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Ref: 12-757-L4-01
Date: 15th December 2020

Russell WBHO
13 Westpoint Enterprise Park
Clarence Avenue
Trafford Park
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By Email

Dear Sir/Madam,

SUPPLEMENTARY GROUND INVESTIGATION REPORT (AREA 1) NEW SMITHFIELD MARKET

Further to the completion of our recent Ground Investigation works, E3P has prepared a supplementary ground investigation report to discuss the additional findings as an assessment for the proposed commercial development at New Smithfield Market, which is to be read in conjunction with the previous E3P Phase 1 (Report Ref: 12-757-r3 July 2020) and Phase 2 Geoenvironmental Site Assessment Reports (report ref: 12-757-R2 July 2020)

1. BACKGROUND

E3P understands that Russell WBHO are considering the proposed future redevelopment of a parcel of land known as Smithfield Market, Lawton Street, Greater Manchester for a commercial unit with associated hardstanding and utility infrastructure.

E3P has previously been instructed to carry out both a Phase 1 Geoenvironmental Site Assessment (12757-r1 August 2018, updated in July 2020) and a Phase 2 Geoenvironmental Site Assessment (November 2018, updated in July 2020). However, at the time of the Phase 2 assessment, there were two areas of limited access due to active buildings and traffic. These were the north eastern and western sector of the site.

As these areas have now become accessible, E3P has completed additional trial pitting. The area shown as Area 1 within Figure 1 is the main discussion of this letter report. Area 2 will be assessed during a separate investigation when access becomes available. Area 3 has sufficiently been investigated at this time.



FIGURE 1 AREAS REQUIRING FURTHER INVESTIGATION



E3P has scoped out the following works in order to gain further coverage of site investigation across Area 1 at the request of Russells Construction. This further investigation has been designed to provide further investigation that will aid the proposed remediation and enabling works overview and geotechnical assessment.



1.1. SITE SETTING

Site Address	Whitworth Street East, Manchester, M11 2WJ	
Grid Reference	E388490, N397100	
Current Site Use	The site is currently occupied by vehicle parking, industrial storage units and access associated with New Smithfield Market which is located immediately north. Storage of commercial material, including waste skips, is present on the site. Hardstanding is present across the site with peripheral landscaping in the central sector and southern boundary with small trees and bushes.	
Environmental Setting	Drift Geology	Glacial Till - BGS borehole logs indicate sandy silty Clay.
	Bedrock Geology	Chester Formation – Sandstone.
	Hydrogeology	Secondary A aquifer overlying a principal aquifer (bedrock geology).
	Hydrology	The closest surface water feature is identified 136 m south and is unnamed. Corn Brook is 600 m west and the Ashton Canal is 1 km north of the site
	Flood Risk	The site is not within an area prone to fluvial flooding.
Site History	Historical mapping indicates the site was occupied by a locomotive and carriage works up to the mid-1900s, including railway tracks, cranes and tanks. Since circa 1970s, the New Smithfield Market has occupied the site and surrounding area; the subject site is located within the vehicle access and parking area of the market.	

2. PREVIOUS REPORTS

The following previous desk-based site assessment and ground investigation reports have been reviewed to form part of the overall site assessment:

- ✚ E3P Phase 1 Geoenvironmental Desk Study (ref: 12-757-R1-2, dated July 2020);
- ✚ E3P Phase 2 Geoenvironmental Site Assessment (ref: 12-757-R2-1, dated November 2018); and
- ✚ E3P Phase 2 Geoenvironmental Site Assessment (ref: 12-757-R2-2, dated July 2020).

The key findings of the previous site investigation reports are summarised below and where necessary data used to support the overall site assessment.

2.1. E3P PHASE 1 GEOENVIRONMENTAL DESK STUDY

The desk study indicated that, historically, the subject site was occupied by a locomotive and carriage works up to the mid-1900s, including railway tracks, cranes and tanks. Since circa 1970s, the New Smithfield Market has occupied the site and surrounding area; the subject site is located within the vehicle access and parking area of the market.



Human Health

Historical and commercial land uses on the site, as well as Made Ground represent potential localised sources of heavy metal, polycyclic aromatic hydrocarbon (PAH), petroleum hydrocarbon, asbestos, and ground gas. Considering the potential for direct contact during development works and within proposed landscaping areas, these potential sources of soil and groundwater contamination represent a moderate risk to construction workers and commercial end users. An intrusive ground investigation to identify and assess for the presence of these contaminants is required to facilitate further risk assessment and determine appropriate remediation and / or mitigation measures.

Controlled Waters

Historical and current commercial land uses on site, including a locomotive yard, as well as Made Ground, represent potential localised sources of mobile hydrocarbon contamination. Hardstanding across the site and underlying superficial Clay deposits reduce the potential for infiltration and migration of mobile contaminants, if present. However, considering the underlying Principal Aquifer, a moderate to high risk to controlled waters is identified. Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment.

Ground Gas

Made Ground associated with historical development may be a source of carbon dioxide and methane. Carbon dioxide and methane have associated asphyxiation and explosive risks respectively; if present, the risks can be appropriately mitigated through the careful design of building structures.

2.1.1. E3P PHASE 2 GEOENVIRONMENTAL SITE ASSESSMENT

The initial site investigation was carried out between the 28th August and the 3rd September 2018 with supplementary investigation carried out on the 14th and 15th May 2020.

Site Works

- ✦ The site works comprised 16 window sample boreholes, seven mechanically excavated trial holes and three deep cable percussive boreholes. Due to the investigation being undertaken whilst the Smithfield Market was operating, access was not viable across some areas of the site therefore it is recommended that further investigation is carried out following a cease in site operations and demolition of current site buildings.

Ground Conditions

- ✦ Made Ground was encountered within all exploratory hole locations between ground level to depths in excess of 5.00 m bgl in WS105 where the full depth of Made Ground was not proven. Made Ground typically comprises a concrete/asphalt underlain by a grey gravel sub-base. A reworked brown gravelly clay with gravel of brick, concrete and asphalt was encountered within several locations across the site (TP105, TP106, TP107, WS104, WS106, CP101, WS201, WS205 and TP203).
- ✦ Drift deposits were generally consistent across the site, predominantly comprising stiff, high-strength, brown, slightly gravelly CLAY with mudstone identified between 0.50 and 14.95 m bgl (CP201). The CLAY was identified within all locations except for TP101, TP105 and WS203, where the full extent of Made Ground could not be proven.



Human Health

- ✚ Chemical analysis of soils identified the presence of asbestos (<0.001%), lead and SVOCs within localised areas. The chronic risk to human health associated with the elevated concentrations of heavy metals and asbestos can be mitigated through the construction of the proposed building and hardstanding which will remove the potential for direct contact with the contaminant source and the site end user.
- ✚ The elevated levels of SVOCs present a potential risk of volatilisation to indoor air, however as these have only been encountered within one area of the site (south-east corner – WS201) it is anticipated that these will be treated as a localised hotspot. Therefore, during a process of cut/fill enabling works, further delineation, assessment and potential hotspot removal should be undertaken where these soils may be chemically validated to assess chemical suitability for retention on site in an area of no future sensitivity.
- ✚ Asbestos in the form of amosite has also been identified within localised areas in shallow Made Ground deposits (WS206, 0.40m). Asbestos quantification confirms impacted materials can be excavated and placed below an area of low sensitivity. No visual signs of ACM were encountered during the ground investigation; it is therefore likely that only trace fibres are present. Impacted soils should be managed according to the asbestos risk mitigation conceptual site model.
- ✚ Chemical analysis of the natural CLAY drift deposits has identified these soils to be acceptable for use as subsoil within any proposed landscaping areas; however, further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site.

Controlled Waters Assessment

- ✚ Groundwater samples could not be taken, therefore the assessment was completed based on leachate samples. It should be noted that leachate analysis is an aggressive test which overstates the risk.
- ✚ The controlled waters assessment identified that the data exceeds indicates that the data exceeds the EQS values for the following inorganic compounds:
 - TPH Aromatic C12-C16
 - TPH Aromatic C16-C35
- ✚ The TPH carbon bands C16 to C21 and C21 to C25 identified within the leachate samples are of a general low solubility, and therefore mobility, suggesting that these will not migrate to controlled water receptors. However, it must be noted that these were found in WS201 which is also where elevated SVOCs were identified within the soil samples and will undergo further investigation and delineation as part of the remediation works. The previously completed investigation in the southern sector of the site did not identify any contaminant exceedances that may pose a risk to controlled waters.
- ✚ Given the site is underlain by low-permeability, predominantly cohesive, glacial till deposits, which will afford protection to the underlying principal aquifer, there is considered to be a low risk to controlled waters and the wider environ as no complete pollutant linkage can be determined.
- ✚ Based on the above, upon completion of the works to identify the source of the contaminants identified in the vicinity of WS201 and further assessment, it is likely that there will be no unacceptable level of risk to the controlled water receptors.



Geotechnical Assessment

- ✦ Upon completion of a phase of cut-and-fill enabling works, it is likely that the most cost effective option for the majority of the site would be to utilise shallow pad foundations to support the portal frame of the proposed commercial/industrial building bearing at least 500 mm below the stiff to very stiff medium to high strength cohesive soils.
- ✦ The previous report for the south eastern sector made recommendations for vibro stone columns but the location for the proposed structure has now been relocated to an area of more favourable ground conditions.



3. SUPPLEMENTARY GROUND INVESTIGATION

3.1. GENERAL OVERVIEW

A supplementary ground investigation has been designed based on the findings of the desk study and the findings of the previous site investigations, with exploratory holes advanced to target specific potential contaminant sources but mainly to investigate areas that were not previously accessible. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development and has considered the findings of the previous phase of works.

Exploratory fieldwork was completed on the 26th October 2020. The works are summarised in Table 3.1.

TABLE 3.1 SUMMARY OF FIELDWORK

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)
Previously Encountered Hydrocarbon Impacted Material and Former Works Building	TP201	Mechanically Excavated Trial Pit	1.60
	TP202		2.70
Former Works Building and Travelling Crane	TP204		2.30
General Ground Conditions Including the Presence/Nature of Obstructions	TP205		2.50
Former Works Building	TP203		2.50
	TP206		2.30
	TP208		2.50
Previously Encountered Made Ground Deposits and General Ground Conditions Including the Presence/Nature of Obstructions	TP207		2.70

Mechanically excavated trial pits were advanced to investigate ground conditions and to retrieve environmental samples, spatially distributed to offer the maximum site coverage whilst also being advanced to target specific contaminant sources.

The sampling locations are illustrated in Drawing 12-757-005. The ground conditions encountered are indicated on the logs, which are included with this letter.

3.2. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analysis comprising:

-  Metals;
-  pH, total sulphate, water-soluble sulphate (2:1 extract);
-  Sulphide;



-  Cyanide;
-  Phenols;
-  Semi-volatile organics (SVOCs);
-  Volatile organics (VOCs);
-  Total and speciated polycyclic aromatic hydrocarbons (PAHs);
-  Asbestos identification and quantification; and,
-  Speciated and banded total petroleum hydrocarbon (TPH).

I2 Analytical undertook the analytical work and the testing results are included with this letter and discussed in Section 5.

Selected samples were submitted to PSL Laboratory where the following geotechnical tests were undertaken:

-  Atterberg limits determinations;
-  Moisture Content;
-  Particle Size Distribution; and
-  Optimum Moisture Content/Dry Density.

Laboratory analysis sheets are included with this letter and are summarised in Section 4.



4. GROUND AND GROUNDWATER CONDITIONS

4.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 4.1.

TABLE 4.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (m bgl)		
	MADE GROUND	STIFF CLAY	SAND
TP201	0.00-1.40	1.40-1.60	–
TP202	0.00-0.70	1.60-2.70	0.70-1.60
TP203	0.00-2.50	–	–
TP204	0.00-0.80	0.80-2.30	–
TP205	0.00-0.80	0.80-2.50	–
TP206	0.00-0.60	0.60-2.30	–
TP207	0.00-1.80	1.80-2.70	–
TP208	0.00-0.70	0.70-2.50	–

4.2. MADE GROUND

During these supplementary trial holes, Made Ground was encountered within all exploratory hole locations from ground level to depths in excess of 2.50 m bgl in TP203 where the full extent of the Made Ground was not proven.

Made Ground typically comprises concrete/asphalt underlain by a grey sandy gravel sub-base. Underlying this a black sandy gravel was encountered between 0.60 m bgl and 1.40 m bgl within TP201 with gravel of brick, asphalt and clinker. A strong hydrocarbon odour and visible sheen were also recorded within this stratum. TP201 was undertaken in a similar area to the previously undertaken WS201 which identified a gravelly reworked clay to 1.90m with a hydrocarbon odour and rare black staining.

A similar Made Ground was also encountered within TP207 as a black sandy gravel with gravel of brick, clinker, asphalt and mudstone at depths between 0.35 m bgl and 1.80 m bgl. However, there was no hydrocarbon odour or sheen recorded.

A reworked brown gravelly clay with gravel of brick, asphalt, concrete and pottery was encountered within TP203, to depths in excess of 2.50 m bgl where the full depth of Made Ground was not proven.

