PHASE II GEO-ENVIRONMENTAL SITE ASSESSMENT

Commercial Development Land
Hareshill Road, Heywood

Prepared for:

Russells Construction

Report Ref: 11-697-r1 Rev 3

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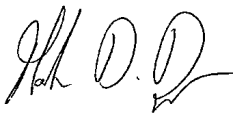
SIGNATURE	
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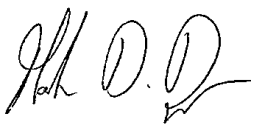
SIGNATURE	
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EXECUTIVE SUMMARY		
Site Address	Employment Parcel - Land to the southwest of Hareshill Road, Heywood, Rochdale, OL10 2TD	
Grid Reference	384559E, 409190N	
Current Site Use	The majority of the subject area is a large undeveloped plateau that has been the subject of historical level raising by the importation and placement of inert materials to achieve the current landform. The site has a covering of self-seeded grasses and vegetation across the eastern and central sectors where the landform falls by engineered earth slopes to Hareshill Road in the east and Pilsworth Road to the north. The western development areas are at a lower elevation, accessed from Pilsworth Road. This land is undeveloped agricultural land and has not been the subject of any recorded previous level raising operation.	
Proposed Development	Russells are delivering the construction of a wider strategic development of the South Heywood Development Area for the development of a link road, up to 1000 homes and approximately 1.458million sq ft of commercial use, a local retail centre, primary school, open space and associated works. The commercial industrial sector which is the subject of this investigation will be developed for a number of large industrial buildings with ancillary external infrastructure.	
Environmental Setting	*Drift Geology*	The northern sector of the site is shown to be underlain with glacial till, but no drift deposits are recorded for the southern half of the site.
	Bedrock Geology	Pennine Lower Coal Measures Formation are present beneath the entire South Heywood Development Area.
	Hydrogeology	The drift strata are classified as undifferentiated aquifers. The Coal Measures are classified as a Secondary A Aquifer. One groundwater abstraction is identified within the central sector of the site for farming and domestic purposes
	Hydrology	Numerous streams are mapped within the Development Area boundary. Where observed, the streams generally flowed in an easterly direction, following the land gradient.
	Flood Risk	The subject site is not shown to be in an area of Flood Risk.
Site History	Prior to the level raising, historical mapping suggests that the industrial development site remained largely undeveloped agricultural land with a number of farm and residential buildings, a stream and drainage ditches running through the site and ponds some of which have since been infilled or silted up. The area in question is a recorded inert landfill where inert material was imported prior to deposition in a controlled manner over a number of years in compliance with the pertinent Environment Agency Exemptions and Standard Rules Environmental Permit for the deposition of materials that complied with the correct EWC Codes. The importation of material as set out above resulted in the creation of the current landform.	

EXECUTIVE SUMMARY	
Previous Reports	A phase 1 report was previously completed by E3P Ltd in November 2016 (Ref: 11094 r1)
Utility Locations	A full GPR survey has been undertaken for the site identifying surface water and foul sewers within the site boundary. A foul sewer is evident crossing the central sector of the site from east to west and apparently continuing beneath the canal on the western boundary to the field on the opposite side.
Site Landfill Operations	The EA regulatory database search report identified Hareshill Farm Equestrian Centre off Hareshill Road, as a licenced Waste Management Facility that was operational between 2012 and 2015. No other details are provided. A review of aerial photography confirmed that this is a large earthworks and anecdotal information indicates that the works are for the formation of an equestrian centre. A review of the waste permit for this facility (EPR/CB37 38AC) states the following: *The permit authorises a deposit for recovery activity allowing the importation of waste engineering fill, which will consist of inert waste only. The site has planning permission for the construction of equestrian facilities within associated horse cross country track and formation of fishing lodges for recreational use.* *The permit will authorise up to 306,000 tonnes of waste construction material to achieve the approved reclamation levels and complete the project. Permitted wastes do not include hazardous wastes. The activity will be carried out in accordance with the approved waste recovery plan.* It is known that the Casey Group operated the Hareshill Site for the importation of inert materials, which by very definition are stable in structure with no organic content / putrescible material that would be subject to decay and degradation that would induce a reduction in the mass and thus induce subsidence at the surface. The primary land stability risk associated with the filled materials is the absence of any specific compaction criteria / engineering operations that would provide further clarification with respect to the structural integrity of the placed inert material.
Radon	Unaffected – no special precautions required.
Coal Mining / Land Stability	E3P has reviewed the, BGS Geological Mapping and CA information, in addition to completing 6 No. 30m rotary boreholes to investigation shallow mine workings; a summary of which is detailed below: The intrusive ground investigations comprising six deep rotary boreholes did not identify any shallow coal seams or evidence of historic mine workings to the base of the boreholes; Due the lack of coal being identified and presence of faulting in the area it is reasonably possibly that the coal has not been mined due to poor continuity of the coal and/ or the coal seams were too thin to be economically viable. When considering the absence of any historical features indicating unrecorded mine workings, a viable coal seam or any evidence to suggest the presence of unconsolidated workings, it is considered the proposed development is unlikely to be at a significant risk of subsidence associated with coal mining.

EXECUTIVE SUMMARY	
E3P Intrusive Ground Investigation	
Ground Investigation Works	E3P has completed a supplementary and detailed intrusive Ground Investigation comprising mechanically excavated trial pits, window sample boreholes, concrete coring, dynamic cone penetrometers, in-situ CBR, rotary open holes, static maintained zone load testing and environmental monitoring installations.
Ground Conditions	**Made Ground** The conjectured depth of Made Ground suggests that the upfill extends to Depths of ~2.0-3.0m in the south extending to ~9.0m in the north.The Made Ground is variable in composition and structure, with sandy gravely clays the most prevalent soil matrix. The material is generally consistent with inert soils generated during the excavation of civil engineering infrastructure within a development site. The material was observed to exhibit stiff medium strength characteristics with little oversized elements, putrescible or deleterious elements. The proven depth of upfilled inert material is set out within the E3P conjectured depth of Made Ground Drawing presented within Appendix III 11-697-007. **Drift** The drift deposits are encountered within all exploratory holes where the full depth of Made Ground was penetrated and comprised a firm to stiff high strength light grey sandy CLAY with sandstone with localised medium dense to dense brown gravelly fine to medium SAND with sandstone. **Solid** Cable Percussion boreholes indicate the presence of drift deposits to between 5.0m and 12.0m below the upfilled plateau, where boreholes were terminated due to refusal in impenetrable stratum. This may be indicative of the bedrock at this depth however it is considered the sandstone bedrock was located at a greater depth and refusals were due to sandstone boulders. ***Groundwater*** No discernible aquifer was identified, with only very localised perched water ingress noted within the upfill material. The placed upfill was observed to be compacted with little or no voiding observed, therefore the potential for water ingress is limited.
Contaminated Land Assessment	
Human Health	A Tier I Human Health Risk Assessment has been undertaken using the chemical analysis results of the soils and comparing to the relevant Tier I criteria. This assessment has identified the presence of elevated lead, asbestos. Asbestos in the form of chrysotile has also been identified within localised areas in shallow Made Ground deposits. Asbestos quantification has been undertaken on 3 of the 4 positive samples and all results have returned with <0.001% weight asbestos. No visual signs of ACM were encountered during the Ground Investigation, therefore it is likely only trace fibres are present within the Made Ground containing demolition rubble. Therefore, the Made Ground soils will need to be carefully managed to ensure no significant exposure occurs.

EXECUTIVE SUMMARY	
Human Health	The specific design and installation process for the appropriate cover systems will be clearly defined within the Site remediation & Enabling Works Strategy, however industry best practice (as outlined within BRE 465) will require the following minimum depths of certified clean cover: • Landscaped areas– **300mm** Chemical analysis of the natural clay and topsoil has indicated that it may be suitable for use within soft landscaping, however further testing would be required to confirm this. Chemical analysis of the natural clay drift deposits identified these soils to be acceptable for use as subsoil within the proposed lansdscaped 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	There is considered to be no unacceptable level of risk to the controlled water receptors.
Ground Gas	Ground gas monitoring suggests that the site can be predominantly classified as CS1 and in these areas, it is considered that gas protection measures will not be required. However, localised areas of the site have been assessed as being CS2, CS3 and CS4. E3P have used professional judgement to classify WS113 as CS4 which is inline with guidance from CIRIA C665 Example 5. It will be necessary to either remove the material within the proximity of the significantly elevated methane where the site is classified as CS4, or alternatively undertake quantitative real time monitoring utilising Gas Clams to inform a robust risk assessment.
Potable Water Infrastructure	This will need to be confirmed following the completion of a UKWIR Risk Assessment. Post remediation and enabling works ground conditions may be different from those identified during this site investigation.
Geotechnical Assessment	
Underground Obstructions	The only previous structures recorded on-site are associated with recent hardstand and access roadways utilised during level raising operations. No significant relict structures or infrastructure is anticipated.
Utilities	High Pressure Gas and Water Main transects through the site, this is clearly recorded and reflected by a no-developable easement. Any works within close proximity to this infrastructure will require detailed site specific risk assessment.
Allowable Bearing Pressure (ABP)	The underlying natural clay has been assessed as having a net Allowable Bearing Pressure (ABP) of circa 100kN/m^2 where present albeit limited due to deep Made Ground increasing to in excess of 250kN/m^2 with depth. The natural sands and gravels encountered are medium dense to very dense. The presumed weathered bedrock at depths between 6.0m and 12.0m beneath the raised plateau have a calculated ABP >500kN/m2.

EXECUTIVE SUMMARY	
Foundation Options	Given the depth of upfill Made Ground, it is considered that proposed structures will be constructed using a Pile Foundation to transfer structural loading to the underlying competent weathered bedrock stratum at a depth generally between 3.0m and 8.0m. All buildings will be constructed with ground gas mitigation measures to ensure complete protection. Ground Improvement options including Vibro Replacement Stone Columns (VSC) or Rapid Impact Compaction will be limited by the design ABP in the order of 150kN/m2 that could be achieved for a structural foundation.
Building Floor Slabs & External Hardstanding	A process of Rolled Dynamic Compaction (RDC) could be utilised to induce total consolidation to the placed fill material, induce primary and secondary settlement and ensure a safe and uniform allowable bearing pressure across the site for a design ground bearing floor slab with a UDL of 50kN/m2. A process of lime and cement stabilisation could be applied to the near surface layers to construct a bound sub-base replacement layer across the platform to ensure a CBR in the order of 15-30% at formation. The bound sub-base would provide the required temporary works platform for a piling rig and when capped with suitable Type 1 MOT would facilitate the construction of a ground bearing floor slab to institutional design requirements. Where the site will be subject to a process of upfill to achieve the required development elevation, the material will need to be compacted to ensure compliance as a structural fill material. In reality this placement and compaction of materials will necessitate the additional of lime and OPC to ensure the required structural properties and ensure the required in-situ densities. It is therefore considered that the use of lime and OPC stabilisation to construct a bound sub-base replacement layer would be extended to compliment the site cut / fill process which could then be completed in any climatic condition. As alternative to the afore mentioned Ground Engineering / Compaction solution, it would be possible to cut / fill the site to the required development platform prior to the construction of Vibro Replacement Stone Columns to ensure a safe and uniform Allowable Bearing pressure (ABP) of the ground bearing slab and external hardstand. It is anticipated that a site wide grid of stone columns across a 3.0m centre would be required. If a VSC solution was utilised, it would be necessary to undertake prior enabling works with engineering of materials within areas of upfill engineered to ensure End Product Specification where material is placed to ensure the in-situ density is equal to or exceeding the laboratory defined maximum with moisture to be within the defined control limits. E3P has instigated a number of static maintained zone load tests across the upfilled area with an applied UDL >50kN/m2. Settlement will be monitored frequently to 0.1mm to assess the induced settlement of a prolonged period. The results of this analysis will be presented within the final draft of this report.

EXECUTIVE SUMMARY	
Heave Precautions	Geotechnical testing has confirmed the clay soils to be of low volume change potential. 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 re-enforcement within the slab to be designed by the Structural Engineer.
Zone Load Tests	The Zone Load monitoring completed to date confirmed that future settlement of the underlying unconsolidated soils may be an issue that requires mitigating during the enabling works by ground improvement to ensure total consolidation of historically placed material. Consideration must be given to the deeper fill materials of recently placed sandy clay material beyond 2.50m bgl as deep seated settlement may be a secondary factor. The use of Rolled Dynamic Compaction of Ground Improvement by VSC can ensure the engineering of the Made Ground to ensure the primary and secondary consolidation is within the required parameters.
Soakaway Drainage	Due to the presence of deep Made Ground containing a degree of potentially mobile contaminants in addition to the presence of significant low permeability clays across the site, it is considered that soakaway drainage will be unsuitable for the proposed commercial development.
Sulphate Assessment	Concrete classification will be DS1 AC1s & DS2-AC2s upon completion of the Remediation and Enabling Works.
CBR Design %	Granular soils can be re-engineered to ensure a CBR in the order of 4-5% within the sub-grade during favourable climatic conditions. Natural clay soils will provide a CBR in the order of 2-4% during drier climatic periods, however If water is allowed to shed onto the formation, the CBR will reduce to <2% which will require specialist engineering of the sub-grade.
Cut / Fill	Development levels unknown at this time, however cut fill works will be required to prepare the development platform. A geotechnical specification of works will be required to document filled material types, compaction methodologies and validation testing relevant to the proposed development end use.
Waste Characterisation	Stable Non-Reactive (non-hazardous / inert). Any material that is to be disposed to landfill should undergo assessment using Technical Guidance WM3: *Waste Classification - Guidance on the classification and assessment of waste.*

EXECUTIVE SUMMARY	
Recommendations	Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course: - Arboriculture Survey; - Geotechnical Earthworks Strategy (Infrastructure); - Remediation & Enabling Works strategy; and, - Build Phase Contamination Mitigation Strategy.

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Appendix II Glossary
Appendix III Drawings

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Drawing No 11-697-003 – Historical Features Plan
Drawing No 11-697-004 – Proposed Development Plan
Drawing No 11-697-005 – Exploratory Hole Location Plan
Drawing No 11-697-006 – Development Constraints with Exploratory Hole Locations
Drawing No 11-697-007 – Conjectured Depth of Made Ground Plan
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Appendix V E3P Exploratory Hole Logs
Appendix VI Chemical Testing Results
Appendix VII Origin of Tier I Generic Assessment Criteria
Appendix VIII Geotechnical Testing Results
Appendix IX Zone Load Testing Results

1. INTRODUCTION

1.1 Background

E3P has been commissioned by Russells Construction to undertake a detailed II Geo-Environmental Site Investigation for a wider strategic development of the South Heywood Development Area

This report is required to determine potential contaminated land liabilities, remediation requirements and geotechnical engineering works that will be required as part of the proposed commercial development.

The scope of work the following elements:

- *Design of suitable intrusive ground investigation;*
- *Window sample probeholes with and construction of environmental monitoring installations;*
- *Deep cable percussive boreholes with groundwater monitoring installations;*
- *Mechanically excavated trial pits;*
- *Sand replacement tests;*
- *In-situ geotechnical testing;*
- *Chemical & geotechnical laboratory analysis;*
- *Groundwater monitoring and sampling;*
- *Ground gas monitoring;*
- *Contamination risk assessment & conceptual site model;*
- *Geotechnical assessment & interpretation; and,*
- *Factual and interpretive reporting.*

1.2 Proposed Development

Russells are delivering the construction of a wider strategic development of the South Heywood Development Area for the development of a link road, up to 1000 homes and approximately 1.458million sq ft of commercial use, a local retail centre, primary school, open space and associated works.

The commercial industrial sector which is the subject of this investigation will be developed for a number of large industrial buildings with ancillary external infrastructure.

A The area that is the subject of this Site Investigation is classified as the proposed employment parcel located at the westerly extremity of the wider South Heywood Development Area as indicated in Figures 1.1 & 1.2 overleaf.

Figure 1.1 – Employment Location



Figure 1.2 – Employment Aerial Photograph



1.3 Objectives

The objectives of the Geo-Environmental Investigation are to:

- Review historical plans, geology, hydrogeology, site sensitivity, flood-plain issues, mining records and any local authority information available in order to complete a Desk Study in line with Environment Agency (EA) document Model Procedures for the Management of Contaminated Land (Contaminated Land Report 11 (CLR11));

- Undertake a preliminary stage of sampling and analysis to provide an overview of environmental issues identified;
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors;
- Assess the geotechnical information and provide preliminary recommendations in relation to foundations, pavement construction and floor slabs; and,
- Provide recommendations regarding future works required.

1.4 Previous Reports

The following reports have previously been completed for the site:

E3P Ltd – *Phase 1 Report – South Heywood- Ref Report No. 11-094r1 - September 2016*

The pertinent points of the E3P ltd report have been included within Section 2.0 of this report.

1.5 Limitations

The limitations of this report are presented in Appendix I.

1.6 Confidentiality

E3P has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.

2. E3P GROUND INVESTIGATION OVERVIEW

2.1 Previous E3P Phase I Desk Study Summary

Human Health Risk

Localised areas of Made Ground associated with infilled ponds and field boundaries may be present across the site and Made Ground may also be present within areas of development such as farm buildings and associated structures. Additionally, a waste facility has been identified in the west of the site where significant depths of inert material are known to have been deposited.

Where Made Ground and farm buildings are present, localised heavy metal, hydrocarbon and asbestos impact may also be present associated with spillages or disposal and accumulation of anthropogenic material. If any impacted soil is identified, then these may pose a risks to human health particularly within proposed commercial areas. However, if a risk identified then it is considered these risks can be mitigated in full through careful construction and the provision of a cover system within affected landscaped areas or through localised remediation of locally impacted soil

Controlled Waters

Significant on-site sources of potentially mobile contaminants are not anticipated at the subject site, however localised areas of possible fuel storage and/or pesticide storage cannot be entirely discounted within the on-site farm areas. As the land is largely pasture, widespread pesticide or herbicide spraying is considered unlikely.

The risk to controlled waters is likely to be governed by the underlying drift, which for the majority of the Development Area comprises low permeability Glacial Till. In these areas, vertical and lateral migration of any mobile contaminants is likely to be limited. The areas of more permeable drift are located in the south of the site and typically comprises open agricultural/pasture land where significant sources of contamination are not anticipated.

Ground Gas

Former ponds, field boundaries and an old quarry have been identified within the wider Development Area while a waste facility and historical mining activity have been identified in the west and east respectively. Alluvial and organic deposits associated with ponds etc in addition to Made Ground associated with any waste activities may be a localised source of carbon dioxide and methane at the near surface. Ground gases associated with historical mine workings are only likely to be an issue within the vicinity of the former shaft where a preferential pathway may exist to underground shallow mine workings.

Ground gas pose a risk where they are allowed to accumulate within confined spaces such as excavations, sub-structures or deep excavations. Therefore, if a gas risk is identified, construction workers should carefully manage entry within deep excavations or confined spaces and allow for adequate monitoring.

Additionally, should a ground gas risk be identified to end users, the risks can be mitigated through the adoption of suitable control measures within the building construction and if necessary localised source removal.

Geotechnical Risk

Based on the desk study information, the following geotechnical assessment has been made:

- The site is located in area that may be affected by historical mining activity. This area will need to be subject to detailed site investigation and any shallow works or shafts may need to be stabilised to facilitate future development;
- A number of historically infilled ponds and reservoirs are present within the site boundary which are potential sources of alluvial deposits, silts and possible organic peat deposits in addition to potential depths of Made Ground. Investigation will be required in order to assess these and undertake in-situ geotechnical testing to determine the likely foundation solution for plots in these areas; and,
- The land at the north eastsector has been infilled with a significant depth of inert material and as such there is the potential for ongoing and long term unacceptable degrees of differential and total settlement induced by structural and infrastructure loading. However, it is considered that due to the nature of the fill material (inert/construction wastes) it will be feasible to sort and process it on-site and re-use a significant proportion within the proposed development.;
- The site is large in size with topographical variances of approximately 10m in localised areas of the development area. In order to construct a commercial development, earthworks will be required to create a level developable platform.

