remediation strategy".*

This document has been produced to address the final bullet point of the above condition.

The proposed structures, hereon referred to as Blocks A-E are displayed on drawing ref. C5313/04.

1.4 Available Information

This report should be read in conjunction with Wardell Armstrong - Phase 1 Contaminated Land Assessment (ref. LO10517 R006.01) issued in January 2018, Geotechnical & Environmental Associates (GEA) – Desk Study and Ground Investigation Report (ref. J18242) issued in June 2019 and Brownfield Solutions Ltd (BSL) Site Investigation Proposal (ref. NHA/C5313/11937) issued in March 2023.

The following reports have been produced for the site and should be read in conjunction with this assessment (in date order):

- Wardell Armstrong - Phase 1 Contaminated Land Assessment (ref. LO10517 R006.01) issued in January 2018.
- 1st Line Defence Limited Express Preliminary UXO Risk Assessment (ref. EP7634-00) issued in November 2018.
- Geotechnical & Environmental Associates (GEA) – Desk Study and Ground Investigation Report (ref. J18242) issued in June 2019.
- EOD Contracts Ltd Explosive Ordnance Desk Top Study (ref. EOD/23/23040/DTS) issued in February 2023.
- Brownfield Solutions Ltd (BSL) Site Investigation Proposal (ref. NHA/C5313/11937) issued in March 2023.
- BSL, Phase II Geo-Environmental Assessment Report (ref. JEM/C5313/12029) issued in April 2023.
- BSL, Addendum Ground Gas Risk Assessment (ref. AJS/C5313/12123) issued in June 2023.

It is assumed that the Local Planning Authority will have provided the above reports to the appropriate statutory consultees and the recommendations therein have been accepted.

Japanese Knotweed has been noted on site and the treatment and removal/treatment of this will be issued under a separate cover by a specialist.

1.5 Limitations

This report has been prepared for the sole use and reliance of the Client, Domis Construction Ltd. This report shall not be relied upon or transferred to any other parties without the express written authorisation of BSL. If an unauthorised third party comes into possession of this report they rely on it at their risk and the authors owe them no duty of care or skill.

Current UK guidance and legislation has been used in the environmental assessment of the site, BSL is not liable for any subsequent changes in the guidance and legislation.

BSL have used reasonable skill, care and diligence in the production of this report. The findings and opinions conveyed via this report are based on information obtained from a number of sources as detailed within this report, BSL have assumed this information is correct and reliable. Nevertheless, BSL cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

The recommendations within this report are based upon the proposed site end use provided to BSL at the time of writing. If the end use or development layout changes from the proposal, then the recommendations may change or become invalid.

The site plans enclosed in this report should not be scaled off. Any site boundary line depicted on plans does not imply legal ownership of land.

Any recommendations made in this report should be confirmed with the Regulatory Authorities prior to implementation to ensure compliance.

2.0 GROUND MODEL SUMMARY

2.1 Description of Site

The site is located off Dutton Street, Manchester, M3 1LD. It is located within Manchester City Centre, approximately 200m northwest of Manchester Victoria Railway Station, centred on National Grid Reference 383870, 399260 as shown on the Site Location Plan, Drawing No. C5313/01.

The main site features and potential issues identified during the time of the intrusive investigation are detailed below:

Feature	Description
Site Area	The total area of the site is approximately 1.4 hectares. The site comprises three distinct areas, with the difference in levels formed by remnant retaining walls or built slopes., with the upper/ highest level being along the eastern edge (Area A), the middle level being in the centre of the site (Area B) and the lowest level at the west of the site (Area C). A plan showing the areas of the site is shown on drawing ref. C5313/04.
Site Access	Access to Area A can be gained off Dutton Street along the eastern edge of the site via three locked gates. Access to Area B is via a locked pedestrian gate in the hoarding off New Bridge Street to the south of the site. Access to Area C is gained through the adjacent Great Ducie Street car park to the west of the site accessed off Francis Street.
Current Land Use and Site Features	Area A is predominantly surfaced with either tarmac or concrete and at the time of investigation was being used as a commercial car park. Further to the north of Area A is an area of disused soft landscaping which had recently been cleared of vegetation with a steep embankment which slops down towards the north-western boundary of that area of the site. Beyond the area of soft landscaping was a small two storey building of masonry construction with associated hardstanding/yard to the rear. Area A is separated from Area B and Area C by retaining walls and steep embankments. Area B is enclosed on the north, east and partially at the south by circa 5m high retaining walls that support the upper section of the site and is surfaced with either tarmac or concrete that had been previously used as a car park however was inaccessible to vehicles during the time of investigation. Area C comprises a section of the Great Ducie Street car park, surfaced with tarmac or gravel which at the time of investigation was being used as a commercial car park.
Potential Sources of Gross Contamination	No obvious sources of gross contamination were observed.
Vegetation	The site is generally devoid of vegetation given the site is predominantly hard surfaced and vegetation clearance had already been undertaken. The remaining mature trees were being felled whilst BSL site works were progressing. Following the vegetation clearance, some smaller shrubs and brambles remain in areas of soft landscaping including suspected Japanese Knotweed.
Topography	As discussed above, the site is spread over three levels connected by either retaining wall features or steep slopes of soft landscaping. The level of Area A ranges from 38.46m AOD at the northwest to 40.20m AOD at the southeast and has the exploratory holes in this area had an average level of 39.77m AOD. The level of Area B ranges from 35.56m AOD at the northwest to 35.63m AOD at the southeast and has the exploratory holes in this area had an average level of 35.69m AOD. The level of Area C ranges from 29.49m AOD at the northwest to 30.48m AOD at the southeast and has the exploratory holes in this area had an average level of 30.57m AOD.

Feature	Description
Site Boundaries	Area A is bounded to the northeast by Dutton Street and to the southeast by New Bridge Street, its boundary was formed of a combination of remnant brick walls, galvanised palisade fencing or heras fencing. The southwestern and northwestern boundaries lie within the Great Ducie Street car park, but there is no distinct physical feature that marks these boundaries. Area B of the site is encapsulated by the above.
Surrounding Area	The site is set within Manchester City Centre and is predominantly bordered with commercial developments. To the north and east of the site there are commercial buildings including warehouses, mechanics and second-hand car sales as well as restaurants. To the southeast of the site there are large car parks. To the south of the site is New Bridge Street and beyond this is the Manchester AO Events Arena Complex. To the west of the site is the Manchester College City campus and Great Ducie Street car park.

2.2 Environmental Setting

Site History

The site has had a significant industrial past, including a brewery and print works, smithy, timber yard, iron works, hat works, box works, eight chimneys, a carriage works, waterproof clothing factory, engineering works, cotton works, garage, motor repair works and car parking. A number of tanks have been recorded within the site boundary historically.

Historical mapping from 1787 and 1794 suggests the potential presence of a spring in the middle of the site which flowed towards a brewery directly to the south of the site, whilst mapping from 1850 shows lakes and a canal to the north of the site which were later infilled and built upon. Two large reservoirs were originally present in the middle of the site during this period.

Manchester bomb mapping indicates at least one bombing incident recorded within the site boundary and several other incidents recorded in the immediate vicinity of the site during WWII.

Published Geology and Hydrogeology

From the Phase 1 Assessment and published geology, it was anticipated that ground conditions would comprise the following sequence of strata (top down):

- Made Ground; over
- Devensian Till (clays, sands and gravels); over
- Chester Formation (Sandstone. Previously known as the Chester Pebble Beds Formation).

Hydrogeology

Based on the inferred geology, a summary of the Environment Agency aquifer designations is presented in the table below:

Stratum	Coverage	Aquifer Designation
Devensian Till	Full Site	Secondary Aquifer (Undifferentiated). The classification is assigned where it is not possible to attribute either category A or B to the aquifer.
Chester Formation	Full Site	Principal Aquifer. This is Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale.

The site does not lie within 500m of a Source Protection Zone.

A now historical groundwater abstraction license was recorded onsite (SJ89NW3264) operated by Interbrew UK Ltd for drinking, cooking, sanitary and washing purposes as well as brewery processes. There are no active potable abstractions within 2000m.

Hydrology

The nearest named watercourse is the River Irk circa 171m east of the site, which flows into the Irwell over 200m to the west.

Potential Environmental Constraints

There are no landfill sites recorded within 250m.

Radon

Information from the environmental database report and the updated online UK maps of radon indicates the property is not in a radon affected area and therefore no radon protective measures are necessary in accordance with BRE Report 211 'Radon – Guidance on protective measures for new dwellings' 2015 Edition.

UXO Risk

EOD Contracts Ltd Explosive Ordnance Desk Top Study (ref. EOD/23/23040/DTS) issued in February 2023 indicates the site is at moderate risk of UXO, primary due to historical recorded bomb strikes and bomb damage on the site. It was recommended an Explosive Ordinance Disposal Engineer is required to over watch ground investigations and any future construction works.

2.3 Ground Conditions

Observed Geology and Groundwater

From the investigations carried out, the ground conditions can be summarised as below (top down):

Area A

- Made ground generally comprising Asphalt, concrete, gravelly sand and sandy gravelly clay from ground level to between 0.45m and 3.80m bgl.
- Natural superficial deposits comprising interbedded granular and cohesive stratum proven to depths between 0.50m and 22.00m bgl.
- Solid geology comprising sandstone proven to depths ranging between 23.00m and 37.40m bgl.

Area B

- Made ground generally comprising Asphalt, concrete, gravelly sand and sandy gravelly clay from ground level to between 0.55m and 1.50m bgl.
- Natural superficial deposits comprising slightly gravelly slightly sandy clay proven to depths between 0.95m and 5.38m bgl.
- Solid Geology of the Chester Formation not encountered in this area.

Area C

- Made ground generally comprising Asphalt and gravelly sand from ground level to between 2.10m and 4.60m bgl.
- Natural superficial deposits comprising sand and gravel proven to depths between 3.00m and 11.50m bgl.
- Solid geology comprising sandstone proven to depths ranging between 16.00m and 22.00m bgl.

Plans showing the thickness of made ground across the site (ref. C5313/06) and the depth to bedrock against ordnance datum (ref. C5313/05) are presented to the rear of the report.

The depths to groundwater and locations present during site works are shown in the table below:

Location	Depth During Site Works (m)	Comments
BH102	20.00 (19.94m AOD)	
BH108	7.50 (22.36m AOD)	
BH109	6.00 (24.48m AOD)	
TP103	0.30 (30.15m AOD)	Small seepage
TP105	0.60 (39.64m AOD)	Small seepage
TT101	1.70 (28.82m AOD)	Medium seepage
TT102	1.70 (28.77m AOD)	Medium seepage

Within installed standpipes, post site works monitoring has revealed the following depths to groundwater:

Location	Depth During Monitoring Period (range) (m)	
	Min	Max
Overall min/max	1.10	14.70
BH03 (GEA)	6.30	7.40
BH102	14.06 (25.63m AOD)	14.70 (24.99m AOD)
BH103	1.97 (37.97m AOD)	2.00 (37.94m AOD)
BH106 (Shallow)	NGW	2.05 (38.27m AOD)
BH106 (Deep)	12.67 (27.55m AOD)	13.00 (27.22m AOD)
BH108	NGW	1.97 (27.89m AOD)
WS101	2.34 (37.21m AOD)	2.60 (36.7m AOD)
WS102	NGW	NGW
WS105	1.10 (34.57m AOD)	1.66 (34.01m AOD)

Observations
During the works undertaken by BSL, observations for both visual and olfactory evidence of contamination were undertaken.

In WS105 a localised mild hydrocarbon odour and staining were noted in made ground soils between 0.30m and 0.60m bgl (area underlain by cohesive natural strata).

In TT101 a mild hydrocarbon odour and staining was noted in made ground soils between 1.90m and 2.10m bgl. The associated PID reading for those soils was 0.0ppm, indicating a likely very low residual/nuisance odour as opposed to significant or gross contamination. No sheen was noted on groundwater. BSL note that that no visual/olfactory evidence of this was recorded in the several attempts to drill BH07 immediately to the north by GEA), suggesting that this is highly localised.

In addition to the above, BSL maintained a watching brief during the excavations undertaken by the archaeologists, no visual or olfactory evidence of contamination was observed during these excavations.

Former Wells and Possible Culvert
Whilst attempts were made to locate former wells, no features attributable to possible abstraction wells were identified during this investigation, although a concrete slab in the location of Well C was recorded, representative of the capping of this well carried out by PP O'Connor. The demolition document states *"Three wells were present on site which were live springs connected to the River Irwell. The wells were capped off with concrete as per the client's request and then marked up on the relevant drawings to illustrate their position".*

Attempts were also made to identify a possible culvert via trenching, but no such feature was able to be located during these works.

3.0 SUMMARY OF RISK ASSESSMENTS

3.1 General

The previous site investigation has confirmed the following:

- Pervasive heavy metal and PAH contamination within the made ground.
- Asbestos (loose fibres) within the made ground soils at 7 No. locations.
- Possible presence of Japanese Knotweed.
- Moderate risk of UXO.

3.2 Human Health Risks

As part of the risks assessment, chemical test results were screened against the LQM/CIEH S4ULs and DEFRA C4SLs for a residential end use without homegrown produce. A summary of this assessment is provided below.

Metals
The following elevated metals were detected:

Exploratory Hole	Depth (m)	Stratum	Metal	Concentration (mg/kg)	Adopted Screening Value (mg/kg)
TP102	0.50-0.60	Made Ground	Arsenic	93	40
			Lead	1300	310
BH102	0.00-0.20	Made Ground	Lead	390	310
BH102	0.50-1.00	Made Ground	Mercury	2.4	1.2
			Lead	740	310
BH103	0.70-1.00	Made Ground	Lead	2900	310
BH104	0.80-1.20	Made Ground	Arsenic	95	40
BH106	0.50-1.00	Made Ground	Lead	490	310
WS104A	0.30-0.40	Made Ground	Lead	950	310
			Mercury	1.4	1.2

Asbestos
The locations where asbestos have been detected in the made ground, alongside the results of quantification are summarised in the table below:

Exploratory Hole	Depth (m)	Asbestos ID	Concentration by Weight (%)
BH102	0.00-0.20	Chrysotile & Amosite	0.097
BH103	0.70-1.00	Chrysotile	0.001
WS104a	0.30-0.40	Chrysotile	0.017

In addition to the above, asbestos was also detected in 4 No. samples tested by GEA in the form of loose fibres / fibre bundles with concentrations ranging between <0.001% and 0.021%.