The findings of the supplementary trial holes correlate with the findings of the previous investigations and the Made Ground is generally uniform across the site with localised areas of deeper Made Ground.

4.3. DRIFT DEPOSITS

Drift deposits were generally consistent across the site, predominantly comprising stiff, high-strength, brown, slightly gravelly CLAY with gravel of mudstone. The CLAY was identified within all locations between the depths of 0.60 m bgl and 2.70 m bgl with the exception of TP203, where the full extent of Made Ground could not be proven.



A brownish grey fine to medium SAND was encountered within TP202 at depths between 0.70 m bgl and 1.60 m bgl.

4.4. SOLID GEOLOGY

The solid bedrock geology was not encountered during this investigation, however, BGS boreholes infer bedrock at 76.20 m bgl (SJ89NE42).

4.5. GROUNDWATER

Groundwater strikes were encountered as seepages. The depth of the seepages is shown on the exploratory hole records enclosed and are summarised in Table 4.2.

TABLE 4.2 SUMMARY GROUNDWATER STRIKES

LOCATION	DEPTH TO STRIKE (m)	NOTES
TP201	1.30	Slow seepage, visible iridescence
TP204	0.60	Slow seepage

4.6. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of potential contamination has been identified during the site investigation and these are summarised in Table 4.3.

TABLE 4.3 SUMMARY VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

LOCATION	DEPTH (m)	STRATUM	NOTES
TP201	0.60	Made Ground	Strong hydrocarbon odour and black staining
TP202	0.70	SAND	Strong hydrocarbon odour
TP207	0.35	Made Ground	Black staining and clinker

4.7. SOIL CONSISTENCY

Undrained shear strength values were measured using field hand shear vane tests. Results of the tests are presented in Table 4.4, which indicate the clay soils to vary between stiff and very stiff. Strength test data is generally consistent with the field descriptions of the aforementioned soils.

TABLE 4.4 SUMMARY OF HAND SHEAR VANE TESTS

LOCATION	DEPTH	SHEAR STRENGTH (kPa)	CALCULATED ALLOWABLE BEARING PRESSURE (kN/m ²)
TP201	1.50	195	449
TP202	1.80	167	384
TP202	2.20	181	416
TP203	1.20	181	416
TP203	2.00	196	451
TP204	1.00	145	334



LOCATION	DEPTH	SHEAR STRENGTH (kPa)	CALCULATED ALLOWABLE BEARING PRESSURE (kN/m ²)
TP204	1.60	198	455
TP205	1.20	162	373
TP205	2.00	185	426
TP206	1.00	172	396
TP206	1.80	193	444
TP207	2.00	196	451
TP207	2.50	177	407
TP208	1.00	201	462
TP208	2.00	203	467

4.8. SIDE STABILITY AND EASE OF EXCAVATION

The sides of the exploratory trial pit excavations appeared to be generally stable during excavation and the natural strata was generally excavated with ease.

4.9. SOIL PLASTICITY

The Atterberg limits determinations, summarised in Table 4.5, show the clay to be of predominantly moderate plasticity.

TABLE 4.5 SUMMARY OF PLASTICITY INDEX TEST RESULTS

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING 425 µm SIEVE (%)	MODIFIED PLASTICITY INDEX
TP203	2.00	18	21	43	22	98	21.56
TP206	1.00	16	22	45	23	93	21.39

The results of the Atterberg limits testing confirmed that the soils would be deemed to be predominantly moderate Volume Change Potential in accordance with the classification system utilised by the LABC/NHBC industry guidance.

4.10. PARTICLE SIZE DISTRIBUTION

Particle Size Distribution Tests have been undertaken on selected samples of granular and cohesive material via wet sieve to obtain information on the soil fractions. The results are included in Table 3.6 below. The full results have been included with this letter.



TABLE 4.6 SUMMARY OF PARTICLE SIZE DISTRIBUTION TEST RESULTS

LOCATION	LABORATORY DESCRIPTION	DEPTH (m)	SOIL FRACTION (%)			
			COBBLES	GRAVEL	SAND	SILT/CLAY
TP208	Brown slightly gravelly very sandy CLAY	1.20	0	1	23	76

4.11. SOIL DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Dry density / moisture content relationship analysis has been conducted on soils using via utilising proctor compaction tests utilising a 2.5kg rammer. The results of the tests have been summarised in Table 4.7 below. The full results have been included with this letter.

TABLE 4.7 SUMMARY DRY DENSITY AND MOISTURE CONTENT

LOCATION	LABORATORY DESCRIPTION	TOP DEPTH (m)	METHOD OF COMPACTION	INITIAL MOISTURE CONTENT (%)	OPTIMUM MOISTURE CONTENT (%)	MATERIAL RETAINED ON 37.5mm SIEVE (%)	MAX DRY DENSITY (MG/M ³)	MATERIAL RETAINED ON 20.0mm TEST SIEVE (%)
TP208	Brown mottled grey slightly sandy CLAY	1.20	2.5kg	18	13	0	1.92	0

The proctor compaction tests have indicated that the material tested is not within 3% of the optimum moisture content. The sample was recorded to be wetter than the optimum. It should be noted that if this material is excavated for use in a cut/fill operation careful consideration should be taken in the stabilisation of this material.

Engineering of this type of material will need to be completed during dry weather periods only.

4.12. PH AND SULPHATE

Chemical analyses for pH and soluble sulphate content, summarised in Table 3.8, shows that the soils at the site meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

It should be noted that previous site investigations have recorded elevated sulphate levels within localised areas (WS206 and WS210) which will require DS-2 / AC-1s.

TABLE 4.8 SUMMARY OF pH AND SULPHATE DATA

LOCATION	DEPTH (m)	SO ₄ IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
TP201	1.30	0.25	8.20	DS-1 / AC-1s
TP207	0.40	0.27	7.00	DS-1 / AC-1s



5. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors for the additional ground investigation.

5.1. HUMAN HEALTH RISK ASSESSMENT

At Tier 1 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

The results of the supplementary ground investigation have been summarised within Table 5.1.

TABLE 5.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A COMMERCIAL END USE

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Arsenic	mg/kg	640	7	35	N/A	1	No Further Action
Cadmium	mg/kg	190	7	<0.2	N/A	1	No Further Action
Chromium (VI)	mg/kg	33	7	<4.0	N/A	1	No Further Action
Lead	mg/kg	1100	7	720	N/A	1	No Further Action
Mercury	mg/kg	58	7	1.1	N/A	3	No Further Action
Nickel	mg/kg	980	7	43	N/A	1	No Further Action
Selenium	mg/kg	12000	7	1.5	N/A	1	No Further Action
Copper	mg/kg	68000	7	440	N/A	1	No Further Action
Zinc	mg/kg	730000	7	340	N/A	1	No Further Action
Cyanide – Total	mg/kg	791	7	<1.0	N/A	1	No Further Action
Phenols – Total	mg/kg	210	2	<1.0	N/A	1	No Further Action
Asbestos	Fibres	NFD	2	NFD	N/A	4	No Further Action
Naphthalene	mg/kg	190	8	180	N/A	3	No Further Action
Acenaphthylene	mg/kg	83000	8	4.3	N/A	2	No Further Action
Acenaphthene	mg/kg	84000	8	270	N/A	1	No Further Action
Fluorene	mg/kg	63000	8	200	N/A	1	No Further Action
Phenanthrene	mg/kg	22000	8	620	N/A	2	No Further Action
Anthracene	mg/kg	520000	8	120	N/A	2	No Further Action
Fluoranthene	mg/kg	23000	8	160	N/A	2	No Further Action
Pyrene	mg/kg	54000	8	120	N/A	2	No Further Action
Benzo(a)Anthracene	mg/kg	170	8	24	N/A	2	No Further Action
Chrysene	mg/kg	350	8	21	N/A	2	No Further Action
Benzo(b)Fluoranthene	mg/kg	44	8	9.6	N/A	2	No Further Action
Benzo(k)Fluoranthene	mg/kg	1200	8	3.4	N/A	2	No Further Action
Benzo(a)Pyrene	mg/kg	35	8	6.3	N/A	2	No Further Action
Indeno(123-cd)Pyrene	mg/kg	500	8	1.1	N/A	2	No Further Action



New Smithfield Market

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DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Dibenzo(a,h)Anthracene	mg/kg	3.5	8	0.37	N/A	2	No Further Action
Benzo(ghi)Perylene	mg/kg	3900	8	1.4	N/A	2	No Further Action
TPH-CWG C5-C6 (aliphatic)	mg/kg	3200	2	<0.001	N/A	3	No Further Action
TPH-CWG C6-C8 (aliphatic)	mg/kg	7800	2	<0.001	N/A	3	No Further Action
TPH-CWG C8-C10 (aliphatic)	mg/kg	2000	2	<0.001	N/A	3	No Further Action
TPH-CWG C10-C12 (aliphatic)	mg/kg	9700	2	5.9	N/A	3	No Further Action
TPH-CWG C12-C16 (aliphatic)	mg/kg	59000	2	85	N/A	1	No Further Action
TPH-CWG C16-C35 (aliphatic)	mg/kg	1600000	2	167	N/A	1	No Further Action
TPH-CWG C5-C7 (aromatic)	mg/kg	26000	2	<0.001	N/A	3	No Further Action
TPH-CWG C7-C8 (aromatic)	mg/kg	56000	2	0.037	N/A	3	No Further Action
TPH-CWG C8-C10 (aromatic)	mg/kg	3500	2	0.79	N/A	3	No Further Action
TPH-CWG C10-C12 (aromatic)	mg/kg	16000	2	490	N/A	3	No Further Action
TPH-CWG C12-C16 (aromatic)	mg/kg	36000	2	1500	N/A	3	No Further Action
TPH-CWG C16-C21 (aromatic)	mg/kg	28000	2	1300	N/A	1	No Further Action
TPH-CWG C21-C35 (aromatic)	mg/kg	28000	2	180	N/A	1	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	3200	5	<1.0	N/A	3	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	7800	5	<0.1	N/A	3	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	2000	5	<0.1	N/A	3	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	16000	5	17	N/A	3	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	36000	5	34	N/A	3	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	28000	5	58	N/A	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	28000	5	240	N/A	1	No Further Action
2-Methylnaphthalene	mg/kg	-	2	170	TP201 – 1.50m TP202 – 1.00m	3	Further Action
Dibenzofuran	mg/kg	12*	2	160	TP201 – 1.50m TP202 – 1.00m	3	Further Action
Carbazole	mg/kg	0.0023*	2	21	TP201 – 1.50m TP202 – 1.00m	3	Further Action
Anthraquinone	mg/kg	-	2	9.1	TP201 – 1.50m TP202 – 1.00m	3	Further Action

Notes

Main pathways: PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = vapour inhalation (indoor), PL4 = dust inhalation; PL5 = vertical/lateral migration; PL6 = corrosion of concrete; PL7=tainting of water supply; PL8 = uptake by plants

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; NFD = no fibres detected.

* – GAC derived by Mouchel using CLEA v1.06 (lwr saturation value) for Commercial / Industrial land use (1% SOM).



Referring to Table 5.1, the results of this direct comparison indicates that the data exceeds the screening criteria for a commercial end use for the following contaminants:

- ✳ 2-Methylnaphthalene;
- ✳ Dibenzofuran;
- ✳ Carbazole; and
- ✳ Anthraquinone

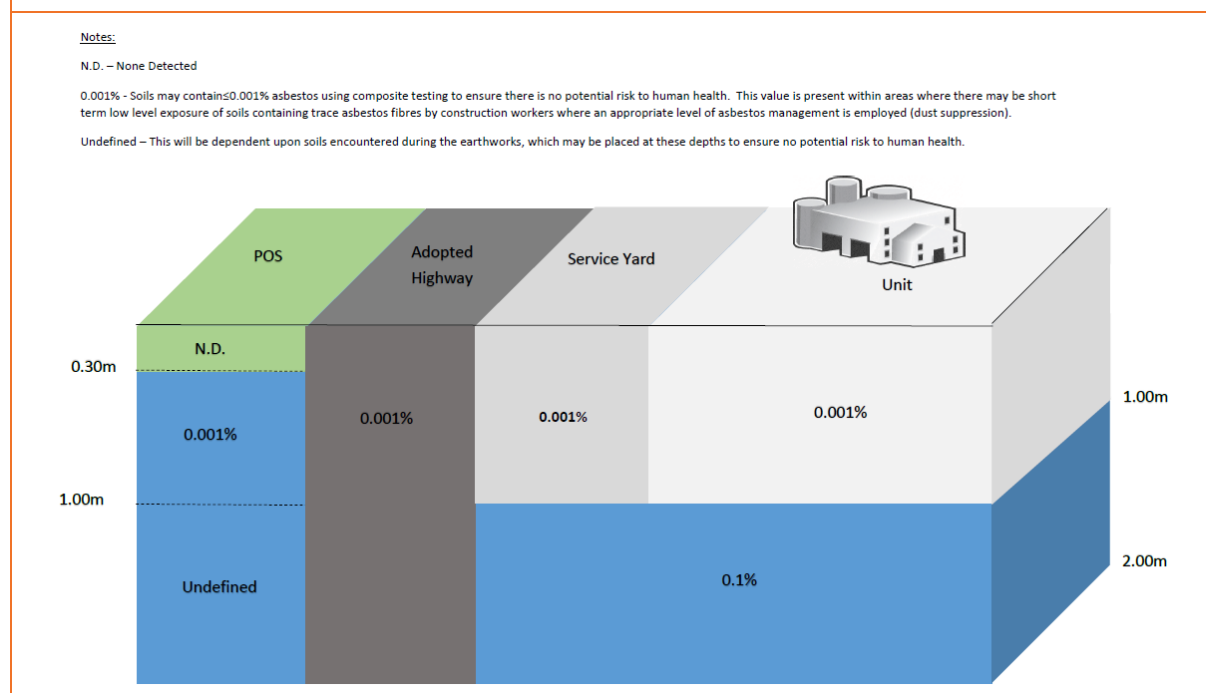
In relation to these exceedances, it can be determined that the main exposure pathways based on the Tier I exceedances of this supplementary ground investigation are:

- Soil ingestion; and
- Vapour inhalation (indoor).