2.2 General

A Ground Investigation has been designed based on the findings of the desk study with exploratory holes advanced to target specific potential contaminant sources summarised in the phase 1 report. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed between the 15th May 2018 and the 21st May 2018. The works are summarised in Table 2.1 below.

Table 2.1 Summary of Fieldwork

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAX DEPTH (mbgl)	MONITORING WELLS RESPONSE ZONE (mbgl)
General Ground Conditions of agricultural land in the north west	WS114	Window Sample Probehole	4.00	1.0-3.0
	WS115		4.00	N/A
	WS116		2.70	N/A
	TP118-TP126	Mechanically Excavated Trial Pit	3.50	N/A
Investigate area of former landfill in the north east of the site	WS105	Window Sample Probehole	4.00	1.0-4.0
	WS107		5.45	1.0-5.0
	WS108		5.45	2.0-5.0
	WS109		5.00	N/A
	WS110		5.45	2.0-5.0
	TP113, TP127-TP130	Mechanically Excavated Trial Pit	2.50	N/A
General Ground Conditions including the presence / nature of obstructions.	TP101-TP112, TP114-TP117 TP131-TP133	Mechanically Excavated Trial Pit	4.80	N/A
	WS101	Window Sample Probehole	1.00	0.5-1.0
	WS102		1.00	0.5-1.0
	WS103		3.00	1.0-3.0
	WS104		3.00	1.0-3.0
	WS106		1.00	N/A
	WS111		0.70	N/A
	WS112		0.20	N/A
	WS113		4.00	1.0-4.0
	WS117		5.45	2.0-4.0
	WS118		1.00	N/A
	WS119		5.45	1.0-3.0
	WS120		5.00	N/A
	WS121		2.00	N/A
Investigation of the deeper strata and installation of deep monitoring wells	BH101	Cable Percussive Borehole	9.50	5.0-9.0
	BH102		9.95	6.0-9.0
	BH103		5.45	1.0-5.45
	BH104		8.45	6.0-8.0
	BH105		13.00	10.0-13.0
	BH106		4.95	2.0-3.0

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.

Window sample probeholes were advanced to undertake detailed in-situ geotechnical testing, obtain environmental samples and install groundwater and ground gas monitoring wells.

In-situ Density Testing by SRD was also conducted in areas of the former landfill.

Deep cable percussive boreholes were completed in order to undertake detailed in-situ geotechnical testing obtain environmental samples and install groundwater and ground gas monitoring wells.

The sampling locations are illustrated in Drawing 11-697-005 (Appendix III). The ground conditions encountered are indicated on the logs which are provided in Appendix V.

Return visits were made to monitor installations for groundwater level and gas concentrations. In addition, selected wells were purged and samples of groundwater recovered for chemical analysis.

2.3 In-Situ Standard Penetration Testing (SPT)

In-situ geotechnical testing was conducted using the Standard Penetration Test (SPT) and where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube. The results are shown in the probehole logs in Appendix VI and presented in Table 3.4 and discussed in Section 5.0.

2.4 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, total and speciated poly-aromatic hydrocarbons (PAHs), SVOCs, VOCs, asbestos and total and speciated petroleum hydrocarbon (TPH).

I2 Analytical undertook the analytical work and the testing results are included in Appendix VII and discussed in Section 9.0.

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

- Atterberg Limits determinations;
- Single Stage Triaxial tests
- Oxygen /Moisture Content tests;
- Compressibility tests;
- Particle Size Distribution tests;

A summary of the Laboratory testing results are presented in Section 3.0 of this report, with the complete certificates within Appendix VIII.

2.5 Maintained Static Zone Load Tests

A series of maintained zone static zone load tests with an applied pressure exceeding 50kN/m2 have been established at varying locations across the site. The tests were utilised to monitor the settlement within the landfilled materials over a duration of six months.

The results of this testing are discussed in section 5.5.

3. GROUND AND GROUNDWATER CONDITIONS

3.1 Ground and Groundwater Conditions

3.1.1 Summary of Ground Conditions

The Ground Investigation generally confirms the published geology and identifies the strata set out in Table 3.1 below:

Table 3.1 Summary of Strata

HOLE	DEPTH TO STRATUM (mbgl)					
	MADE GROUND	SOFT CLAY	TOPSOIL	STIFF CLAY	GRAVEL	SAND
TP101	0.0-2.3	-	-	-	2.3-3.6	-
TP102	0.0-3.2	-	-	-	-	-
TP103	0.0-2.5	-	-	2.5->4.0	1.5-2.0	-
TP104	0.0-2.3	-	-	2.3->3.3	-	-
TP105	0.0-3.4	-	-	-	-	3.4->4.0
TP106	0.0->4.6	-	-	-	-	-
TP107	0.0->4.4	-	-	-	-	-
TP108	0.0->3.0	-	-	-	-	-
TP109	0.0->3.0	-	-	3.0->4.1	-	-
TP110	0.0-2.9	-	-	2.9->4.0	-	-
TP111	0.0->3.8	-	-	-	-	-
TP112	0.0->2.0	-	-	-	-	-
TP113	0.0->2.5	-	-	-	-	-
TP114	0.0->2.6	-	-	-	-	-
TP115	0.0->2.5	-	-	-	-	-
TP116	0.0->3.0	-	-	-	-	-
TP117	0.0->2.5	-	-	-	-	-
TP118	-	2.4->2.9	0-0.3	0.3-2.4	-	-
TP119	-	2.3->2.5	0.0-0.3	0.3-2.3	-	-
TP120	-	2.3-2.5	0.0-0.3	0.3-2.3	-	-
TP121	-	1.5->2.70	0.0-0.5	0.5-1.6	-	-
TP122	-	0.3-2.3	0.0-0.3	-	2.3->2.8	-
TP123	-	0.4-2.5	0.0-0.4	-	2.5->2.7	-
TP124	-	-	0.0-0.2	0.2->3.0	-	-
TP125	-	1.8-2.2	0.0-0.2	0.2-1.1	2.2->2.5	-
TP126	0.0-0.9	2.3->3.5	-	0.9-2.3	-	-
TP127	0->2.5	-	-	-	-	-
TP128	0.0->2.2	-	-	-	-	-
TP129	0.0->2.5	-	-	-	-	-
TP130	0.0->2.4	-	-	-	-	-
TP131	0.0-4.0	-	-	-	-	-
TP132	0.0-4.0	-	-	-	-	-
TP133	0.0-4.0	-	-	-	-	-
WS101	0.0->1.0	-	-	-	-	-
WS102	0.0->1.0	-	-	-	-	-
WS103	0.0-2.8	-	-	-	-	-
WS104	0.0-2.5	-	-	-	-	2.5->3.0
WS105	0.0->4.0	-	-	-	-	-
WS106	0.0-1.0	-	-	-	-	-
WS107	0.0->5.0	-	-	-	-	-
WS108	0.0->0.5	-	-	-	-	-
WS108a	0.0->5.0	-	-	-	-	-
WS109	0.0->5.0	-	--	-	-	-
WS110	0.0->5.0	-	-	-	-	-
WS111	0.0->0.3	-	-	-	-	-
WS111a	0.0-0.5	-	-	-	-	-
WS111b	0.0-0.7	-	-	-	-	-
WS112	0.0-0.2	-	-	-	-	-
WS112a	0.0-0.20	-	-	-	-	-
WS112b	0.0-0.2	-	-	-	-	-
WS112c	0.0-0.2	-	-	-	-	-

HOLE	DEPTH TO STRATUM (mbgl)					
	MADE GROUND	SOFT CLAY	TOPSOIL	STIFF CLAY	GRAVEL	SAND
WS113	0.0->4.0	-	-	-	-	-
WS114	-	0.5-2.5	0.0-0.4	2.5-4.0	-	-
WS115		-	0.0-0.2	0.2-4.0	-	-
WS116	-	-	0.0-0.2	0.2->2.7	-	-
WS117	0.0-3.2	-	-	3.2->5.0	-	-
WS118	0.0->1.0	-	-	-	-	-
WS118a	0.0->1.0	-	-	-	-	-
WS118b	0.0->1.0	-	-	-	-	-
WS119	0.0-3.0	3.0->4.0	-	4.0->5.0	-	-
WS120	0.0-3.2	-	-	3.2-5.0	-	-
WS121	0-2.0	-	-	-	-	-
BH101	0.0-4.6	-	-	4.6-8.0	8.0->9.5	-
BH102	0.0-4.5	-	-	4.5-9.5	9.5-9.95	-
BH103	0.0-4.8	-	-	4.8-5.0	5.0->5.45	-
BH104	0.0-8.1	-	-	-	8.1->8.45	
BH105	0.0-9.0	-	-	9.0-11.5	11.5-13.0	-
BH106	0.0-0.2	-	-	0.2-4.0	4.0->4.95	-

3.1.2 Made Ground

The conjectured depth of Made Ground suggests that the upfill extends to Depths of ~2.0-3.0m in the south extending to ~9.0m in the north.

The Made Ground is variable in composition and structure, with sandy gravely clays the most prevalent soil matrix. The material is generally consistent with inert soils generated during the excavation of civil engineering infrastructure within a development site. The material was observed to exhibit stiff medium strength characteristics with little oversized elements, putrescible or deleterious elements.

The proven depth of upfilled inert material is set out within the E3P conjectured depth of Made Ground Drawing in Appendix III.

3.1.3 Drift Deposits

The drift deposits are encountered within all exploratory holes where the full depth of Made Ground was penetrated and comprised a firm to stiff high strength light grey sandy CLAY with sandstone with localised medium dense to dense brown gravelly fine to medium SAND with sandstone.

3.1.4 Solid Geology

Cable Percussion boreholes indicate the presence of drift deposits to between 5.0m and 12.0m below the upfilled plateau, where boreholes were terminated due to refusal in impenetrable stratum. This may be indicative of the bedrock at this depth however it is considered the sandstone bedrock was located at a greater depth and refusals were due to sandstone boulders.

3.1.5 Groundwater

Groundwater strikes were encountered as seepages. The depth of the seepages are shown on the exploratory hole records and summarised in Table 3.2 overleaf:

Table 3.2 Summary Groundwater Strikes

LOCATION	DEPTH TO STRIKE (m)	NOTES
TP112	1.80	Slow ingress
WS108a	4.00	Slow ingress
WS109	1.50	Slow ingress
WS119	4.00	Slow ingress
WS114	2.00	Slow ingress
TP117	2.30	Slow ingress
WS115	2.00	Slow ingress
WS116	2.00	Slow ingress
TP118	2.40	Slow ingress
TP119	2.30	Slow ingress
TP120	2.00	Slow ingress
TP120	2.30	Slow ingress
TP121	1.60	Slow ingress
TP124	2.40	Slow ingress
TP125	1.80	Slow ingress
TP126	2.30	Slow ingress
TP126	2.50	Slow ingress

Groundwater was observed to be isolated and variable perched ingress generally within the filled material. The groundwater observations are not considered to be representative of a viable aquifer.

3.1.6 Visual and Olfactory Evidence of Contamination

Visual and olfactory evidence of potential contamination has been identified as an ashy odour throughout the Made Ground.

No significant evidence of mobile contamination was identified.

3.1.7 Soil Consistency

Undrained shear strength values were measured using both field hand shear vane tests and laboratory undrained triaxial tests. Results of the tests are presented in Table 3.3 and 3.4 below which indicate the clay soils to vary between soft and very stiff. Strength test data is generally consistent with the field descriptions of the soils given above.

Table 3.3 Summary of Hand Shear Vane Tests

LOCATION	DEPTH	SHEAR STRENGTH KPA	CALCULATED ALLOWABLE BEARING PRESSURE kN/m^2
TP101	0.50	24.67	56.73
TP101	1.00	26.67	61.33
TP101	2.00	36.67	84.33
TP102	1.10	64.00	147.20
TP102	2.00	66.67	153.33
TP102	3.00	36.00	82.80
TP103	1.80	28.00	64.40
TP103	2.80	68.67	157.93
TP103	3.00	60.00	138.00
TP103	3.50	77.33	177.87
TP103	3.90	61.33	141.07
TP104	1.00	81.33	187.07

LOCATION	DEPTH	SHEAR STRENGTH KPA	CALCULATED ALLOWABLE BEARING PRESSURE kN/m²
TP104	2.00	22.00	50.60
TP104	2.40	64.67	148.73
TP104	2.80	54.00	124.20
TP104	3.20	48.00	110.40
TP105	3.00	68.67	157.93
TP105	2.50	62.67	144.13
TP105	2.00	36.00	82.80
TP105	1.50	46.00	105.80
TP106	2.00	27.33	62.87
TP106	2.50	43.33	99.67
TP106	3.00	15.33	35.27
TP106	3.50	11.33	26.07
TP106	4.00	29.33	67.47
TP106	4.50	18.67	42.93
TP107	0.60	32.67	75.13
TP107	1.00	50.67	116.53
TP107	1.30	44.67	102.73
TP107	2.00	50.67	116.53
TP107	2.50	44.67	102.73
TP107	3.00	30.67	70.53
TP107	3.50	26.00	59.80
TP107	4.00	33.33	76.67
TP107	4.30	26.00	59.80
TP108	0.50	42.00	96.60
TP108	1.00	36.00	82.80
TP108	1.50	24.67	56.73
TP108	2.00	31.33	72.07
TP108	2.50	29.33	67.47
TP109	0.50	22.67	52.13
TP109	1.20	18.67	42.93
TP109	2.00	26.67	61.33
TP109	2.60	22.00	50.60
TP109	3.20	75.33	173.27
TP109	3.80	77.33	177.87
TP110	0.50	22.00	50.60
TP110	1.00	37.33	85.87
TP110	1.50	29.33	67.47
TP110	2.00	27.33	62.87
TP110	2.50	21.67	49.83
TP110	3.00	64.67	148.73
TP110	3.50	22.67	52.13
TP111	0.50	32.00	73.60
TP111	1.00	47.33	108.87
TP111	1.50	40.67	93.53
TP112	0.50	24.00	55.20
TP112	1.00	48.00	110.40
TP113	0.50	35.00	80.50
TP113	1.00	28.00	64.40
TP113	1.80	32.00	73.60
TP113	2.00	58.00	133.40
TP114	0.50	32.00	73.60
TP114	1.00	37.33	85.87
TP114	1.50	38.00	87.40
TP115	0.50	34.67	79.73
TP115	1.00	33.33	76.67
TP115	1.50	20.67	47.53
TP115	2.00	62.00	142.60
TP115	2.40	49.33	113.47

LOCATION	DEPTH	SHEAR STRENGTH KPA	CALCULATED ALLOWABLE BEARING PRESSURE kN/m²
TP116	0.50	35.33	81.27
TP116	1.00	49.00	112.70
TP116	1.50	51.33	118.07
TP116	2.00	39.33	90.47
TP116	2.50	57.33	131.87
TP117	1.00	33.33	76.67
TP117	1.50	16.67	38.33
TP117	2.00	32.00	73.60
TP118	0.50	68.67	157.93
TP118	1.00	60.67	139.53
TP118	1.50	55.33	127.27
TP118	2.00	87.33	200.87
TP118	2.50	21.33	49.07
TP119	0.50	41.33	95.07
TP119	1.00	62.67	144.13
TP119	1.50	38.00	87.40
TP119	2.00	65.33	150.27
TP121	0.70	50.67	116.53
TP121	1.00	58.67	134.93
TP121	1.50	36.00	82.80
TP121	2.00	38.67	88.93
TP122	0.50	29.33	67.47
TP122	1.00	17.33	39.87
TP122	2.00	20.00	46.00
TP123	0.50	69.33	159.47
TP123	1.00	41.33	95.07
TP123	1.50	18.67	42.93
TP123	2.00	26.67	61.33
TP123	2.40	28.67	65.93
TP124	0.50	75.33	173.27
TP124	1.00	85.33	196.27
TP124	1.50	48.00	110.40
TP124	2.00	40.67	93.53
TP124	2.50	60.00	138.00
TP125	0.50	53.33	122.67
TP125	1.00	46.67	107.33
TP125	2.00	40.00	92.00
TP126	0.50	44.00	101.20
TP126	1.00	42.67	98.13
TP126	1.50	99.33	228.47
TP126	2.00	64.67	148.73
TP126	2.50	24.67	56.73
TP127	1.00	26.00	59.80
TP127	1.50	60.00	138.00
TP127	2.00	42.67	98.13
TP128	0.70	36.67	84.33
TP128	1.40	52.00	119.60
TP128	2.10	55.33	127.27
TP129	0.50	29.33	67.47
TP129	1.00	40.67	93.53
TP129	1.50	38.00	87.40
TP129	2.00	100.00	230.00
TP129	2.40	49.33	113.47
TP130	1.00	18.00	41.40
TP130	1.50	80.00	184.00
TP130	2.00	19.33	44.47

Table 3.4 Summary of Undrained Shear Strength Test Results

LOCATION	SAMPLE DEPTH (m)	LAB DESCRIPTION	UNDRAINED SHEAR STRENGTH (kN/m^2)	CONSISTENCY
BH102	5.00-5.45	Soft brown mottled grey slightly gravelly sandy CLAY	32-45	Soft
BH104	6.50-6.95	Firm brown mottled grey slightly gravelly very sandy CLAY	61-72	Firm
BH106	1.00-1.45	Firm brown mottled grey slightly gravelly very sandy CLAY	56-77	Firm
WS117	3.50-4.00	Stiff brown mottled grey slightly gravelly very sandy CLAY	92-111	Stiff

Results of the Standard Penetration Tests, including undrained shear strengths derived from SPTs are included on Table 3.5.

3.1.8 Side Stability and Ease of Excavation

The sides of the exploratory trial pit excavations appeared to be generally stable within the natural, however they were unstable within the Made Ground.

The presence of brick and concrete cobbles within the Made Ground deposits meant that in certain places excavation was slow through the Made Ground and in some places, Made Ground could not be fully penetrated. The natural strata was excavated with relative ease.