Poly Aromatic Hydrocarbons (PAHs)
The locations, depth and concentrations of elevated species of PAHs are summarised in the table below:

Exploratory Hole	Depth (m)	Stratum	Species	Concentration (mg/kg)	Adopted Screening Value (mg/kg)
BH101	0.30-0.70	Made ground	Dibenz(a,h)anthracene	0.33	0.32
BH102	0.00-0.20	Made ground	Dibenz(a,h)anthracene	0.34	0.32
BH103	0.70-1.00	Made ground	Benzo(b)fluoranthene	12	4
			Benzo(a)pyrene	9	3.2
			Dibenz(a,h)anthracene	1.4	0.32
BH105	0.20-0.50	Made ground	Dibenz(a,h)anthracene	0.51	0.32
BH106	0.50-1.00	Made ground	Benzo(a)anthracene	19	14
			Benzo(b)fluoranthene	19	4
			Benzo(a)pyrene	16	3.2
			Dibenz(a,h)anthracene	2.2	0.32
TP102	0.50-0.60	Made ground	Benzo(b)fluoranthene	5.6	4
			Benzo(a)pyrene	7.3	3.2
			Dibenz(a,h)anthracene	1.4	0.32
TP103	0.20-0.30	Made ground	Benzo(a)anthracene	19	14
			Benzo(b)fluoranthene	28	4
			Benzo(a)pyrene	26	3.2
			Dibenz(a,h)anthracene	3.9	0.32
TP105	0.40-0.50	Made ground	Benzo(a)anthracene	18	14
			Benzo(b)fluoranthene	15	4
			Benzo(a)pyrene	13	3.2
			Dibenz(a,h)anthracene	1.7	0.32
TT102	0.20-0.30	Made ground	Benzo(b)fluoranthene	6.5	4
			Benzo(a)pyrene	5.8	3.2
			Dibenz(a,h)anthracene	0.79	0.32
WS104A	0.30-0.40	Made ground	Benzo(a)anthracene	18	14
			Benzo(b)fluoranthene	17	4
			Benzo(a)pyrene	15	3.2
			Dibenz(a,h)anthracene	2.2	0.32
WS105	0.30-0.50	Made ground	Benzo(a)anthracene	68	14
			Chrysene	61	31
			Benzo(b)fluoranthene	81	4
			Benzo(a)pyrene	67	3.2
			Dibenz(a,h)anthracene	9.4	0.32

Total Petroleum Hydrocarbons (TPH CWG), BTEX, VOCS and SVOCs
No petroleum hydrocarbons have been identified above the adopted screening criteria, including at WS105 where mild visual/olfactory evidence of potential impaction was noted in soils alongside photo-ionisation detection (PID) readings of 39.2ppm in the shallow made ground.

No BTEX or MTBE, VOCs or SVOCs compounds have been identified above the adopted screening criteria.

Other Data Sources
During the GEA investigation, elevated concentrations of arsenic, lead, naphthalene and petroleum hydrocarbons (one location BH4 – limited to low mobility and non-volatile long chain >EC35-EC40) were noted above human health screening criteria for a residential end use without homegrown produce. The findings of the GEA investigation generally corroborate with the findings of the recent BSL site investigation.

3.3 Permanent Ground Gases and Vapours

A summary of the ground gas monitoring carried out by GEA and BSL is presented below:

- A total of 11 No. spot monitoring visits have been carried out with 5 between December 2018 and May 2019 by GEA and 6 No. visits during April 2023 by BSL.
- Continuous monitoring was utilised in 3 No. boreholes for circa 3 weeks.
- The comprehensive available dataset was considered to be suitable for assessment, including numerous falling pressure events to demonstrate monitoring under worse case conditions had been met.
- The highest methane concentrations were recorded within the shallow installation of BH106, with a maximum concentration of 7.4% v/v recorded on the fifth monitoring visit.
- The highest carbon dioxide concentrations were recorded in the deep installation of BH106 (1.9% v/v) on the third visit.
- The maximum peak flow of 28.9 l/hr was recorded in WS105 on the first visit (considered to be due to groundwater piston effects Steady flows were generally less than 1.0l/hr, but a maximum steady flow of 7.8 l/hr was detected on a single occasion.
- Methane was consistently above 1% within BH106 and BH03.
- Carbon dioxide was consistently well below 5%.
- There is a clear separation based on the CSM, ground conditions and data that no gas is present below the north of the site (Block A).
- Methane detected under Blocks B to E is likely attributable to the made ground and organic strata.
- With liaison with Manchester City Council (MCC) and further assessment within the addendum letter report, it was considered the above was not a significant risk to the development.

On the basis of the above and the assessments carried out, the entire site is classified to fall within Characteristic Situation 1 and therefore no specific mitigation measures are required; it is also considered that due to the nature of the construction of the Blocks with substantial reinforced concrete floor slabs, there will be an inherent level of gas resistance incorporated, which will further reduce the low assessed level of risk.

3.4 Risk to Controlled Waters

Two rounds of groundwater monitoring were undertaken at the site in 2019 by GEA and samples were recovered from installations.

During the first round of monitoring, samples of groundwater measured elevated concentrations of total organic carbon, ammoniacal nitrogen and extractable petroleum hydrocarbons. The samples were obtained using a simple bailer and the marginally elevated concentrations were therefore assessed as likely attributable to the sediment and turbation during sampling. A low flow pump was utilised upon the second visit which revealed marginally elevated concentrations of PAHs within the groundwater from BH11 in the south of the site.

It was concluded that given the site had been utilised as a brewery for many years and groundwater has been abstracted from the sandstone beneath the site for decades, the values are considered likely to arise from localised shallow groundwater conditions rather than site derived contamination affecting the aquifers below the site.

Further groundwater testing has not been carried out by BSL based on the above assessment and the site is not considered to pose a significant risk to controlled water for the following reasons:

- No significant gross or mobile contamination has been identified on site in soils based on the results obtained as a potential indicator of groundwater contamination.
- There is no indication under present conditions of significant pollution of controlled waters and conditions following development of the site will not be any worse, indeed they may improve with increased hard cover and water retaining imported soft landscaping soils.

- The nearest watercourse is approximately 170m away at its nearest point and is considered to represent a culverted section of the River Irk, which is not considered to be in hydraulic continuity with the site.
- The River Irwell is located >250 south of the site.
- Area A and Area B of the site is underlain by low permeability clays which will inhibit lateral and vertical contaminant migration. A considerable concrete slab is present at depth across 80% of Area C, which will inhibit migration of contamination within the shallow made ground into the underlying soils.
- The site does not lie within 500m of an SPZ.
- There are no active groundwater abstractions within 400m. The nearest active abstractions are upgradient away from the River Irwell, the remainder within 2km of the site are for low sensitivity uses.
- There are no potable (sensitive) water abstractions within 2000m.
- It would be technically challenging and probably disproportionately costly to remove contaminants at the identified concentrations from the water to the pre-input stage.
- The site will be subject to extensive earthworks to address the significant differences in site levels. As such any evidence of mobile contamination will be accounted for and appropriately removed from the site, further reducing the risk.

3.5 Summary

A summary of the findings of the previous investigations and assessments where a risk is present (i.e. an unacceptable source-pathway-receptor linkage) which requires mitigation is presented in the table below.

Source	Receptor
<- Poses an unacceptable risk to ->	
Pervasive elevated concentrations of heavy metals, PAH, and asbestos present within the made ground	Human health / construction workers (Residential with homegrown produce)
UXO	Human Health and Property
Japanese Knotweed	Property

Based on the above, it was recommended that a Remedial Strategy was prepared that identifies the specific remediation requirements for the site.

4.0 REMEDIAL OPTIONS APPRAISAL

4.1 Remediation Options

This section has been produced in general accordance with the requirements of LCRM: Stage 2 Options Appraisal.

The Investigations and risk assessment have concluded that the site will require remediation, which is the action required to prevent, minimise, remedy or mitigate the effects of the identified unacceptable risks listed in the section above.

The remediation of the site will need to ensure that upon completion of the development, the ground conditions at the site can be shown to be appropriate for the intended use and that they will not pose unacceptable contamination risks to the identified receptors.

For the options appraisal, there are 3 steps to follow:

1) Identify feasible remediation options.
2) Do a detailed evaluation of options.
3) Select the final remediation option.

The objectives of the remediation will be to sever one or more of the linkages within the source-pathway-receptor (S-P-R) model. There are three broad approaches which can be adopted:

- Remove or treat the source of pollutants.
- Remove or modify the migration pathway.
- Remove or modify the behaviour of the receptor.

The options appraisal process considers the available remedial techniques to achieve the above based on following key criteria:

- Effectiveness.
- Practicality.
- Durability.
- Relative Cost.
- Relative Operational Time (in terms of installation or the activity).
- Sustainability.

The feasibility of each of the listed remedial option is assessed in terms of effectiveness at treating the contamination, which is broken down into; effective (Yes), partially effective (Partially) or not effective (No).

The listed techniques are also assessed in terms of relative cost ranging from negligible cost (£) through moderately expensive (££) to prohibitively expensive (£££).

Timescales over which the remediation technique is operational has been relatively assessed as weeks, months, years and decades. If a given technique is only effective over a period in the order of years to decades then its overall feasibility is diminished.

A sustainable approach can help to ensure that the benefit of doing the remediation is greater than its impact.

The table below summarises the possible remedial options and assesses each against the six key criteria listed above:

Remedial Activity	Effective	Relative Cost	Operational Time	Comments (Practicality / Sustainability / Durability)	Feasible
Civil Engineering Methods					
Cover System	Yes	£	Weeks	Will prevent contact between site end users and shallow contaminated soils, breaking the S-P-R linkage. Not a requirement in hardstanding areas.	Yes - considered a suitable remediation option to mitigate the risk to human health in soft landscaped areas.
Excavation and Disposal (may also require pre-treatment by screening & sorting).	Yes	£££	Weeks	This will effectively remove the source of the contamination, but is much less sustainable compared to other feasible options (excessive cost, take up of landfill space, transport issues, need to replace with clean material)	Yes – in conjunction with other options.
Materials Management (Excavation and Re-Use of Suitable Materials)	Yes	££	Weeks	Excavation and re-use of any suitable materials and potential re-use of treated materials at a suitable depth. Would need to be undertaken in association with a Materials Management Plan (MMP) prepared in accordance with the CLAIRE Definition of Waste Code of Practice and signed off by a Qualified Person.	Yes – in conjunction with other options.
Stabilisation and Solidification	N	££	Weeks to months	Mixing of cement/lime into soils to effectively bind contamination to minimise migration from soil to vapour and dissolved phases and reduce the mobility of contaminants in soils. Bench trials would be required to determine the most suitable binder formulation and to prove that solidification/stabilisation will be effective in reducing leachate concentrations. Option would still require a cover system to mitigate human health risks.	Yes, but discounted as it is considered there is no need for such an aggressive remediation technique based on the proposed development.
New water supply pipelines and utilities	Yes	£	Weeks	Barrier pipe will prevent leaching of contaminants into water supply. Barrier Pipe is highly durable and practical to install. A pipeline risk assessment will be required to confirm. Utilities to be placed within clean corridors to mitigate risks to future below ground maintenance workers.	Yes – in conjunction with other options.

Biological Methods					
Not considered to be relevant to the subject site.					
Chemical Methods					
Not considered to be relevant to the subject site.					
Physical Methods					
Hand Picking (of ACM)	Yes	£	Weeks	Hand picking visible ACM fragments using trained operatives during excavation works.	Yes – potentially feasible if visible fragments of ACM are encountered within the soils.
Passive Methods					
Not considered to be relevant to the subject site.					

4.2 Selected Remedial Options

Based on the above remedial options appraisal, the most appropriate approaches to the residual risks are listed below:

- Excavation and re-use of suitable soils and removal of unsuitable materials under a declared Materials Management Plan.
- Utilise barrier pipe for water feed (confirmation via a pipeline risk assessment required).
- Adopt hand picking of ACMs, if required, with appropriate off-site disposal of any identified ACM.
- Utilise a clean cover system in soft landscaped areas.

The options selected have been chosen because they are considered to be effective, can be carried out practically within the available time periods and are commercially viable.

Treatment of Japanese Knotweed and UXO aspects will be detailed under separate cover by respective specialists.

4.3 Site Remediation Requirements

The key requirements are summarised in the table below:

Source	Contaminants of Concern	Remediation Method	Further Details / Remedial Requirements
1 – Made ground	Metals, PAHs, asbestos	Combination of Materials re-use/disposal, adopt hand picking of ACM (if encountered) and Installation of Clean Cover System	Excavation and re-use of materials in suitable areas. Unsuitable materials to be removed from site. In soft landscaping areas, a cover system comprising "clean" validated topsoil/subsoil should be installed. A warning geo-membrane should also be installed at the base of the clean cover system due to the presence of asbestos.
2 – Made ground	PAHs	Barrier Pipe	Utilise barrier pipe for water feed unless risk assessment determines PE is suitable.

In addition to the specific remedial requirements listed in the tables above which are intended to mitigate the risks from known sources, it was recommended that a watching brief be maintained during the groundworks and construction for any evidence of contamination and BSL consulted for advice.

Detailed requirements are discussed in section 5.0 below. Note where the word "clean" is used from here on, the definition of this shall mean chemically suitable for the intended use.

5.0 DETAILED REMEDIAL REQUIREMENTS AND OTHER CONSTRAINTS

5.1 General

This section is intended to fulfil the requirements of LCRM Stage 3: Remediation and Verification.

All remedial works are to be overseen by suitably experienced and qualified site staff and a site watching brief will be in place alongside regular visits by a suitably qualified person to undertake the necessary verification works described.

The table below provides a summary of requirements in terms of the approximate order of works. It should be noted that the precise sequencing has not yet been confirmed by an appointed Contractor. This Remedial Strategy may also be subject to revision, dependant on the requirements of the regulators.

Task	Description
1.	**Pre-Commencement** Approval of this Remedial Strategy with the Local Authority, Warranty Provider and Environment Agency (EA) prior to site works commencing. Appointment of contractor for the works, who is to obtain appropriate permits, licences and approvals. Other appointments as per CDM requirements. Production and declaration of a Materials Management Plan (MMP) under the DoWCoP prior to any works commencing and/or confirmation of waste exceptions (e.g. U1) to be in place.
2.	**Site Clearance and Demolition Works** Treatment of Japanese Knotweed by a specialist. Clearance of site by UXO specialist. Demolition of buildings, removal of hardstanding, floor slabs and drainage runs. Hand picking of any visible ACM, if encountered, with off-site disposal. A watching brief should be maintained during demolition and clearance/soils strip for any previously unidentified contamination.
3.	**Excavation and Re-use of Site Won Material and Importation of Soils/Aggregates (Earthworks)** Turnover of all made ground with removal of obstructions. Excavation, screening, treatment (if required) and engineering / re-use of soils where suitable, to an appropriate Earthworks Specification in accordance with SHW Series 600. Hand picking of any visible ACM in soils, if encountered, with off-site disposal. Over excavation of service runs and installation of protectaline barrier pipe (or similar).
4.	**Installation of a Clean Cover System** Installation of “clean” validated cover system in soft landscaping areas where required to provide growing medium. Imported soils to be used as part of the cover layer should meet the chemical criteria outlined in Appendix A.
5.	**Verification and Reporting of Remedial Work** Validation of any remedial excavations and reporting. The landscaped areas where made ground is present will require depth validation. Collation of information relating to site clearance, chemical testing, any remedial works, remedial verification, material movements and waste transfer documentation where appropriate. A closure Verification Report will be required to close out the declared Materials Management Plan and submitted to CL:AIRE.