The Tier 1 Human Health Risk Assessment of the data from the supplementary ground investigation has identified the presence of elevated semi-volatile organic compounds (2-methylnaphthalene, dibenzofuran, carbazole and anthraquinone) within TP201 and TP202 in the south east corner of the site. TP201 and TP202 were targeted to investigate the previously identified elevated SVOCs within WS201. As these exceedances correlate with those encountered within WS201, it is confirmed that the elevated levels are present within one area of the site which can therefore be deemed to be a localised hotspot. As these present a potential indoor volatilisation risk, they will require a hotspot removal and validation to assess chemical suitability for retention on site in an area of no future sensitivity.

Asbestos was not identified in any of the samples submitted for chemical analysis however trace asbestos fibres (<0.001%) were encountered within WS206 during the previous investigation. It is therefore likely that only trace fibres are present. Impacted soils should be managed according to the asbestos risk mitigation conceptual site model presented in figure 5.1 below:

FIGURE 5.1 ASBESTOS RISK MITIGATION CONCEPTUAL SITE MODEL



Elevated levels of lead were encountered during the previous site investigation within Made Ground deposits in WS203. The chronic risk to human health associated with the elevated concentrations of heavy metals and asbestos can be mitigated through the construction of the proposed building and hardstanding which will remove the potential for direct contact with the contaminant source and the site end user.

Chemical analysis of the natural CLAY drift deposits has identified these soils to be acceptable for use as subsoil within any proposed landscaping areas; however, further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site.

The specific design and installation process for the appropriate cover systems and growing mediums will be clearly defined within the site remediation and enabling works strategy.

5.2. CONTROLLED WATERS RISK ASSESSMENT

The site sensitivity with respect to controlled waters is summarised within Table 5.2

TABLE 5.2 CONTROLLED WATERS SENSITIVITY PROFILE

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not located within a Groundwater Source Protection Zone	LOW
Distance to the Closest Groundwater Abstraction Point	The closest groundwater abstractions are 397 m southwest for process water.	LOW-MODERATE
Aquifer Classification in Superficial Drift Deposits	The underlying superficial deposits are classified as a secondary A aquifer.	HIGH
Aquifer Classification in Bedrock	The underlying Chester Formation bedrock is classified as a Principal Aquifer.	HIGH
Viability for Anthropogenic Soil in Direct Contact with Aquifer (Drift or Bedrock)	Where the base of Made Ground has been proven, the underlying drift is predominantly cohesive.	LOW/MODERATE
Is the Site Located Within 50 m of a Surface Watercourse?	The risk to surface water is negligible given the absence of a viable receptor within influencing distance of the site.	LOW
SUMMARY The ICSM developed within the context of the site setting has only identified a single viable pollutant linkage, which would be the downward migration of potentially mobile phase-soluble contaminants towards the underlying Principal aquifer within the bedrock. However, the overall sensitivity of this receptor is reduced given the presence of low permeability drift deposits and the absence of any potable groundwater abstraction and thus the potential for the creation of a complete pollutant linkage.		

To further refine the ICSM, E3P has undertaken an initial qualitative assessment of the soil data analysis to assess the potential for a source of separate-phase or dissolved-phase contamination originating from either a defined on-site source or from impacted soils. This assessment is summarised in Table 5.3.



TABLE 5.3 QUALITATIVE RISK TO CONTROLLED WATERS FROM SOIL ANALYTICAL RESULTS

BTEX > 1 mg/kg	Concentrations above the laboratory LOD have been recorded for Toluene, Ethylbenzene, p & m-xylene and o-xylene.
Total VOC > 1 mg/kg	The soil data analysis has not identified any detectable concentrations of TPH C5 to C6 that might otherwise be indicative of VOC impact.
Total SVOC > 1 mg/kg	SVOC analysis identified concentrations considerably elevated above 1 mg/kg within TP201 and TP202.
C5-C10 > 5 mg/kg	All concentrations are below the laboratory LOD.
C10-C12 > 10 mg/kg	Slightly elevated concentrations above 10 mg/kg have been encountered within two locations while one location has indicated a considerable elevation at 490 mg/kg within TP202.
C12-C16 > 50 mg/kg	Elevated concentrations of 370 mg/kg and 1500 mg/kg have been encountered within TP201 and TP202 respectively.
Phenols > 2 mg/kg	All concentrations are below the laboratory LOD.
Naphthalene > 2 mg/kg	Naphthalene has been identified at concentrations greater than 2 mg/kg at TP201 and TP202 with concentrations ranging from 6.9 mg/kg to 180 mg/kg.
Total PAH > 10 mg/kg	Total concentrations of low-solubility PAH compounds greater than 10 mg/kg have been detected within TP201 and TP202.
PCB > 1 mg/kg	A substation is present on site and dates from circa 1978 when the site was redeveloped as the market. Investigation was not able to be carried out in the vicinity of the substation due to live services.
Heavy metals > 500 mg/kg	Concentrations of heavy metals are all below 500 mg/kg with the exception of lead in TP207.

E3P have previously undertaken a controlled waters risk assessment following the ground investigations in 2018 and 2020 utilising leachate samples. The initial assessment did not encounter any elevated levels of contaminants. However, elevated levels of TPH C12-C16 and TPH C16-C35 were recorded within WS201 during the site investigation in July 2020.

To further assess the risk to controlled waters, particularly in the location of identified elevated SVOCs and TPHs in the south-east of the site and in due consideration of the ICSM, E3P has undertaken a Tier I controlled waters risk assessment. The Tier I assessment has included a comparison of leachate analysis from samples of the Made Ground to drinking water standards in the first instance and in absence of these, to environmental quality standards (EQS).

These are presented in Table 4.4.



TABLE 4.4 COMPARISON OF GROUNDWATER ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS SCREENING VALUE ^{1, 2, 3}	DWS ^{3,4,5}	N		MC	LOC. OF EX	ASSESSMENT
		AA		L	GW			
Arsenic	µg/l	50	10	1	0	6.3	N/A	No Further Action
Cadmium	µg/l	0.08-0.25	5	1	0	<0.08	N/A	No Further Action
Chromium (VI)	µg/l	3.4	–	1	0	<5.0	N/A	No Further Action
Chromium (III)	µg/l	4.7	50	1	0	0.6	N/A	No Further Action
Copper	µg/l	1	2000	1	0	18	N/A	No Further Action
Total Cyanide	µg/l	1	50	1	0	<1.0	N/A	No Further Action
Lead	µg/l	1.2	10	1	0	2.2	N/A	No Further Action
Mercury	µg/l	–	1.0	1	0	<0.5	N/A	No Further Action
Nickel	µg/l	4	20	1	0	0.8	N/A	No Further Action
Selenium	µg/l	–	10	1	0	<4.0	N/A	No Further Action
Zinc	µg/l	10.9	–	1	0	12	TP201	Further Action
pH	6–9			1	0	7.8	N/A	No Further Action
PAH								
Naphthalene	µg/l	2	10*	1	0	7.4	N/A	No Further Action
Anthracene	µg/l	0.1		1	0	3.8	N/A	No Further Action
Benzo[b]fluoranthene	µg/l	0.00017*		1	0	<0.01	N/A	No Further Action
Benzo[k]fluoranthene	µg/l	0.00017*		1	0	<0.01	N/A	No Further Action
Benzo(a)pyrene	µg/l	0.00017*		1	0	<0.01	N/A	No Further Action
Indeno(123-cd)pyrene	µg/l	0.00017*		1	0	<0.01	N/A	No Further Action
Fluoranthene	µg/l	0.0063		1	0	<0.01	N/A	No Further Action
Benzo(ghi)perylene	µg/l	1.7–4		1	0	<0.01	N/A	No Further Action
TPH-Aromatic								
TPH C5-C6 (benzene)	µg/l	10	1	1	0	< 1.0	N/A	No Further Action
TPH C6-C8 (toluene)	µg/l	74	700	1	0	< 1.0	N/A	No Further Action
TPH C8-C10 (ethyl benzene)	µg/l	20	300	1	0	< 1.0	N/A	No Further Action
TPH C10-C12 (xylene)	µg/l	30	500	1	0	220	N/A	No Further Action
TPH C12-C16	µg/l	2	90 ⁵	1	0	780	TP201	Further Action
TPH C16-C35	µg/l	50#	90 ⁵	1	0	2280	TP201	Further Action
TPH Aliphatic⁵								
TPH C5-C6	µg/l	–	15000	1	0	<1.0	N/A	No Further Action
TPH C6-C8	µg/l	–	15000	1	0	<1.0	N/A	No Further Action
TPH C8-C10	µg/l	–	300	1	0	<1.0	N/A	No Further Action
TPH C10-C12	µg/l	–	300	1	0	<10	N/A	No Further Action
TPH C12-C16	µg/l	–	300	1	0	<10	N/A	No Further Action
TPH C16 – C21	µg/l	–	300**	1	0	<10	N/A	No Further Action



New Smithfield Market

Supplementary Ground Investigation Report – Area 1 December 2020

DETERMINAND	UNIT	EQS SCREENING VALUE ^{1, 2, 3}	DWS ^{3,4,5}	N		MC	LOC. OF EX	ASSESSMENT
		AA		L	GW			
TPH C21-C35	µg/l	–	300**	1	0	<10	N/A	No Further Action

Notes

Solubility <0.01µg/l

AA – Annual Average

MAC- Maximum Admissible Concentration

* Polycyclic aromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water

** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)

CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

This comparison indicates that the data exceeds the DWS and/or EQS values for the following heavy metals and inorganic compounds:

- ✳ Zinc;
- ✳ TPH Aromatic C12-C16; and
- ✳ TPH Aromatic C16-C35.

The TPH carbon bands C16 to C21 and C21 to C25 identified within the leachate samples are of a general low solubility, and therefore mobility, suggesting that these will not migrate to controlled water receptors.

Marginally elevated levels of zinc have been recorded within TP201 when compared against the EQS values in the absence of DWS values. Given that the elevation is only marginal and is the only exceedance encountered including previous assessments, it is anticipated that the risk is low. Particularly given that the depth to bedrock is deemed to be circa 70 m below current site levels, therefore there is a significant depth of low-permeability CLAY to reduce the downward migration to the underlying bedrock aquifer.

It must also be noted that the exceedances were encountered within TP201 which is also where elevated SVOCs were identified within the soil samples. Similar exceedances of TPH C16 to C35 were encountered within the previous site investigation within WS201 adjacent to TP201.

This area, including TP202 and WS201, will undergo further investigation, delineation and treatment or removal as part of the remediation works therefore it is likely that the source of the contamination will be removed reducing the risk to the controlled waters from leaching.

On this basis, it is anticipated that upon completion of the remediation works there will be no significant risk to the underlying principal aquifer and no further assessment is required at this stage.



6. GEOTECHNICAL ASSESSMENT

6.1. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the net safe allowable bearing pressure (ABP) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 6.1

TABLE 6.1 SUMMARY OF ABP

COHESIVE SOILS			
DESCRIPTION	DEPTH (RANGE m bgl)	UNDRAINED SHEAR STRENGTH (CU) (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)
Stiff CLAY	1.00	145	333
Very stiff CLAY	1.00-2.50	162-203	372-466

Based on the assessment of the relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff glacial clays where an ABP can be achieved in excess of 200 kN/m².

Prior to the detailed design of a detailed foundation solutions, a programme of remediation and enabling works will be required to remove any buried obstructions and cut/fill the site to provide suitable development platform levels.

Upon completion of these enabling works, it is likely that the most cost effective option for the majority of the site would be to utilise shallow pad foundations to support the portal frame of the proposed commercial/industrial building bearing at least 500 mm below the stiff to very stiff medium to high strength cohesive soils.

Foundations should be designed to account for the potential for differential settlement where cohesive and granular deposits are present.

It must be noted that if the foundations for the current buildings and infrastructure on-site are significant, removal may cause site wide disturbance to the underlying strata, therefore it may be more cost effective to use vibro stone columns to support the pad foundations. However, disturbance of cohesive materials should be minimal and where clay soils are removed, they must be re-engineered in accordance with an appropriate geotechnical specification.