Table 3.5 Standard/Cone Penetration Test Results

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS101	0.5	MG: slightly silty gravelly clay	50	56.02	N/A	Very high strength	Very Stiff	280.09
WS102	0.5	MG: slightly silty gravelly clay	50	56.02	N/A	Very high strength	Very Stiff	280.09
WS103	1	MG: slightly gravelly silty clay	12	12.10	N/A	Medium strength	Stiff	60.49
	2	MG: slightly sandy gravelly clay	11	10.05	N/A	Medium strength	Stiff	50.24
	3	sandy CLAY	40	34.79	N/A	Very high strength	Very Stiff	173.93
WS104	1	MG: slightly sandy gravelly clay	16	16.13	N/A	High strength	Very Stiff	80.65
	2	MG: slightly sandy gravelly clay	17	15.53	N/A	High strength	Very Stiff	77.65
	3	very gravelly SAND	50	43.48	Dense	N/A	N/A	N/A
WS105	1	MG: slightly silty gravelly clay	11	11.09	N/A	Medium strength	Stiff	55.45
	2	MG: slightly silty gravelly clay	12	10.96	N/A	Medium strength	Stiff	54.81
	3	MG: slightly silty gravelly clay	10	8.70	N/A	Medium strength	Stiff	43.48
	4	MG: slightly silty gravelly clay	44	37.17	N/A	Very high strength	Very Stiff	185.87
WS106	1	MG: slightly silty gravelly clay	50	50.41	N/A	Very high strength	Very Stiff	252.04

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS107	1	MG: sandy gravelly clay	14	14.11	N/A	Medium strength	Stiff	70.57
	2	MG: sandy gravelly clay	4	3.65	N/A	Very low strength	Soft	18.27
	3	MG: sandy gravelly clay	13	11.31	N/A	Medium strength	Stiff	56.53
	4	MG: sandy gravelly clay	23	19.43	N/A	High strength	Very Stiff	97.16
	5	MG: sandy gravelly clay	9	7.47	N/A	Low strength	Firm	37.33
WS108	0.5	MG: sandy gravelly clay	28	31.37	N/A	Very high strength	Very Stiff	156.85
	1	MG: sandy gravelly clay	13	13.11	N/A	Medium strength	Stiff	65.53
	2	MG: sandy gravelly clay	4	3.65	N/A	Very low strength	Soft	18.27
	3	MG: sandy gravelly clay	12	10.44	N/A	Medium strength	Stiff	52.18
	4	MG: sandy gravelly clay	0	0.00	N/A	FALSE	FALSE	0.00
	5	MG: sandy gravelly clay	16	13.27	N/A	Medium strength	Stiff	66.37
WS109	1	MG: sandy gravelly clay	4	4.03	N/A	Low strength	Firm	20.16
	2	MG: sandy gravelly clay	30	27.41	N/A	High strength	Very Stiff	137.03
	3	MG: sandy gravelly clay	14	12.18	N/A	Medium strength	Stiff	60.88
	4	MG: sandy gravelly clay	11	9.29	N/A	Medium strength	Stiff	46.47

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS109	5	MG: sandy gravelly clay	21	17.42	N/A	High strength	Very Stiff	87.11
WS110	1	MG: sandy gravelly clay	4	4.03	N/A	Low strength	Firm	20.16
	2	MG: sandy gravelly clay	20	18.27	N/A	High strength	Very Stiff	91.35
	3	MG: sandy gravelly clay	30	26.09	N/A	High strength	Very Stiff	130.45
	4	MG: sandy gravelly clay	19	16.05	N/A	High strength	Very Stiff	80.26
	5	MG: sandy gravelly clay	8	6.64	N/A	Low strength	Firm	33.18
WS111	0.3	MG: sandy gravelly clay	50	60.52	N/A	Extremely high strength	Very Stiff	302.61
WS111a	0.5	MG: sandy gravelly clay	50	56.02	N/A	Very high strength	Very Stiff	280.09
WS111b	0.7	MG: very gravelly sand	50	53.21	N/A	Very high strength	Very Stiff	266.04
WS112	0.2	MG: very gravelly sand	50	64.25	N/A	Extremely high strength	Very Stiff	321.24
WS112a	0.2	MG: very gravelly sand	50	64.25	N/A	Extremely high strength	Very Stiff	321.24
WS112b	0.2	MG: very gravelly sand	50	64.25	N/A	Extremely high strength	Very Stiff	321.24
WS112c	0.2	MG: very gravelly sand	50	64.25	N/A	Extremely high strength	Very Stiff	321.24
WS113	1	MG: sandy gravelly clay	7	7.06	N/A	Low strength	Firm	35.29
	2	MG: very gravelly sand	23	21.01	N/A	High strength	Very Stiff	105.06

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS113	3	MG: sandy gravelly clay	6	5.22	N/A	Low strength	Firm	26.09
	4	MG: sandy gravelly clay	50	42.24	N/A	Very high strength	Very Stiff	211.21
WS114	1	sandy gravelly CLAY	7	7.06	N/A	Low strength	Firm	35.29
	2	very sandy CLAY	31	28.32	N/A	High strength	Very Stiff	141.60
	3	very sandy CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41
WS115	1	sandy CLAY	8	8.07	N/A	Medium strength	Stiff	40.33
	2	sandy CLAY	9	8.22	N/A	Medium strength	Stiff	41.11
	3	sandy CLAY	24	20.87	N/A	High strength	Very Stiff	104.36
	4	sandy CLAY	40	33.79	N/A	Very high strength	Very Stiff	168.97
WS116	1	sandy CLAY	15	15.12	N/A	High strength	Very Stiff	75.61
	2	sandy CLAY	16	14.62	N/A	Medium strength	Stiff	73.08
	2.7	sandy CLAY	50	44.01	N/A	Very high strength	Very Stiff	220.03
WS117	1	MG: slightly gravelly sandy clay	4	4.03	N/A	Low strength	Firm	20.16
	2	MG: very gravelly slightly sandy clay	10	9.14	N/A	Medium strength	Stiff	45.68
	3	MG: slightly gravelly sandy clay	11	9.57	N/A	Medium strength	Stiff	47.83
	4	CLAY	14	11.83	N/A	Medium strength	Stiff	59.14
	5	CLAY	18	14.93	N/A	Medium strength	Stiff	74.67
WS118	1	MG: sandy gravelly clay	50	50.41	N/A	Very high strength	Very Stiff	252.04
WS118a	1	MG: sandy gravelly clay	50	50.41	N/A	Very high strength	Very Stiff	252.04

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS118b	1	MG: sandy gravelly clay	50	50.41	N/A	Very high strength	Very Stiff	252.04
WS119	1	MG: sandy gravelly clay	13	13.11	N/A	Medium strength	Stiff	65.53
	2	MG: very gravelly sand	8	7.31	N/A	Low strength	Firm	36.54
	3	sandy CLAY	6	5.22	N/A	Low strength	Firm	26.09
	4	sandy CLAY	7	5.91	N/A	Low strength	Firm	29.57
	5	sandy CLAY	16	13.27	N/A	Medium strength	Stiff	66.37
WS120	1	MG: slightly sandy gravelly clay	8	8.07	N/A	Medium strength	Stiff	40.33
	2	MG: slightly sandy gravelly clay	16	14.62	N/A	Medium strength	Stiff	73.08
	3	MG: slightly sandy gravelly clay	16	13.91	N/A	Medium strength	Stiff	69.57
	4	sandy CLAY	11	9.29	N/A	Medium strength	Stiff	46.47
	5	sandy CLAY	50	41.48	N/A	Very high strength	Very Stiff	207.41
WS121	1	MG: very gravelly sand	30	30.24	Dense	N/A	N/A	N/A
	2	MG: very gravelly sand	50	45.68	Dense	N/A	N/A	N/A
BH101	1	MG: slightly sandy gravelly clay	10	10.08	N/A	Medium strength	Stiff	50.41
	2	MG: slightly sandy gravelly clay	15	13.70	N/A	Medium strength	Stiff	68.52
	3	MG: slightly sandy gravelly clay	14	12.18	N/A	Medium strength	Stiff	60.88
	4	MG: slightly sandy gravelly clay	9	7.60	N/A	Low strength	Firm	38.02

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
BH101	5	sandy gravelly CLAY	17	14.10	N/A	Medium strength	Stiff	70.52
	6	sandy gravelly CLAY	14	11.48	N/A	Medium strength	Stiff	57.39
	7.5	sandy gravelly CLAY	50	40.56	N/A	Very high strength	Very Stiff	202.82
	9	silty GRAVEL	50	40.34	Dense	N/A	N/A	N/A
	9.5	silty GRAVEL	50	40.30	Dense	N/A	N/A	N/A
BH102	1	MG: slightly sandy gravelly clay	12	12.10	N/A	Medium strength	Stiff	60.49
	2	MG: slightly sandy gravelly clay	13	11.88	N/A	Medium strength	Stiff	59.38
	3	MG: slightly sandy gravelly clay	14	12.18	N/A	Medium strength	Stiff	60.88
	4	MG: slightly sandy gravelly clay	15	12.67	N/A	Medium strength	Stiff	63.36
	6	sandy CLAY	12	9.84	N/A	Medium strength	Stiff	49.19
	7.5	sandy CLAY	15	12.17	N/A	Medium strength	Stiff	60.85
	9	sandy CLAY	50	40.34	N/A	Very high strength	Very Stiff	201.71
	9.5	sandy GRAVEL	50	40.30	Dense	N/A	N/A	N/A
BH103	1	MG: slightly sandy gravelly clay	16	16.13	N/A	High strength	Very Stiff	80.65
	2	MG: slightly sandy gravelly clay	15	13.70	N/A	Medium strength	Stiff	68.52
	4	MG: slightly sandy gravelly clay	7	5.91	N/A	Low strength	Firm	29.57
	5	sandy GRAVEL	50	41.48	Dense	N/A	N/A	N/A

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
BH104	1	MG: slightly sandy gravelly clay	16	16.13	N/A	High strength	Very Stiff	80.65
	2	MG: slightly sandy gravelly clay	11	10.05	N/A	Medium strength	Stiff	50.24
	3	MG: slightly sandy gravelly clay	11	9.57	N/A	Medium strength	Stiff	47.83
	4	MG: slightly sandy gravelly clay	12	10.14	N/A	Medium strength	Stiff	50.69
	8	MG: slightly sandy gravelly clay	33	26.71	N/A	High strength	Very Stiff	133.56
BH105	1	MG: slightly sandy gravelly clay	11	11.09	N/A	Medium strength	Stiff	55.45
	2	MG: slightly sandy gravelly clay	10	9.14	N/A	Medium strength	Stiff	45.68
	3	MG: slightly sandy gravelly clay	11	9.57	N/A	Medium strength	Stiff	47.83
	4	MG: slightly sandy gravelly clay	9	7.60	N/A	Low strength	Firm	38.02
	5	MG: slightly sandy gravelly clay	9	7.47	N/A	Low strength	Firm	37.33
	6	MG: slightly sandy gravelly clay	12	9.84	N/A	Medium strength	Stiff	49.19
	7.5	MG: slightly sandy gravelly clay	10	8.11	N/A	Medium strength	Stiff	40.56
	9	MG: slightly sandy gravelly clay	8	6.45	N/A	Low strength	Firm	32.27
	12	silty GRAVEL	50	37.21	Dense	N/A	N/A	N/A
	13	silty GRAVEL	50	35.87	Dense	N/A	N/A	N/A

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
BH106	2	sandy CLAY	8	7.31	N/A	Low strength	Firm	36.54
	3	slightly gravelly CLAY	9	7.83	N/A	Low strength	Firm	39.13
	4	sandy GRAVEL	50	42.24	Dense	N/A	N/A	N/A
	4.5	sandy GRAVEL	50	41.82	Dense	N/A	N/A	N/A

3.1.9 Soil Plasticity

The Liquid and Plastic Limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average Plasticity Index (PI) for each "type" of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth.

E3P typically only consider a soil to be shrinkable if the proportion finer than 63µm is >35%.

PI results are compared against guidance given in the NHBC Standards, Chapter 4.2 (revised January 2014), which advocates the use of modified Plasticity Index (I'p), defined as:

I'p = Ip * (%< 425µm/100)

ie if PI is 30%, but the soil contains 80% < 425µm, then: I'p = 30 * 80/100 = 24%.

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425µm sieve is routinely reported by testing labs.

E3P apply engineering judgment where PI results are spread over a range of classifications. Consideration is given to the average values for each particular soil type (ie differentiate between residual soil and alluvium), the number of results in each class and the actual values.

The Atterberg Limits determinations are presented in table 3.6

Table 3.6 Summary of Plasticity Index Test Results

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING 425µm SIEVE (%)	MODIFIED PLASTICITY INDEX	NHBC VOLUME CHANGE POTENTIAL
WS114	1.00	16	16	32	16	94	15.05	Low
WS114	2.00	10	14	29	15	95	14.25	Low
TP118	1.00	15	13	27	14	92	12.88	Low
TP124	1.00	14	16	33	17	96	16.32	Low
TP124	2.00	15	15	31	16	97	15.52	Low
BH106	2.00	16	16	33	17	96	16.32	Low
BH106	3.00	15	17	34	17	93	15.81	Low

3.1.10 Particle Size Distribution

A number of bulk samples of the underlying strata were taken and submitted for particle size distribution analysis. A summary of the results is provided below with the full results in Appendix VIII.

Table 3.7 Summary of Particle Size Distribution Test Results

LOCATION	DEPTH (m)	Cobbles (%)	Gravel (%)	Sand (%)	Silt / Clay (%)
TP101	2.50	0	58	22	20
TP103	1.50	0	8	19	73
TP107	3.00	10	39	27	24
TP109	2.00	38	26	21	15
TP109	3.50	0	1	36	63
TP114	1.50	0	20	40	40
BH101	1.00-1.45	25	34	20	21
BH101	5.00-5.45	0	37	27	36
BH102	1.00-1.45	0	28	36	36
BH102	6.00-6.45	0	12	33	55
BH103	2.50-3.00	0	22	43	35
BH103	4.00-4.50	17	27	21	35
BH104	2.50	0	28	28	44

3.1.11 Soil Compressibility

Consolidation Tests have been undertaken on selected samples of clay using an odometer to obtain consolidation properties. Tests include an unload cycle to help assess potential heave. The results are included in Table 3.8 and show the Clay to be of medium compressibility apart from under low loadings where they can be of high compressibility.

Table 3.8 Summary Consolidation Test Data

LOCATION	DEPTH (m)	LOAD INCRAMENT	Mv	Cv
BH102	5.00	0-105	0.441	15.972
		105-210	0.180	10.097
		210-420	0.129	9.454
		420-840	0.069	9.322
		840-105	0.016	-
BH104	6.50	0-135	0.252	20.529
		135-270	0.082	17.390
		270-540	0.051	15.636
		540-1080	0.033	14.967
		1080-135	0.399	-
BH106	1.00	0-25	Swelling	Swelling
		25-50	0.110	20.522
		50-100	0.137	9.991
		100-200	0.110	5.619
		200-25	0.026	-

LOCATION	DEPTH (m)	LOAD INCRAMENT	Mv	Cv
WS117	3.50-4.00	0-75	0.327	33.862
		75-150	0.164	28.871
		150-300	0.114	21.819
		300-600	0.072	9.948
		600-75	0.016	-

The results have determined that the clay soil is of generally moderate compressibility. 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 as it would appear that at depth the cohesive deposits are wet of the optimum.

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

3.1.12 Sand Replacement Tests

E3P undertook sand replacement tests on the material within the landfill in order to get an understanding of the current compaction.

A summary of the results is presented in table 3.9 below and full results are within VIII.

Table 3.9 Summary of Sand Replacement Test Data

LOCATION	Bulk Density (Mg/m³)	Moisture Content (%)	Dry Density (Mg/m³)	Percentage Compactions (%)
SRD test 1	1.90	16	1.64	86.3
SRD test 2	1.98	13	1.76	88.9
SRD test 3	1.94	16	1.68	86.6
SRD test 4	2.05	12	1.83	89.3
SRD test 5	2.26	7.8	2.10	92.9
SRD test 6	2.10	13	1.86	88.57
SRD test 7	1.88	16	1.63	86.7

3.1.13 Dry Density / Moisture Content Relationship

A number of dry density / moisture content tests have been undertaken using a 4.5kg rammer. The results of the test are summarised in table 3.10 below and presented in full within Appendix VIII.

Table 3.10 Summary of Sand Replacement Test Data

LOCATION	Bulk Density (Mg/m³)	Initial Moisture Content (%)	Optimum Moisture Content (%)	Particle Density (Mg/m3)	Max Dry Density (Mg/m³)
BH101	1.00-1.45	17	14	2.53	1.79
BH102	6.00-6.45	19	10	2.60	2.00
BH103	4.00-4.50	22	11	2.55	1.92
BH104	2.50	17	8	2.57	2.03
TP101	2.50	20	14	2.72	1.88
TP103	1.50	22	16	2.55	1.76

LOCATION	Bulk Density (Mg/m³)	Initial Moisture Content (%)	Optimum Moisture Content (%)	Particle Density (Mg/m3)	Max Dry Density (Mg/m³)
TP107	3.00	17	11	2.50	1.88
TP109	3.50	14	11	2.68	2.00
TP114	1.50	17	11	2.58	1.92

3.1.14 pH and Sulphate

Chemical analyses for pH and soluble sulphate content contained in Appendix VI (summarised below in Table 3.11), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005).

Elevated sulphate concentrations meeting Class DS-2, AC-2 were noted within the Made Ground deposits in a small number of areas.

Table 3.11 Summary of pH and Sulphate Data

LOCATION	DEPTH (m)	SO_4 IN 2:1 WATER / SOIL (g/l)	pH VALUE	CLASSIFICATION
TP101	1.00	0.62	7.3	DS2-AC2s
TP102	2.00	0.46	7.8	DS1-AC1
TP107	1.50	1.2	8.7	DS2-AC2s
WS103	0.50	0.20	8.4	DS1-AC1
TP111	1.00	0.56	9.0	DS2-AC2s
TP101	0.10	0.54	7.6	DS2-AC2s
TP104	0.20	0.077	7.2	DS1-AC1
TP107	0.10	0.11	7.0	DS1-AC1
TP108	2.50	0.25	7.8	DS1-AC1
TP109	0.10	0.071	7.7	DS1-AC1
TP110	2.50	0.90	8.9	DS2-AC2s
TP110	3.50	0.036	5.2	DS1-AC1
TP114	1.50	0.26	8.0	DS1-AC1
WS107	0.50	0.71	7.4	DS2-AC2s
WS115	0.10	0.013	6.0	DS1-AC1
TP119	1.00	0.015	5.1	DS1-AC1
TP120	0.10	0.13	6.1	DS1-AC1
TP125	0.10	0.022	7.7	DS1-AC1
TP126	0.50	0.099	7.9	DS1-AC1
TP126	1.20	0.065	7.2	DS1-AC1
TP130	1.40	0.10	8.1	DS1-AC1

3.2 Ground Gas

A ground gas assessment has been completed in accordance with guidance provided within CIRIA 665 *Assessing risk posed by hazardous ground gases to buildings*.

3.2.1 Investigation Rationale

The ICSM has identified that the underlying Made Ground and landfill may represent a potential source of ground gas generation. Based the identification of these sources, E3P has determined that the site represents a high ground gas source generation potential.

Within the context of the proposed commercial end use and ground gas generation potential, the gas assessment requires 12 visits are required over 3 months with at least two sets of readings at low or falling atmospheric pressure as set out within CIRIA 665 Tables 5.5a and 5.5b.
The spacing requirements for monitoring wells are detailed within CIRIA 665 Table 4.2 and which indicates that for moderate gas hazard sites (*Older domestic landfill sites, disused shallow mine workings, hydrocarbon vapour sources*) and a high sensitivity development nominal well spacing should be between 25m and 50m.

Table 3.12 Ground Gas Monitoring Location Rationale

LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS101	Made Ground	1.00
WS103	Made Ground	1.00
WS104	Made Ground	3.00
WS107	Made Ground	5.00
WS108	Made Ground	5.00
WS110	Made Ground	5.00
WS113	Made Ground	4.00
WS114	Natural	3.00
WS117	Made Ground	4.00
WS119	Made Ground	4.00
BH101	Natural	9.50
BH102	Natural Material	9.00
BH103	Made Ground	5.00
BH104	Made Ground	8.00
BH105	Natural material	13.00
BH106	Migrating gases	3.00

3.2.2 Monitoring Methodology

Concentrations of methane (CH_4), carbon dioxide (CO_2) and Oxygen (O_2) were measured using an infra-red gas analyser (GFM435) and gas flow rates were measured using an attached flow pod.

Gas measurements were recorded for a minimum of sixty seconds at each location, at which point the maximum concentration of CH_4 and CO_2 together with the lowest concentration of O_2 were recorded. The results of the ground gas monitoring are presented in Table 3.13 (overleaf).