Task	Description
	Complete remedial validation report(s) in line with regulatory guidance and warranty provider requirements. The report(s) should be submitted to the Local Authority and warranty provider for approval following completion.

5.2 Demolition Works

Issues surrounding demolition of above ground buildings is outside the scope of this report, it is assumed that all existing above ground buildings and structures will be removed to ground level prior to remedial works commencing, following completion of any enabling works such as asbestos removal where present.

The excavation of all hardstanding areas, slabs, basement structures, relict foundations and similar below ground obstructions, will be undertaken with materials stockpiled and tested to determine their fate (on-site re-use or off-site disposal) in accordance with a Materials Tracking System.

All excavations should be suitably benched or otherwise supported for the duration of the works in accordance with relevant industry guidance.

Archaeological aspects should be considered by a specialist during demolition and earthworks, but are beyond the scope of this report.

5.3 Earthworks

General Considerations
Work procedures should be designed to minimise the risk of dust becoming airborne by suitable means, such as keeping the exposed soils damp or covered at all times. It is important that the control measures in place are sufficiently robust to prevent release of contaminated dust into the surrounding environment.

Watching Brief
A watching brief shall be maintained during the groundworks and construction for any evidence of contamination and BSL consulted for advice should any suspect materials or areas of hydrocarbon impaction be identified.

Geotechnical Considerations
Whilst geotechnical aspects are not specifically considered within this Remedial Strategy, all earthworks should be undertaken in accordance with an appropriate Earthworks' Specification.

If present, unsuitable materials (e.g. timber, metals and plastics) removed during screening should be segregated and stored in a suitable location prior to off-site disposal to a suitable licence facility. Where practicable materials should be re-used or recycled.

The contractor should be responsible for controlling groundwater entry into excavations.

Materials Management
Any works involving the movement of soils within the site boundary shall be done in accordance with a Materials Management Plan (MMP) under the CL:AIRE Definition of Waste Code of Practice (CoP). Further guidance is presented in Appendix B.

To implement the DoWCoP, there is a requirement to notify the Environment Agency and Local Authority of the intention to use the code of practice in principal, after which there is a 21-day notice period for their response.

In order to re-use soils under the DoWCoP, there are four key criteria that need to be met:

- The aims and objectives of the project meet the requirements of the Waste Framework Directive.
- The soils can be demonstrated to be suitable for use (backed up by chemical/geotechnical testing and assessment).
- There is certainty of use (i.e. materials tacking which should be in place as part of good site practice in any case).
- Quantity (the quantity of materials used should be known).

Information on existing site levels, proposed levels, volumes generated (e.g. foundation / drainage excavation arisings) would need to be known in order to complete the MMP.

If the DoWCoP is the chosen route, it is an absolute that the MMP should be in place and declared by a Qualified Persons (QP) before works commence, otherwise excavated soils could constitute an illegal deposit of waste and enforcement action could be taken by the EA and HMRC.

In regard to "clean" naturally occurring soils only that are to be re-used on their site of origin, these are covered by a Waste Framework Directive (WFD) exclusion. So long as the project can prove the four criteria (listed above) then permits or the DoWCoP are not required. However, many projects still use the DoWCoP to ensure compliance.

Re-use of soils containing asbestos should comply with the CL:AIRE publication 'Interpretation for Managing and working with Asbestos in Soil and Construction and Demolition Materials' (CAR-SOILTM) and CAR 2012.

In terms of the re-use of brick/concrete crush materials, the DoWCoP does cover aggregates, but only on the site of origin and the EA WRAP aggregate Quality Protocol might best apply to ensure quality standards.

Imported Materials and Materials for Re-use
Any soils or materials imported or to be re-used as part of the works should be tested for chemical compliance and suitability in line with the guidance stipulated in Appendix A and the proposed end use.

Any imported material should be approved by BSL and the Local Authority prior to being imported onto site.

Where feasible, imported topsoil should conform to the requirements of BS 3882:2015 (Specification for Topsoil and requirements for use), or as agreed with the client. Imported subsoil should also conform to the requirements of BS 38601:2013 (Specification for subsoil and requirements for use), or as agreed with the client.

In addition, all materials must be free from aggressive / invasive weeds (such as Japanese Knotweed and Giant Hogweed) and bulk vegetative growth.

Asbestos Impacted Soils
During the excavation, sorting and screening of soils, any easily identifiable asbestos containing material (e.g. asbestos cement sheeting tile etc) shall be removed by hand picking and disposed off-site to a suitably licensed waste facility by a suitably qualified and licensed contractor.

The reuse of excavated soils contaminated by asbestos should also be carried out in accordance with "Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance (shortened name CAR-SOILS™)" with work requirements assessed by a competent person in line with the Joint Industry Working Group (JIWG)

Decision Support Tool for CAR 2012 Work Categories (i.e. are the works notifiable or not and are they non-licenced or licenced).

The presence of asbestos within the ground will require a safe system of work to be set up on site to deal with the asbestos risk from the made ground. This may include, but be not limited to:

- Personal working in the vicinity of the ACM should be suitably trained and competent in line with CAR 2012.
- Careful segregation of stockpiles on site.
- Defining transport routes.
- Cleaning down of machinery in designated areas.
- Suitable PPE, RPE and decontamination unit for ground workers.
- Damping down of soils to prevent dust migration.
- Air quality reassurance monitoring (before/during/after works).

Note that a reduction in control methods is possible if natural factors are present (e.g. wet ground or raining).

An Asbestos Management Plan (AMP) should be produced to detail H&S requirements for working with asbestos on site.

Air Monitoring and Dust
Risks associated with the transport of soils that potentially contain asbestos fibres, such as dust emission, should be appropriately managed.

In the areas where asbestos has been identified where soils are to be disturbed, then it is recommended that boundary asbestos and dust monitoring should be undertaken before site works commence to establish baseline conditions. This monitoring should continue at points during earthworks to determine if during the works there is evidence of an increased risk of release of fibres to the air / surface soils.

Boundary air monitoring results during works shall be compared with acceptable maximum standards set by the HSE. For asbestos, these air monitoring procedures and limits are given in HSG 248 entitled "Asbestos: The analysts' guide for sampling, analysis and clearance procedures" and CAR 2012. The monitoring should be undertaken by a UKAS accredited laboratory/contractor. The limit used is governed by the levels stated in the above guidance documents and the accuracy of the testing used.

The proposed method uses the WHO fibre counting method with a limit of detection of 0.001 f/ml and a reporting limit of 0.01 f/ml. Should there be breaches of the 0.1 f/ml four hour control limit, then work will be stopped and a course of action agreed between the project team and the regulators (if deemed necessary).

Groundworkers should have appropriate personal UKAS accredited air monitoring to monitor for the presence of airborne asbestos fibres, along with access to a combination of suitable personal protective equipment (PPE) and respiratory protective equipment (RPE) for immediate use, if required.

Should elevated levels of airborne asbestos fibres be recorded during personal monitoring, the work item or area shall be suspended and the Principal Contractor Site Manager shall be immediately informed, who will consider if further mitigation measures are necessary. The Contractor will inform BSL, the client and the Local Authority within 24 hours of the incident, if deemed a requirement and agree measures, if necessary.

Re-use of Asbestos Impacted Soils
In terms of materials placement (i.e. re-use), if implemented, the following criteria will deliver a site that is suitable for use in terms of asbestos risk (applicable to the built environment only):

- Soils between finished ground level to 0.45m depth must be characterised by nil asbestos.
- Soils below 0.45m depth or directly beneath building plots (i.e. below hardstanding, floor slabs, etc) and adopted highways/pavements must be characterised by asbestos at or <0.001% w/w asbestos.
- For soils >1.00m below finished ground levels, asbestos in soils should be <0.1% w/w and providing that asbestos contaminated soils are placed below this depth, then it is considered that there is no risk to human health. Efforts should be made to remove any visible ACM, providing it is practical to do so and does not generate any increased level of risk.

These criteria have been used on similar sites to the satisfaction of the local regulatory authority.

Records of all activities undertaken, especially where soils containing 0.1% w/w to 0.001% w/w are placed below 1.00m, should be kept in a Health & Safety file for future reference, noting that this primarily applies to persons engaged in excavation works below 1.00m depth. CAT B training is likely to be required for operatives excavating below these depths, although the contractor should undertake their own risk assessments to confirm requirements.

Well Decommissioning
Existing monitoring wells to be decommissioned to remove potential pathways. Covers and pipe shall be removed, and the resultant annulus filled with bentonite grout or concrete in accordance with EA guidance. Photographic evidence of this exercise should be provided for the verification report.

Placement of 'Clean' Service Corridors
Given the presence of asbestos in soils, elevated concentrations of heavy metals and PAH's, service corridors should be placed by over-excavation and replacement of materials with "clean – i.e. chemically suitable for the intended use" validated backfill during the earthworks in accordance with the utility providers requirements.

This could be undertaken following bulk earthworks, but is likely to result in the further disposal of soils potentially containing asbestos and extra PPE requirements. There may also be increased costs associated with delays in utility authorities providing services.

A water pipeline risk assessment has not been carried out to date and it is assumed that "Protectaline" barrier pipe services will be required as per the remedial options appraisal, although the requirements of utility companies should be sought before earthworks commence.

Photographic evidence of installation of the clean corridors should be provided for the verification report.

UXO
The UXO desk study indicates the majority of the site is at Moderate UXO Risk.

It is recommended that a site-specific plan for the management of UXO risk is written for this site. This plan should be kept on site and be referred to in the event that a suspect item of UXO is encountered at any stage of the project. It should detail the steps to be taken in the event of such a discovery, considering elements such as communication, raising the alarm, nominated responsible persons etc.

It is recommended within the UXO report that there should be an UXO specialist presence on site to support shallow intrusive works. As a minimum precaution, all personnel working on the site should be briefed on the basic identification of UXO and what to do in the event of encountering a suspect item.

This should in the first instance be undertaken by a UXO Specialist. Posters and information on the risk of UXO can be held in the site office for reference.

5.4 Cover Layer

A cover system comprising "clean" validated topsoil/subsoil should be placed in proposed soft landscaped areas.

Imported soils to be used as part of the cover layer should meet the chemical criteria outlined in Appendix A.

It should be noted that the screening criteria and scenarios adopted within Appendix A are conservative, thus an exceedance of a contaminant will not necessarily deem the material to be unsuitable. Any exceedances detected and overall material suitability will be assessed on a case by case basis, with the results included and discussed in the Validation Report.

The installation of a clean cover system will break the pathway to human health from the heavy metal, PAH and asbestos contamination and act as a growing medium.

In accordance with Manchester City Council requirements, the cover layer in public open space (POS) soft landscaping areas should comprise (top down):

- Min 150mm "clean" validated topsoil; over
- 300mm "clean" validated subsoil; over
- Warning barrier membrane/geotextile.

For areas of proposed trees, a tree pit will need to be excavated and additional subsoil provided above the hard dig layer / membrane, further guidance over suitable thickness' should be obtained from a landscape architect.

Site drainage should be taken into consideration with the implementation of the clean cover layer. It is also essential to provide a structured, uncompacted and well-aerated soil profile for the successful establishment and subsequent growth of plants and grass. However, where heavy machinery and large volumes of soil are excavated and stored, soil structure can easily be destroyed by over-compaction, leading to poor drainage and failed garden planting. This can often be mitigated by careful site planning or rotavating the soils as required.

The above is subject to agreement with the Local Authority and the warranty provider, and requirements should be confirmed at the earliest opportunity.

5.5 Records

Accurate records and as-built drawings will need to be kept, updated and provided for all aspects of the remedial works as they progress.

The construction works should be devised in a way to allow the maximum re-use of site won materials adhering to current waste regulations. To allow this and demonstrate compliance with Waste Management Licensing Regulations the Contractor should maintain an accurate Materials Management Plan (MMP). These shall show the source, description, classification and placement location of all fill used on the site. The plans shall be revised regularly with archive versions maintained for future reporting purposes. The MMP should show the extent of any excavations undertaken on site.

5.6 Stockpile Management

Segregation of materials and stockpiles should be maintained, and accurate records kept to avoid the potential for cross contamination. Good site practice for stockpile management includes, but is not limited to:

- Damping down of the site surface, excavations and stockpiles to prevent the generation of dust (wind blown asbestos fibres can contaminate "clean" topsoil stockpiles potentially resulting in expensive disposal costs).
- Stockpiles sizes should be kept to a minimum to reduce 'wind whip' causing potentially hazardous material to be blown from the pile.
- Once at the intended size, stockpiles should be "sealed" to ensure no excess materials are placed and mixed into the stockpiled to prevent cross contamination.
- Clean, validated material proposed for re-use as part of the cover system should ideally be placed on a suitable polythene membrane or clean concrete hardstanding to prevent any cross contamination.
- Appropriate loading of plant to prevent spillages.
- Appropriate signage should be displayed so that site workers/visitors are aware of the intended use and are alerted to the potential hazards associated with the material to be stored on site.

Examples of good site practice for stockpile management are presented below:

Stockpile sealed and cordoned off with warning sign	Sheeting of contaminated materials

5.7 Testing

Prior to commencing any works the Contractor will submit to the Clients Representative (Suitably qualified Geo-environmental Engineers) details for the testing laboratories to be used together with their UKAS and MCERTS accreditations (as appropriate). The Clients Representative will approve the laboratories subject to them holding the relevant certifications. Alternatively, providing the Client's Representative is a suitably qualified Engineer, then they may attend site to obtain samples for appropriate testing.

Tests carried out by a laboratory without the approval of the Client's Representative will be rejected.

All samples will be taken in accordance with relevant guidance (e.g. BS 10175:2011+A2:2017).

The contractor is responsible for the testing of the physical properties of any imported or processed material to be used in the engineering works. This applies to both site won and any imported materials.

Site won material shall be tested to confirm its chemical suitability. Contaminated material for disposal should be tested to define the most economical disposal route. In addition, any material to be imported to the site shall be tested and its suitability demonstrated prior to it being brought to the site.

The geotechnical suitability of site-won materials will be confirmed before reuse, by appropriate earthworks testing, in accordance with an Earthworks Specification (preparation of which is outside the scope of this remedial strategy).

5.8 Permits

The appointed contractor will need to hold or obtain relevant waste permits or exemptions (where applicable) in accordance with the Environmental Permitting Regulations 2016 to carry out waste recovery, treatment and re-use activities on site. Alternatively, waste recovery and re-use operations shall be in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP), 2011 and an approved Materials Management Plan (MMP) declared under the DoWCoP by a Qualified Person (QP).

A crusher/screener will also require a waste permit or exemption. Aggregates should be processed in accordance with relevant WRAP Quality Protocol to produce a non-waste product.