Trees are present on the site periphery. Foundations that are within influencing distance of these trees will require deepening to mitigate against the chance of heave.

A detailed foundation zoning plan is included as Drawing 12-757-009 in Appendix III.

6.2. GROUND FLOOR SLABS

A ground-bearing slab will be viable for the commercial structures; however, it will need to be constructed utilising a sub-base with the thickness designed by a structural engineer to ensure that settlement tolerances are taken into consideration.



Due to the presence of substantial thickness of Made Ground across the site, is considered that ground-bearing floor slabs, whilst viable, will require detailed design to accommodate variability of the formation and account for differential settlement. A Geotechnical compaction specification will be required to determine how the development platform should be constructed.

Where a ground-bearing floor slab is to be constructed within the conjectured zone of tree influence, the clay will need to be removed to ensure that any desiccated soil cannot swell and induce heave to the structure. Alternatively, it may be possible to design the structure to resist the influence of clay heave using exaggerated sub-base and additional reinforcement within the slab to be designed by the structural engineer.

Where it is necessary to undertake cut-and-fill works utilising site-derived cohesive soils, careful consideration must be given to seasonal climatic conditions, which will have a significant impact of moisture conditions and the ability to compact clay soils in the wetter winter months. It may be necessary to undertake an element of stabilisation works through the addition of lime to ensure the soils can be engineered to the required performance standards.

It would be possible to utilise soil stabilisation techniques that incorporate the addition of lime and OPC to construct a stiffened soil horizon with a CBR > 15% to constitute a sub-base replacement layer that could then be capped with Type 1 MOT. The use of soil stabilisation could be extended within the conjectured zone of tree influence to modify the structure of clay soils and negate the potential for volumetric instability.

Depending on the design requirements of the proposed commercial care home structure, and its location on-site, it would be possible to utilise either a suspended or cast in-situ floor slab to incorporate the principals outlined above.

A Geotechnical Specification will be required in order to deliver a suitable development platform.



7. CONCLUSIONS AND RECOMMENDATIONS

The findings of this supplementary investigation did not encounter anything that significantly changes the approach set out the E3P Remediation Strategy (Report ref: 12-757-R4-2 August 2020). Therefore, the Remediation Strategy does not require further amendments and is still relevant to the site.

However, further investigation is still required in the west of the site and the area of impact in the south east of the site will require full delineation and assessment.

A Geotechnical Specification will be required in order to deliver a suitable development platform.

I trust that the above information is sufficient at this time and if you require anything further please do not hesitate to contact me

Yours sincerely,
For and on behalf of E3P Ltd



Stuart Ellis
Senior Geoenvironmental Consultant



Enclosed:

Exploratory Borehole Logs
i2 Chemical Analysis Reports
PSL Geotechnical Testing Reports
Drawings:

- 12-757-002 – Proposed Development Plan
- 12-757-003 – Historical Features Plan
- 12-757-004 – Site Features Plan
- 12-757-005 – Exploratory Hole Location Plan
- 12-757-006 – Depth of Made Ground Plan
- 12-757-007 – Depth to Founding Strata Plan
- 12-757-008 – Development Constraints Plan
- 12-757-009 – Foundation Zoning Plan
- 12-757-018 – Contamination Exceedance Plan





Historical Features

-  Storage Units
-  Former Works Buildings
-  Former Traveling Crane
-  Substation
-  Former Railway Tracks

Notes:

P1	REVB	23.06.2020	LM	SE
P1	REVA	19.06.2020	LM	SE
Phase	Issue	Date	Drawn	Checked

Client:

Russells Construction

Job Title:

Barton & Redman,
Manchester

Job No:

12-757

Drawing No:

003

Date:

23.06.2020

Scale:

NTS @ A3

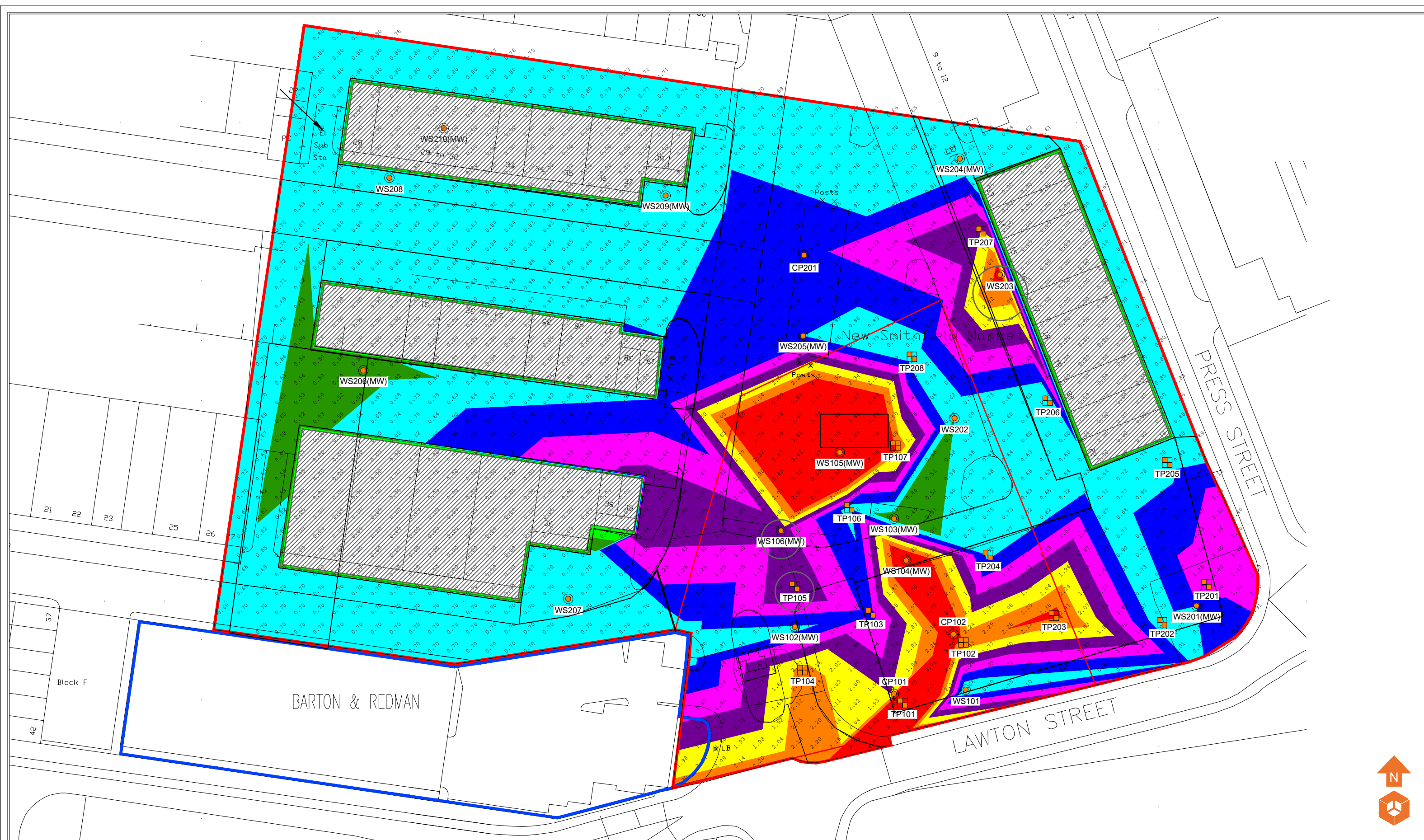


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Site Features Concrete Car Park Main Access Road Storage Units Storage Gatehouse Concrete Wall	Notes:					Client: Russells Construction	Job No: 12-757	Date: 25.06.2020	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk
							Drawing No: 004	Scale: NTS @ A3	
							Drawing Title: Site Features Plan	The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.	
P1 REVB 25.06.2020 LM SE P1 REVA 17.06.2020 LM SE Phase Issue Date Drawn Checked						Job Title: Barton & Redman, Manchester			



Location Symbols

- WS208 Approximate Window Sample Probehole Location
- WS209(MW) Approximate Window Sample Probehole Location with Install
- TP201 Approximate Trial Pit Location
- CP201 Approximate Cable Percussive Borehole Location

Made Ground Depth (m)

- Depth of Made Ground 0.00 - 0.29m
- Depth of Made Ground 0.30 - 0.59m
- Depth of Made Ground 0.60 - 0.89m
- Depth of Made Ground 0.90 - 1.19m
- Depth of Made Ground 1.20 - 1.49m
- Depth of Made Ground 1.50 - 1.79m
- Depth of Made Ground 1.80 - 2.09m
- Depth of Made Ground 2.10 - 2.49m
- Depth of Made Ground >2.50m

- Depth of Made Ground may be deeper due to known Services
- Hole Refused on Obstruction

Notes:

P1	REVE	02.12.2020	CB	SE
P1	REVC	23.07.2020	LM	SE
P1	REVB	16.07.2020	CB	SE
P1	REVA	26.06.2020	LM	SE
P1	REVA	18.06.2020	LM	SE
Phase	Issue	Date	Drawn	Checked

Client:

Russells Construction

Job Title:

Barton & Redman,
Manchester

Job No:

12-757

Drawing No:

006

Date:

02.12.2020

Scale:

NTS @ A3

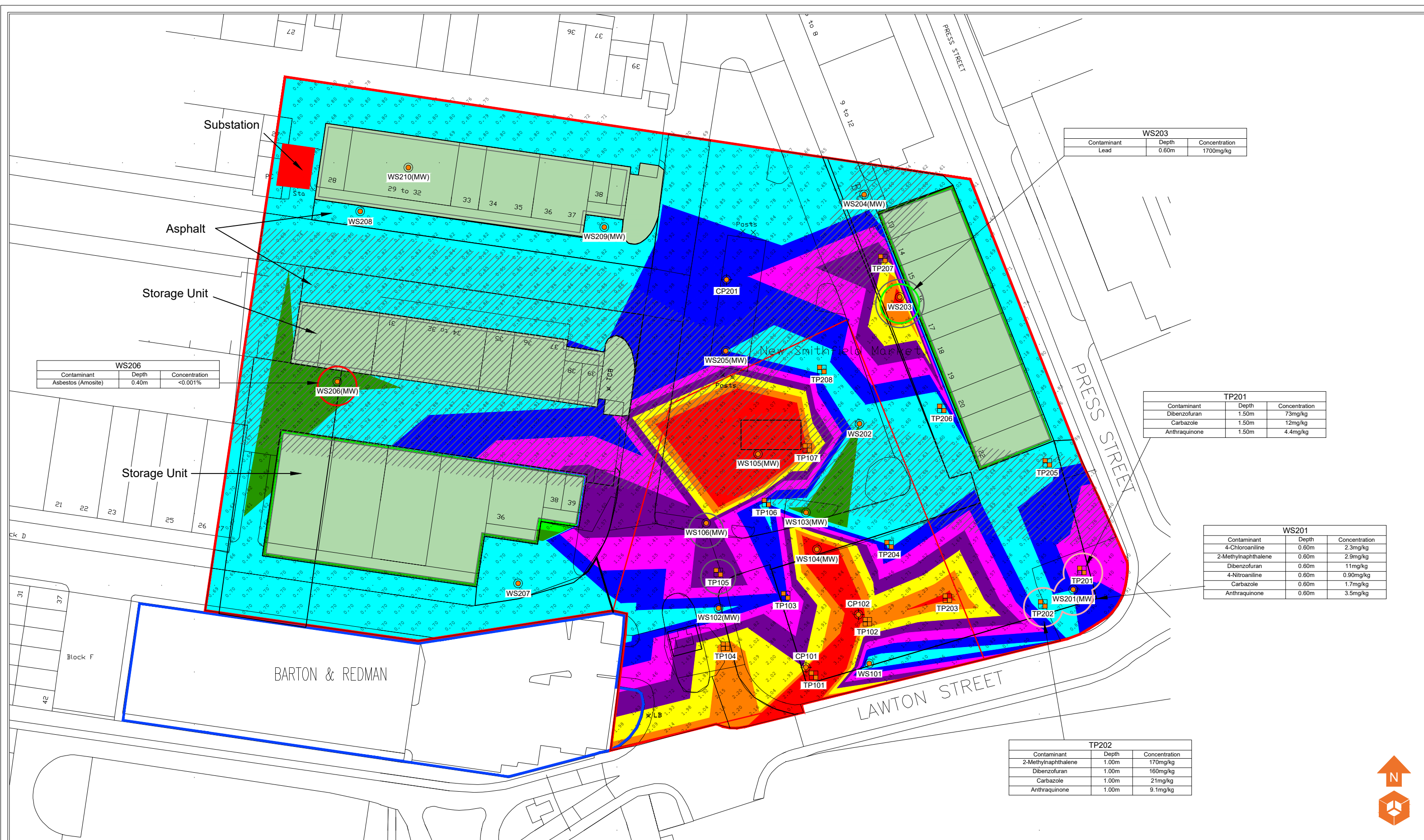
Drawing Title:

Depth of Made Ground
Plan



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WS206		
Contaminant	Depth	Concentration
Asbestos (Amosite)	0.40m	<0.001%