Table 3.13 Summary of Ground Gas Monitoring Results

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
WS101	12/6/18	0.1	0.1	0.00013	1	1	0.0013	19.3	1010	Rising	0.13	0.5 – 1.0	1.00	0.84
	22/6/18	0.1	0.1	0.0001	0.9	0.9	0.0009	19.4	1017	Steady	0.1		1.00	0.86
	4/7/18	0.1	0.1	0.00026	1.1	1.1	0.00286	19.2	1018	Falling	0.26		1.00	0.89
	11/7/18	0.1	0.1	-0.0019	1.2	1.2	-0.0228	19.1	1005	Falling	-1.9		0.98	Dry
	19/7/18	0.1	0.1	-0.00217	1.4	1.4	-0.0304	18.9	1003	Steady	-2.17		0.95	Dry
	26/7/18	0.1	0.1	-0.0016	1.5	1.5	-0.024	18.5	1004	Falling	-1.6		0.95	Dry
	2/8/18	0.1	0.1	0.0001	1.7	1.7	0.0017	18.3	1006	Rising	0.1		0.94	Dry
	13/8/18	0.1	0.1	0.00013	1.3	1.3	0.00169	18.5	1008	Rising	0.13		0.94	Dry
	28/8/18	0.1	0.1	0.00052	1.2	1.2	0.00624	18.4	1007	Steady	0.52		0.98	Dry
	4/9/18	0.1	0.1	0.00128	1.0	1.0	0.0128	18.2	1008	Steady	1.28		1.00	Dry
	14/9/18	0.1	0.1	0.00013	1.1	1.1	0.00143	18.3	1005	Steady	0.13		1.00	Dry
	24/9/18	0.1	0.1	0.00026	1.2	1.2	0.00312	18.3	1016	Rising	0.26		1.00	Dry
WS102	12/6/18	Well Damaged							1010	Rising	-	0.5 – 1.0	-	-
	22/6/18	Well Damaged							1017	Steady	-		-	-
	4/7/18	Well Damaged							1018	Falling	-		-	-
	11/7/18	Well Damaged							1005	Falling	-		-	-
	19/7/18	Well Damaged							1003	Steady	-		-	-
	26/7/18	0.1	0.1	0.00096	1.8	1.8	0.01728	18.1	1004	Falling	0.96		1.05	Dry
	2/8/18	0.1	0.1	0.00128	1.6	1.6	0.02048	18.3	1006	Rising	1.28		1.05	Dry
	13/8/18	0.1	0.1	0.00089	1.2	1.2	0.01068	18.5	1008	Rising	0.89		1.05	Dry
	28/8/18	0.1	0.1	0.00096	1.1	1.1	0.01056	19.3	1007	Steady	0.96		1.08	Dry
	4/9/18	0.1	0.1	0.00227	1.2	1.2	0.02724	19.4	1008	Steady	2.27		1.1	Dry
	14/9/18	0.1	0.1	0.0019	0.9	0.9	0.0171	19.7	1005	Steady	1.9		1.1	Dry
	24/9/18	0.1	0.1	0.00087	1.1	1.1	0.00957	19.4	1016	Rising	0.87		1.09	Dry

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
WS103	12/6/18	0.1	0.1	0.00013	0.1	0.1	0.00013	20.5	1010	Rising	0.13	1.0 – 3.0	3.00	Dry
	22/6/18	0.1	0.1	0.0001	0.1	0.1	0.0001	20.6	1017	Steady	0.1		3.00	Dry
	4/7/18	0.1	0.1	0.00026	0.1	0.1	0.00026	20.5	1018	Falling	0.26		3.00	Dry
	11/7/18	0.1	0.1	0.00052	0.1	0.1	0.00052	20.7	1005	Falling	0.52		3.02	2.8
	19/7/18	0.1	0.1	0.00013	0.1	0.1	0.00013	20.9	1003	Steady	0.13		3.05	2.9
	26/7/18	0.1	0.1	0.00026	0.1	0.1	0.00026	20.6	1004	Falling	0.26		3.03	2.94
	2/8/18	0.1	0.1	0.00052	0.1	0.1	0.00052	20.5	1006	Rising	0.52		3.04	2.95
	13/8/18	0.1	0.1	0.00026	0.1	0.1	0.00026	20.4	1008	Rising	0.26		3.03	2.9
	28/8/18	0.2	0.1	0.00104	0.2	0.2	0.00104	20.3	1007	Steady	0.52		2.04	2.91
	4/9/18	0.4	0.1	0.00052	0.3	0.3	0.00039	20.2	1008	Steady	0.13		3.05	2.9
	14/9/18	0.1	0.1	0.00026	0.2	0.2	0.00052	20.2	1005	Steady	0.26		3.04	2.94
	24/9/18	0.1	0.1	0.00013	0.1	0.1	0.00013	20.4	1016	Rising	0.13		3.03	2.91
WS104	12/6/18	0.1	0.1	0.00052	0.1	0.1	0.00052	20.4	1010	Rising	0.52	1.0 – 3.0	2.90	Dry
	22/6/18	0.1	0.1	0.00079	0.1	0.1	0.00079	20.6	1017	Steady	0.79		2.91	Dry
	4/7/18	0.1	0.1	0.00026	0.1	0.1	0.00026	20.5	1018	Falling	0.26		2.90	Dry
	11/7/18	0.1	0.1	0.00013	0.1	0.1	0.00013	20.4	1005	Falling	0.13		2.90	Dry
	19/7/18	0.1	0.1	0.0001	0.1	0.1	0.0001	20.5	1003	Steady	0.1		2.91	Dry
	26/7/18	0.1	0.1	-0.00026	0.1	0.1	-0.00026	20.6	1004	Falling	-0.26		2.90	Dry
	2/8/18	0.1	0.1	-0.00013	0.1	0.1	-0.00013	20.8	1006	Rising	-0.13		2.91	Dry
	13/8/18	0.1	0.1	-0.00052	0.1	0.1	-0.00052	20.7	1008	Rising	-0.52		2.90	Dry
	28/8/18	0.1	0.1	0.00026	0.3	0.3	0.00078	19.9	1007	Steady	0.26		2.94	Dry
	4/9/18	0.1	0.1	0.00013	0.6	0.6	0.00078	19.6	1008	Steady	0.13		2.96	Dry
	14/9/18	0.1	0.1	-0.00013	0.3	0.3	-0.00039	19.8	1005	Steady	-0.13		2.93	Dry
	24/9/18	0.1	0.1	-0.00013	0.1	0.1	-0.00013	20.1	1016	Rising	-0.13		2.92	Dry
WS105	12/6/18	Well Destroyed												

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
WS107	12/6/18	0.1	0.1	0.0018	0.1	0.1	0.0018	18.6	1010	Rising	1.8	1.0 – 5.0	4.9	4.82
	22/6/18	0.1	0.1	0.0024	0.1	0.1	0.0024	18.3	1017	Steady	2.4		4.91	4.78
	4/7/18	0.1	0.1	0.00089	0.1	0.1	0.00089	18.1	1018	Falling	0.89		4.9	4.80
	11/7/18	10.1	10.1	0.05252	0.9	0.9	0.00468	15.1	1005	Falling	0.52		4.99	4.80
	19/7/18	38.3	38.3	0.09958	1.1	1.1	0.00286	0.3	1003	Steady	0.26		5.0	4.84
	26/7/18	5.1	5.1	0.00663	0.8	0.8	0.00104	10.2	1004	Falling	0.13		4.97	4.87
	2/8/18	2.7	2.7	0.0027	0.9	0.9	0.0009	11.2	1006	Rising	0.1		4.96	4.86
	13/8/18	3.6	3.6	0.00936	0.7	0.7	0.00182	10.8	1008	Rising	0.26		4.98	4.89
	28/8/18	10.3	10.3	0.09167	1.2	1.2	0.01068	4.5	1007	Steady	0.89		4.99	4.8
	4/9/18	26.3	26.3	0.41028	2.2	2.2	0.03432	1.3	1008	Steady	1.56		5.0	4.79
	14/9/18	5.9	5.9	0.05664	0.8	0.8	0.00768	10.4	1005	Steady	0.96		4.99	4.81
	24/9/18	0.7	0.7	0.01218	0.3	0.3	0.00522	19.7	1016	Rising	1.74		4.98	4.82
WS108	12/6/18	0.1	0.1	0.00013	0.5	0.5	0.00065	18.4	1010	Rising	0.13	2.0 – 5.0	4.8	3.71
	22/6/18	0.1	0.1	0.0001	0.4	0.4	0.0004	18.7	1017	Steady	0.1		4.78	3.68
	4/7/18	0.1	0.1	0.0001	0.6	0.6	0.0006	18.1	1018	Falling	0.1		4.8	3.75
	11/7/18	0.5	0.1	-0.00445	0.9	0.9	-0.00801	17.4	1005	Falling	-0.89		4.78	3.76
	19/7/18	0.7	0.3	-0.0112	1.4	1.4	-0.0224	15.1	1003	Steady	-1.6		4.77	3.77
	26/7/18	0.4	0.1	-0.00384	1.2	1.2	-0.01152	15.9	1004	Falling	-0.96		4.77	3.79
	2/8/18	0.3	0.1	-0.0036	1.1	1.1	-0.0132	16.2	1006	Rising	-1.2		4.78	3.81
	13/8/18	0.4	0.1	-0.006	1.4	1.4	-0.021	15.7	1008	Rising	-1.5		4.77	3.82
	28/8/18	0.1	0.1	-0.00026	1.2	1.2	-0.00312	16.5	1007	Steady	-0.26		4.78	3.78
	4/9/18	0.1	0.1	0.00052	1.0	1.0	0.0052	17.1	1008	Steady	0.52		4.77	3.72
	14/9/18	0.1	0.1	0.0001	0.9	0.9	0.0009	17.8	1005	Steady	0.1		4.78	3.74
	24/9/18	0.1	0.1	0.00013	1.2	1.2	0.00156	16.2	1016	Rising	0.13		4.7	3.79

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
WS110	12/6/18	0.1	0.1	0.0019	0.1	0.1	0.0019	20.5	1010	Rising	1.9	2.0 – 5.0	3.8	3.25
	22/6/18	0.1	0.1	0.00238	0.1	0.1	0.00238	20.7	1017	Steady	2.38		3.8	3.23
	4/7/18	0.1	0.1	0.0012	0.1	0.1	0.0012	20.6	1018	Falling	1.2		3.8	3.26
	11/7/18	0.7	0.1	0.00364	1.1	1.1	0.00572	16.1	1005	Falling	0.52		3.8	3.10
	19/7/18	1.5	1.5	0.0255	2.0	2.0	0.034	13.8	1003	Steady	1.7		3.81	3.08
	26/7/18	0.6	0.6	0.00576	1.2	1.2	0.01152	16.4	1004	Falling	0.96		3.8	3.11
	2/8/18	0.4	0.4	0.0004	0.8	0.8	0.0008	17.6	1006	Rising	0.1		3.81	3.13
	13/8/18	0.6	0.6	0.00312	1.1	1.1	0.00572	16.7	1008	Rising	0.52		3.8	3.16
	28/8/18	0.2	0.1	0.0024	0.5	0.5	0.006	17.9	1007	Steady	1.2		3.82	2.56
	4/9/18	0.1	0.1	0.00154	0.2	0.2	0.00308	20.4	1008	Steady	1.54		3.82	2.06
	14/9/18	0.1	0.1	0.00095	0.4	0.4	0.0038	19.9	1005	Steady	0.95		3.81	2.10
	24/9/18	0.1	0.1	0.00084	0.6	0.6	0.00504	19.4	1016	Rising	0.84		3.82	2.16
WS113	12/6/18	0.1	0.1	0.0016	0.3	0.3	0.0048	20.4	1010	Rising	1.6	1.0 – 4.0	3.44	3.44
	22/6/18	0.1	0.1	0.00116	0.2	0.2	0.00232	20.7	1017	Steady	1.16		3.44	3.44
	4/7/18	0.1	0.1	0.0009	0.5	0.5	0.0045	20.3	1018	Falling	0.9		3.44	Dry
	11/7/18	0.1	0.1	0.00052	0.9	0.9	0.00468	19.4	1005	Falling	0.52		3.45	Dry
	19/7/18	**The bung was found to be blocked and subsequently replaced.**												
	19/7/18	71.6	71.6	2.26972	7.5	7.5	0.23775	0.4	1003	Rising	3.17	1.0 – 4.0	3.45	Dry
	26/7/18	15.2	15.2	0.2888	6.1	6.1	0.1159	5.2	1004	Steady	1.9		3.46	Dry
	2/8/18	10.8	10.8	0.0108	4.6	4.6	0.0046	7.5	1006	Falling	0.1		3.48	Dry
	13/8/18	12.3	12.3	0.1476	5.1	5.1	0.0612	6.8	1008	Falling	1.2		3.47	Dry
	28/8/18	20.3	20.3	0.05278	7.9	7.9	0.02054	4.2	1007	Steady	0.26		3.47	3.10
	4/9/18	61.3	61.3	0.07969	8.8	8.8	0.01144	0.1	1008	Steady	0.13		3.47	2.76
	14/9/18	42.3	42.3	0.41454	5.1	5.1	0.04998	7.9	1005	Steady	0.98		3.48	3.90
	24/9/18	37	37	0.6771	4.6	4.6	0.08418	10.6	1016	Rising	1.83		3.45	3.50

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
WS114	12/6/18	0.1	0.1	0.00123	1.3	1.3	0.01599	19.4	1010	Rising	1.23	1.0 – 3.0	2.15	2.10
	22/6/18	0.1	0.1	0.00241	1.1	1.1	0.02651	19.7	1017	Steady	2.41		2.15	2.07
	4/7/18	0.1	0.1	0.0009	1.4	1.4	0.0126	19.3	1018	Falling	0.9		2.18	2.10
	11/7/18	0.1	0.1	0.0019	0.9	0.9	0.0171	20.1	1005	Falling	1.9		2.95	2.20
	19/7/18	0.1	0.1	0.00244	0.1	0.1	0.00244	20.8	1003	Rising	2.44		2.97	2.32
	26/7/18	0.1	0.1	0.00196	0.8	0.8	0.01568	19.8	1004	Steady	1.96		2.98	2.33
	2/8/18	0.1	0.1	0.00096	0.6	0.6	0.00576	19.7	1006	Falling	0.96		2.96	2.40
	13/8/18	0.1	0.1	0.0012	0.7	0.7	0.0084	19.6	1008	Falling	1.2		2.97	2.40
	28/8/18	0.1	0.1	0.00052	1.1	1.1	0.00572	19.2	1007	Rising	0.52		2.99	2.49
	4/9/18	0.1	0.1	0.0001	1.3	1.3	0.0013	18.8	1008	Steady	0.1		3	2.56
	14/9/18	0.1	0.1	0.00026	1.4	1.4	0.00364	18.4	1005	Steady	0.26		2.99	2.60
	24/9/18	0.1	0.1	0.00052	1.1	1.1	0.00572	19.1	1016	Rising	0.52		3	2.90
WS117	12/6/18	0.1	0.1	0.00026	1.1	1.1	0.00286	18.5	1010	Rising	0.26	2.0 – 4.0	4	2.10
	22/6/18	0.1	0.1	0.00013	0.9	0.9	0.00117	18.9	1017	Steady	0.13		4	2.06
	4/7/18	0.1	0.1	0.00052	1.3	1.3	0.00676	18.2	1018	Falling	0.52		4	2.16
	11/7/18	0.1	0.1	0.00026	0.8	0.8	0.00208	19.1	1005	Falling	0.26		3.99	2.15
	19/7/18	0.1	0.1	0.0001	0.7	0.7	0.0007	19.4	1003	Steady	0.1		3.98	2.12
	26/7/18	0.1	0.1	0.00013	0.5	0.5	0.00065	19.8	1004	Falling	0.13		3.99	2.16
	2/8/18	0.1	0.1	0.00026	0.6	0.6	0.00156	19.6	1006	Rising	0.26		4	2.30
	13/8/18	0.1	0.1	0.00052	0.5	0.5	0.0026	19.5	1008	Rising	0.52		3.99	2.25
	28/8/18	0.1	0.1	0.00196	0.7	0.7	0.01372	19.1	1007	Steady	1.96		4	2.28
	4/9/18	0.1	0.1	0.00222	0.8	0.8	0.01776	18.9	1008	Steady	2.22		4	2.30
	14/9/18	0.1	0.1	0.0015	0.7	0.7	0.0105	19	1005	Steady	1.5		4	2.31
	24/9/18	0.1	0.1	0.00192	0.5	0.5	0.0096	19.4	1016	Rising	1.92		4	2.36

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
WS119	12/6/18	10.1	10.1	0.02626	0.4	0.4	0.00104	12.5	1010	Rising	0.26	1.0 – 4.0	4	Dry
	22/6/18	9.5	9.5	0.01235	0.3	0.3	0.00039	13	1017	Steady	0.13		4	Dry
	4/7/18	8.1	8.1	0.04212	0.6	0.6	0.00312	11.9	1018	Falling	0.52		4	Dry
	11/7/18	0.1	0.1	-0.00085	0.4	0.4	-0.0034	19.2	1005	Falling	-0.85		4	Dry
	19/7/18	0.1	0.1	-0.00121	0.2	0.1	-0.00242	20.8	1003	Steady	-1.21		4	Dry
	26/7/18	0.3	0.1	-0.0063	0.3	0.3	-0.0063	20.5	1004	Falling	-2.1		4	Dry
	2/8/18	0.2	0.1	-0.00104	0.5	0.5	-0.0026	19.9	1006	Rising	-0.52		4	Dry
	13/8/18	0.1	0.1	-0.00013	0.4	0.4	-0.00052	20	1008	Rising	-0.13		4	Dry
	28/8/18	0.1	0.1	0.00026	0.3	0.3	0.00078	19.9	1007	Steady	0.26		4.01	3.90
	4/9/18	0.1	0.1	0.00013	0.2	0.2	0.00026	19.5	1008	Steady	0.13		4.02	3.81
	14/9/18	0.1	0.1	-0.00013	0.2	0.2	-0.00026	19.7	1005	Steady	-0.13		4.04	3.83
	24/9/18	0.1	0.1	0.00013	0.3	0.3	0.00039	19.4	1016	Rising	0.13		4	3.90
BH101	12/6/18	0.8	0.8	0.00104	2.9	2.9	0.00377	1.5	1010	Rising	0.13	5.0 – 9.0	8.58	3.82
	22/6/18	0.7	0.7	0.0007	2.7	2.7	0.0027	1.8	1017	Steady	0.1		8.57	3.9
	4/7/18	0.5	0.5	0.0013	3.1	3.1	0.00806	1.2	1018	Falling	0.26		8.6	3.92
	11/7/18	0.4	0.4	-0.00208	2.5	2.5	-0.013	2.7	1005	Falling	-0.52		8.87	4.10
	19/7/18	0.3	0.3	-0.00285	2.3	2.3	-0.02185	3	1003	Steady	-0.95		8.9	4.26
	26/7/18	0.3	0.1	0.00285	2.9	2.9	0.02755	3.2	1004	Falling	0.95		8.84	4.29
	2/8/18	0.1	0.1	0.0014	3.5	3.3	0.049	3.9	1006	Rising	1.4		8.83	4.30
	13/8/18	0.2	0.1	0.0032	3.1	3.1	0.0496	3.4	1008	Rising	1.6		8.84	4.40
	28/8/18	0.1	0.1	0.00096	1.1	1.1	0.01056	18.2	1007	Steady	0.96		8.91	4.40
	4/9/18	0.1	0.1	0.00133	0.4	0.4	0.00532	20	1008	Steady	1.33		8.95	4.45
	14/9/18	0.1	0.1	0.0019	2.4	2.4	0.0456	4.9	1005	Steady	1.9		8.92	4.52
	24/9/18	1.2	1.2	0.02808	3.5	3.5	0.0819	1.6	1016	Rising	2.34		8.9	4.50