It is the contractor's duty of care to ensure that any waste to be treated or disposed off-site is transported by a licenced waste carrier and that the waste facility is licenced, permitted or holds an appropriate exemption.

Evidence of the above should be maintained and provided on request along with any waste transfer or consignment notes for materials removed off-site.

5.9 Surface Water Runoff

The contractor should provide and maintain means to intercept surface run off in accordance with good site practice. Run-off from the site shall not be allowed to enter adjacent waterways or drainage gullies without the permission of the Drainage and Highway Authorities.

Surface waters from the site shall be discharged to the mains sewer under consent from the local Water Authority.

It should be noted that groundwater impacted by hydrocarbons may require some form of treatment prior to discharge, alternatively if only small amounts of water are encountered, this could be stored and removed to a suitable waste disposal facility.

5.10 Unexpected Contamination

If any unexpected contaminated materials are encountered by the contractor, then works should cease in that area and the contractor should consulted BSL for advice prior to any irrevocable action at the site.

Unrecorded Underground Storage Tanks
There is no evidence of former underground fuel storage tanks on site to date, however the procedure in the event of encountering unexpected and unrecorded tanks is detailed below. The same applies to the discovery of any significant/gross hydrocarbon contamination.

The Underground Storage Tanks (USTs) should be removed off site and the surrounding soils assessed. The following decommissioning procedure should be followed as a minimum prior to removal off-site:

- Remove liquid contents and dispose.
- Purge any vapours.
- Excavate USTs and cradle/bund.
- Cold cut tanks.

The same methodology should be applied to any associated fuel lines, interceptor and pumps.

As a minimum all free phase should be removed from the soil or groundwater. Skimmer pumps will be required to pump impacted groundwater into IBCs for offsite disposal. If a tanker is to be used, the contractor should ensure it is suitable for the intended use as VOC vapours may pose an explosive risk during pumping/transportation.

Potentially impacted soils from around the tanks (or area of discovered gross impaction) will be removed and stored in a sealed bunded area for testing and disposal (or re-use if feasible).

All excavations of contaminated soil plumes and treatment of groundwater should be carried out under the guidance and direction of a qualified and experienced geo-environmental engineer. Delineation of excavations should be assisted by measuring VOCs headspaces using a Photo-ionisation Detector to ensure that soils only warranting remediation are excavated.

The impacted area will be excavated and removed until clean faces and base are encountered. The sides and bases of excavations should be tested as per the requirements in Appendix A, with a minimum of 5 No. samples per excavation (i.e. sides and base).

Impacted soils surplus to requirements will be disposed off site to a suitably licensed facility.

All testing required by the receiving landfill will be scheduled and paid for by the Remediation Contractor. Results will be submitted to BSL for approval.

Soils unsuitable for re-use should be removed from site and shall either be excavated and immediately loaded onto a lorry for disposal to a suitable landfill facility or temporarily stockpiled on site for later removal. In the case of the latter, the stockpile should be located on an impermeable membrane in a bunded area and covered with an impermeable membrane at the end of each working day. Where soils are wet when excavated, adequate measures should be taken to ensure there is no surface run-off onto surrounding soils.

6.0 STAKEHOLDERS AND RESPONSIBILTIES

6.1 Key Stakeholders

A summary of the key project stakeholders is presented below (not exhaustive):

Client / Developer	Consultant / Engineer	Contractor	CDM Stakeholders	Regulators
Domis Construction Ltd	Brownfield Solutions Ltd (BSL)	Demolition, Remediation and Groundworks Contractors (Domis Construction Ltd)	Principal Contractor (Domis Construction Ltd) Principal Designer (TBC) Health and Safety Executive (HSE)	Manchester City Council (regulator - Human Health risk and planning consent) Environment Agency (EA) (regulator - controlled waters and waste r) Warranty provider (e.g. NHBC/LABC)

6.2 Client

The remediation works will come under the umbrella of CDM 2015 Regulations. The Client is responsible for formally appointing a Principal Designer and Principal Contractor, otherwise the Client assumes the role of Principal Designer. All pre-construction information will need to be made available to the appointed duty holders and sufficient time and resources allowed.

6.3 Consultant/Engineer (Client's Representative)

A suitably qualified Geo-Environmental Engineer/consultant should be appointed as the client's representative to oversee the works, who will have a visiting role throughout and provide advice when required.

They should be responsible for:

- Providing appropriate supervision of the remedial works (either part time or full time).
- Monitoring the works to ensure compliance with this strategy and specification.
- Audit testing of materials. (However, it is the responsibility of the contractors to demonstrate the suitability/acceptability and the compliance of the material with the specification).
- Approval of test results.
- Validation of the works.

They will maintain records of the works to include the following:

- Record sheets to include a summary of the activities.
- Aspects relating to Environmental Control or non-compliance with this strategy.
- Test Results.

Liaison will be carried out with relevant regulators prior to commencing on site. The design of the Remedial Strategy can be adapted to avoid unnecessary delays at a later date.

Validation information will be supplied to the Local Authority for approval in a Verification Report. The report will include relevant site records and stand as certification that the remedial works have been carried out in accordance with this strategy.

6.4 Contractor

The contractor appointed to oversee the development construction works should comply with the following regulations, guidance and legislation relating to the works:

- Environmental Protection Act 1990.
- Health and Safety Executive "Protection of Workers and the General Public during the Redevelopment of Contaminated Land", HS(G)66, HMSO 1991.
- Duty of Care Regulations 1991.
- Water Resources Act 1991.
- Water Industry Act 1991.
- Environment Act 1995.
- The Control of Substances Hazardous to Health Regulations 2002.
- Hazardous Waste Regulations.
- Control of Asbestos Regulations (CAR) 2012.
- Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance (shortened name CAR-SOIL™)".
- The Construction, Design and Management Regulations 2015.

The contractor should provide adequate supervision for all the site works. This shall include a suitably experienced Remediation Engineer or Site Manager who will validate the work and maintain records allowing preparation of a validation report for the works.

The appointed contractors will be responsible for maintaining all records in connection with the works.

Records shall include details of:

- All the material imported to the site (including volume, source and chemical composition).
- All the material exported from the site (including volume, destination and chemical composition).
- The size and extent of the remedial excavations (lateral extent and depth plotted on suitable plans).
- Any treatment undertaken.
- Details of the contractor's waste exemptions, if applicable.
- Discharge of any groundwater.

6.5 CDM Stakeholders - Health & Safety

The appointed Principal Contractor (PC) will need to produce a Construction Phase Plan for the work, prepare risk assessments and method statements. The PC will be responsible for the coordination of welfare and H&S matters on-site including sub-contractors.

The Principal Designer/Client will review the Construction Phase Plan and notify the local office of the Health and Safety Executive (HSE) of the works prior to commencing (via form F10). Unless otherwise agreed with the client, the table below provides a broad outline of the overall project team.

All works should be carried out in a manner that will safeguard all site employees. This should include but not be limited to; site induction for all staff and visitors, training/safety awareness training, issue of Personal Protective Equipment (PPE) and the provision of suitable welfare facilities.

Further advice is provided within HSE publication 'HSG 66 Protection of Workers and the General Public during Redevelopment of Contaminated Land'.

The works should be carried out in a manner to protect against damage to property or nuisance to property or persons on the site or within its immediate vicinity. Noise and dust issues should be considered. Members of the public should be excluded from the works areas and the contractor should maintain suitable security to ensure unauthorised persons cannot access the works.

Appropriate temporary protection and warning signs should be erected to warn of hazards that may result as a consequence of the works.

6.6 Regulators

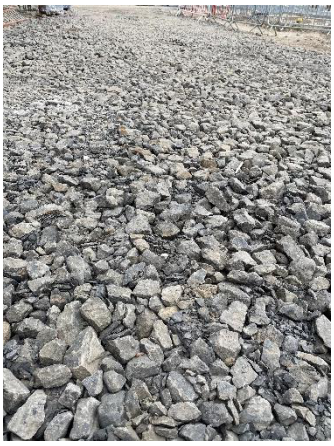
Implement the regulations and environmental standards set by government. The contents of this report will need to be agreed in advance of works with the regulators.

7.0 VERIFICATION PLAN

7.1 Clean Cover System

Prior to importing any soils, test results for the proposed import will be provided to the clients representative, alongside the confirmation of the source (greenfield/brownfield/recycled etc).

Once installed by the groundworks contractor, there is a requirement to provide evidence of the chemical suitability and depths of the clean cover system, with inspections to be carried out by a suitably qualified Geo-environmental Engineer in a randomly selected area of the soft landscaping areas. confirmatory photographs will be taken for inclusion in the validation report. An example of good practice for depth validation is provided below:

Containing staff, datum bar and photo board, clearly showing spoil and pit depth	Plot Overview
Evidence of Hard Dig Layer	**Evidence of Warning Membrane**
	

In areas of soft landscaping/public open space (POS), validation pits should be excavated at a frequency of circa one pit per 25m x 25m area of POS.

Minor variances in the thickness of individual soils layers cover may be tolerated during validation, provided the overall clean cover system is a minimum depth of 450mm to minimise soils mixing and includes an engineered element such as a warning membrane or hard dig layer. If the thickness is varied,

the topsoil layer should be a minimum thickness of 100mm in accordance with warranty provider standards.

If a warning geotextile is utilised, this should be sufficiently durable and robust for the lifetime of the development. If a hard dig layer is opted for, first generation clean quarried stone is generally preferred and this should be a minimum of 100mm thick.

Where made ground has been completely removed down to natural strata, the cover system as such is not required, however a "clean" topsoil/subsoil layer comprising a minimum of 100mm "clean" topsoil is still required to act as a growing medium with no obstructions within the top 450mm that would prevent plant growth (unless for instance that raised beds are adopted). Evidence of the removal of made ground soils down to natural strata will be required in such areas (visual inspection by an engineer with photos taken or survey data provided with photos from the contractor).

If the cover system is deemed to be insufficient, the groundworks contractor will be informed and advised on how much more material is needed for the cover system to be meet requirements, with a additional verification pits re-excavated after rectification to confirm that a sufficient thickness of soil is present.

7.2 Well Decommissioning

Wells should be decommissioned in accordance with EA guidance and backfilled with a low permeability material (i.e. concrete or bentonite). For decommissioned wells, photographic evidence should be provided of their removal and infilling.

7.3 Service Entries / Ventilation

Photographic evidence should be provided to show the presence of expanding foam in service entries and internal ventilation measures/air conditioning to provide additional lines of evidence for the above assigned level of risk at the site.

7.4 Contingency Planning

Should significantly contaminated material be encountered during the development (e.g. gross hydrocarbon impaction) then a suitably qualified geo-environmental engineer should be consulted for advice. Measures may include the excavation of the material which should stockpiled on 2000-gauge polythene sheeting, sampled and tested for an appropriate range of contaminants.

Once the laboratory analysis of the material is available, an assessment will be undertaken to determine whether it will need to be disposed off-site to a suitable facility or if the materials could be retained on site re-used with or without some form of treatment within regulatory requirements.

Depending on the nature of any such impact it may be necessary to undertake validation testing of the excavation faces in order to demonstrate that no such materials are left in-situ.

Should gross asbestos contamination be identified, then all works should cease until an Asbestos Management Plan is put into place (if not done so already) and remedial requirements are confirmed by a suitably qualified geo-environmental engineer. Note remedial works under such instances may be classified as either licenced or non-licenced and may be notifiable to the Health and Safety Executive (HSE). Works would need to comply with CAR 2012 and CARSOILS™.

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DRAWINGS

GENERAL NOTES:

1. REFER TO DRAWING BRW-REN-ZZ-XX-DR-A-00010 AND 5-60011 FOR GENERAL NOTES.

COLUMN SETTING OUT
ALL COLUMNS TO BE LOCATED CONCENTRICALLY ON GRIDLINES UNLESS NOTED OTHERWISE

FAÇADE SUPPORT
FOR FACADE PRINCIPLES, INCLUDING BRICKSLIP SYSTEM, MASONRY SUPPORT, SECONDARY STEEL WORK ETC, REFER TO FACADE CONSULTANTS INFORMATION

CAST-IN CHANNELS & FIXINGS
FOR ALL CAST-IN CHANNEL AND FIXINGS REQUIREMENTS, INCLUDING SPECIFICATION AND DETAILED SETTING OUT, REFER TO CLADDING CONTRACTORS, LIFT MANUFACTURES AND SAUNTRADE DRAWINGS.

WHERE CAST-IN CHANNEL AND FIXINGS ARE INDICATED ON THE RENAISSANCE DRAWINGS, THESE ARE INDICATIVE AND FOR COORDINATION PURPOSES ONLY, REFERENCE SHOULD BE MADE TO THE RELEVANT CONTRACTOR DRAWINGS FOR DETAILED REQUIREMENTS.

FLOOR LEVEL - TOLERANCE & SURFACE REGULARITY
THE CONCRETE FRAME IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE RATION STRUCTURAL CONCRETE SPECIFICATION TOLERANCES. IN ADDITION FLOOR SLABS WILL DEFLECT AT MID-SPAN UP TO SPAN/360. WHERE FLOOR FINISHES REQUIRE AN ENHANCED SURFACE REGULARITY (E.G. SR1, SR2 OR SR3) ALLOW FOR SELF LEVELLING SCREED OR COMPOUND.