WS203		
Contaminant	Depth	Concentration
Lead	0.60m	1700mg/kg

TP201		
Contaminant	Depth	Concentration
Dibenzofuran	1.50m	73mg/kg
Carbazole	1.50m	12mg/kg
Anthraquinone	1.50m	4.4mg/kg

WS201		
Contaminant	Depth	Concentration
4-Chloroaniline	0.60m	2.3mg/kg
2-Methylnaphthalene	0.60m	2.9mg/kg
Dibenzofuran	0.60m	11mg/kg
4-Nitroaniline	0.60m	0.90mg/kg
Carbazole	0.60m	1.7mg/kg
Anthraquinone	0.60m	3.5mg/kg

TP202		
Contaminant	Depth	Concentration
2-Methylnaphthalene	1.00m	170mg/kg
Dibenzofuran	1.00m	160mg/kg
Carbazole	1.00m	21mg/kg
Anthraquinone	1.00m	9.1mg/kg

Development Constraints Features

- Substation
- Storage Units

Made Ground Depth (m)

- Depth of Made Ground 0.00 - 0.29m
- Depth of Made Ground 0.30 - 0.59m
- Depth of Made Ground 0.60 - 0.89m
- Depth of Made Ground 0.90 - 1.19m
- Depth of Made Ground 1.20 - 1.49m
- Depth of Made Ground 1.50 - 1.79m
- Depth of Made Ground 1.80 - 2.09m
- Depth of Made Ground 2.10 - 2.49m
- Depth of Made Ground >2.50m

- Depth of Made Ground may be deeper due to known Services
- Hole Refused on Obstruction

Contamination Exceedances

- Asbestos
- SVOC
- Lead

Notes:

Client:

Russells Construction

Job No:

12-757

Date:

02.12.2020

Drawing No:

008

Scale:

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P1	REVC	02.12.2020	CB	SE
P1	REVB	27.07.2020	LM	SE
P1	REVA	18.06.2020	LM	SE
Phase	Issue	Date	Drawn	Checked

Job Title:

Barton & Redman,
Manchester

Drawing Title:

Development Constraints
Plan

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Summary of Heave Precaution Requirements								
Volume Change Potential	Required Foundation Depth (m)	Minimum Void Dimensions for Foundations, Ground Beams & Suspended In-Situ Concrete Ground Floors		Minimum Void Dimensions Under Pre-Cast Concrete & Suspended Timber Floors				
		Thickness of Void Former Against Side of Foundation of Ground Beam (mm)	Thickness of Void Former on Underside of Edge Beam & Floor Slab (mm)	Void Dimension (mm)				
Low Volume Change Potential (<20%)	>2.00	No Special Precautions			200			
	2.00-2.50	-	50					
Medium Volume Change Potential (20-40%)	1.50-2.00	25	50	250				
	2.00-2.50	25	100					
High Volume Change Potential (>40%)	>2.50	Engineer Design			Engineer Design			
	1.50-2.00	25	75					
	2.00-2.50	35	150	300				
	>2.50	Engineer Design						
Engineer Design								
Minimum Width of Strip Footings								
Type of Ground (including Engineered Fill)	Condition of Ground	Total Load of Load-Bearing Walling more than (kN/linear metre)						
		20	30	40	50	60	70	
		Minimum Width of Strip Foundation (mm)						
Gravel	Sand	Medium Dense to Dense	250	300	400	500	600	650
Clay	Sandy Clay	Stiff	250	300	400	500	600	650
Clay	Sandy Clay	Firm	300	350	450	600	750	850
Items Considered								
Bearing Capacity			TBC					
Trees			TBC					
Historical			TBC					
Groundwater Table			TBC					
FFL			TBC					
Contamination			TBC					
Remediation			TBC					
Volume Change Potential			TBC					
Root Protection Areas			TBC					
Residual Risks								
Foreseeable Risks That Cannot be Avoided	Applicable (Y/N)	Action to Reduce Risk				Justification for Design Decision		
Deep Excavations	Y	Identify locations on drawing and depths on schedule				Lesser risk than other alternatives		
Trench Collapse	Y	Risk highlighted on drawing				Lesser risk than other alternatives		
Use of Working Platform for Pile/Vibro Operations	Y	Compliance with working platform directive required				Pile/Vibro foundation less risky than other alternatives		



- Anticipated Foundation Types**
- TS** Traditional Strip Foundations
Minimum depth 1200mm below proposed First Floor Level.
Maximum safe bearing pressure limited to 100kN/m2.
 - MT** Mass Trench Fill Foundations
Minimum depth 1200mm below proposed First Floor Level.
Maximum safe bearing pressure limited to 100kN/m2.
 - V** Vibro Stone Ground Compaction
In accordance with NRSBC Chapter 4.2.
 - P** Piled Foundations
Where the proposed foundation depth exceeds 2.50m a piled foundation option rather than a trench fill / deep reinforced strip foundations may be adopted. Columns or tie beams supported by ground beams.
 - R** Raft Foundations
Minimum safe bearing pressure limited to 50kN/m2 or approved engineer's greater. Raft foundations to be designed by a structural engineer in accordance with Chapter 4.5 of BS8100:2019. Raft foundations are considered suitable to mitigate against potential differential clay shrink / expansion in accordance with Section 4.2, sub-section 2(b).
 - TB** Traditional Strip / Trench Block Foundations
Foundation may be located at different levels current level with build up in Trench Block and subsequent backfill to development level.
 - Colours on Plot Corners to be Used When Referring to Foundation Schedule.**
(Opening First Layers & Levels)

- Depth to Target Founding Strata**
- Footings 0.75 - 0.90m Deep
From First Floor Level
In accordance with NRSBC Chapter 4.2
 - Footings 0.90 - 1.25m Deep
From First Floor Level
In accordance with NRSBC Chapter 4.2
 - Footings 1.25 - 1.50m Deep
From First Floor Level
In accordance with NRSBC Chapter 4.2
 - Footings 1.50 - 1.75m Deep
From First Floor Level
In accordance with NRSBC Chapter 4.2
 - Footings 1.75 - 2.00m Deep
From First Floor Level
In accordance with NRSBC Chapter 4.2
 - Footings 2.00 - 2.25m Deep
From First Floor Level
In accordance with NRSBC Chapter 4.2
 - Footings 2.25 - 2.50m Deep
From First Floor Level
In accordance with NRSBC Chapter 4.2

- Engineered Foundation Solutions**
- Footings >2.50m Deep
From First Floor Level
In accordance with NRSBC Chapter 4.2
 - Vibro
 - Low Volume Change Potential Clay
Heave precautions required to underside of cast in situ floor slab (with no sub-floor void) within corrected zone of free influence. Heave precautions not required to foundation.
- Structural Design Risk Management**
Abnormal residual risks associated with the design outcomes on the drawing:
- ****
 - ****

Notes:				
P1	REVA	19.06.2020	LM	SE
Phase	Issue	Date	Drawn	Checked

Client:

Russells
Construction

Job Title:

Barton & Redman,
Manchester

Job No:

12-757

Drawing No:

009

Date:

19.06.2020

Scale:

NTS

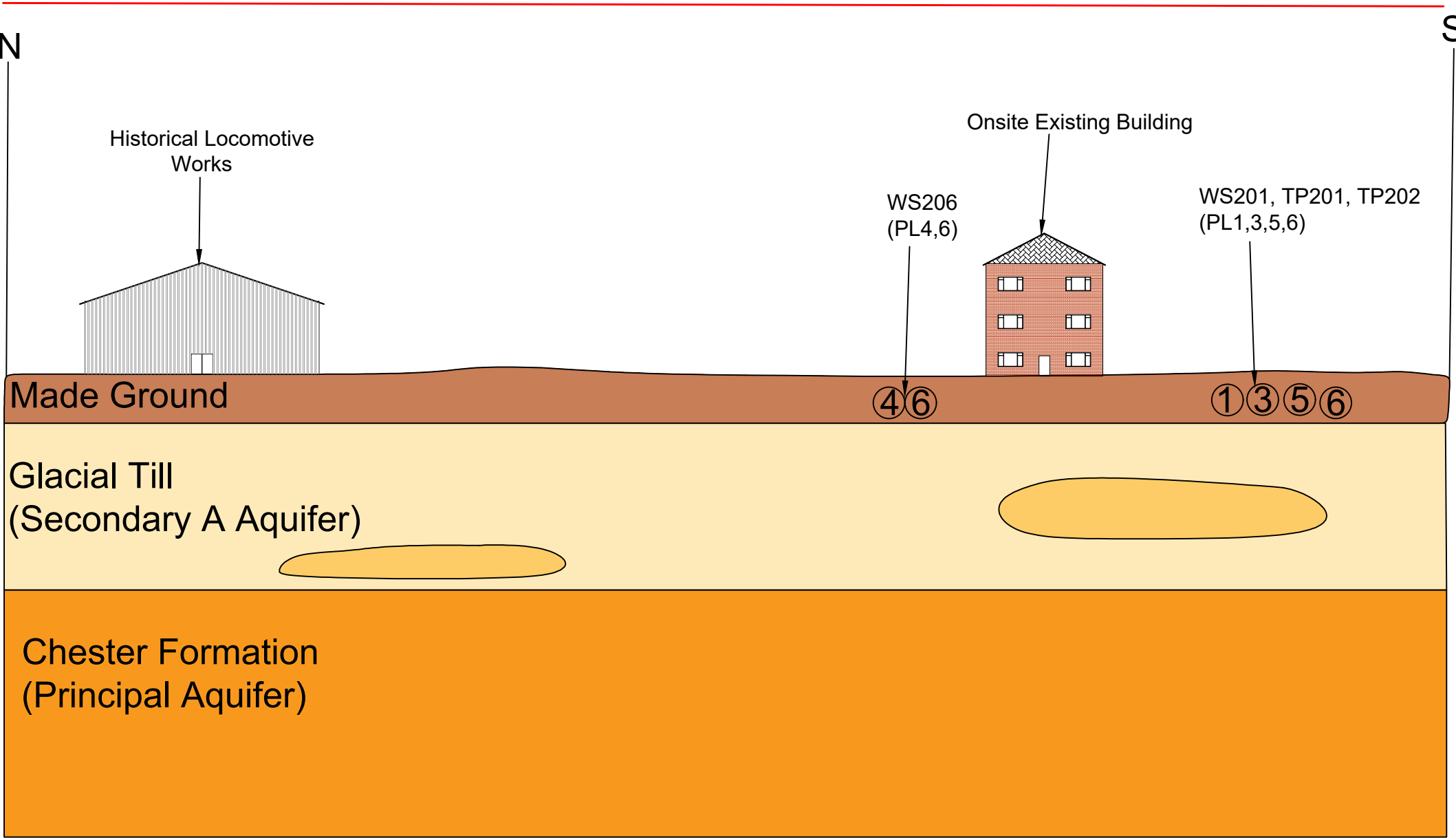
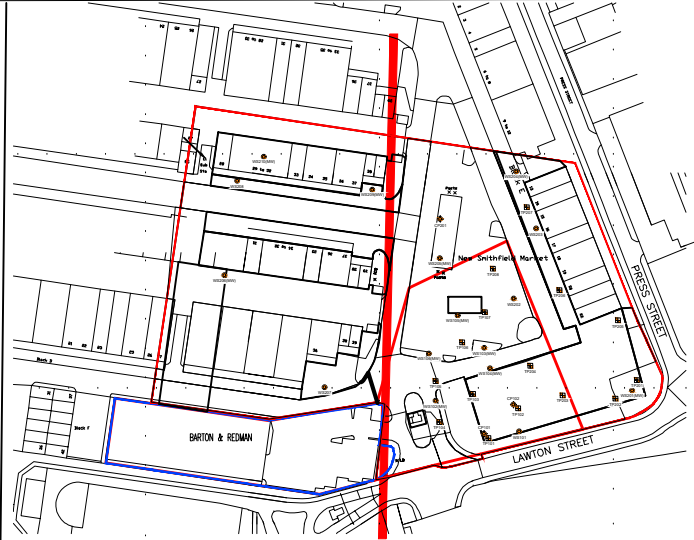
Drawing Title:

Concept Foundation
Zoning Plan

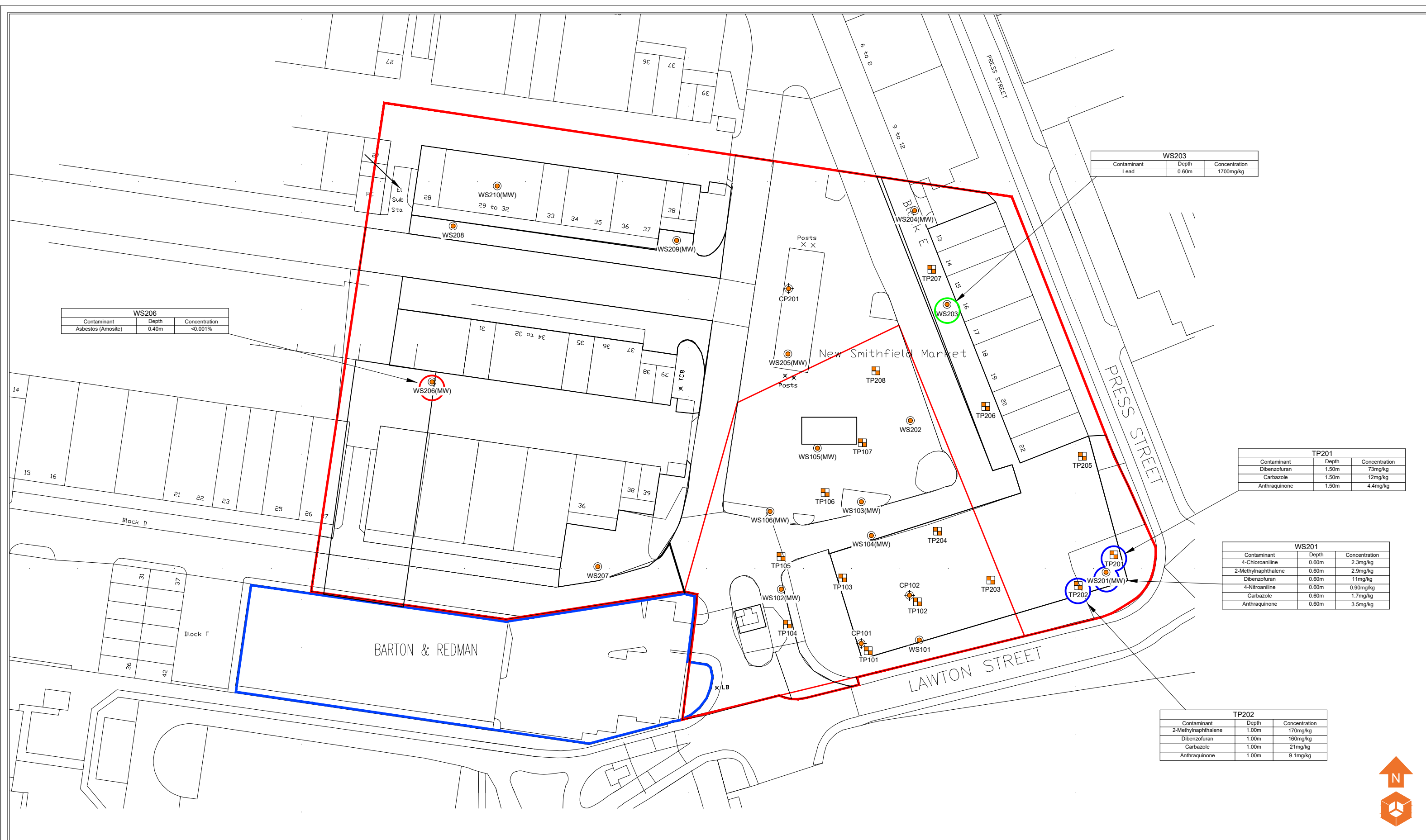
Environmental Engineering
Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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ID	SOURCE	EXPOSURE	POTENTIAL PATHWAY
PL1 PL2	Heavy Metals, heavy end Hydrocarbons & Non Volatile Polycyclic Aromatic Hydrocarbon (PAH)	Dermal Contact and Ingestion of Soils	Construction Workers & end users
PL3	Semi Volatile Polycyclic Aromatic, and petroleum and diesel range Hydrocarbon Compounds, Chlorinated Hydrocarbons	Volatilisation / Accumulation, Vapour Inhalation	Construction Workers & end users
PL4	Asbestos Containing Materials (ACM)	Fibre / Dust Inhalation	Construction Workers, Residential End Users &Third Party Property
PL5	Hazardous Ground Gases (Infilled Features on and within 250m of the site)	Inhalation of Gas	Construction Workers and end users
PL6	Water Soluble mobile Contaminants	Vertical and Lateral Migration	Secondary A Aquifer / Surface Water Courses
PL7	Sulphate (Made Ground)	Corrosion of Concrete	Foundations and Concrete
PL8	Organic Contaminants such as hydrocarbons	Corrosion of Pipeline	Potable Water Supply



CSM Features Made Ground Glacial Till (Secondary A Aquifer) Chester Formation (Principal Aquifer)	Notes:					Client: Russells Construction	Job No: 12-757	Date: 02.12.2020	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk
							Drawing No: 010	Scale: NTS	
						Job Title: Barton & Redman, Manchester	Drawing Title: Conceptual Site Model		



Location Symbols		Contamination Exceedances	
	Approximate Window Sample Probehole Location		Asbestos
	Approximate Window Sample Probehole Location with Install		SVOC
	Approximate Trial Pit Location		Lead
	Approximate Cable Percussive Borehole Location		

Notes:

Client:
Russells Construction

Job No:
12-757

Drawing No:
018

Date:
02.12.2020

Scale:
NTS @ A3

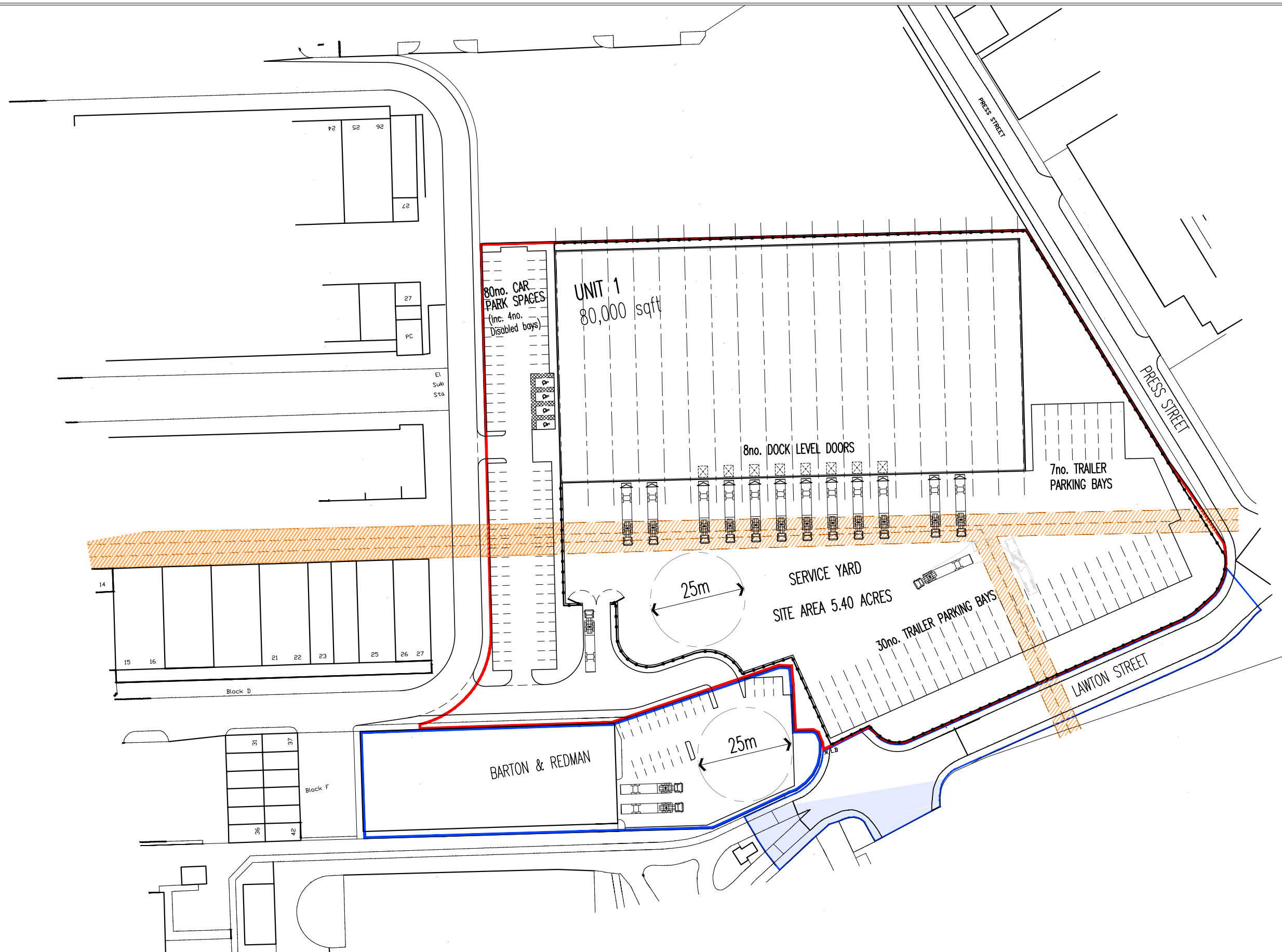
Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

P1	REVB	02.12.2020	CB	SE
P1	REVA	09.07.2020	LM	SE
Phase	Issue	Date	Drawn	Checked

Job Title:
**Barton & Redman,
Manchester**

Drawing Title:
**Contamination Exceedances
Plan**

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Notes:				
P1	REVA	18.06.2020	LM	SE
Phase	Issue	Date	Drawn	Checked

Client:	
Russells Construction	
Job Title:	
Barton & Redman, Manchester	

Job No:	12-757	Date:	18.06.2020
Drawing No:	002	Scale:	NTS @ A3
Drawing Title:		Proposed Development Plan	



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Project Name: Barton & Redman	Project No. 12757	Co-ords: 388613.00 - 397110.00 Level:	Date 26/10/2020
Location: Manchester	Dimensions (m): 1.60 Depth 1.60		Scale 1:30
Client: Russells Construction			Logged N Dawson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
 1.30	0.20	ES		0.30			MADE GROUND: Asphalt.	
				0.60			MADE GROUND: Grey sandy gravel (sub-base). Gravel is fine to medium angular to sub-angular of limestone.	
							MADE GROUND: Black sandy clayey gravel. Gravel is fine to coarse sub-angular of mudstone, brick, asphalt and clinker. Very strong hydrocarbon odour and oil sheen on material and within water.	1
	1.30	ES		1.40			Stiff brown sandy gravelly CLAY. Gravel is fine to medium sub-rounded of mudstone.	
	1.50 1.50	ES HVP	195	1.60			End of Pit at 1.60m	2
								3
								4

Trial Pit Photographs



Trial Pit 201

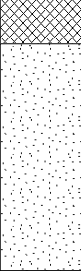
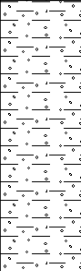


Trial Pit 201 Spoil

Remarks: 1. Terminated at 1.60 m bgl due to water ingress and hydrocarbon impact. 2. Water strike encountered at 1.30 m bgl. 3. Strong hydrocarbon odour and oil substance encountered at 0.60 - 1.40 m bgl.

Stability: Stable

Project Name: Barton & Redman	Project No. 12757	Co-ords: 388606.00 - 397101.00 Level:	Date 26/10/2020
Location: Manchester		Dimensions (m): 1.60 Depth 2.70	Scale 1:30
Client: Russells Construction			Logged N Dawson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.30			MADE GROUND: Asphalt.	
				0.70			MADE GROUND: Grey sandy gravel (sub-base). Gravel is fine to medium angular to sub-angular of limestone.	
	1.00	ES					Brownish grey fine to medium SAND. Strong hydrocarbon odour.	1
	1.80	HVP	167	1.60			Stiff brown sandy gravelly CLAY. Gravel is fine to medium sub-rounded of mudstone.	2
	2.00 2.00 2.20	D ES HVP	181					
				2.70			End of Pit at 2.70m	3
								4

Trial Pit Photographs



Trial Pit 202



Trial Pit 202 Spoil

Remarks: 1. Complete. 2. Strong hydrocarbon odour with sand at 0.70 - 1.60 m bgl.

Stability: Stable

Project Name: Barton & Redman	Project No. 12757	Co-ords: 388590.00 - 397098.00 Level:	Date 26/10/2020
Location: Manchester		Dimensions (m): 1.60 Depth 2.50	Scale 1:30
Client: Russells Construction			Logged N Dawson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.30			MADE GROUND: Asphalt.	
	0.80	ES					MADE GROUND: Grey sandy gravel (sub-base). Gravel is fine to medium angular to sub-angular of limestone.	
	1.20	HVP	181	1.00			MADE GROUND: Stiff brown sandy gravelly clay. Gravel is fine to medium sub-rounded of mudstone, brick and pottery.	1
	2.00 2.00 2.00	D ES HVP	196	2.50			End of Pit at 2.50m	2
								3
								4

Trial Pit Photographs



Trial Pit 203



Trial Pit 203 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Barton & Redman	Project No. 12757	Co-ords: 388573.00 - 397113.00 Level:	Date 26/10/2020
Location: Manchester		Dimensions (m): 1.60 Depth 2.30	Scale 1:30
Client: Russells Construction			Logged N Dawson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
 0.60				0.30			MADE GROUND: Asphalt.	
				0.80			MADE GROUND: Grey sandy gravel (sub-base). Gravel is fine to medium angular to sub-angular of limestone.	
	1.00	HVP	145				Stiff brown sandy gravelly CLAY. Gravel is fine to medium sub-rounded of mudstone.	1
	1.20	ES						
	1.40	D						
	1.60	HVP	198					2
				2.30			End of Pit at 2.30m	3
								4

Trial Pit Photographs



Trial Pit 204

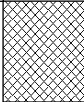
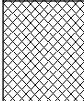
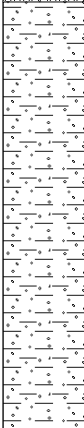


TP204 (1)

Remarks: 1. Complete. 2. Water strike encountered at 0.60 m bgl as perched water.