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
BH102	12/6/18	0.1	0.1	0.0001	3.5	3.5	0.0035	4.9	1010	Rising	0.1	6.0 – 9.0	8.49	5.60
	22/6/18	0.1	0.1	0.0001	3.3	3.3	0.0033	5.2	1017	Steady	0.1		8.48	5.55
	4/7/18	0.1	0.1	0.00013	3.7	3.9	0.00481	4.2	1018	Falling	0.13		8.5	5.63
	11/7/18	0.1	0.1	-0.0012	4.2	4.2	-0.0504	3.9	1005	Falling	-1.2		8.55	5.60
	19/7/18	0.1	0.1	-0.00159	5.6	5.6	-0.08904	3.7	1003	Steady	-1.59		8.58	5.67
	26/7/18	0.1	0.1	-0.00085	5.9	5.9	-0.05015	3.1	1004	Falling	-0.85		8.56	5.70
	2/8/18	0.1	0.1	-0.00052	4.8	4.8	-0.02496	3.8	1006	Rising	-0.52		8.57	5.75
	13/8/18	0.1	0.1	-0.00026	5.1	5.1	-0.01326	3.9	1008	Rising	-0.26		8.56	5.80
	28/8/18	0.1	0.1	0.00089	6.1	6.1	0.05429	2.2	1007	Steady	0.89		8.59	5.84
	4/9/18	0.4	0.4	0.00484	6.5	6.5	0.07865	1.6	1008	Steady	1.21		8.6	5.80
	14/9/18	0.1	0.1	-0.00052	5.9	5.9	-0.03068	2.8	1005	Steady	-0.52		8.6	5.90
	24/9/18	0.2	0.1	0.00052	5.2	5.2	0.01352	3.8	1016	Rising	0.26		8.6	6.20
BH103	12/6/18	0.1	0.1	0.00013	0.9	0.9	0.00117	18.2	1010	Rising	0.13	1.0 – 5.45	5.25	Dry
	22/6/18	0.1	0.1	0.0001	0.7	0.7	0.0007	18.5	1017	Steady	0.1		5.25	Dry
	4/7/18	0.1	0.1	0.0001	1.2	1.2	0.0012	18.1	1018	Falling	0.1		5.25	Dry
	11/7/18	0.1	0.1	-0.0029	1.1	1.1	-0.0319	15.9	1005	Falling	-2.9		5.38	Dry
	19/7/18	0.2	0.2	-0.00616	1.4	1.2	-0.04312	15.1	1003	Steady	-3.08		5.4	Dry
	26/7/18	0.1	0.1	-0.00026	1.1	1.1	-0.00286	16.4	1004	Falling	-0.26		5.4	Dry
	2/8/18	0.1	0.1	-0.00052	0.8	0.8	-0.00416	17.6	1006	Rising	-0.52		5.38	Dry
	13/8/18	0.1	0.1	-0.00026	1.1	1.1	-0.00286	16.8	1008	Rising	-0.26		5.39	Dry
	28/8/18	4.2	4.2	0.0798	1.9	1.9	0.0361	7.2	1007	Steady	1.9		5.36	Dry
	4/9/18	13.9	13.9	0.29607	2.5	2.5	0.05325	0.5	1008	Steady	2.13		5.34	Dry
	14/9/18	0.1	0.1	0.0019	2.8	2.8	0.0532	2.4	1005	Steady	1.9		5.36	Dry
	24/9/18	0.1	0.1	0.00154	3.2	3.2	0.04928	4.7	1016	Rising	1.54		5.34	Dry

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
BH104	12/6/18	0.1	0.1	0.00089	0.1	0.1	0.00089	20.4	1010	Rising	0.89	6.0 – 8.0	7.78	7.50
	22/6/18	0.1	0.1	0.00133	0.1	0.1	0.00133	20.6	1017	Steady	1.33		7.78	7.53
	4/7/18	0.1	0.1	0.00096	0.1	0.1	0.00096	20.3	1018	Falling	0.96		7.79	7.55
	11/7/18	0.3	0.1	0.00156	0.1	0.1	0.00052	20.6	1005	Falling	0.52		7.82	7.50
	19/7/18	0.6	0.1	-0.00078	0.1	0.1	-0.00013	20.8	1003	Steady	-0.13		7.85	7.55
	26/7/18	0.1	0.1	0.00052	0.1	0.1	0.00052	20.7	1004	Falling	0.52		7.85	7.55
	2/8/18	0.1	0.1	0.00079	0.1	0.1	0.00079	20.8	1006	Rising	0.79		7.86	7.57
	13/8/18	0.1	0.1	0.00052	0.1	0.1	0.00052	20.6	1008	Rising	0.52		7.85	7.50
	28/8/18	0.3	0.1	0.0036	0.1	0.1	0.0012	20.4	1007	Steady	1.2		7.86	7.56
	4/9/18	0.7	0.1	0.01008	0.2	0.2	0.00288	20.5	1008	Steady	1.44		7.87	7.60
	14/9/18	0.1	0.1	0.0009	0.1	0.1	0.0009	20.4	1005	Steady	0.9		7.85	7.62
	24/9/18	0.1	0.1	0.00026	0.1	0.1	0.00026	20.3	1016	Rising	0.26		7.85	7.65
BH105	12/6/18	2.6	2.6	0.0026	0.3	0.3	0.0003	18.8	1010	Rising	0.1	10.0 – 13.0	12.96	8.99
	22/6/18	2.4	2.4	0.0024	0.3	0.3	0.0003	18.8	1017	Steady	0.1		12.96	8.93
	4/7/18	2.1	2.1	0.00273	0.4	0.4	0.00052	18.2	1018	Falling	0.13		12.97	9.00
	11/7/18	1.9	1.9	0.00988	0.3	0.3	0.00156	19.1	1005	Falling	0.52		12.99	8.90
	19/7/18	1.7	1.7	0.01343	0.5	0.5	0.00395	19	1003	Steady	0.79		13	8.71
	26/7/18	1.4	1.4	0.0168	0.5	0.5	0.006	18.8	1004	Falling	1.2		12.99	8.73
	2/8/18	1.5	1.5	0.0252	0.6	0.6	0.01008	18.9	1006	Rising	1.68		12.98	8.75
	13/8/18	1.6	1.6	0.01424	0.5	0.5	0.00445	19	1008	Rising	0.89		12.99	8.80
	28/8/18	0.6	0.6	0.00312	0.6	0.6	0.00312	18.9	1007	Steady	0.52		12.95	8.80
	4/9/18	0.4	0.4	0.00052	0.7	0.7	0.00091	18.7	1008	Steady	0.13		12.93	8.79
	14/9/18	0.9	0.9	0.02223	0.6	0.6	0.01482	17.9	1005	Steady	2.47		12.94	9.10
BH106	12/6/18	Well Destroyed												

4. 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.

4.1 Human Health Risk Assessment

At a 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 this comparison have been summarised within Table 4.1 (overleaf).

Table 4.1 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	25	75	N/A	1	No Further Action
Cadmium	mg/kg	190	20	0.5	N/A	1	No Further Action
Chromium (VI)	mg/kg	33	25	<4.0	N/A	1	No Further Action
Lead	mg/kg	1100	25	200	N/A	1	No Further Action
Mercury	mg/kg	58	25	1.5	N/A	2	No Further Action
Nickel	mg/kg	980	25	38	N/A	1	No Further Action
Selenium	mg/kg	12000	25	2.0	N/A	1	No Further Action
Copper	mg/kg	68000	25	130	N/A	1	No Further Action
Zinc	mg/kg	730000	25	230	N/A	1	No Further Action
Cyanide - Total	mg/kg	791	25	3	N/A	1	No Further Action
Phenols - Total.	mg/kg	210	25	<1.0	N/A	1	No Further Action
Asbestos	Fibres	NFD	25	Chrysotile	TP102-2.00m TP104-1.20m TP114-1.50m TP126-0.50m	4	**Further Action**
Naphthalene	mg/kg	190	25	2.3	N/A	2	No Further Action
Acenaphthylene	mg/kg	83000	25	0.29	N/A	3	No Further Action
Acenaphthene	mg/kg	84000	25	1.9	N/A	1	No Further Action
Fluorene	mg/kg	63000	25	1.8	N/A	1	No Further Action
Phenanthrene	mg/kg	22000	25	17	N/A	3	No Further Action
Anthracene	mg/kg	520000	25	4.6	N/A	3	No Further Action
Fluoranthene	mg/kg	23000	25	22	N/A	3	No Further Action
Pyrene	mg/kg	54000	25	18	N/A	3	No Further Action
Benzo(a)Anthracene	mg/kg	170	25	9.7	N/A	3	No Further Action
Chrysene	mg/kg	350	25	7.0	N/A	3	No Further Action
Benzo(b)Fluoranthene	mg/kg	44	25	8.2	N/A	3	No Further Action
Benzo(k)Fluoranthene	mg/kg	1200	25	4.2	N/A	3	No Further Action
Benzo(a)Pyrene**	mg/kg	35	25	7.4	N/A	3	No Further Action
Indeno(123-cd)Pyrene	mg/kg	500	25	4.0	N/A	3	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	3.5	25	0.98	N/A	3	No Further Action
Benzo(ghi)Perylene	mg/kg	3900	25	4.6	N/A	3	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	3200	25	<1.0	N/A	2	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	7800	25	<0.10	N/A	2	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	2000	25	<0.10	N/A	2	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	16000	25	6.8	N/A	2	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	36000	25	34	N/A	2	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	28000	25	180	N/A	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	28000	25	370	N/A	1	No Further Action

Notes
Main Exposure Pathways: 1 = Soil Ingestion, 2 = Vapour Inhalation (indoor), 3 = Dermal Contact & Ingestion, 4 = Dust Inhalation.
Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; Loc of Ex = Location of Exceedance; NFD = No Fibres Detected
* The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C_5-C_{12}) and the Tier 1 values for aromatic compound for the non-volatile fractions (C_{12}-C_{35}). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.

Referring to Table 4.1, the results of this direct comparison indicates that the data exceeds the screening criteria for a commercial end use for the following contaminants:

- Chrysotile

Asbestos in the form of loose Chrysotile fibres has been identified in the granular Made Ground in TP102-2.00m, TP104-1.20m, TP114-1.50m, TP126-0.50m.

No significant concentrations of VOC's were identified in the soils submitted for chemical analysis.

The laboratory analysis confirms the assessment within the initial conceptual site model that the main constituents of concern were likely to be Asbestos.

In relation to these exceedances, the following can be determined:

- The main exposure pathways based on the Tier I exceedances are:
    1. Fibre / Dust Inhalation

- The exceedances for all determinands are associated within Made Ground deposits.

Risk Assessment and Mitigation

All of the identified elevated concentrations have primary exposure pathways related to inhalation of particulate.

Asbestos in the form of chrysotile has also been identified within localised areas in shallow Made Ground deposits. Asbestos quantification has been undertaken on 3 of the 4 positive samples and all results have returned with <0.001% weight asbestos. No visual signs of ACM were encountered during the Ground Investigation, therefore it is likely only trace fibres are present within the Made Ground containing demolition rubble. Therefore, the Made Ground soils will need to be carefully managed to ensure no significant exposure occurs.

The specific design and installation process for the appropriate cover systems will be clearly defined within the Site remediation & Enabling Works Strategy, however industry best practice (as outlined within BRE 465) will require the following minimum depths of certified clean cover:

- Landscaped areas– **300mm**

Chemical analysis of the natural clay and topsoil has indicated that it may be suitable for use within soft landscaping, however further testing would be required to confirm this.

4.2 Controlled Waters Risk Assessment

The site sensitivity with respect to controlled waters is summarised within Table 4.2

Table 4.2 Controlled Waters Sensitivity Profile

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	None	**LOW**
Distance to the closest groundwater abstraction point.	None within 1km	**LOW**
Aquifer Classification in Superficial Drift Deposits.	Secondary Undifferentiated	**LOW**
Aquifer classification in Bedrock.	Secondary A Aquifer	**MODERATE**
Viability for Anthropogenic soil in direct contact with aquifer (drift or bedrock).	Deep Made Ground has been encountered however it does not appear to be in direct contact with the underlying bedrock	**MODERATE**
Is the site located within 50m of a surface watercourse?	Numerous Unnamed stream are present on the site.	**MODERATE**
Summary The ICSM developed within the context of the site setting has identified a viable pollutant risk which would be the downward migration of potentially mobile phase soluble contaminants towards the underlying Secondary A aquifer and lateral migration into adjacent watercourses. However, the overall sensitivity of this receptor is reduced given the absence of any groundwater abstraction and thus the potential for the creation of a complete pollutant linkage and the lack of any water quality data for the nearby watercourse.		

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 4.3.

Table 4.3 Qualitative Risk to Controlled Waters from Soil Analytical Results

BTEX - >1mg/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 VOC - > 1mg/kg	
Total SVOC - > 1 mg/kg	PAH analysis recorded concentrations either below or only slightly elevated above the laboratory LOD.
C5-C10 - > 5mg/kg	All concentrations are below the laboratory LOD.
C10-C12 - > 10mg/kg	Max concentration of 6.8mg/kg identified
C12-C16 - > 50mg/kg	Max concentration of 34mg/kg identified.
Phenols – > 2mg/kg	All concentrations are below the laboratory LOD.
Naphthalene - > 2mg/kg	A max naphthalene concentrations of 2.3mg/kg has been identified.
Total PAH - > 10mg/kg	Phenanthrene, Fluoranthene and pyrene have all been identified in concentrations greater than 10mg/kg with a max concentration of 22mg/kg.
PCB - > 1mg/kg	No potential sources of PCB have been identified.
Heavy metals - > 500mg/kg	Concentrations of heavy metals are all below 500mg/kg.

In due consideration of the ICSM which has identified a potential pollutant linkage associated with the migration towards the underlying Secondary A Aquifer and on-site streams 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 in west and groundwater samples to Drinking Water Standards and Environmental Quality Standards (EQS).

These are presented in Table 4.4 overleaf.

Table 4.4 Comparison of Groundwater Analysis with Tier 1 Screening Levels

DETERMINAND	UNITS	EQS SCREENING VALUE [1, 2, 3]		DWS [3,4,5]	N (L-Leachate, GW – Groundwater)	MC	LOC OF EX	ASSESSMENT
		AA	MAC					
Arsenic	µg/l	50	-	10	5L and 4 GW	12	WS104	Further Action
Cadmium	µg/l	0.08	0.45	5	5L and 4 GW	<0.08	N/A	No Further Action
Chromium (VI)	µg/l	3.4	-	-	5L and 4 GW	<5.0	N/A	No Further Action
Chromium (III)	µg/l	4.7	-	50	5L and 4 GW	0.8	N/A	No Further Action
Copper (hardness)	µg/l	1-28		2000	5L and 4 GW	22	TP109-2.90m	Further Action
Total Cyanide	µg/l	1	-	50	5L and 4 GW	14	WS108, WS104	Further Action
Lead	µg/l	1.2	14	10	5L and 4 GW	4.0 2.6 1.6	TP109-2.90m BH105 WS110	Further Action
Mercury	µg/l	-	0.07	1.0	5L and 4 GW	0.12	WS104	Further Action
Nickel	µg/l	4	34	20	5L and 4 GW	10 8.4 8.1 4.5	WS110 WS108 WS104 BH105	Further Action
Selenium	µg/l		-	10	5L and 4 GW	7.8	N/A	No Further Action
Zinc(hardness)	µg/l	8-125	-	-	5L and 4 GW	13	N/A	No Further Action
pH	6-9					7.2	N/A	No Further Action
PAH								
Naphthalene	µg/l	2	130	10*	5L and 4 GW	<0.01	N/A	No Further Action
Anthracene	µg/l	0.1	0.1		5L and 4 GW	<0.01	N/A	No Further Action
Benzo[b]fluoranthene	µg/l	1.7^{-4}	0.017		5L and 4 GW	<0.01	N/A	No Further Action
Benzo[k]fluoranthene	µg/l	1.7^{-4}	0.017		5L and 4 GW	<0.01	N/A	No Further Action
Benzo(a)pyrene	µg/l	1.7^{-4}	0.27		5L and 4 GW	<0.01	N/A	No Further Action
Flouranthene	µg/l	0.0063	0.12		5L and 4 GW	<0.01	N/A	No Further Action
Benzo(ghi)perylene	µg/l	1.7^{-4}	8.2^{-3}		5L and 4 GW	<0.01	N/A	No Further Action
TPH-Aromatic								
TPH C5-C6 (benzene)	µg/l	10	50	1	5L and 4 GW	<1.0	N/A	No Further Action
TPH C6-C8 (toluene)	µg/l	50	-	700	5L and 4 GW	<1.0	N/A	No Further Action
TPH C8-C10 (ethyl Benzene)	µg/l	20	-	300	5L and 4 GW	<1.0	N/A	No Further Action
TPH C10-C12 (xylene)	µg/l	30	-	500	5L and 4 GW	<10	N/A	No Further Action
TPH C12-C16	µg/l	2	130	90[5]	5L and 4 GW	<10	N/A	No Further Action
TPH C16-C35	µg/l	50#	50#	90[5]	5L and 4 GW	<10	N/A	No Further Action
TPH Aliphatic [5]								
TPH C5-C6	µg/l	-	-	15000	5L and 4 GW	<1.0	N/A	No Further Action
TPH C6-C8	µg/l	-	-	15000	5L and 4 GW	<1.0	N/A	No Further Action
TPH C8-C10	µg/l	-	-	300	5L and 4 GW	<1.0	N/A	No Further Action
TPH C10-C12	µg/l	-	-	300	5L and 4 GW	<10	N/A	No Further Action
TPH C12-C16	µg/l	-	-	300	5L and 4 GW	<10	N/A	No Further Action
TPH C16 – C21	µg/l	-	-	300**	5L and 4 GW	<10	N/A	No Further Action
TPH C21-C35	µg/l	-	-	300**	5L and 4 GW	<10	N/A	No Further Action
SVOC								
4-Methyphenol	µg/l	-	-	-	4 GW	8.4	WS104	Further Action
Isophorone	µg/l	-	-	-	4 GW	1.8	WS104	Further Action
Diethyl Phthlate	µg/l	-	-	-	4 GW	4.0	WS104	Further Action
Azobenzene	µg/l	-	-	-	4 GW	1.8	WS110	Further Action
Dibutyl Phthalate	µg/l	-	-	-	4 GW	1.1	WS110	Further Action

Notes
Solubility <0.01µg/l

AA – Annual Average
MAC- Maximum Admissible Concentration
* Sum of The specified compounds are benzo[b]fluoranthene (CAS 205-99-2), benzo[k]fluoranthene (CAS 207-08-9), benzo[g,h,i]perylene (CAS 191-24-2) and indeno[1,2,3-c,d]pyrene (CAS 193-39-5)

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)

For the purposes of the Tier 1 assessment E3P has compared the laboratory test data directly to the EQS and DWS values.

This comparison indicates that the data exceeds for the following inorganic compounds:

- Arsenic
- Copper
- Cyanide
- Lead
- Mercury
- Nickel

It should be noted that the Tier I assessment criteria provides a conservative view, which may over-state the risk. Inorganic determinands identified above are of a general low solubility ad therefore mobility, suggesting that these will not migrate to controlled water receptors.

BH105 is installed within the underlying natural strata with the overlying Made Ground screened off. Within the water sample taken levels of Nickel and Lead were slightly elevated above the Annual Average but they were below the MAC and DWS, therefore it is not deemed that there is any significant risk.

Given the site is underlain by low permeability predominantly cohesive Glacial Till Deposits which will afford protection to the underlying Secondary A Aquifer; there is considered to be a low risk to controlled waters and the wider environ as no complete pollutant linkage can be determined. Furthermore, the nearest surface watercourse do not have a recorded river quality and therefore are not deemed to be highly sensitive receptors.

Based on the above, there is considered to be no unacceptable level of risk to the controlled water receptors.

4.3 Ground Gas

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report 665 (*Assessing risks posed by hazardous ground gases to buildings*, 2007). However, it is recommended that the full ground gas assessment and recommended protection measures are agreed with the local authority prior to their adoption on-site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

CIRIA C665, provide assessments for carbon dioxide and methane based upon Gas Screening Values (GSVs) utilising flow rates and concentrations. The site based GSVs for steady state methane and carbon dioxide are based upon the following equation:

$$GSV = \frac{concentration\ (by\ vol)}{100} \times flowrate\ (1/hr)$$

The GSVs within CIRA C665 are based upon all buildings other than standard residential houses. The thresholds for GSVs based upon CIRIA guidance are provided within Table 4.5 (below)

Table 4.5 Thresholds for Gas Screening Values (GSV) in accordance with CIRIA C665 Commercial End Use.