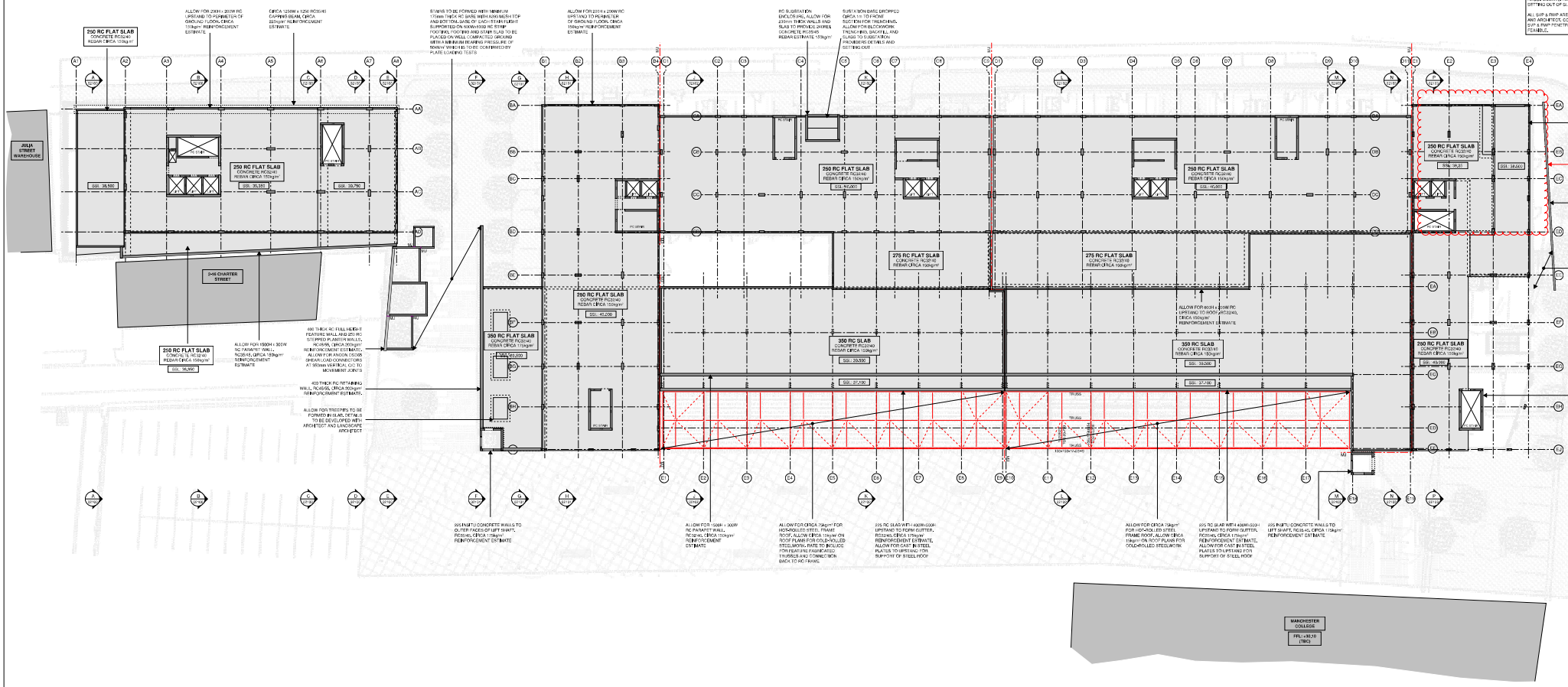
SERVICE PENETRATIONS & RISER
ALL SERVICE OPENING TO THE BUILDING SERVICES CONSULTANTS REQUIREMENTS, REFER TO THE ARCHITECTS DRAWINGS FOR DETAILED SETTING OUT OF SLAB EDGE AND SERVICE OPENINGS.

ALL SVP & PWP ARE TO BE SET OUT BY THE BUILDING SERVICES CONSULTANT AND ARCHITECT. CONTRACTOR TO ALLOW FOR CASTING FIRE COLLARS TO ALL SVP & PWP PENETRATION AND ALL OTHER SERVICE OPENINGS WHERE REQUIRED.

ROOF & TERRACE LEVEL SLAB DEFLECTION
THE REINFORCED CONCRETE FRAME WILL DEFLECT UNDER IT'S OWN SELF-WEIGHT, FINISHES AND PLANT LOADING, COMPOUNDING SLAB DEFLECTIONS AT MIDSPAN BETWEEN COLUMNS WILL BE UP TO SPAN/250. FOR THE ARRANGEMENT SHOWN MIDSPAN DEFLECTION COULD BE IN THE RANGE OF 15~20mm.

IF THE ARCHITECT, ROOFING CONTRACTOR, OR ROOFING SUPPLIER REQUIRE A FLAT ROOF WITH NO NEGATIVE FALLS THEN THIS SHOULD BE FORMED WITH THE TAPERED ROOF INSULATION AND AGREED BETWEEN THE ABOVE PARTIES AND THE MAIN CONTRACTOR, ALTERNATIVELY THE SLAB CAN BE LAID TO FALLS, FALLS TO BE AGREED WITH THE ARCHITECT

TOWNHOUSE STAIRS
ALLOW FOR FEATURE STAIRS TO TOWNHOUSES TO ARCHITECTS DESIGN INTENT AND CONSULTANT SUPPLIERS DESIGN AND DETAIL, INCLUDING FIXINGS BACK TO PRIMARY RC FRAME



BLOCK A

RC60/60 (85% GGBS)
350kg/m³ REBAR ESTIMATE — **TYP INTERNAL COLUMN**

RC50/60 (85% GGBS)
180kg/m³ REBAR ESTIMATE — **TYP EDGE COLUMN**

RC40/50 (40% GGBS) - SLOW SLIP WALLS
RC40/50 (85% GGBS) - JUMPED WALLS
225kg/m³ REBAR ESTIMATE — **SHEAR & CORE WALLS**

BLOCK B, C, D & E

RC60/60 (85% GGBS)
350kg/m³ REBAR ESTIMATE — **TYP INTERNAL COLUMN**

RC60/60 (85% GGBS)
350kg/m³ REBAR ESTIMATE — **TYP EDGE COLUMN**

RC40/50 (40% GGBS) - SLOW SLIP WALLS
RC40/50 (85% GGBS) - JUMPED WALLS
225kg/m³ REBAR ESTIMATE — **SHEAR & CORE WALLS**

RC COLUMNS
REFER TO PLANS FOR SIZES THROUGHOUT THE BUILDING.
ALLOW RC60/60 CONCRETE GRADE FOR ALL COLUMNS WITH CIRCA 350 kg/m³ REINFORCEMENT ESTIMATE.
SIZES TO BE REVIEWED AT STAGE 2/3 AND 4 AND SUBJECT TO ADJUSTMENT TO SUIT STAGE2 CONSTRUCTION, AXIAL SHORTENING ASSESSMENT AND INPUT FROM FACADE CONSULTANT ON ALLOWABLE MOVEMENTS.

PERIMETER COLUMN SIZES AT GROUND FLOOR ADJACENT TO HIGHWAYS, MAY HAVE TO INCREASE IN SIZE TO REMIT ACCIDENTAL VEHICLE IMPACT LOAD, TBC AT STAGE 3

KEY

MJ — STRUCTURAL MOVEMENT JOINT TO BE CONTINUOUS THROUGH FRAME INCLUDING ALL ARCHITECTURAL FINISHES AND BUILDING ELEMENTS WITH THE EXCEPTION OF THE MOVEMENT JOINTS AT ROOF LEVEL. ALLOW FOR ±10mm HORIZONTAL MOVEMENT (OPENING & CLOSING), +/-5mm HORIZONTAL MOVEMENT (BUILDING) AND +/-10mm VERTICAL MOVEMENT (SETTLEMENT & DEFLECTIONS)

RIBA STAGE 2-

THESE DRAWINGS ARE INTENDED TO COMMUNICATE THE INITIAL CONCEPT FOR THE PROPOSED BUILDINGS AND ARE APPROPRIATE FOR RIBA STAGE 2- (CONCEPT). DUE TO CLIENTS PROGRAMME THESE PROPOSALS HAVE BEEN PRODUCED WITH LIMITED INPUT FROM THE WIDER DESIGN TEAM AND ARE BASED ON WORK IN PROGRESS ARCHITECTURAL FLOOR PLANS AND PLANNING DRAWINGS.

ALL STRUCTURAL SIZES ARE INDICATIVE ONLY AND TO ASSIST WITH HIGH LEVEL COSTING BY THE PROJECT QUANTITY SURVEYOR AND CONTRACTOR. ALL STRUCTURAL SIZES AND REINFORCEMENT RATES ARE INDICATIVE AT THIS STAGE AND ARE SUBJECT TO CHANGE AS THE DESIGN DEVELOPS THROUGH RIBA STAGES 2 (CONCEPT DESIGN, STAGE 3 (SPATIAL CO-ORDINATION) AND STAGE 4 (TECHNICAL DESIGN).

A DESIGN CONTINGENCY OF 15-20% IS RECOMMENDED TO ALLOW FOR DESIGN DEVELOPMENT DURING RIBA STAGE 2a- 3 AND STAGE 4 (TECHNICAL DESIGN) AND TO REFLECT INPUT FROM CONTRACTOR DESIGNED PACKAGES.

SCALE 1:200

Rev	Description	Date	By	Chkd
P01	RIBA STAGE 2- INITIAL CONCEPT	24.04.23	PC	KG

renaissance

Renaissance Associates Ltd
Canvas Warehouse
77 Dale Street
Manchester
M1 2HG

client
BRWRY
MANCHESTER

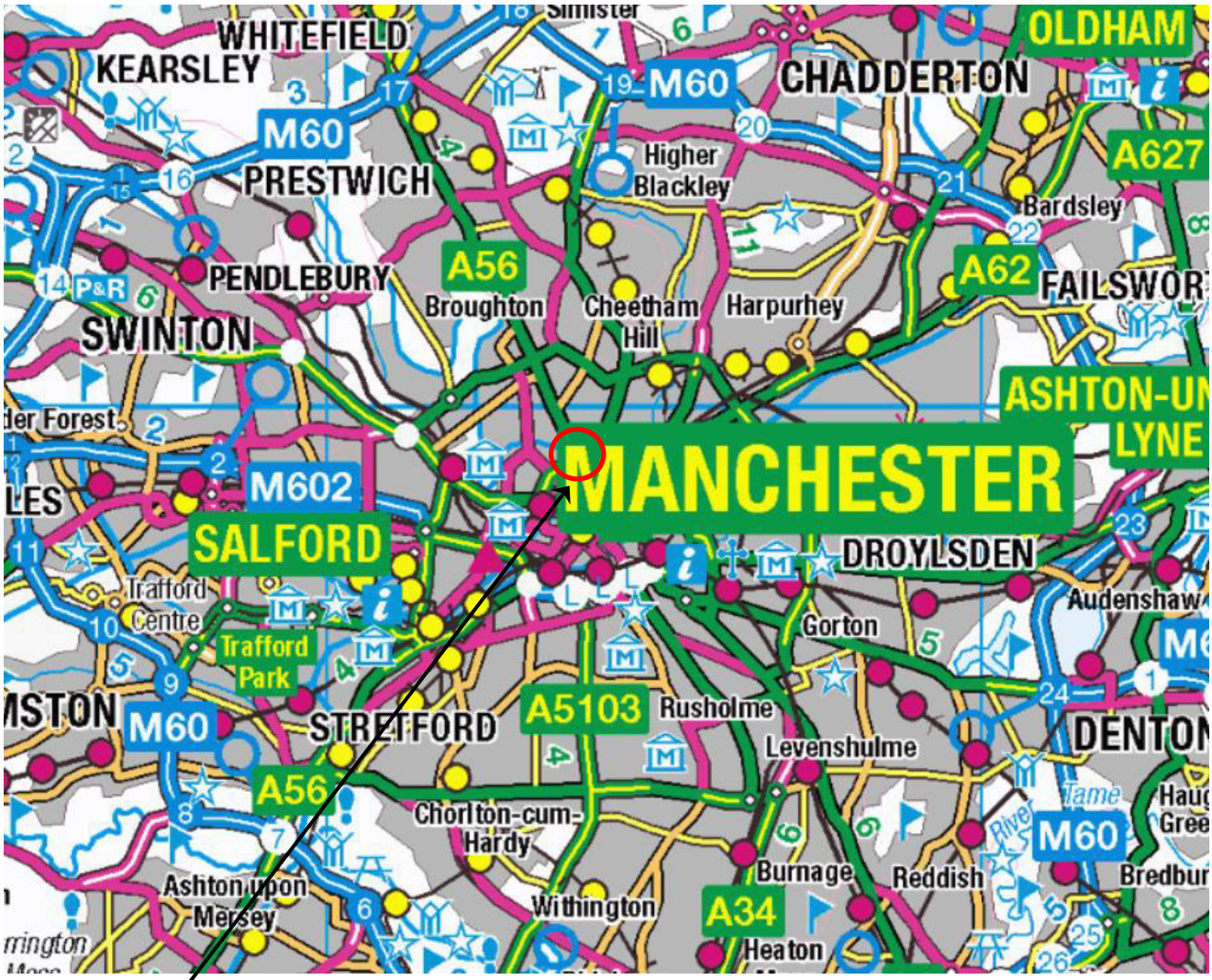
Drawing Title
SITE WIDE
GROUND FLOOR PLAN

Status
RIBA STAGE 2-

Size	Date	Drawn by	Designed by	Checked by
A0	FEB 23	PC	-	KG

Scale	Project No.
1:200	2211-T-1

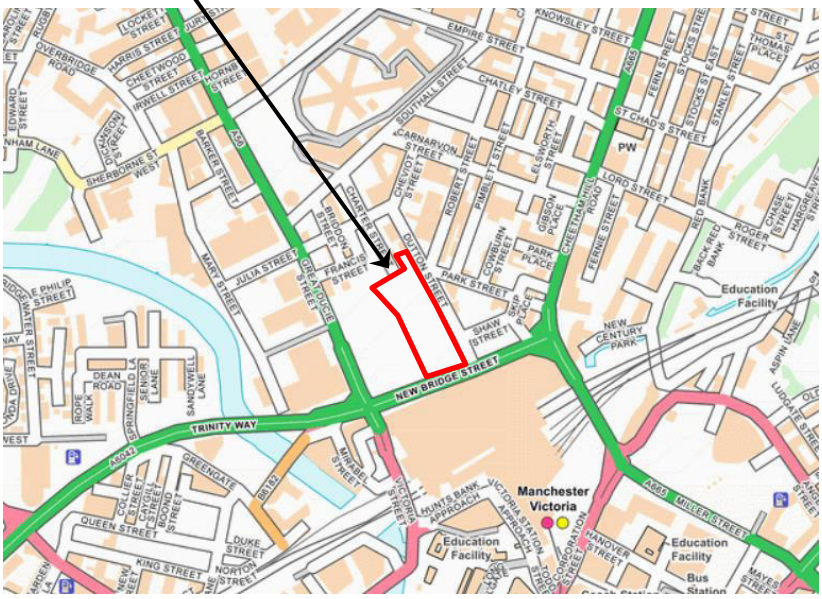
Project	Originator	Volume	Level	Type	Role	Category/Number	Suffix
BRW-REN-ZZ-00-DR-S-01100-P01							