Stability: Stable

Project Name: Barton & Redman	Project No. 12757	Co-ords: 388604.00 - 397134.00 Level:	Date 26/10/2020
Location: Manchester		Dimensions (m): 1.60 Depth 2.50	Scale 1:30
Client: Russells Construction			Logged N Dawson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.40			MADE GROUND: Asphalt.	
	0.60	ES		0.80			MADE GROUND: Grey sandy gravel (sub-base). Gravel is fine to medium angular to sub-angular of limestone.	
	1.00 1.00 1.00 1.20	B D ES HVP	162				Stiff brown sandy gravelly CLAY. Gravel is fine to medium sub-rounded of mudstone.	1
	2.00	HVP	185	2.50			End of Pit at 2.50m	2
								3
								4

Trial Pit Photographs



Trial Pit 205

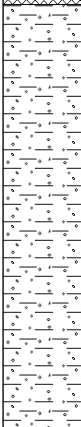


Trial Pit 205 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Barton & Redman	Project No. 12757	Co-ords: 388578.00 - 397141.00 Level:	Date 26/10/2020
Location: Manchester	Client: Russells Construction	Dimensions (m): 1.60 Depth 2.30	Scale 1:30 Logged N Dawson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.30			MADE GROUND: Concrete	
				0.60			MADE GROUND: Grey sandy gravel (sub-base). Gravel is fine to medium angular to sub-angular of limestone.	
	1.00 1.00 1.00	D ES HVP	172				Stiff brown sandy gravelly CLAY. Gravel is fine to medium sub-rounded of mudstone.	1
	1.80	HVP	193					2
				2.30			End of Pit at 2.30m	3
								4

Trial Pit Photographs



Trial Pit 206



Trial Pit 206 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Barton & Redman	Project No. 12757	Co-ords: 388563.00 - 397177.00 Level:	Date 26/10/2020
Location: Manchester	Dimensions (m): Depth 2.70		Scale 1:30
Client: Russells Construction	0.60 1.60		Logged N Dawson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.40	ES		0.35			MADE GROUND: Concrete	
							MADE GROUND: Black sandy clayey gravel. Gravel is fine to coarse sub-angular of mudstone, brick, asphalt and clinker.	1
	2.00 2.00 2.00	D ES HVP	196	1.80			Stiff brown sandy gravelly CLAY. Gravel is fine to medium sub-rounded of mudstone.	2
	2.50	HVP	177	2.70			End of Pit at 2.70m	3
								4

Trial Pit Photographs



Trial Pit 207



Trial Pit 207 Spoil

Remarks: 1. Complete. 2. Slightly unstable within loose Made Ground fill between 0.35 m bgl and 1.80 m bgl.

Stability: Unstable

Project Name: Barton & Redman	Project No. 12757	Co-ords: 388546.00 - 397151.00 Level:	Date 26/10/2020
Location: Manchester	Dimensions (m): 1.60 Depth 2.50		Scale 1:30
Client: Russells Construction			Logged N Dawson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30			MADE GROUND: Asphalt.	
				0.70			MADE GROUND: Grey sandy gravel (sub-base). Gravel is fine to medium angular to sub-angular of limestone.	
	1.00	HVP	201				Dark brown mottled grey gravelly CLAY. Gravel is fine to medium sub-rounded of mudstone.	1
	1.20 1.20	D ES						
	2.00	HVP	203					2
				2.50			End of Pit at 2.50m	3
								4

Trial Pit Photographs



Trial Pit 208



Trial Pit 208 Spoil

Remarks: 1. Complete

Stability: Stable



Nicola Dawson

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Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 20-38514

Project / Site name:	Smithfield Market, Barton and Redman	Samples received on:	27/10/2020
Your job number:	12-757	Samples instructed on/ Analysis started on:	29/10/2020
Your order number:	12-757-ND-H	Analysis completed by:	05/11/2020
Report Issue Number:	1	Report issued on:	05/11/2020
Samples Analysed:	1 leachate sample - 8 soil samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number				1668108	1668109	1668110	1668111
Sample Reference				TP201	TP201	TP201	TP202
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	1.30	1.50	1.00
Date Sampled				26/10/2020	26/10/2020	26/10/2020	26/10/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	1.8	24	15	8.7
Total mass of sample received	kg	0.001	NONE	0.9	1.5	0.4	0.4

Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	-	-
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	8.2	-	-
Total Cyanide	mg/kg	1	MCERTS	-	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	-	690	-	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	510	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.25	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	253	-	-
Sulphide	mg/kg	1	MCERTS	-	170	-	-
Total Sulphur	mg/kg	50	MCERTS	-	4200	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	-	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	17	-
Acenaphthylene	mg/kg	0.05	MCERTS	0.34	-	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	0.33	-	12	-
Fluorene	mg/kg	0.05	MCERTS	0.55	-	5.9	-
Phenanthrene	mg/kg	0.05	MCERTS	1.1	-	13	-
Anthracene	mg/kg	0.05	MCERTS	0.25	-	2	-
Fluoranthene	mg/kg	0.05	MCERTS	0.84	-	3.8	-
Pyrene	mg/kg	0.05	MCERTS	1.3	-	2.8	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.87	-	0.72	-
Chrysene	mg/kg	0.05	MCERTS	1	-	0.61	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	0.24	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	0.14	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	0.22	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	6.53	-	57.6	-
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Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number	1668108	1668109	1668110	1668111
Sample Reference	TP201	TP201	TP201	TP202
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	1.30	1.50	1.00
Date Sampled	26/10/2020	26/10/2020	26/10/2020	26/10/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	14	9.1	5.7
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	180	96
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	-	1.3	0.66
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	0.4	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	-	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	23	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	270	25	18
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	140	12	11
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	28	38	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0	1.2	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	37	19
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	220	66	67

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	3.7
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	100
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	130
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	75
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	5.9
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	12	-	85
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	22	-	100
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	11	-	67
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	46	-	260

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	0.037
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	0.79
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	29	-	490
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	370	-	1500
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	410	-	1300
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	71	-	180
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	890	-	3500

TPH (C5 - C6)	mg/kg	1	NONE	-	-	< 1.0	-
TPH (C6 - C8)	mg/kg	0.1	MCERTS	-	-	< 0.1	-
TPH (C8 - C10)	mg/kg	0.1	MCERTS	-	-	< 0.1	-
TPH (C10 - C12)	mg/kg	2	MCERTS	-	-	17	-
TPH (C12 - C16)	mg/kg	4	MCERTS	-	-	34	-
TPH (C16 - C21)	mg/kg	1	MCERTS	-	-	32	-
TPH (C21 - C35)	mg/kg	1	MCERTS	-	-	11	-
TPH (C35 - C40)	mg/kg	10	MCERTS	-	-	< 10	-
TPH Total C5 - C40	mg/kg	10	MCERTS	-	-	110	-

Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number	1668108	1668109	1668110	1668111
Sample Reference	TP201	TP201	TP201	TP202
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	1.30	1.50	1.00
Date Sampled	26/10/2020	26/10/2020	26/10/2020	26/10/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accred- itation Status	

SVOCs

Aniline	mg/kg	0.1	NONE	-	< 0.1	-	< 0.1
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	< 0.2
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	-	6.9	-	180
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	170
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	-	2.7	-	4.3
Acenaphthene	mg/kg	0.05	MCERTS	-	130	-	270
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	-	73	-	160
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
Fluorene	mg/kg	0.05	MCERTS	-	92	-	200
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	-	290	-	620
Anthracene	mg/kg	0.05	MCERTS	-	33	-	120
Carbazole	mg/kg	0.3	MCERTS	-	12	-	21
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	-	4.4	-	9.1
Fluoranthene	mg/kg	0.05	MCERTS	-	82	-	160
Pyrene	mg/kg	0.05	MCERTS	-	64	-	120
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	13	-	24
Chrysene	mg/kg	0.05	MCERTS	-	10	-	21
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	7.5	-	9.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	2.3	-	3.4
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	4.3	-	6.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05

Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number				1668108	1668109	1668110	1668111
Sample Reference				TP201	TP201	TP201	TP202
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	1.30	1.50	1.00
Date Sampled				26/10/2020	26/10/2020	26/10/2020	26/10/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05

Miscellaneous Organics

Coal Tar		N/A	NONE	Not Identified	-	-	-
Total Residue	mg/kg	10	NONE	2700	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number					1668112	1668113	1668114	1668677
Sample Reference					TP204	TP207	TP208	TP206
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)					1.20	0.40	1.20	1.00
Date Sampled					26/10/2020	26/10/2020	26/10/2020	26/10/2020
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE		< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE		13	15	13	12
Total mass of sample received	kg	0.001	NONE		0.4	0.4	0.4	0.4

Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	-	-
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	7	-	-
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	-	2100	-	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	540	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.27	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	269	-	-
Sulphide	mg/kg	1	MCERTS	-	6	-	-
Total Sulphur	mg/kg	50	MCERTS	-	1500	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	-	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.27	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	2.2	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.51	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	2.8	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	2.8	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	2.3	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	1.8	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	1.8	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	1.1	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	1.9	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	1.1	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.37	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	1.4	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	20.4	< 0.80	< 0.80
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Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number				1668112	1668113	1668114	1668677
Sample Reference				TP204	TP207	TP208	TP206
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	0.40	1.20	1.00
Date Sampled				26/10/2020	26/10/2020	26/10/2020	26/10/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.1	35	9.6	7.6
Barium (aqua regia extractable)	mg/kg	1	MCERTS	120	-	160	140
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.96	-	1.2	1.1
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	-	0.6	0.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	20	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	24	440	23	21
Lead (aqua regia extractable)	mg/kg	1	MCERTS	16	720	14	13
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	1.1	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	29	43	34	30
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.5	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	26	-	32	28
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	57	340	62	58

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	5.8	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	16	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	58	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	240	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	26	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	350	< 10	< 10

Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number					1668112	1668113	1668114	1668677
Sample Reference					TP204	TP207	TP208	TP206
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)					1.20	0.40	1.20	1.00
Date Sampled					26/10/2020	26/10/2020	26/10/2020	26/10/2020
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accred- itation Status					
SVOCs								
Aniline	mg/kg	0.1	NONE		-	-	-	-
Phenol	mg/kg	0.2	ISO 17025		-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS		-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS		-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS		-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS		-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS		-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS		-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS		-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS		-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS		-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE		-	-	-	-
Isophorone	mg/kg	0.2	MCERTS		-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS		-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS		-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS		-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS		-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS		-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS		-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE		-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS		-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE		-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS		-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS		-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE		-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS		-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS		-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS		-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS		-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS		-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS		-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS		-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025		-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS		-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS		-	-	-	-
Fluorene	mg/kg	0.05	MCERTS		-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS		-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS		-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS		-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS		-	-	-	-
Anthracene	mg/kg	0.05	MCERTS		-	-	-	-
Carbazole	mg/kg	0.3	MCERTS		-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS		-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS		-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS		-	-	-	-
Pyrene	mg/kg	0.05	MCERTS		-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025		-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS		-	-	-	-
Chrysene	mg/kg	0.05	MCERTS		-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS		-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS		-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS		-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS		-	-	-	-

Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number				1668112	1668113	1668114	1668677
Sample Reference				TP204	TP207	TP208	TP206
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	0.40	1.20	1.00
Date Sampled				26/10/2020	26/10/2020	26/10/2020	26/10/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-

Miscellaneous Organics

Coal Tar		N/A	NONE	-	-	-	-
Total Residue	mg/kg	10	NONE	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number				1668115
Sample Reference				TP201
Sample Number				None Supplied
Depth (m)				1.30
Date Sampled				26/10/2020
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accred- itation Status	

General Inorganics

pH	pH Units	N/A	ISO 17025	7.8
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	30
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	7.4
Acenaphthylene	µg/l	0.01	ISO 17025	3.2
Acenaphthene	µg/l	0.01	ISO 17025	160
Fluorene	µg/l	0.01	ISO 17025	64
Phenanthrene	µg/l	0.01	ISO 17025	30
Anthracene	µg/l	0.01	ISO 17025	3.8
Fluoranthene	µg/l	0.01	ISO 17025	0.57
Pyrene	µg/l	0.01	ISO 17025	0.34
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	270
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	6.3
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.6
Copper (dissolved)	µg/l	0.7	ISO 17025	18
Lead (dissolved)	µg/l	1	ISO 17025	2.2
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	0.8
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	12

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10



Analytical Report Number: 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Your Order No: 12-757-ND-H

Lab Sample Number				1668115
Sample Reference				TP201
Sample Number				None Supplied
Depth (m)				1.30
Date Sampled				26/10/2020
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accred- itation Status	

Petroleum Hydrocarbons

TPH1 (C10 - C40)	µg/l	10	NONE	3300
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TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	220
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	780
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	1700
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	580
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	3300

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 20-38514

Project / Site name: Smithfield Market, Barton and Redman

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1668108	TP201	None Supplied	0.3	Black gravel with tar.**
1668109	TP201	None Supplied	1.3	Grey sandy clay with gravel.
1668110	TP201	None Supplied	1.5	Brown clay.
1668111	TP202	None Supplied	1	Grey sand with gravel.
1668112	TP204	None Supplied	1.2	Brown clay with gravel.
1668113	TP207	None Supplied	0.4	Grey rubble with gravel and clinker.**
1668114	TP208	None Supplied	1.2	Brown clay.
1668677	TP206	None Supplied	1	Brown clay.