CIRIA – NO SUB-FLOOR VOID	
CLASSIFICATION	**GSV (METHANE AND CARBON DIOXIDE)**
CS1	<0.07
CS2	<0.70
CS3	<3.5
CS4	<15
CS5	<70
CS6	>70

4.3.1 Sources of Ground Gas

The Phase I report and subsequent Ground Investigation has identified the following potential sources of ground gas:

- Made Ground Deposits
- Landfill Areas
- Coal Seams (Overlain by low permeability clay)

4.3.2 Groundwater

Groundwater levels were observed to fluctuate over the monitoring period with levels stay relatively stable over the monitoring period. The greatest groundwater change occurred within WS114 where levels decreased by 0.80m over the monitoring period.

4.3.3 Gas Flow

During the monitoring a positive flow was noted with all of the monitoring wells. The measure of positive flow is considered to be the result of groundwater fluctuations causing compression

as opposed to gas generation as highest flows are recorded during periods of high groundwater levels.

Negative flows are indicative of back pressure from wind being greater than the active flow from the wells. Negative flows were recorded in WS101, WS104, WS108, WS119, CP101, CP102, CP103 and CP104.

4.3.4 Gas Concentrations

Methane has been recorded within monitoring wells WS103, WS107, WS108, WS110, WS113, WS119, CP101, CP102, CP103, CP104 and CP105 at maximum concentrations of 71.6% v/v (WS113). No elevated concentrations were recorded within any of the remaining monitoring wells.

Carbon dioxide concentrations were recorded within all the monitoring wells at concentrations ranging from 0.2% v/v to 8.8% v/v (WS113). The maximum carbon dioxide was also associated within low oxygen concentrations and appear to be associated with Made Ground which was identified in WS113.

4.3.5 Gas Assessment

In accordance with the methodology outlined with the CIRIA publication C665, E3P have utilised the results of the ground gas monitoring surveys to calculate a tentative Gas Screening Value (GSV). The GSVs for the monitoring positions are summarised in Table 4.6.

Table 4.6 Gas Risk Profile & Location

LOCATION	Max CO2	GSV	Max CH4	GSV	Classification
WS101	1.7	0.00312	0.2	0.00052	CS1
WS102	1.8	0.02724	0.2	0.00227	CS1
WS103	0.3	0.00104	0.4	0.00104	CS1
WS104	0.6	0.00079	0.1	0.00079	CS1
WS107	2.2	0.03432	38.3	0.41028	CS3
WS108	1.4	0.0052	0.7	0.00052	CS1
WS110	2.0	0.01152	1.5	0.00576	CS1
WS113	8.8	0.23775	71.6	2.26972	CS4
WS114	1.4	0.02651	0.1	0.00244	CS1
WS117	1.3	0.01776	0.1	0.00222	CS1
WS119	0.6	0.00312	10.1	0.04212	CS2
BH101	3.5	0.0819	1.2	0.02808	CS2
BH102	6.5	0.07865	0.4	0.00089	CS2
BH103	3.2	0.05325	13.9	0.0798	CS2
BH104	0.2	0.00288	0.7	0.01008	CS1
BH105	0.7	0.02724	2.6	0.0681	CS2

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

Ground gas monitoring suggests that the site can be predominantly classified as CS1 and in these areas, it is considered that gas protection measures will not be required. However, localised areas of the site have been assessed as being CS2, CS3 and CS4. E3P have used professional judgement to classify WS113 as CS4 which is inline with guidance from CIRIA C665 Example 5.

It will be necessary to either remove the material within the proximity of the significantly elevated methane where the site is classified as CS4, or alternatively undertake quantitative real time monitoring utilising Gas Clams to inform a robust risk assessment.

Properties within these areas will require specialist protection measures as detailed below.

4.4 Commercial Building Gas Risk Mitigation

British Standard BS8485 (2015) provides different types commercial property that require assessment. These building types are:

- **Type C building:** commercial building with central building management control of any alterations to the building or its uses and central building management control of the maintenance of the building, including the gas protection measures. Single occupancy of ground floor and basement areas. Small to large size rooms with active ventilation or good passive ventilation of all rooms and other internal spaces throughout ground floor and basement areas. Probably civil engineering construction. Examples include offices, some retail premises, and parts of some public buildings (such as schools, hospitals, leisure centres and parts of hotels).

- **Type D building:** industrial style building having large volume internal space(s) that are well ventilated. Corporate ownership with building management controls on alterations to the ground floor and basement areas of the building and on maintenance of ground gas protective measures. Probably civil engineering construction. Examples are retail park sales buildings, factory shop floor areas, warehouses. (Small rooms within these style buildings should be separately categorized as Type B or Type C).

Based on the ground gas risk assessment and the proposed Type C and D Building, it is envisaged that a point score of 1.5 - 4.5 will be required for affected properties as summarised in Table 4.7 (dependant on the buildings location on site).

Table 4.7 BS8485 (2015) Points Required for Building Types

CHARACTERISTIC SITUATION	MINIMUM GAS PROTECTION SCORE (POINTS)			
	High Sensitivity		Low Sensitivty	
	Type A building	Type B building	Type C building	Type D building
1	0	0	0	0
2	3.5	3.5	2.5	1.5
3	4.5	4	3	2.5
4	6.5	5.5	4.5	3.5
5	—	6.5	5.5	4.5
6	—	—	7.5	6.5

1.5 – 4.5 points must be achieved by installation of a suitable combination of measures detailed Table 4.8.

Table 4.8 Summary of Ground Gas Mitigation Measures - BS8485 (2015)

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER	SCORE[A]
a) Floor and substructure design	
Precast suspended segmental subfloor (i.e. beam and block).	0
Cast in situ ground bearing floor slab (with only nominal mesh reinforcement.	0.5
Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations.	1 or 1.5[B]
Basement floor and walls conforming to BS 8102:2009, Grade 2 waterproofing..[C]	2
Basement floor and walls conforming to BS 8102:2009, Grade 3 waterproofing. [C]	2.5

A) The scores are conditional on breaches of floor slabs, etc., being effectively sealed.
B) To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in (see A.2.2.2).
C) The score is conditional on the waterproofing not being based on the use of a geosynthetic clay liner waterproofing product (see C.3, Note 4).

PROTECTION ELEMENT SYSTEM		SCORE	COMMENTS
Gas protection scores for ventilation protection measures			
(a) Pressure relief pathway (usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building)		0.5	Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and / or is not terminated in a venting trench (or similar), then the score is zero.
(b) Passive sub floor dispersal layer: Media used to provide the dispersal layer are: • *Clear void* • *Polystyrene void former blanket* • *Geocomposite void former blanket* • *No-fines gravel layer with gas drains* • *No-fines gravel layer*	Very good performance	2.5	The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned taking into account the recommendations in Annex B of BS8485:2015. Passive ventilation should be designed to meet at least "good performance".
	Good performance	1.5	
(c) Active dispersal layer, usually comprising fans with active abstraction (suction) from a sub floor dilution layer, with roof level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers.		1.5 to 2.5	This system relies on continued serviceability of the pumps, therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents. Active ventilation should always be designed to meet at least "good performance".
(d) Active positive pressurization by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket.		1.5 to 2.5	This system relies on continued operation of the pumps, therefore alarm and response systems should be in place. The score assigned should be based on the efficient "coverage" of the building footprint and the redundancy of the system. Active ventilation should always be designed to meet at least "good performance".

PROTECTION ELEMENT SYSTEM	SCORE	COMMENTS
(e) Ventilated car park (floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park)	4	Assumes that the car park is vented to deal with car exhaust fumes, designed to *Buildings Regulations 2000, Approved Document F [9].*
Gas protection score for the gas resistant membrane		
Gas resistant membrane meeting all of the following criteria: • *Sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m^2/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method_;* • *Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;* • *Sufficiently strong to withstand in-service stresses (eg settlement if placed below a floor slab);* • *Sufficiently strong to withstand the installation process and following trades until covered (eg penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools etc);* • *Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and,* • *Verified in accordance with CIRIA C735.*	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.40mm thickness (equivalent to 370g/m^2 for polyethylene) reinforced membrane (virgin polymer) meets the performance criteria opposite. If a membrane is installed that does not meet all the criteria opposite then the score is zero.
This table should be read in conjunction with the notes presented in BS8485 (2015)		

4.5 Conceptual Site Model

Following the completion of the intrusive site investigation, chemical analysis and risk assessment the conceptual model shown in Table 4.9 has been prepared for the site.

Table 4.9 Conceptual Model

POLLUTANT LINKAGE	PATHWAY	RECEPTOR	CONTAMINANT (SOURCE)	PROBABILITY	RISK	ASSESSMENT AND RECOMMENDATIONS
PL1	Dermal contact. Inhalation of soil, fibres and dust. Ingestion of soils, dust, vegetables, soil attached to vegetables. Windblown dust.	Future site users. Offsite receptors.	ACM (former buildings, potentially in made ground,).	Likely	Low	Asbestos in the form of chrysotile has also been identified within localised areas in shallow Made Ground deposits. Asbestos quantification has been undertaken on 3 of the 4 positive samples and all results have returned with <0.001% weight asbestos. No visual signs of ACM were encountered during the Ground Investigation, therefore it is likely only trace fibres are present within the Made Ground containing demolition rubble. Therefore, the Made Ground soils will need to be carefully managed to ensure no significant exposure occurs.
PL2	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Offsite land users.	Methane, carbon dioxide. (coal measures and potentially infilled features on and within 250m of the site).	Low likelihood	Moderate	Ground gas monitoring suggests that the site can be predominantly classified as CS1 and in these areas, it is considered that gas protection measures will not be required. However, localised areas of the site have been assessed as being CS2, CS3 and CS4. Properties within these areas will require specialist protection measures as detailed below.
PL3	Surface Run-off. Migration through permeable strata and preferential pathways Perched waters migration.	Groundwater (Secondary A Aquifer). Surface water	Mobile contaminants such as metals, (made ground and landfill).	Unlikely	Low	Only slightly elevated levels of heavy metals have been proved to be present in small number of locations. These are typically of low solubility and mobility therefore it unlikely that there is any significant pathway to any receptors.

POLLUTANT LINKAGE	PATHWAY	RECEPTOR	CONTAMINANT (SOURCE)	PROBABILITY	RISK	ASSESSMENT AND RECOMMENDATIONS
PL4	Sulphate attack on concrete.	Building structure.	Sulphate (potential ash within made ground).	Likely	Moderate / Low	Chemical analyses for pH and soluble sulphate content contained shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005). Elevated sulphate concentrations meeting Class DS-2, AC-2 were noted within the Made Ground deposits in a small number of areas. .

5. GEOTECHNICAL ASSESSMENT

5.1 Proposed Development

Russells are delivering the construction of a wider strategic development of the South Heywood Development Area for the development of a link road, up to 1000 homes and approximately 1.458million sq ft of commercial use, a local retail centre, primary school, open space and associated works.

The commercial industrial sector which is the subject of this investigation will be developed for a number of large industrial buildings with ancillary external infrastructure.

5.2 Summary of Ground Conditions

Made Ground
The conjectured depth of Made Ground suggests that the upfill extends to Depths of ~2.0-3.0m in the south extending to ~9.0m in the north. The Made Ground is variable in composition and structure, with sandy gravely clays the most prevalent soil matrix. The material is generally consistent with inert soils generated during the excavation of civil engineering infrastructure within a development site. The material was observed to exhibit stiff medium strength characteristics with little oversized elements, putrescible or deleterious elements.

The proven depth of upfilled inert material is set out within the E3P conjectured depth of Made Ground Drawing in Appendix III.

Drift
The drift deposits are encountered within all exploratory holes where the full depth of Made Ground was penetrated and comprised a firm to stiff high strength light grey sandy CLAY with sandstone with localised medium dense to dense brown gravelly fine to medium SAND with sandstone.

Solid
Cable Percussion boreholes indicate the presence of drift deposits to between 5.0m and 12.0m below the upfilled plateau, where boreholes were terminated due to refusal in impenetrable stratum. This may be indicative of the bedrock at this depth however it is considered the sandstone bedrock was located at a greater depth and refusals were due to sandstone boulders.

Groundwater
No discernible aquifer was identified, with only very localised perched water ingress noted within the upfill material. The placed upfill was observed to be compacted with little or no voiding observed, therefore the potential for water ingress is limited.

5.3 Site Preparation

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the Specification for Highway Works. This should include:

- Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infiled with suitable compacted engineered fill;
- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill; and,

- Buried structures and old foundations have been encountered on site. These should be excavated from below the proposed development foot print with the resulting void backfilled.

5.4 Foundation Conditions & 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 5.1

Table 5.1 Summary of ABPs

GRANULAR SOILS			
Description	**Depth (range bgl)**	**Relative Density**	*Allowable Bearing Pressure (kN/m²)*
Gravelly SAND	3.00 – 9.00	Dense	*>200*
COHESIVE SOILS			
Description	**Depth (range m bgl)**	**Undrained Shear Strength (Cu) kN/m²**	*Allowable Bearing Pressure (kN/m²)*
Stiff Sandy CLAY (North Western Area)	1.00-2.00	35-47	*80.5-108.1*
Firm Sandy CLAY (Variable across the site)	3.00-6.00	23 -70	52.9-161

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net Allowable Bearing Potential, the suitable target founding stratum has been identified as the underlying bedrock.

Given the depth of upfill Made Ground, it is considered that proposed structures will be constructed using a Pile Foundation to transfer structural loading to the underlying competent weathered bedrock stratum at a depth generally between 3.0m and 8.0m.

All buildings will be constructed with ground gas mitigation measures to ensure complete protection.

Ground Improvement options including Vibro Replacement Stone Columns (VSC) or Rapid Impact Compaction will be limited by the design ABP in the order of 150kN/m2 that could be achieved.

Table 5.2 Anticipated Foundations

LOCATION	ANTICIPATED FOUNDING STRATA DEPTH	GROUND WATER	FOUNDATION TYPE	TYPE OF CONCRETE	REMARKS
TP101	4.00	N/A	Driven Pile	DS2-AC2s	SOFT MADE GROUND
TP102	>4.00	N/A	Driven Pile	DS-1 AC-1s	N/A
tp103	4.00	N/A	Driven Pile	DS-1 AC-1s	SOFT MADE GROUND
TP104	>4.00	N/A	Driven Pile	DS-1 AC-1s	
TP105	>4.00	N/A	Driven Pile	DS-1 AC-1s	N/A
TP106	>5.00	N/A	Driven Pile	DS-1 AC-1s	SOFT MADE GROUND
TP107	>5.00	N/A	Driven Pile	DS2-AC2s	N/A
TP108	>4.00	N/A	Driven Pile	DS-1 AC-1s	N/A
TP109	3.50	N/A	Driven Pile	DS-1 AC-1s	SOFT MADE GROUND
TP110	>4.50	N/A	Driven Pile	DS2-AC2s	
TP111	>4.50	N/A	Driven Pile	DS2-AC2s	
TP112	>3.00	1.80	Driven Pile	DS-1 AC-1s	
TP113	>3.00	N/A	Driven Pile	DS1-AC1	
TP114	>3.00	N/A	Driven Pile	DS1-AC1	
TP115	>3.00	N/A	Driven Pile	DS1-AC1	
TP116	>3.50	N/A	Driven Pile	DS1-AC1	N/A
TP117	>3.00	2.30	Driven Pile	DS1-AC1	SOFT MADE GROUND
TP118	>3.50	2.40	Driven Pile	DS1-AC1	SOFT CLAY AT 2.40M
TP119	>3.00	2.30	Driven Pile	DS1-AC1	SOFT CLAY 2.30->2.50
TP120	>3.00	2.00	Driven Pile	DS1-AC1	SOFT CLAY FROM 1.90 TO >2.50M
TP121	>3.15	1.60	Driven Pile	DS1-AC1	SOFT CLAY 1.50M T0 2.70M
TP122	>3.25	N/A	Driven Pile	DS1-AC1	SOFT CLAY 0.30M TO 2.30M
TP123	>3.15	N/A	Driven Pile	DS1-AC1	SOFT CLAY 1.50M TO 2.50M
TP124	3.00	2.40	Driven Pile	DS1-AC1	N/A
TP125	>3.00	1.80	Driven Pile	DS1-AC1	N/A
TP126	>3.50	2.30	Driven Pile	DS1-AC1	SOFT CLAY AT 2.40M
TP127	>3.00	N/A	Driven Pile	DS1-AC1	SOFT MADE GROUND
TP128	>2.75	N/A	Driven Pile	DS1-AC1	N/A
TP129	>3.00	N/A	Driven Pile	DS1-AC1	N/A
TP130	>3.00	N/A	Driven Pile	DS1-AC1	SOFT MADE GROUND
TP131	>4.00	N/A	Driven Pile	DS1-AC1	N/A
TP132	>4.00	N/A	Driven Pile	DS1-AC1	N/A
TP1232	>4.00	N/A	Driven Pile	DS1-AC1	N/A
Ws101	>3.00	N/A	Driven Pile	DS1-AC1	N/A
WS102	>3.00	N/A	Driven Pile	DS1-AC1	N/A
WS103	3.45	N/A	Driven Pile	DS1-AC1	N/A
WS104	3.45	N/A	Driven Pile	DS1-AC1	N/A
WS105	>4.50	N/A	Driven Pile	DS1-AC1	N/A

LOCATION	ANTICIPATED FOUNDING STRATA DEPTH	GROUND WATER	FOUNDATION TYPE	TYPE OF CONCRETE	REMARKS
WS106	>3.00	N/A	Driven Pile	DS1-AC1	N/A
WS107	>5.45	N/A	Driven Pile	DS2-AC2s	N/A
WS108	>5.45	4.00	Driven Pile	DS1-AC1	N/A
WS109	>5.45	1.50	Driven Pile	DS1-AC1	N/A
WS110	>5.45	N/A	Driven Pile	DS1-AC1	N/A
WS111	>3.00	N/A	Driven Pile	DS1-AC1	N/A
WS112	>3.00	N/A	Driven Pile	DS1-AC1	N/A
WS113	>4.45	N/A	Driven Pile	DS1-AC1	N/A
WS114	4.50	2.00	Driven Pile	DS1-AC1	N/A
WS115	>4.00	2.00	Driven Pile	DS1-AC1	N/A
WS116	3.15	2.00	Driven Pile	DS1-AC1	N/A
WS117	>5.00	N/A	Driven Pile	DS1-AC1	SOFT MADE GROUND
WS118	>3.00	N/A	Driven Pile	DS1-AC1	N/A
WS119	>5.45	4.00	Driven Pile	DS1-AC1	N/A
WS120	5.45	N/A	Driven Pile	DS1-AC1	N/A
WS121	>2.50	N/A	Driven Pile	DS1-AC1	N/A
BH101	9.50	N/A	Driven Pile	DS1-AC1	N/A
BH102	10.00	N/A	Driven Pile	DS1-AC1	N/A
BH103	6.00	N/A	Driven Pile	DS1-AC1	N/A
BH104	9.00	N/A	Driven Pile	DS1-AC1	N/A
BH105	13.00	N/A	Driven Pile	DS1-AC1	N/A
BH106	5.00	N/A	Driven Pile	DS1-AC1	N/A

E3P has prepared a ground improvement design risk matrix which is summarised in Table 5.3 to ensure that the ground conditions are have been proven by the intrusive Site Investigation are satisfactory to facilitate the appropriate stabilisation.