SITE LOCATION

NEAREST POSTCODE: M3 1LD

SITE ENTRANCE WHAT3WORDS: ///TITLE.MILE.SPAN



REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

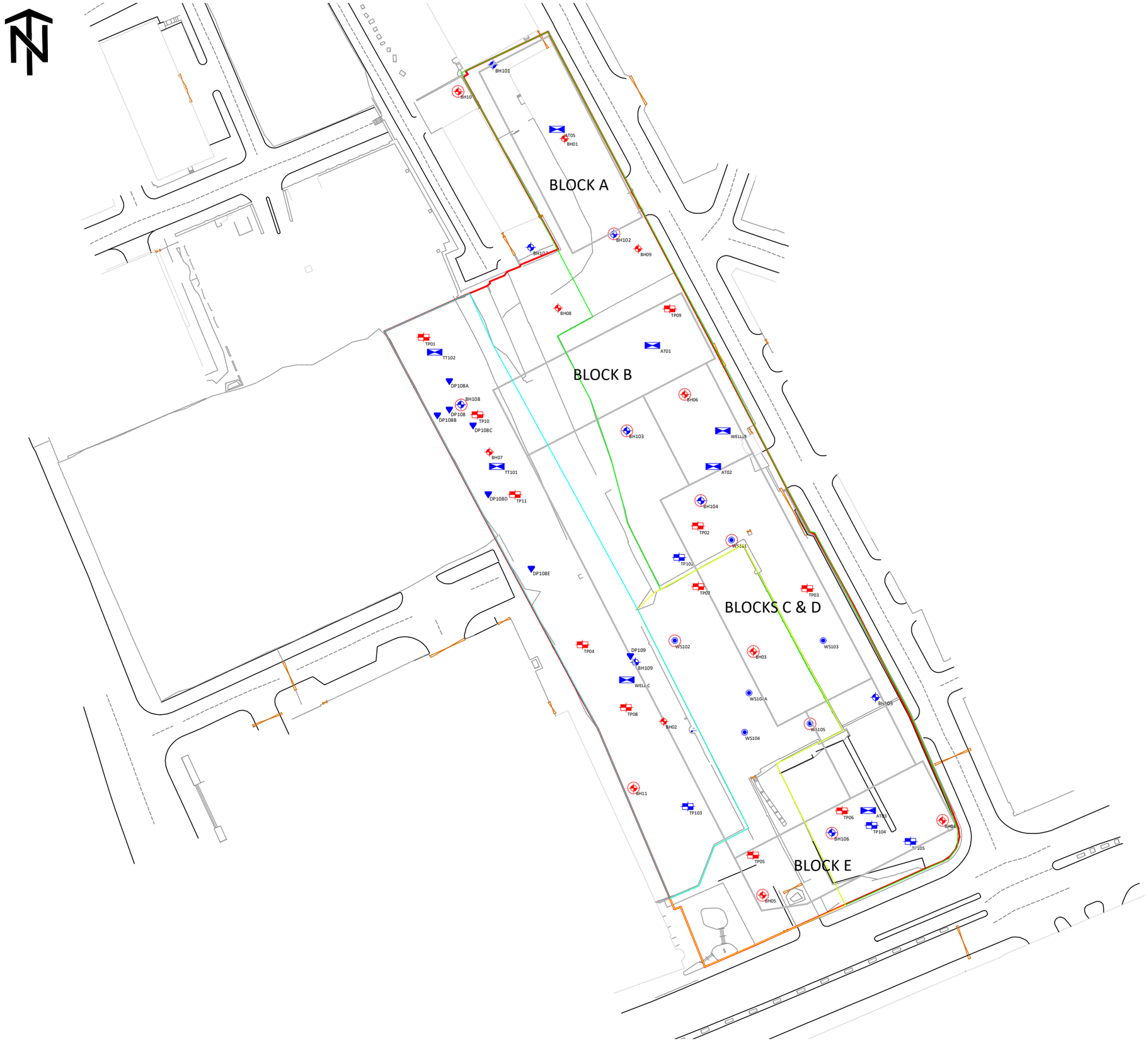
CLIENT
DOMIS CONSTRUCTION LTD

PROJECT TITLE
BRWRY SITE, NEW BRIDGE STREET, MANCHESTER

DRAWING TITLE
SITE LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C5313/01	-	NTS	22/03/23

DRAWN BY	CHECKED BY
SD	NS



KEY	
	APPROXIMATE SITE BOUNDARY
	AREA A
	AREA B
	AREA C
TPXXX	TRIAL PIT
TTXXX	TRIAL TRENCH
WSXXX	WINDOW SAMPLE BOREHOLE
BHXXX	CABLE PERCUSSIVE / ROTARY BOREHOLE
DPXX	DYNAMIC PROBE
BHXX	GEA CABLE PERCUSSIVE / ROTARY BOREHOLE (2018)
TPXX	GEA TRIAL PITS (2018)
	BOREHOLE INSTALLATION

NOTES

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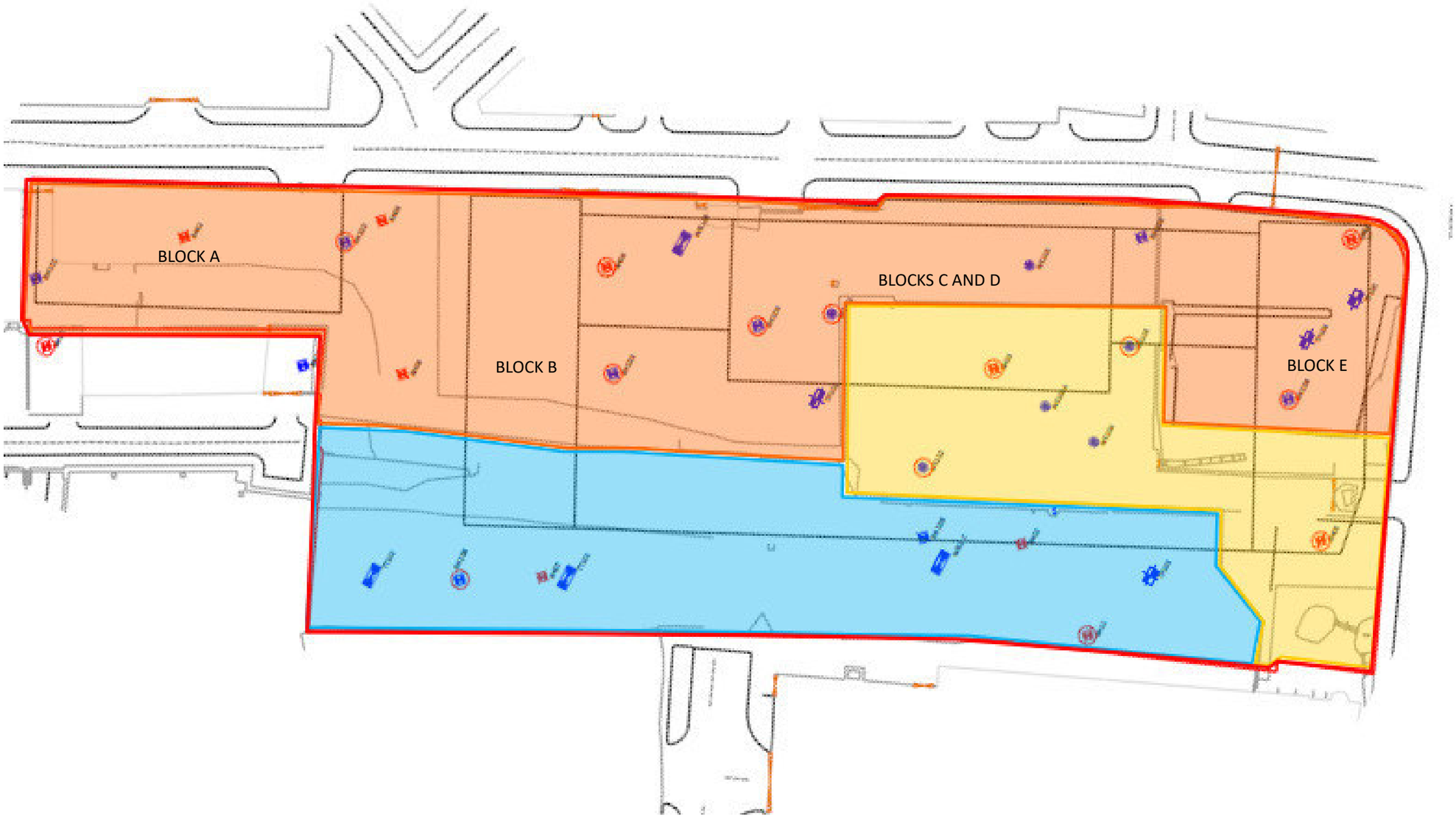
PROJECT TITLE
BRWRY, MANCHESTER

DRAWING TITLE
EXPLORATORY HOLE LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C5313/03	-	NTS	27.04.2023

DRAWN BY	CHECKED BY
MB	NS



KEY

- APPROXIMATE SITE BOUNDARY
- AREA A
- AREA B
- AREA C

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
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REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

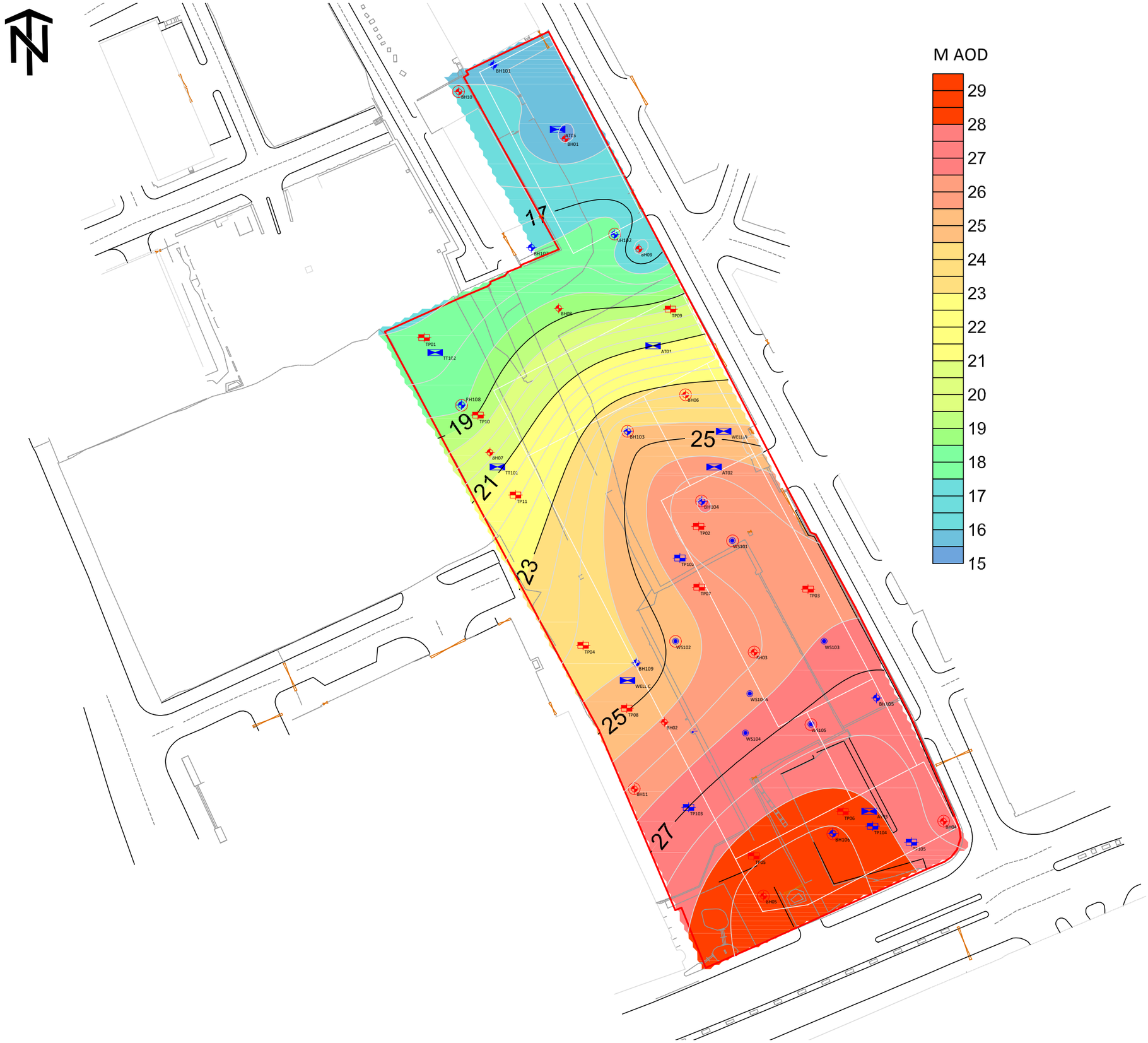
CLIENT
DOMIS CONSTRUCTION LTD

PROJECT TITLE
BRWRY, MANCHESTER

DRAWING TITLE
SITE AREA PLAN

DRAWING No.	REVISION	SCALE	DATE
C5313/04	-	NTS	25/04/23

DRAWN BY	CHECKED BY
SD	NS



KEY	
	APPROXIMATE SITE BOUNDARY
	AREA A
	AREA B
	AREA C
TPXXX	TRIAL PIT
TTXXX	TRIAL TRENCH
WSXXX	WINDOW SAMPLE BOREHOLE
BHXXX	CABLE PERCUSSIVE / ROTARY BOREHOLE
DPXX	DYNAMIC PROBE
BHXX	GEA CABLE PERCUSSIVE / ROTARY BOREHOLE (2018)
TPXX	GEA TRIAL PITS (2018)
	BOREHOLE INSTALLATION

NOTES

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BROWNFIELD SOLUTIONS LTD

CLIENT

DOMIS CONSTRUCTION LTD

PROJECT TITLE

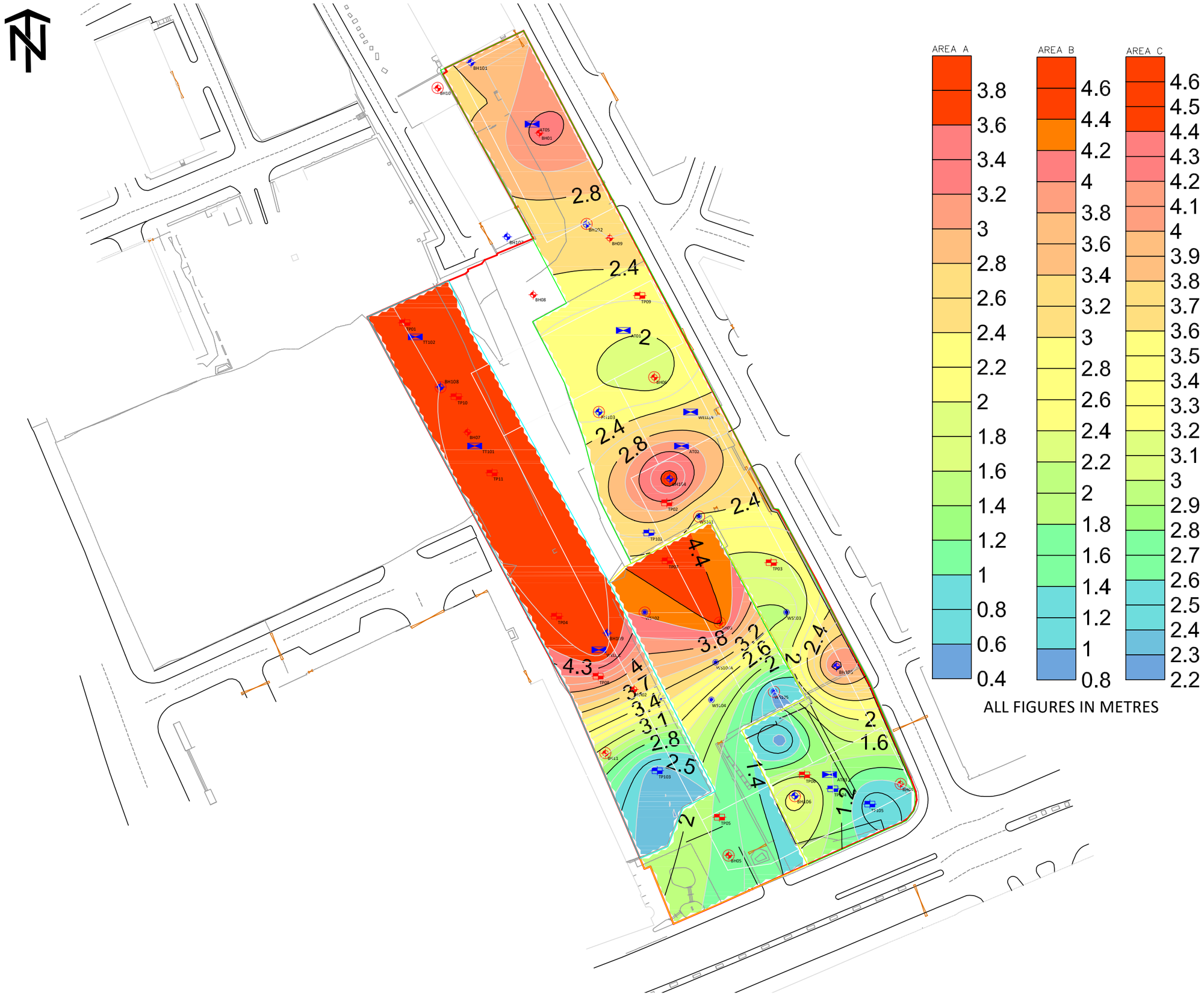
BRWRY, MANCHESTER

DRAWING TITLE

DEPTH TO BEDROCK (MAOD)