**Non MCERTS Matrix

Analytical Report Number : 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In house method.	L005-PL	W	ISO 17025
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS

Analytical Report Number : 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Coal Tar in Soil	In-house method by GC-MS, by calculation of discrete polycyclic aromatic content.	In-house method by calculation	L064-UK	D	NONE
Total cyanide in leachate - 1µg/l	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Sample Deviation Report



Analytical Report Number : 20-38514

Project / Site name: Smithfield Market, Barton and Redman

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP201	None Supplied	S	1668108	b	Coal Tar in Soil	L064-UK	b
TP201	None Supplied	S	1668108	b	Speciated EPA-16 PAHs in soil	L064-PL	b



LABORATORY REPORT



4043

Contract Number: PSL20/6416

Report Date: 21 November 2020

Client's Reference: 12757

Client Name: E3P
Taylor Road
Urmston
Manchester
M41 7JQ

For the attention of: Nicola Dawson

Contract Title: Barton and Redman

Date Received: 13/11/2020

Date Commenced: 13/11/2020

Date Completed: 21/11/2020

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

H Daniels
(Senior Technician)

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

4043

PSL
Professional Soils Laboratory

Barton and Redman

Contract No:

PSL20/6416

Client Ref:

12757

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



4043

PSL
Professional Soils Laboratory

Barton and Redman

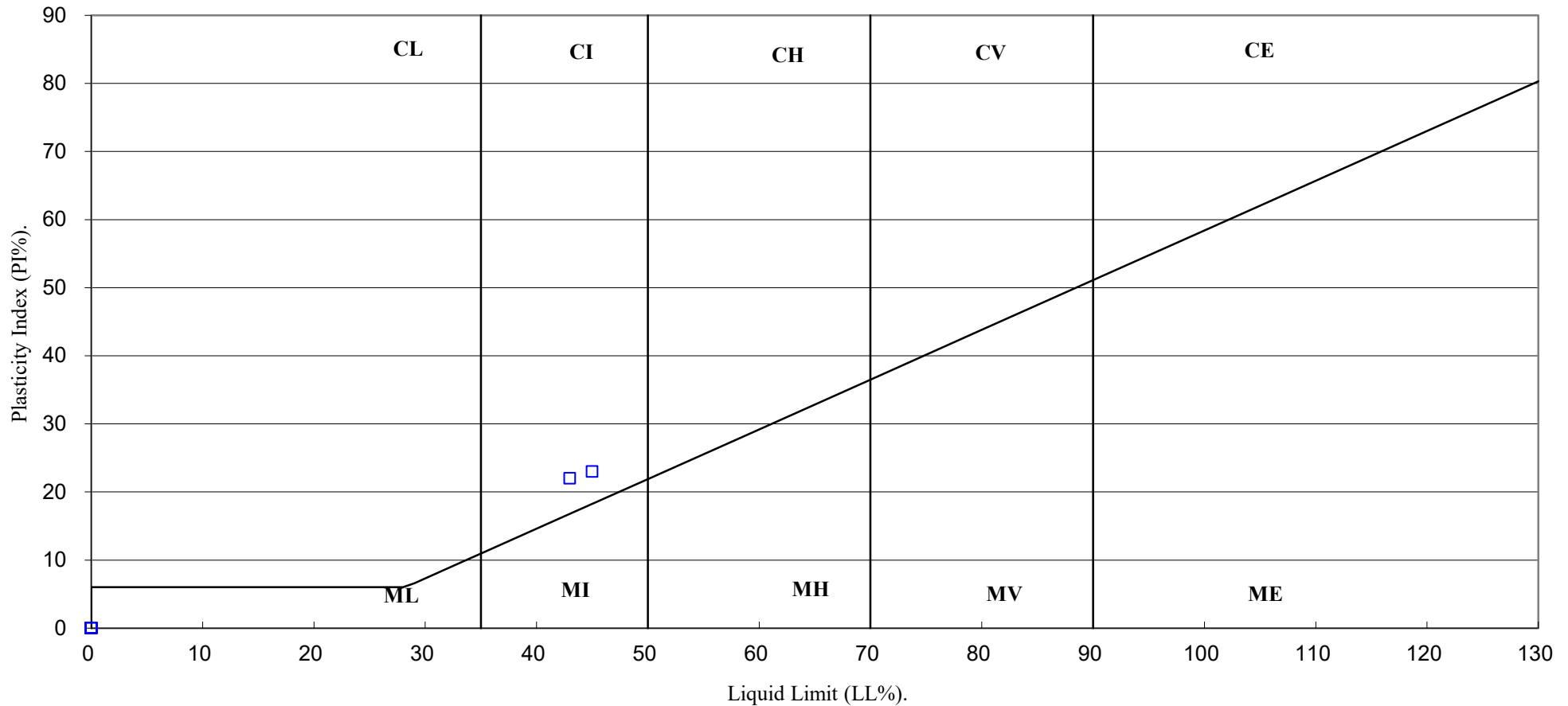
Contract No:

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PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



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12757

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

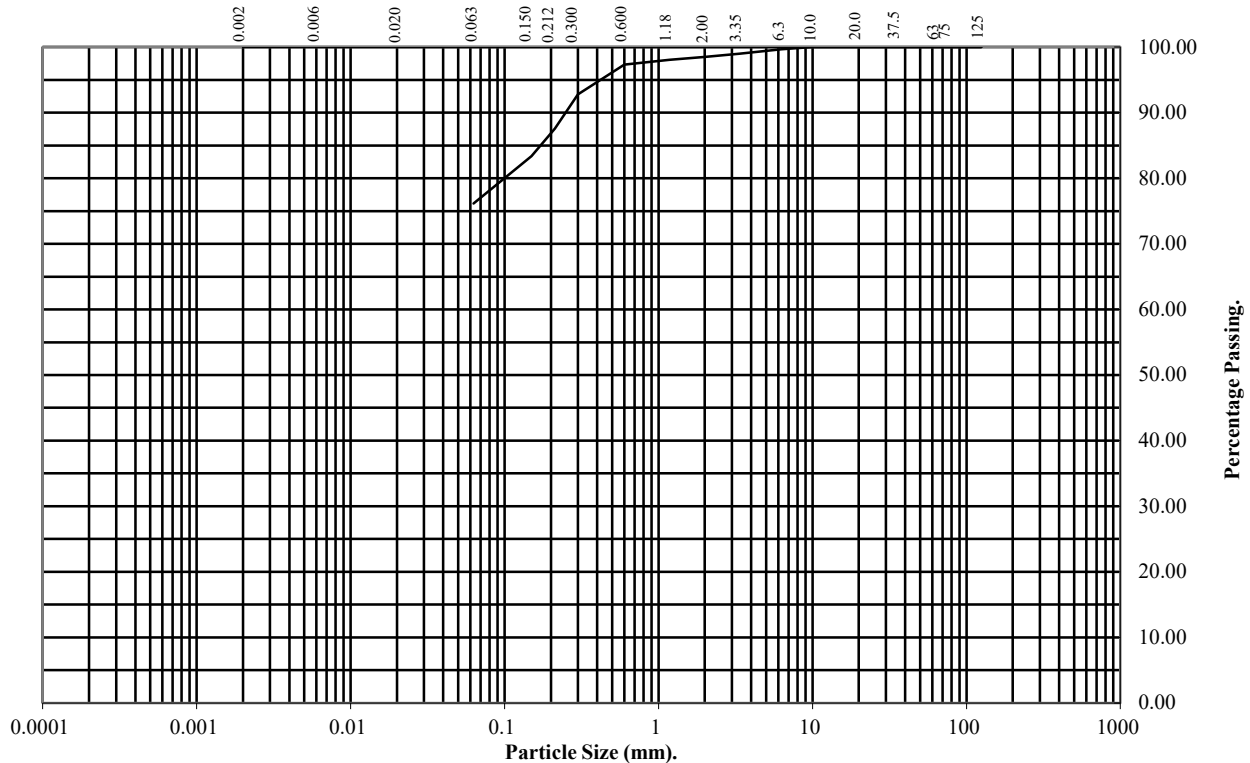
Hole Number: TP208

Top Depth (m): 1.20

Sample Number:

Base Depth(m):

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	99
1.18	98
0.6	97
0.3	93
0.212	88
0.15	83
0.063	76

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	23
Silt/Clay	76

Remarks:

See Summary of Soil Descriptions



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Contract No:
PSL20/6416
Client Ref:
12757

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.3 : 1990

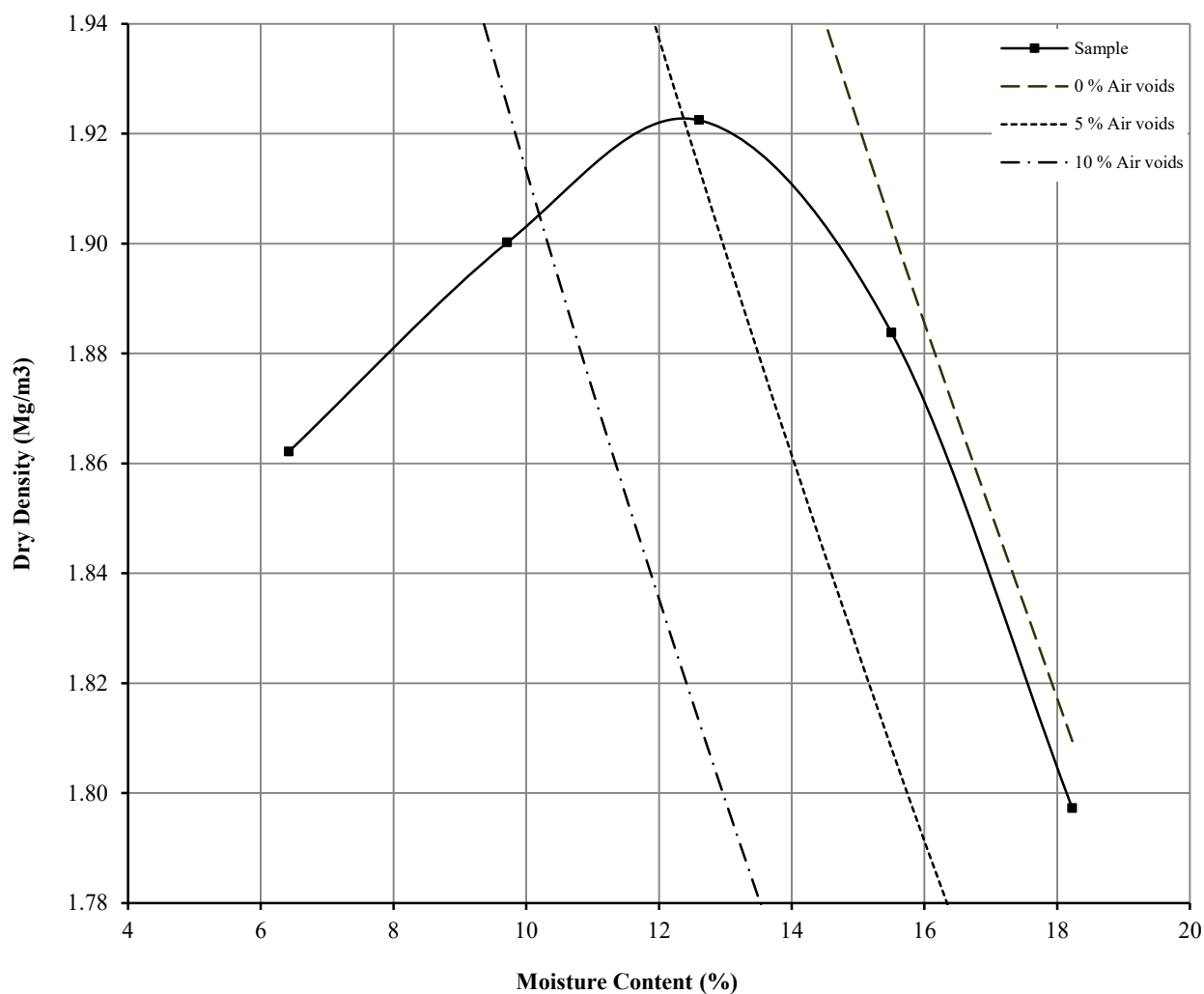
Hole Number: TP208

Top Depth (m) : 1.20

Sample Number:

Base Depth (m) :

Sample Type: B



Initial Moisture Content:	18	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.7	Assumed	Material Retained on 37.5 mm Test Sieve (%):	0
Maximum Dry Density (Mg/m ³):	1.92		Material Retained on 20.0 mm Test Sieve (%):	0
Optimum Moisture Content (%):	13			
Remarks See summary of soil descriptions				



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Contract
PSL20/6416
Client Ref
12757