Table 5.3 Ground Improvement Design Risk Matrix

RISK ITEM	COMMENT	PASS / FAIL
Soft clays with an undrained shear strength less than 30kN/m^2	Clay soils are generally firm however soft clays across the site within the Made Ground have been encountered across the site, albeit in sporadic and highly isolated instances. SPT N Values indicate a calculated Cu >30kN/m2 for all test positions. Where shear strength are reduced the reduced shear measurement is attributed to increased granular content in may locations. Given the structure of the material, absence of notable voiding and reasonable compaction and time in-situ, it is considered that the material will provide the required lateral support to a vibro stone column with a specialist engineer design.	PASS

RISK ITEM	COMMENT	PASS / FAIL
Ground with peat layers close to foundation level or the base of the stone column, or where intermediate layers of peat are thicker than 200mm either as a single layer or the sum of the thicknesses of individual layers throughout the length of the stone column.	None identified	**PASS**
Voided filled ground, eg old water tanks, pottery, glass bottles, concrete rubble or brick fill of unsuitable grading	Fill material is present across the site that will require remediation and enabling works in order to make the underlying Made Ground suitable for development.	**PASS – on completion of enabling works.**
Loose or non-engineered fill not previously subject to rising or fluctuating water levels saturation	None Identified	**PASS**
Filled ground still settling or expected to settle under its own weight or due to the effects of surcharging/up-filling where there is a high organic content or where decay is continuing.	The deeper filled materials (~>3.0m bgl) have been subject to a significant surcharge pressure (>60kN/m2) for over five years and as such will have undergone total induced settlement and thus the instability risk and potential for future unquantified differential settlement is insignificant in terms of infrastructure loading. The near surface materials have not been subject to the same surcharge pressure and while self-weight settlement will have occurred in majority of locations, the potential for differential settlement in this sub-stratum is currently undefined.	**PASS**
Fill, containing degradable material where organic material forms more than 15% of fill by volume	None Identified	**PASS**
Clays with a plasticity index greater than 40%	None Identified	**PASS**
Highly sensitive soils liable to collapse or remoulding	None Identified	**PASS**
Cohesive soils with trees in influencing distance.	Plots where in tree influence have been modelled and will either be subject to a piled or Mass Trench Fill solution.	**PASS**
Overall Risk Rating & Suitability for Vibratory Ground Improvement		**PASS – SPECIALIST DESIGN REQUIRED**

A depth to founding strata plan is included as Drawing 11-697-008 in Appendix III.

5.5 Zone Load Assessment

5.5.1 Background

E3P completed a phase of Zone Load Analysis in accordance with BS1377: Part 9, Section 4.2. The monitoring of the settlement was required to determine the long term settlement of the recently placed materials within the proposed commercial development site.

5.5.2 Testing and Surveying

Four tests have been positioned on site for zone load analysis. For the avoidance of any doubt the site has previously been infilled to depth sin excess of 9.00m bgl as part of a landfill operation

The Zone Load tests have been positioned in in accordance with BS1377: Part 9, Section 4.2 as per the E3P Zone Load Test Design and Method Statement, enclosed within this letter (Ref: Drawing 11-697-005). The base plate of each test was surveyed at each corner prior to loading and subsequent monitoring was completed at each 15kN/m2 increment until the total loading of 60kN/m2 was achieved. Each location was surveyed using a precise laser level to the accuracy of 0.1mm and calibrated on each visit using two fixed control points.

The Zone Load testing for all Phases has been completed with the monitoring taking place between 114 day durations. Table 5.4 below provides a summary of the durations for each test as testing was commenced at varying stages of the enabling works due to a phased approach of completion.

Table 5.4 Test Duration Summary

TEST LOCATION	START DATE	END DATE	DURATION (DAYS)
ZL1	04/07/2018	26/10/2018	114
ZL2	04/07/2018	26/10/2018	114
ZL3	04/07/2018	26/10/2018	114
ZL4	04/07/2018	26/10/2018	114

Zone Load Certificates and methodology information are enclosed in Appendix IX.

5.5.3 Assessment

Monitoring indicates that the materials beneath the site are not uniform. This is indicated by the variances and fluctuations across all four corners of each test which is indicative of differential settlement.

Table 5.5 provides a summary of the results for each of the four Zone Load Tests detailing the duration to the creep stabilisation and maximum settlement.

Table 5.5 Summary of Results

TEST LOCATION	APPLIED LOADING (KN/M2)	MAXIMUM DEFORMATION (MM)	MAXIMUM AVERAGE DEFORMATION (MM)	DURATION TO CREEP STABILISATION (DAYS)
ZL1	60	64	61.25	Not stabilised
ZL2	60	42	40.25	Not stabilised
ZL3	60	27	25.75	Not stabilised
ZL4	60	65	60	Not stabilised

The testing completed indicates that under an applied load of 60kN/m2 the test does achieve a settlement of up to 64mm.

The testing within all four locations identified varying deformation across the four zone load locations which implies varying underlying strata causing differential settlement.

Upon review of the data it is notable that there appears to be varying results across the monitoring period. Therefore, considering the manor in which the plates have settled indicates that there is significant potential of unacceptable differential settlement across the site implying the infill material has not been engineered to a poor specification. It is apparent that from the initial assessment and analysis that the material has not been placed uniformly across the site and may have been subject to varying compaction methods. specification. It must also be noted that the tests completed will only have had an impact on the top ~2.5m of materials, but the Made Ground on-site has been proven to 9.0m bgl in the north of the site and was placed from 2012 onwards and therefore any of the earlier buried material has potential to have undergone complete self weight settlement.

The creep phase also appears to be ongoing throughout the monitoring period, with no obvious halt in the settlement.

To conclude, it is evident from the monitoring completed to date that future settlement of the unconsolidated soils within the upper 3.00m, may be an issue that requires mitigating during the enabling works by Ground Engineering.

5.6 Ground Floor Slabs

A process of Rolled Dynamic Compaction (RDC) could be utilised to induce total consolidation to the placed fill material, induce primary and secondary settlement and ensure a safe and uniform allowable bearing pressure across the site for a design ground bearing floor slab with a UDL of 50kN/m2.

A process of lime and cement stabilisation could be applied to the near surface layers to construct a bound sub-base replacement layer across the platform to ensure a CBR in the order of 15-30% at formation. The bound sub-base would provide the required temporary works platform for a piling rig and when capped with suitable Type 1 MOT would facilitate the construction of a ground bearing floor slab to institutional design requirements.

Where the site will be subject to a process of upfill to achieve the required development elevation, the material will need to be compacted to ensure compliance as a structural fill material. In reality this placement and compaction of materials will necessitate the additional of lime and OPC to ensure the required structural properties and ensure the required in-situ densities. It is therefore considered that the use of lime and OPC stabilisation to construct a bound sub-base replacement layer would be extended to compliment the site cut / fill process which could then be completed in any climatic condition.

As alternative to the afore mentioned Ground Engineering / Compaction solution, it would be possible to cut / fill the site to the required development platform prior to the construction of Vibro Replacement Stone Columns to ensure a safe and uniform Allowable Bearing pressure (ABP) of the ground bearing slab and external hardstand. It is anticipated that a site wide grid of stone columns across a 3.0m centre would be required.

If a VSC solution was utilised, it would be necessary to undertake prior enabling works with engineering of materials within areas of upfill engineered to ensure End Product Specification

where material is placed to ensure the in-situ density is equal to or exceeding the laboratory defined maximum with moisture to be within the defined control limits.

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 re-enforcement within the slab to be designed by the Structural Engineer.

Where it is necessary to undertake cut / 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.

5.7 Heave Precautions

The Liquid and Plastic Limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average Plasticity Index (PI) for each “type” of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth.

E3P typically only consider a soil to be shrinkable if the proportion finer than 63µm is >35%. PI results are compared against guidance given in the NHBC Standards, Chapter 4.2 (revised January 2014), which advocates the use of modified Plasticity Index (I’p), defined as:

I’p = Ip * (%< 425µm/100)

ie if PI is 30%, but the soil contains 80% < 425µm, then: I’p = 30 * 80/100 = 24%.

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425µm sieve is routinely reported by testing labs.

E3P apply engineering judgment where PI results are spread over a range of classifications. Consideration is given to the average values for each particular soil type (ie differentiate between residual soil and alluvium), the number of results in each class and the actual values.

The Atterberg Limits determinations show the clay to be of low volume change potential. This report will be updated when the results are available.

A summary of Heave Precautions is presented in Table 5.6.

Table 5.6 Summary of Heave Precautions

		MINIMUM VOID DIMENSION FOR FOUNDATIONS, GROUND BEAMS AND SUSPENDED IN-SITU CONCRETE GROUND FLOORS		MINIMUM VOID DIMENSIONS UNDER PRE-CAST CONCRETE AND SUSPENDED TIMBER FLOORS
Plasticity Index of Soil	**Required Foundation Depth (m)**	**Thickness of Void Former Against Side of Foundation or Ground Beam (mm)**	**Thickness of Void Former on Underside of Edge Beam and Floor Slab (mm)**	**Void Dimension (mm)**
High Plasticity (>40)	>2.50	Engineer Design		Engineer Design
	2.00-2.50	35	150	300
	1.50-2.00	25	75	
Moderate Plasticity (20-40)	>2.50	Engineer Design		Engineer Design
	2.00-2.50	25	100	250
	1.50-2.00	25	50	
Low Plasticity (<20)	2.00-2.50	-	50	200
	>2.00	No Special Precautions		

5.8 Pavement Construction

A programme of remediation and enabling works will be required to remediate the proposed road sub-grade in accordance with the requirements of the highways design manual (series 600) for a Method Compaction.

It is considered that the material can be re-engineered to a method to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.

5.9 Drainage

The presence of substantial depths of Made Ground across some areas of the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

Due to the presence of deep Made Ground containing a degree of potentially mobile contaminants in addition to the presence of significant low permeability clays across the site, it is considered that soakaway drainage will be unsuitable for the proposed commercial development.

If soak-away drainage is to be considered, full BRE365 Testing must be completed to inform the detailed design.

5.10 Concrete Durability

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

Elevated sulphate concentrations meeting Class DS-2, AC-2 were noted within the Made Ground deposits in a small number of areas.

5.11 Excavations

Trial Pits were generally unstable within the Made Ground and stable within natural strata, as such it is considered that near surface excavations will be feasible. Areas where Made Ground exceeded 2.00m, excavations were generally less stable.

Site observations indicated that excavations should be feasible in the near surface with normal plant, however obstructions were identified in the near surface. It is anticipated that any obstructions will be grubbed out during the reduced level dig for the sub structure works.

However, due to the depth and variability of the Made Ground and likelihood of trench collapse it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97.

If local pumping of groundwater is required during the advancement of excavations for the proposed foundations. Consideration should be given for the potential for dewatering gravels in the surrounding areas to the subject site that may cause structural damage to buildings sub-structures in close proximity to the site.

Table 5.7 Civil Engineering Excavation Risk Matrix

Risk Item	Present	Comment
Running Sands	No	Dewatering may be required during excavation for drainage infrastructure.
Minor Water ingress	Yes	Ingress of water into foundation excavation will potentially flood foundation excavations limiting the viability of spread foundations to be constructed.
Shallow Bedrock	Yes	N/A

5.12 Coal Mining Risk Assessment & Recommendations

A detailed coal mining risk assessment has been undertaken due to the identified presence of shallow coal mining (recorded shaft / potential shallow workings) on-site and in the immediate surrounding area.

Table 5.8 Coal Mining Geology

COAL SEAM	THICKNESS	OUTCROP	DEPTH
Sand Rock Mine	N/A	**On-site – West**	**Outcrop on-site**
Six Inch Mine	N/A	**On-site - West**	**Outcrop on-site**
Bassey Mine	N/A	**On-site - West**	**Outcrop on-site**
Lower Foot Mine	N/A	**On-site - West**	**Outcrop on-site**
Lower Mountain Mine	N/A	**On-site - West**	**Outcrop on-site**

A review of the mining geology confirmed the presence of five seams outcropping within the western sector of the site. All of the seams do not progress far due to the presence of faults.

Scope of intrusive Ground Investigation

In due consideration of the potential presence of a shallow mine workings in the west and north western sectors, a series of rotary boreholes have been advanced in accordance with Coal Authority Permission ref: 16170 to assess the potential presence of shallow workings within this seam and the potential for ground instability to induce a future subsidence event within the proposed development.

Summary of Ground Investigation Works

Rotary Boreholes to Investigate Workings in Coal

Six No. rotary boreholes have been advanced at the locations detailed within the E3P exploratory borehole location plan at positions to interject the potential coal seams and assess the potential for any workings.

Table 5.9 Rotary Boreholes

ROTARY BOREHOLE	DEPTH TO ROCKHEAD	DEPTH TO TOP / (THICKNESS) OF COAL	EVIDENCE OF MINING ACTIVITY / SEAM	REMARKS
RB101	3.00	N/A	N/A	N/A
RB102	4.00	N/A	N/A	N/A
RB103	5.20	N/A	N/A	N/A
RB104	4.30	N/A	N/A	N/A
RB105	3.50	N/A	N/A	N/A
RB106	1.50	N/A	N/A	N/A

No coal or evidence of coal workings was identified within any of the rotary boreholes drilled.

Summary of Coal Mining Issues

E3P has reviewed the, BGS Geological Mapping and CA information, in addition to completing 6 No. 30m rotary boreholes to investigation shallow mine workings; a summary of which is detailed below:

The intrusive ground investigations comprising six deep rotary boreholes did not identify any shallow coal seams or evidence of historic mine workings to the base of the boreholes;

Due the lack of coal being identified and presence of faulting in the area it is reasonably possibility that the coal has not been mined due to poor continuity of the coal and/ or the coal seams were too thin to be economically viable.

When considering the absence of any historical features indicating unrecorded mine workings, a viable coal seam or any evidence to suggest the presence of unconsolidated workings, it is considered the proposed development is unlikely to be at a significant risk of subsidence associated with coal mining.

5.13 Further Works

Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course:

- Arboricultural Survey;
- Materials Management Plan;
- Geo-technical Earthworks Strategy (Infrastructure).
- Remediation & Enabling Works strategy; and
- Full three dimensional earthworks Cut / Fill Model.

5.14 Construction Activity and Inspection

The following activities and inspections should be incorporated in to the site works:

- Due to the variability of the soils at the site it is recommended that sufficient allowance is made for the inspection of formation and sub formations to foundations and pavement construction;

- Excavations where access is required should be subject to a risk assessment from a competent person and where appropriate mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 utilised;

- It is considered that de-watering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to provision of space for settling tanks or an attenuation pond;

- Where access to confined spaces is required appropriate mitigation measures should be addressed within the Construction Stage Health and Safety Plan. Particular account should be taken of the gas results; and,

- The presence of potential contamination and mitigation measures should be addressed as part of the Construction Stage Health and Safety Plan and should include measures to design out the risks, reduce their impact and finally the use of Personnel Protective Equipment (PPE).

6. CONCLUSIONS AND RECOMMENDATIONS

Contaminated Land	
Human Health	A Tier I Human Health Risk Assessment has been undertaken using the chemical analysis results of the soils and comparing to the relevant Tier I criteria. This assessment has identified the presence of elevated lead, asbestos. Asbestos in the form of chrysotile has also been identified within localised areas in shallow Made Ground deposits. Asbestos quantification has been undertaken on 3 of the 4 positive samples and all results have returned with <0.001% weight asbestos. No visual signs of ACM were encountered during the Ground Investigation, therefore it is likely only trace fibres are present within the Made Ground containing demolition rubble. Therefore, the Made Ground soils will need to be carefully managed to ensure no significant exposure occurs. The specific design and installation process for the appropriate cover systems will be clearly defined within the Site remediation & Enabling Works Strategy, however industry best practice (as outlined within BRE 465) will require the following minimum depths of certified clean cover: • Landscaped areas– **300mm** Chemical analysis of the natural clay and topsoil has indicated that it may be suitable for use within soft landscaping, however further testing would be required to confirm this. Chemical analysis of the natural clay drift deposits have identified these soils to be acceptable for use as subsoil within the proposed landscaped 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	Low risk to controlled waters.
Ground Gas	Ground gas monitoring suggests that the site can be predominantly classified as CS1 and in these areas, it is considered that gas protection measures will not be required. However, localised areas of the site have been assessed as being CS2, CS3 and CS4. However, localised areas of the site have been assessed as being CS2, CS3 and CS4. E3P have used professional judgement to classify WS113 as CS4 which is inline with guidance from CIRIA C665 Example 5. It will be necessary to either remove the material within the proximity of the significantly elevated methane where the site is classified as CS4, or alternatively undertake quantitative real time monitoring utilising Gas Clams to inform a robust risk assessment.
Potable Water	This will need to be confirmed following the completion of a UKWIR Risk Assessment. Post remediation and enabling works ground conditions may be different from those identified during this site investigation.
Geotechnical Issues	
The only previous structures recorded on-site are associated with recent hardstand and access roadways utilised during level raising operations. No significant relict structures or infrastructure is anticipated. The Zone Load monitoring completed to date confirmed that future settlement of the underlying unconsolidated soils may be an issue that requires mitigating during the enabling works.	

This could be completed through the use of lime stabilisation and or re-engineering of the drift deposits to achieve >95% compaction.

Consideration must be given to the deeper fill materials of recently placed sandy clay material beyond 2.50m bgl as deep seated settlement may be a secondary factor.

Given the depth of upfill Made Ground, it is considered that proposed structures will be constructed using a Pile Foundation to transfer structural loading to the underlying competent weathered bedrock stratum at a depth generally between 3.0m and 8.0m.

All buildings will be constructed with ground gas mitigation measures to ensure complete protection.

Ground Improvement options including Vibro Replacement Stone Columns (VSC) or Rapid Impact Compaction will be limited by the design ABP in the order of 150kN/m2 that could be achieved.

A process of Rolled Dynamic Compaction (RDC) could be utilised to induce total consolidation to the placed fill material, induce primary and secondary settlement and ensure a safe and uniform allowable bearing pressure across the site for a design ground bearing floor slab with a UDL of 50kN/m2.

A process of lime and cement stabilisation could be applied to the near surface layers to construct a bound sub-base replacement layer across the platform to ensure a CBR in the order of 15-30% at formation. The bound sub-base would provide the required temporary works platform for a piling rig and when capped with suitable Type 1 MOT would facilitate the construction of a ground bearing floor slab to institutional design requirements.

Where the site will be subject to a process of upfill to achieve the required development elevation, the material will need to be compacted to ensure compliance as a structural fill material. In reality this placement and compaction of materials will necessitate the additional of lime and OPC to ensure the required structural properties and ensure the required ins-tu densities. It is therefore considered that the use of lime and OPC stabilisation to construct a bound sub-base replacement layer would be extended to compliment the site cut / fill process which could then be completed in any climatic condition.

As an alternative to the afore mentioned Ground Engineering / Compaction solution, it would be possible to cut / fill the site to the required development platform prior to the construction of Vibro Replacement Stone Columns to ensure a safe and uniform Allowable Bearing pressure (ABP) of the ground bearing slab and external hardstand. It is anticipated that a site wide grid of stone columns across a 3.0m centre would be required.

If a VSC solution was utilised, it would be necessary to undertake prior enabling works with engineering of materials within areas of upfill engineered to ensure End Product Specification where material is placed to ensure the in-situ density is equal to or exceeding the laboratory defined maximum with moisture to be within the defined control limits.

Exploratory Ground Investigation works have not identified any evidence of viable coal seams or unrecorded historical mine workings that would be considered to represent a risk of subsidence associated with consolidation of voids.

END OF REPORT

APPENDIX I
LIMITATIONS



1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the Client as indicated in Section 1.2.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.

8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.