DRAWING No.	REVISION	SCALE	DATE
C5313/05	-	NTS	25.04.2023

DRAWN BY	CHECKED BY
JM	NS



KEY	
	APPROXIMATE SITE BOUNDARY
	AREA A
	AREA B
	AREA C
TPXXX	TRIAL PIT
TTXXX	TRIAL TRENCH
WSXXX	WINDOW SAMPLE BOREHOLE
BHXXX	CABLE PERCUSSIVE / ROTARY BOREHOLE
DPXX	DYNAMIC PROBE
BHXX	GEA CABLE PERCUSSIVE / ROTARY BOREHOLE (2018)
TPXX	GEA TRIAL PITS (2018)
	BOREHOLE INSTALLATION

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
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REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD

CLIENT
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PROJECT TITLE
BRWRY, MANCHESTER

DRAWING TITLE
MADE GROUND THICKNESS PLAN (M)

DRAWING No.	REVISION	SCALE	DATE
C5313/06	-	NTS	27.04.2023

DRAWN BY	CHECKED BY
JM	NS

APPENDIX A

Chemical Specification for Soils

BROWNFIELD SOLUTIONS LTD

Quality Control Methodology for Imported and Re-used Soils

Prior to Importation and Re-use

Reliable testing results should be provided, or samples should be obtained at the source and tested prior to either importation to the subject site or re-use on site of origin as early as possible.

The frequency and scope of testing will vary depending on the source, the required testing for possible sources is provided below. These rates are based on professional judgement and acceptance of similar criteria used on similar sites to the satisfaction of the local regulatory authority. Results should be compared to the acceptance criteria also with this appendix.

Material Use	Testing Frequency*	Suite of Analysis					
		1	2	3	4	5	6
Topsoil							
Greenfield Source including Site Won (Top 600mm)	*1 per 50m^3	■	■				
Brownfield/Recycled Source including Site Won (Top 600mm)	**1 per 50m^3	■	■	■			
Subsoil							
Greenfield Source (Top 600mm)	*1 per 150m^3	■	■				
Brownfield/Recycled Source (Top 600mm)	**1 per 150m^3	■	■	■			
Site Won (Top 600mm)	*1 per 150m^3	■	■	■			
First Generation (i.e. quarried sand)	No testing required. Certificate of material provenance is required.						
Physical Stone Break Layer							
First Generation (i.e. quarried stone)	No testing required. Certificate of material provenance is required.						
Site Generated / Imported 6F2	*1 per 500m^3	■	■	■			
General Fill* **							
Site Generated / Imported 6F2	*1 per 1000m^3	■	■				
Site Won Made Ground	*1 per 250m^3						■
	*1 per 1000m^3	■	■	■			
Site Won Natural Arisings on Brownfield Site	*1 per 1500m^3	■	■				■
Site Win Natural Arisings on Greenfield Site	*1 per 2000m^3	■	■				

Notes

1 – BSL Default Suite - *Arsenic, Cadmium, Chromium (total and hex), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons (PAH 16), water soluble sulphate (2:1 Extract), soil organic matter, and pH.*
2 – Asbestos ID (and Quantification if detected).
3 – TPH Analysis - *Speciated Total Petroleum Hydrocarbons (TPH CWG) including BTEX and MTBE.*
4 – VOC Analysis - *Volatile Organic compounds (VOCs) by GC-MS (ex TIC).*
5 – SVOC Analysis - *Semi-Volatile Organic compounds (SVOCs) by GC-MS (ex TIC).*
6 – Visual Inspection & on-site screening for VOC using calibrated PID.

* - Minimum of 3 samples per source.
** Minimum of 6 samples per source.
***To be used at depths >600mm bgl or below building/hardstanding.

The testing should be undertaken at a UKAS accredited laboratory and be MCERTS accredited and all results should be below existing residential guideline values which are presented in Appendix A.

Topsoil/Subsoil

The above specification is to determine if material is chemically clean, for suitability as a growing medium reference should be made to BS3882:2015 Specification for Topsoil and BS 8601:2013 Specification for Subsoil and Requirements for Use.

In addition to the above sampling frequencies and testing, all imported topsoil/subsoil should also confirm to the following criteria:

- Have a maximum stone size of 75mm.
- Be clean and free of foreign debris including building waste materials or contaminants e.g. brick, glass, asbestos and plasterboard, etc.

For imported soils, approval should be obtained from the Local Authority prior to importing to site.

Site Won Crushed Hardcore/Concrete (for use below building/hardstanding only)

In addition to the above sampling frequencies and testing; for re-use of hardcore/concrete (Grade 6) on the site of origin, BSL proposes the following inspection criteria:

- No visual contamination (oil staining etc).
- Limited deleterious material (organics, wood, etc).
- Limited metal.
- No visible asbestos containing material (ACM).
- Quantifiable Asbestos at or <0.001 w/w%.

Production of Grade 6 materials should be done under WRAP quality protocols or similar. Inspections and sampling would need to be carried out by a qualified geo-environmental engineer. For geotechnical performance, reference should be made to Series 600 Earthworks Guidance.

If the above criteria for asbestos is exceeded, then further consideration and assessment will be required. Works would need to be undertaken in compliance with the Control of Asbestos Regulations (CAR) 2012 and an Asbestos Plan of Works may be required.

Post Importation

The imported soils should be inspected on site to confirm it is the same material inspected at source and it is suitable for use. Once imported to site, tests should also be undertaken to confirm the batch is suitable prior to use and has not been contaminated in transit.

A management plan should be in place on site for storage and transportation. The material should be stockpiled separately and well segregated on site to prevent cross contamination in accordance with good site practice.

Accurate records of movement of soils should be kept in order to be incorporated in the final verification report.

Approval should be obtained from the Local Authority prior to use on site.

Validation and Verification Report

Site
A final verification report should be issued to the Local Authority/Warranty Provider (e.g. NHBC) detailing records of the re-use and importation of soils, alongside their use on the site.

Cover Layer
Once the chemical suitability of soils used for a cover system in soft landscaping and garden areas has been confirmed, the material can be placed in these areas.

The depth of the cover layer should be recorded, and photographs taken as evidence to be issued to the Local Authority/warranty provider in the verification report.

Approval for the placement of the cover layer should be obtained from the Local Authority/Warranty Provider.

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Human Health Remediation Targets

Source	Contaminant	Unit	Import and Re-use in Soft Landscaped Areas <450mm; Based on human health without homegrown produce (1% SOM)	Import and Re-use in POS areas and below hardstanding >450mm Criteria based on Human health - POS resi (1%SOM)
LQM S4UL	Arsenic	mg/kg	40	79
LQM S4UL	Cadmium	mg/kg	85	120
LQM S4UL	Chromium (III)	mg/kg	910	1500
LQM S4UL	Chromium (VI)	mg/kg	6	7.7
LQM S4UL	Copper	mg/kg	7100	12000
C4SL	Lead	mg/kg	330	760
LQM S4UL	Mercury, Elemental	mg/kg	1.2	16
LQM S4UL	Nickel	mg/kg	180	230
LQM S4UL	Selenium	mg/kg	430	1100
LQM S4UL	Zinc	mg/kg	40000	81000
LQM S4UL	Phenol (total)	mg/kg	750	760
LQM S4UL	Acenaphthene	mg/kg	3000	15000
LQM S4UL	Acenaphthylene	mg/kg	2900	15000
LQM S4UL	Anthracene	mg/kg	31000	74000
LQM S4UL	Benz(a)anthracene	mg/kg	11	29
LQM S4UL / DEFRA C4SL	Benzo(a)pyrene	mg/kg	3.2	5.7
LQM S4UL	Benzo(b)fluoranthene	mg/kg	3.9	7.1
LQM S4UL	Benzo(ghi)perylene	mg/kg	360	640
LQM S4UL	Benzo(k)fluoranthene	mg/kg	110	190
LQM S4UL	Chrysene	mg/kg	30	57
LQM S4UL	Dibenz(a,h)anthracene	mg/kg	0.31	0.57
LQM S4UL	Fluoranthene	mg/kg	1500	3100
LQM S4UL	Fluorene	mg/kg	2800	9900
LQM S4UL	Indeno(1,2,3,cd)pyrene	mg/kg	45	82
LQM S4UL	Naphthalene	mg/kg	2.3	4900
LQM S4UL	Phenanthrene	mg/kg	1300	3100
LQM S4UL	Pyrene	mg/kg	3700	7400
LQM S4UL	TPH Aliphatic EC 5 - 6*	mg/kg	42	570000
LQM S4UL	TPH Aliphatic EC 6 - 8*	mg/kg	100	600000
LQM S4UL	TPH Aliphatic EC 8 - 10*	mg/kg	27	13000
LQM S4UL	TPH Aliphatic EC 10 - 12*	mg/kg	130	13000
LQM S4UL	TPH Aliphatic EC 12 - 16*	mg/kg	1100	13000
LQM S4UL	TPH Aliphatic EC 16 - 35*	mg/kg	65000	250000
LQM S4UL	TPH Aliphatic EC 35 - 44*	mg/kg	65000	250000
LQM S4UL	TPH Aromatic EC 5 - 7*	mg/kg	370	56000
LQM S4UL	TPH Aromatic EC 7 - 8*	mg/kg	860	56000
LQM S4UL	TPH Aromatic EC 8 - 10*	mg/kg	47	5000
LQM S4UL	TPH Aromatic EC 10 - 12*	mg/kg	250	5000
LQM S4UL	TPH Aromatic EC 12 -16*	mg/kg	1800	5100
LQM S4UL	TPH Aromatic EC 16 - 21*	mg/kg	1900	3800
LQM S4UL	TPH Aromatic EC 21 - 35*	mg/kg	1900	3800
LQM S4UL	TPH Aromatic EC 35 - 44*	mg/kg	1900	3800
LQM S4UL	Benzene	mg/kg	0.38	72
LQM S4UL	Toluene	mg/kg	880	56000
LQM S4UL	Ethyl Benzene	mg/kg	83	24000
LQM S4UL	Xylene - o	mg/kg	88	41000
LQM S4UL	Xylene - m	mg/kg	82	41000
LQM S4UL	Xylene - p	mg/kg	79	41000
CL:AIRE 2010	MTBE (methyl tert-butyl ether)	mg/kg	49	49
NA	Asbestos (No visual ACM)	% w/w	Nil	0.001% *
pH	BS3882	pH Units	NA	5 - 8.2

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See LQM/CIEH S4ULs Human Health Risk Assessment document for notes regarding derivation.

Criteria for PAH and TPH assumes an SOM of 1%.

*Soil matrix should contain no free product.

All imported material to have chemical concentrations less than the above levels for the site, with the exception of pH which is a range.

Test results to be provided to the engineer prior to placing soils, where appropriate.

All tests result to be undertaken by a UKAS Laboratory holding accrediation for the relevant tests.

Also see Section 5.3 of Remedial Strategy for Asbestos Placement Depths.

APPENDIX B

BSL Guidance – Re-use and Disposal of Waste

Re-Use Of Waste - Guidance Note

Definition of Waste
The Environment Agency considers waste to be *"...any material that is discarded, or intended to be discarded..."* This includes any soil from trenches, footing, site strip etc. It is no longer required in its original location, therefore it is considered to be waste.

CL:AIRE: Code of Practice
Where materials are excavated for construction purposes, wherever possible these should be retained on site for engineering purposes if they are suitable for use. This can be implemented under the CL:AIRE "Development Industry Code of Practice for the Definition of Waste" (CL:AIRE DoWCoP), also commonly referred to as a "Materials Management Plan".

The developer/contractor is advised to complete all works under the DoWCoP.

Potential scenarios where soils may be able to be re-used:

- Material capable of being used in another place on the same site without treatment.
- Material capable of being used in another place on the same site following ex-situ treatment on site.
- Material capable of being used in another development site without treatment (Direct Transfer).
- Material capable of being used in another development site following ex-situ treatment on another site eg Hub site.

The Code of Practice requires 4 No. Factors to be addressed:

1. Protection of human health and protection of the environment.
2. Suitability of use, without further treatment.
3. Certainty of use.
4. Quantity of material.

In order to satisfy these requirements the following are required:

i) Consultation/approval with Local Authority & Environment Agency to confirm they have no objections to the proposed re-use of waste soils, or the risk assessments for the site.
ii) Risk Assessments to demonstrate that the site does not present an Environmental Hazard.
iii) Remediation Strategy for contaminated sites (or Design Statement for non-contaminated sites).
iv) Materials Management Plan (MMP) which details material generated stockpiles and the end use.
v) Volume calculations.
vi) Planning permission for the development.
vii) Contractual details to be clear, regarding who steps in is a contractor goes into administration/liquidation.

The use of the CoP is effectively industry regulated, there is a requirement to appoint an independent Qualified Person (QP) who checks all the requirements have been met and registers the documentation with the Environment Agency. This person must not have had any involvement with the preparing of the risk assessments or remedial strategy on the site.
Soils which require treatment on site (eg bioremediation, stabilisation) will require an Environmental Permit for treatment, together with justification and validation to prove, once treated, this material is suitable for use.
Site management procedures need to be in place to ensure that material is tracked through from excavation stockpiling, treatment and remediation processes. Should the process of material tracking be considered non-robust, or not adhered to, this may fail the test whether excavated materials may be considered non-waste.

Alternatives include the EA U1 exemption (soils and stones <1000 tonnes and aggregates <5000 tonnes) and the Waste Framework Directive, which applies to naturally occurring soils used on site of origin only. Aggregates can also fall under the EA WRAP Quality Protocols.

Waste Classification For Soils

Introduction
Waste producers have a duty of care to classify the waste they are producing:

- before it is collected, disposed of or recovered.
- to identify the controls that apply to the movement of the waste.
- to complete waste documents and records.
- to identify suitably authorised waste management options.
- to prevent harm to people and the environment.

The most sustainable and economic method of dealing with waste soil is usually the retention and re-use on site. Where this is not possible there are three main options for the disposal of soils:

1. Disposal to a permitted waste recycling facility.
2. Re-use on another site (subject to the suitability).
3. Disposal to a landfill site.

The disposal to a permitted facility will be subject to the **specific conditions of the permits for each individual facility** and will vary dependent on location and environmental sensitivity of the receiving site. Re-use on another site will also be subject to the acceptability criteria of that site.

The guidance below relates to disposal to **landfill sites only**.

Background for Landfill Disposal
In July 2005 the United Kingdom implemented the European Directive 1999/31/EC (The Landfill Directive), this introduced the current regime for waste and waste disposal to landfill. The Landfill Directive places controls on waste disposal. These controls include requirements to follow the waste acceptance procedures and criteria that have been agreed by the Council of the European Union and are laid out in Council Decision 2003/33/EC.

Before a waste can be accepted at a landfill site, the landfill **operator** must be satisfied that the waste meets his permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC).

If disposal to landfill is the best management option for the waste soils, these procedures **must** be followed or the operator may refuse to accept the waste.

Key Points

- Not all waste can be landfilled
- Landfills are classified according to whether they can accept **hazardous**, **non-hazardous** or **inert** wastes.
- Wastes can only be accepted at a landfill if they meet the waste acceptance criteria (WAC) for that class of landfill.
- Most wastes must be treated before you can send them to landfill.
- There are formal processes for identifying and checking wastes that must be followed before wastes can be accepted at a landfill site.

Classification
Wastes are listed in the European Waste Catalogue (EWC 2002) and grouped according to generic industry, process or waste types. Wastes within the EWC are either hazardous or non-hazardous. Some of these wastes are hazardous without further assessment (absolute entries) or are 'mirror' entries that require further assessment of their hazardous properties in order to determine whether they are hazardous waste.

Waste soil has mirror entries on the EWC and as such the first phase of the waste classification process is that of determining if the waste is hazardous or not i.e the hazard assessment. The most common EWC waste codes related to soil are:

17 05	**soil (including excavated soil from contaminated sites), stones and dredging spoil**
17 05 03*	soil and stones containing dangerous substances
17 05 04	soil and stones other than those mentioned in 17 05 03

Soils may contain certain contaminants (eg asbestos, oil,) which have prescribed concentration thresholds, that if breached will render the material hazardous waste. These are based on specific "hazardous properties" which include hazards such as carcinogenicity, flammability and toxicity.

In the first instance the concentrations of plausible contaminants within the soil should be identified and wastes should be **classified based on their total concentrations**.

Waste Definitions

Inert	• Will not undergo any significant physical, chemical or biological transformations. • Will not dissolve. • Will not burn. • Will not physically or chemically react. • Will not biodegrade. • Will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. • Has insignificant total leachability and pollutant content. • Produces a leachate with an ecotoxicity that is insignificant (if it produces leachate).
Non-Hazardous	Is not inert (see above) Is not hazardous (see below)
Hazardous	Soil has hazardous properties as defined in WM3 (Guidance on the classification and assessment of waste (1st edition 2015)- Technical Guidance)
Stable Non-reactive hazardous waste#	Hazardous waste, the leaching behaviour of which will not change adversely in the long-term, under landfill design conditions or foreseeable accidents either: in the waste alone (for example, by biodegradation), under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints) or by the impact of other wastes (including waste products such as leachate and gas).

This option allows hazardous waste that is stable and thus has a low leaching potential to be deposited in cells with a standard of containment consistent with non-hazardous wastes.

WAC Testing

The purpose of WAC analysis is to confirm that the waste complies with the relevant WAC for the receiving landfill. If the waste has any disposal route other than a landfill site (e.g. recycling facility, incineration etc) the **WAC is not relevant.** Furthermore the WAC limits **cannot be used to make an assessment of whether a waste is hazardous**. WAC testing does however define if a non-hazardous waste is suitable for an inert landfill.

Classification based on Total Concentrations[1]	Non-Hazardous Waste		Hazardous Waste	
WAC testing	Below inert WAC limit values:	Above inert WAC limit values:	Below hazardous WAC limit values	Above hazardous WAC limit values
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill[2]	HAZARDOUS landfill	PRE-TREATMENT[3]

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).
2 Individual sites may have certain limit values pre-determined in their licence.
3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.

Hydrocarbons in Soils

WM3 uses the term Oil or Waste Oil to cover hydrocarbons products such as fuel oil, petrol or diesel. These are defined by WM3 as hazardous under an absolute entry in the List of Wastes. However hydrocarbons in soils are a mixture rather than a pure product and are therefore not absolute entries.

Known Oils

The simplest scenario is where the identity of the contaminating oil is known or can be identified. If the oil is known the manufacturer's or supplier's REACH compliant safety data sheet for the specific oil can be obtained and the hazard statement codes on that Safety Data Sheet can be used for the hazardous waste assessment.

Where the identity of the oil can only be identified down to a petroleum group level (i.e. the contaminating oil is known to be diesel, but the specific type/brand is unknown), then the classification of that petroleum group should be used in the assessment. The marker compounds associated with that petroleum group may be used to confirm carcinogenicity.

Oils may contain a range of hydrocarbons, so the presence of for instance Diesel Range Organics (DRO) does not enable the assessor to conclude that diesel is present. These hydrocarbons may have arisen from other oils, the laboratory needs to provide an interpretation of the chromatograph to determine if it is consistent with diesel or weathered diesel as a whole.

The concentration of known oils should be determined using a method that as a minimum spans the range in which the carbon numbers for that known oil fall.

Unknown Oils
Where hydrocarbons are contaminating soils it is likely that the oil will be unknown or cannot be determined.

WM3 states that:

For contaminated land specific consideration must be given to the following before proceeding;

- The presence of other organic contaminants, for example solvents or coal tar that could be detected as hydrocarbons. Coal Tar is not an oil and is considered separately in WM3 example 2. Where the site history or investigation indicates the presence of hydrocarbons from oil and other sources (e.g. coal tar), and the origin of the hydrocarbons cannot reliably be assigned to either, then a worst case approach of considering the hydrocarbons both as waste oil (in accordance with this example) and from other sources, for example coal tar should be taken.
- The presence of diesel, or weathered diesel, should be specifically considered by the laboratory and where this is confirmed by the hydrocarbon profile the oil should be assessed as a known or identified oil (diesel).

The use of **marker compounds** is optional; however it is recommended that where possible the marker compounds should be used. WM3 states:

If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic/mutagenic due to the presence of oil if all three of the following criteria are met:

- The waste contains benzo[a]pyrene (BaP) at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.1 of the CLP for BaP)
- This has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D of WM3, and
- The analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel.

For example:

TPH Concentration (mg/kg)	Petrol or Diesel	BaP (mg/kg)	Classification
10,000	No	0.9	Non- Hazardous
1,000	No	Not available	Hazardous
1,000	Yes	Not relevant	Hazardous

References

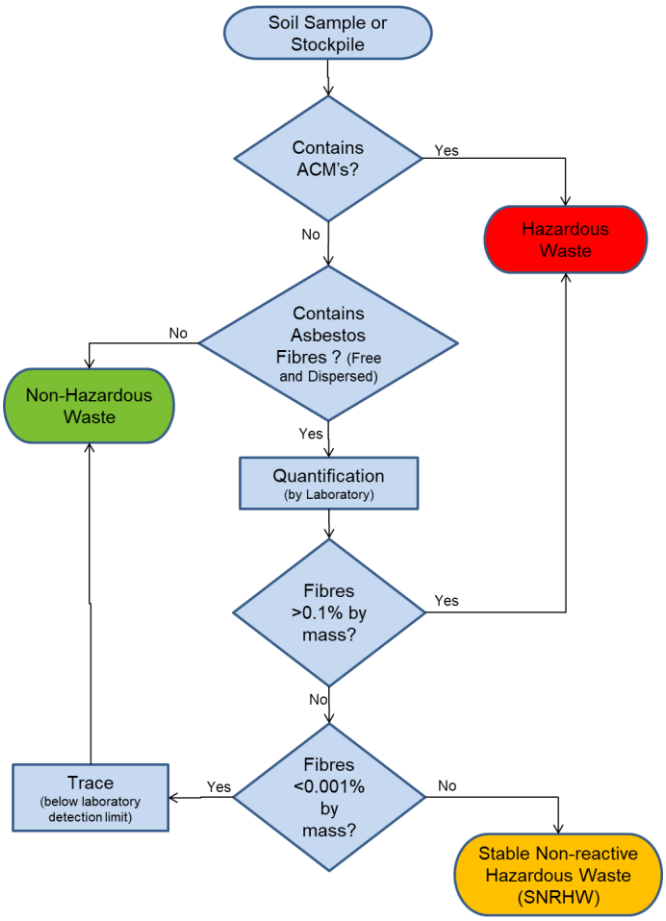
1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the subsequent Council Decisions.
2. Environment Agency Environmental Permitting Regulations: "Inert Waste Guidance- Standards and Measures for the Deposit of Inert Waste on Land" 2009.
3. Environment Agency "Waste acceptance at landfills - Guidance on waste acceptance procedures and criteria" Nov 2010.
4. Environment Agency "Guidance on the classification and assessment of waste (Technical Guidance WM3)".
5. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).
6. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
7. 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament
8. Environmental Permitting Guidance The Landfill Directive For the Environmental Permitting (England and Wales) Regulations 2010 Updated March 2010 Version 3.1
9. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).

Additional Asbestos Guidance Notes

Disposal
The 1st Edition of WM3 "Guidance on the classification and assessment of waste", details the way in which Asbestos is assessed within soils.

The assessment of asbestos containing waste is dependent on whether the asbestos is present as:

- Fibres that are free and dispersed, or
- Identifiable pieces of asbestos containing materials (ACM's)



Identifiable pieces of asbestos are any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye. The result is that commonly soils with visible ACM's are sorted and the ACM's removed by hand picking and separate disposal.
Asbestos concentrations below 0.001% by mass are below standard laboratory detection limits and are not currently regarded as containing asbestos for the purposes of disposal and may be disposed of to an inert landfill site[1]. These levels are often termed "trace" by laboratories.
Asbestos concentrations between 0.001% and 0.1% are stable non-reactive hazardous waste (SNRHW)[1]. Waste transfer stations where soil recycling takes place may be able to take SNRHW, but are unlikely to take soils containing asbestos above trace concentrations.
The following codes should be assigned to the asbestos waste as appropriate:

17 06	**Insulation materials and asbestos-containing construction materials**
17 06 01	Insulation materials containing asbestos
17 06 03	Other insulation materials consisting of or containing hazardous substances
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05	Construction material containing asbestos

WM3 indicates that 17 06 05 would normally be used in preference to 17 06 01 for the asbestos in asbestos contaminated soil and stones.

Construction materials containing asbestos and "*other suitable materials*" may be landfilled at landfills for non-hazardous waste in accordance with the Landfill Directive without testing.

This means that wastes that are only hazardous because of their asbestos content can be disposed of at landfills for non-hazardous waste in separate landfill cells that only accept asbestos wastes and other suitable materials. The Landfill Directive requires that stable non-reactive hazardous waste shall not be deposited with biodegradable waste (for example organic material, household waste, paper etc..) and must meet the waste acceptance criteria set out in accordance with Annex II.

Construction

Health and Safety Executive (HSE) guidance on asbestos is not directly related to soil and much of the guidance focuses on the removal of asbestos from buildings. The overarching legislation is the Control of Asbestos Regulation (CAR 2012). However where work involves (or is likely to involve) contact with asbestos then CAR 2012 requires a risk assessment including whether or not the work is licensed or notifiable non-licensed work and may require an Asbestos Management Plan. Work becomes notifiable if it is considered that the control limit could be exceeded.

Brownfield sites frequently have soils that contain asbestos and the presence of asbestos needs to be considered within the context of construction, particularly in relation to groundworks. The exposure of soils and the use of excavators and plant to move soil around increases the possibility of fibres becoming airborne. However it is good site practice to not generate dusts and to employ dust suppression on all sites regardless of the presence of asbestos.

The legal control limit for asbestos is 0.1f/ml over a continuous four hour period. The control limit is not a '*safe*' level and exposure from work activities involving asbestos must be reduced to as far below the control limit as possible.

Clearly the higher the concentrations in the soil the greater potential there is for fibres to be released, however IOM publication TM/88/14 "the release of dispersed asbestos fibres from soil" 1988 concludes that:

- Mixtures of asbestos in dry soils with asbestos content as low as 0.001% can produce airborne respirable asbestos concentrations greater than 0.1f/ml in dust clouds where the respirable dust concentrations are less than 5mg/m^3.
- An action limit is recommended of no higher than 0.001% asbestos in soils above which steps should be taken to minimise exposure to airborne fibres (eg by wetting).
- The addition of relatively small quantities (10%) of water can reduce the airborne fibre concentrations by an order of magnitude.

Where asbestos has been identified at concentrations above 0.001% as free and dispersed fibres in the soil precautions need to be adopted. Concentrations below this are considered to be normal background, although good site practice dictates that the generation of dusts should be avoided and therefore any fugitive fibre release from minor concentrations should be kept to a practical minimum.

End Use

The use of materials containing asbestos and material containing asbestos is prohibited under EU legislation. There is currently a Joint Industry Working Group (JIWG) tasked with producing a Code of Practice for Asbestos in Soil, Made Ground and Construction & Demolition Material that will clarify in due course the position of the various government agencies.

Asbestos containing materials can remain in situ under a suitable cover system which may be hardsurfacing or soft landscaping (with or without hard dig layers and markers).

There is a risk that future maintenance may compromise such systems and details of the presence of asbestos should be kept in the Health and Safety File.

Preliminary publications from JIWG (April 2015) provide guides for decision making in relation to construction. These are at a "Beta" test stage and further publications will be provided in due course.

The re-use of waste soils should be undertaken in accordance with the CL:AIRE Code of Practice and is subject to suitable risk assessments demonstrating low risk . There is nothing that specifically excludes the re-use of soils containing asbestos as fill to raise levels. However the movement of materials increases the risk of fibres becoming airborne and suitable precautions will be required. The re-use of soils containing asbestos at concentrations above hazardous waste levels is likely to meet with regulatory opposition. Assuming a suitable strategy could be agreed this would take a considerable amount of time and is only likely to be feasible where there is a long program for implementation.

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