10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II
GLOSSARY



TERMS

AST	Above Ground Storage Tank	**SGV**	Soil Guideline Value
BGS	British Geological Survey	**SPH**	Separate Phase Hydrocarbon
BSI	British Standards Institute	**TPH CWG**	Total Petroleum Hydrocarbon (Criteria Working Group)
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes	**SPT**	Standard Penetration Test
CIEH	Chartered Institute of Environmental Health	**SVOC**	Semi Volatile Organic Compound
CIRIA	Construction Industry Research Association	**UST**	Underground Storage Tank
CLEA	Contaminated Land Exposure Assessment	**VCCs**	Vibro Concrete Columns
CSM	Conceptual Site Model	**VOC**	Volatile Organic Compound
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)	**WTE**	Water Table Elevation
DWS	Drinking Water Standard	**m**	Metres
EA	Environment Agency	**km**	Kilometres
EQS	Environmental Quality Standard	**%**	Percent
GAC	General Assessment Criteria	**%v/v**	Percent volume in air
GL	Ground Level	**mb**	Milli Bars (atmospheric pressure)
GSV	Gas Screening Value	**l/hr**	Litres per hour
HCV	Health Criteria Value	**µg/l**	Micrograms per Litre (parts per billion)
ICSM	Initial Conceptual Site Model	**ppb**	Parts Per Billion
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)	**mg/kg**	Milligrams per kilogram (parts per million)
ND	Not Detected	**ppm**	Parts Per Million
LMRL	Lower Method Reporting Limit	**mg/m^3**	Milligram per metre cubed
NR	Not Recorded	**m bgl**	Metres Below Ground Level
PAH	Polycyclic Aromatic Hydrocarbon	**m bcl**	Metre Below Cover Level
PCB	Poly-Chlorinated Biphenyl	**mAOD**	Metres Above Ordnance Datum (sea level)
PID	Photo Ionisation Detector	**kN/m^2**	Kilo Newtons per metre squared
QA	Quality Assurance	**µm**	Micro metre
SGV	Soil Guideline Value		

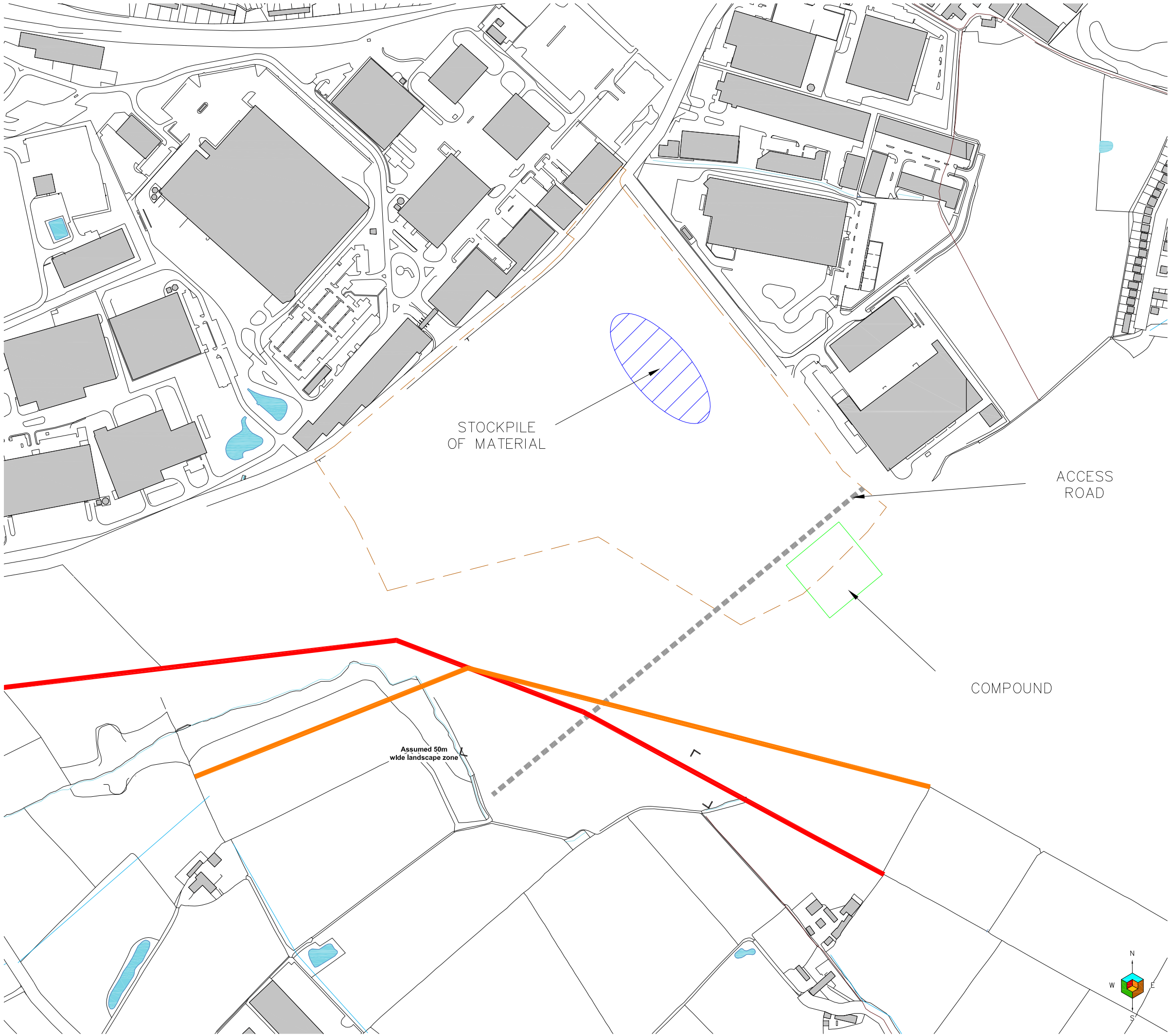
APPENDIX III
DRAWINGS





Drawing 11-697-001

Site Location Plan



Key:

Current Site Features

- Stockpile of Material
- Compound
- Combined Sewer
- Gas Main

Notes:

P1	-	05-07-2018	DRAFT	RW	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client:	Job No:	Date:
Russell Homes	11-697	05-07-2018
	Drawing No: 002	Scale: NTS @ A3
Job Title: South Heywood Commercial	Drawing Title: Site Features Plan	

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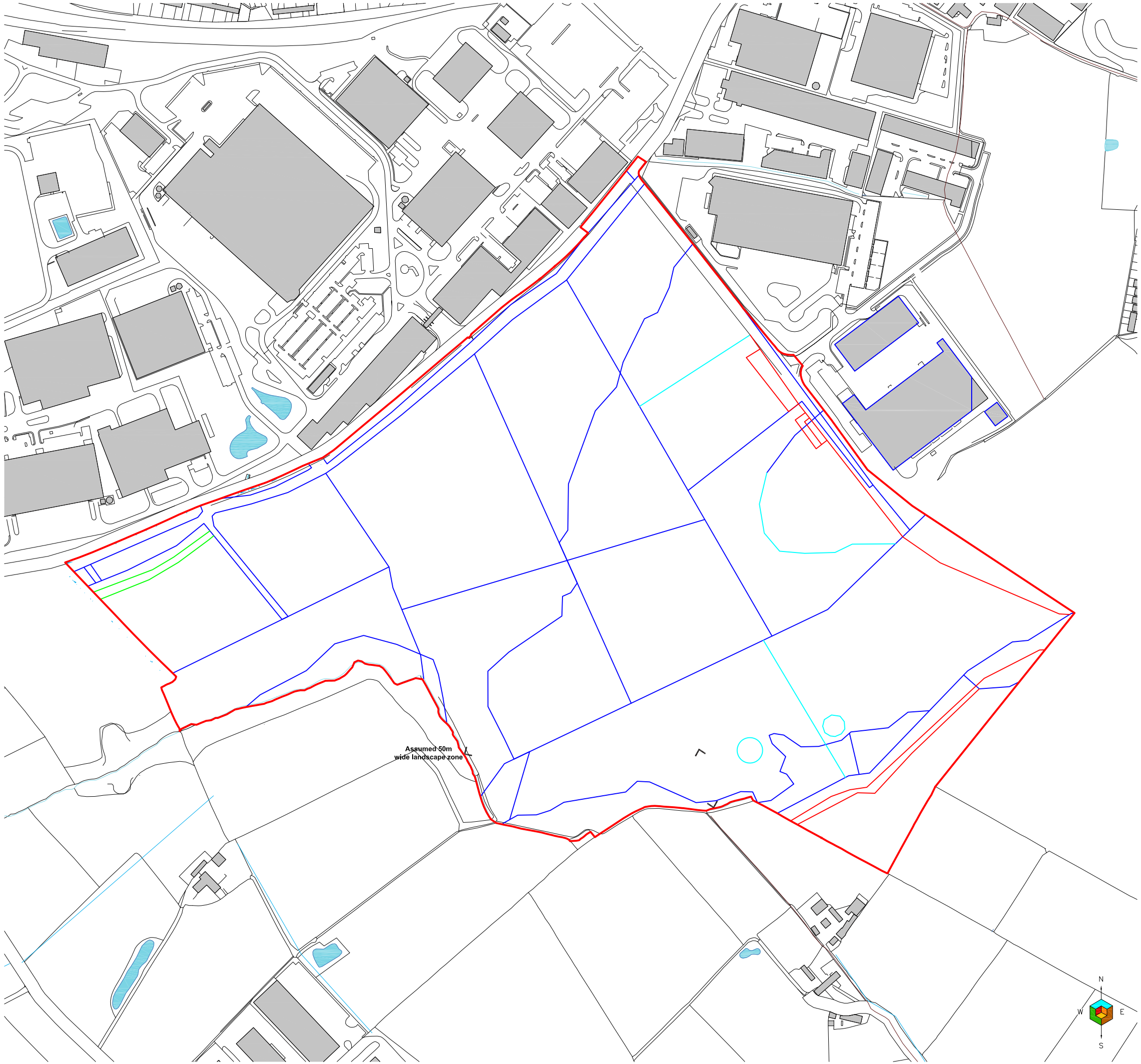

Key:

Historical Features

- Former Field Boundaries (Pre 1848 - Pre 1851)
- Former Field Boundaries and Outbuildings (Pre 1920 - Pre 1950)
- Former Field Boundary Extentions (Pre 1955 - Pre 1956)
- Former Shaft (Pre 1910 - Pre 1956)
- Former Field Boundaries and Footpaths (Pre 1923 - Pre 1932)

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	05-07-2018	DRAFT	CB	MD

Client: Russell Homes

Job No: 11-697

Date: 05-07-2018

Drawing No: 003

Scale: NTS @ A3

Job Title: South Heywood Commercial

Drawing Title: Historical Features Plan

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Key:

Notes:

P1	-	05-07-2018	DRAFT	CB	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Russell Homes

Job No: 11-697

Date: 05-07-2018

Drawing No: 004

Scale: NTS @ A3

Job Title: South Heywood Commercial

Drawing Title: Proposed Development Plan

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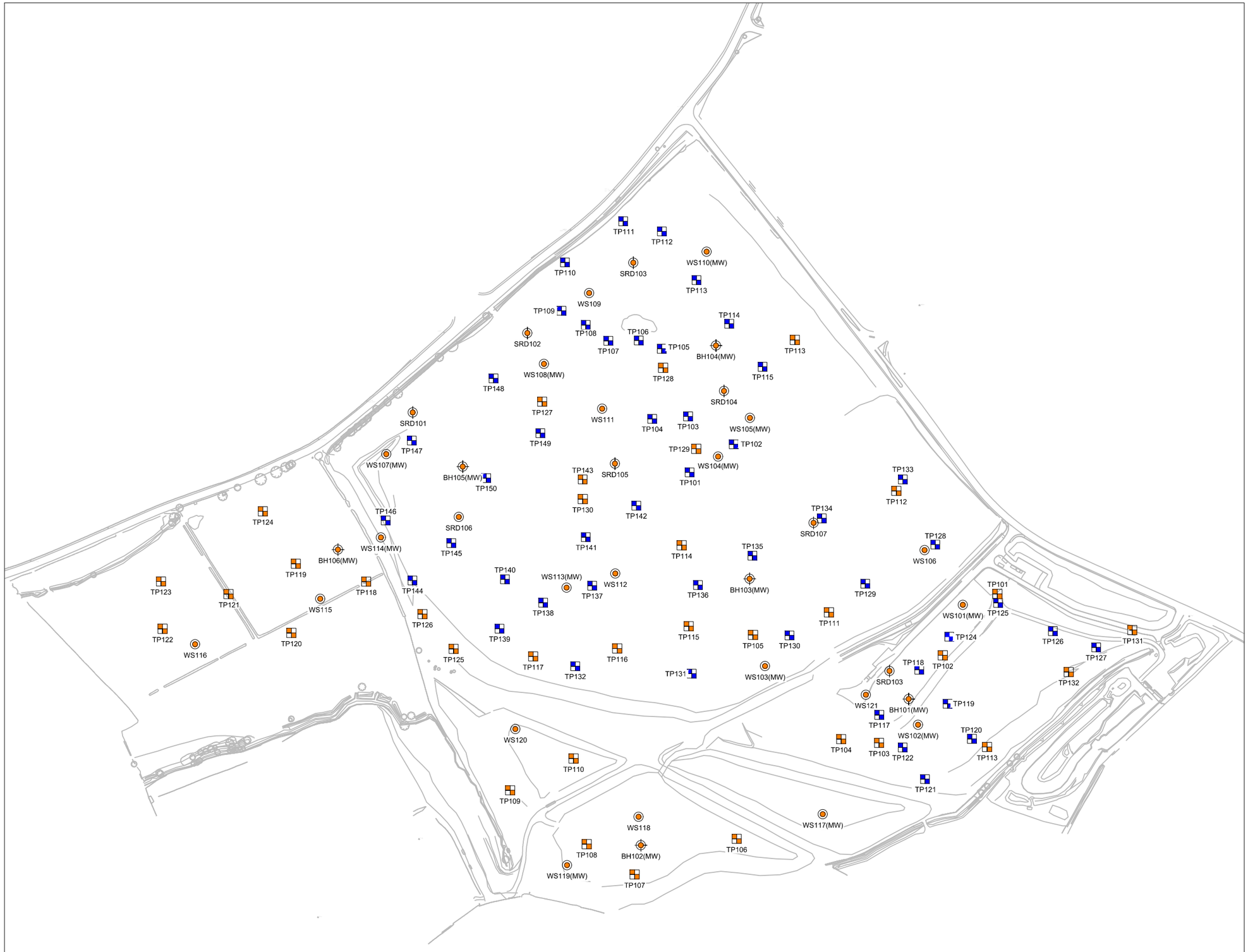

Key:

Location Symbols

TP101	Approximate Trial Pit Location (2017)
WS101(MW)	Approximate Window Sample Probehole Location with Install
TP101	Approximate Trial Pit Location
SRD101	Approximate Sand Replacement Density Test
BH101	Approximate Cable Percussive Borehole Location
RB101	Approximate Rotary Borehole Location
SA101	Approximate Soak Away Location
ZL1	Approximate Zone Load Location
HP101	Approximate Hand Dug Pit Location

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	R3	16-08-2019	REVISION	CB	MD
P1	R2	30-05-2019	REVISION	HM	MD
P1	R1	25-07-2018	REVISION	CB	MD
P1	-	05-07-2018	DRAFT	CB	MD

Client: Russell Homes

Job No: 11-697

Date: 16-08-2019

Drawing No: 005

Scale: NTS @ A3

Job Title: South Heywood Commercial

Drawing Title: Exploratory Hole Location Plan

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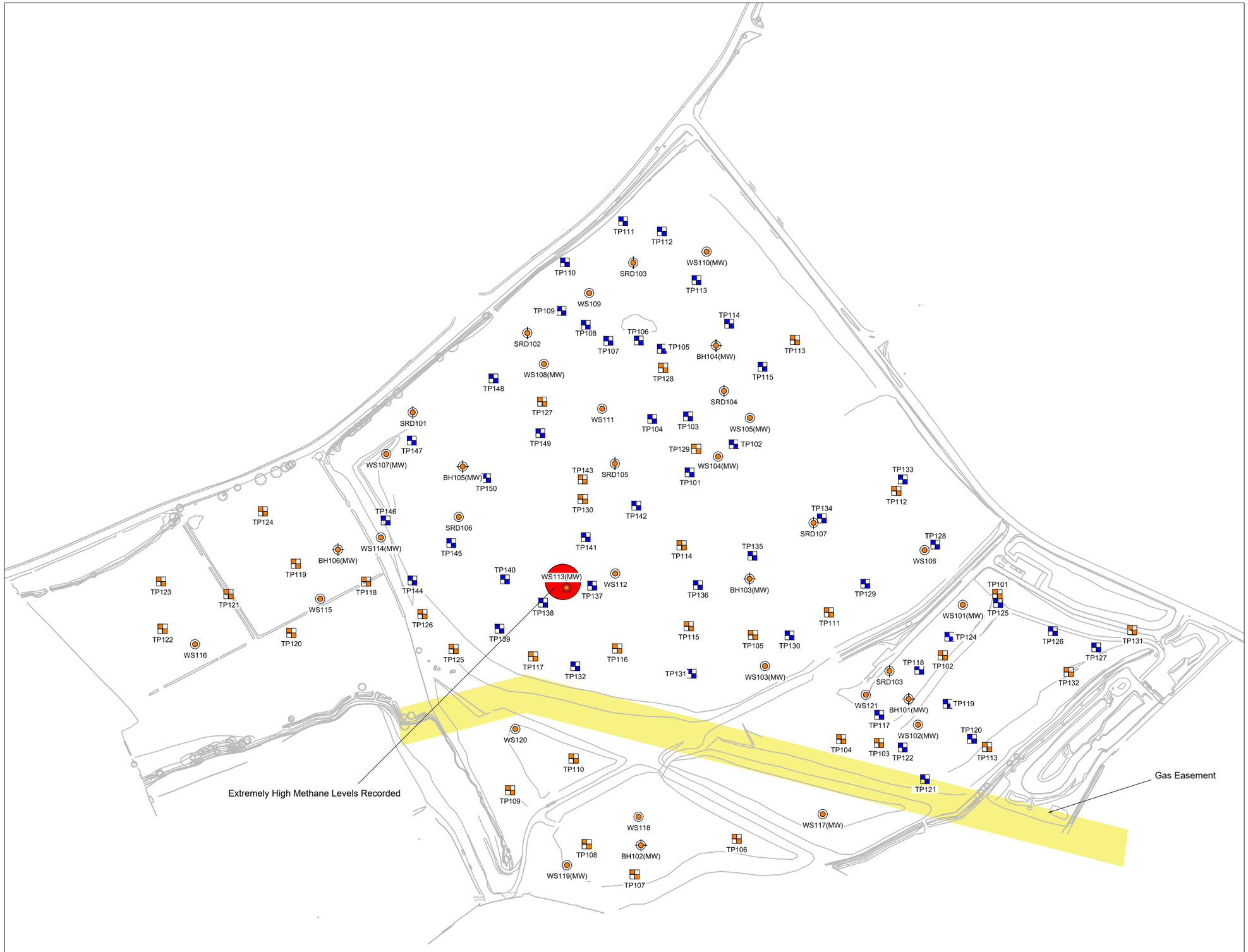

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- RB101 — Approximate Rotary Borehole Location
- SA101 — Approximate Soak Away Location
- ZL1 — Approximate Zone Load Location
- HP101 — Approximate Hand Dug Pit Location

Development Constraints

- Gas Easement
- Extremely High Methane Levels Recorded

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	R2	16-08-2019	REVISION	CB	MD
P1	R1	30-05-2019	REVISION	CB	MD
P1	-	05-07-2018	DRAFT	CB	MD

Client: Russell Homes

Job No: 11-697

Date: 16-08-2019

Drawing No: 005

Scale: NTS @ A3

Job Title: South Heywood Commercial

Drawing Title: Development Constraints with Exploratory Hole Location Plan

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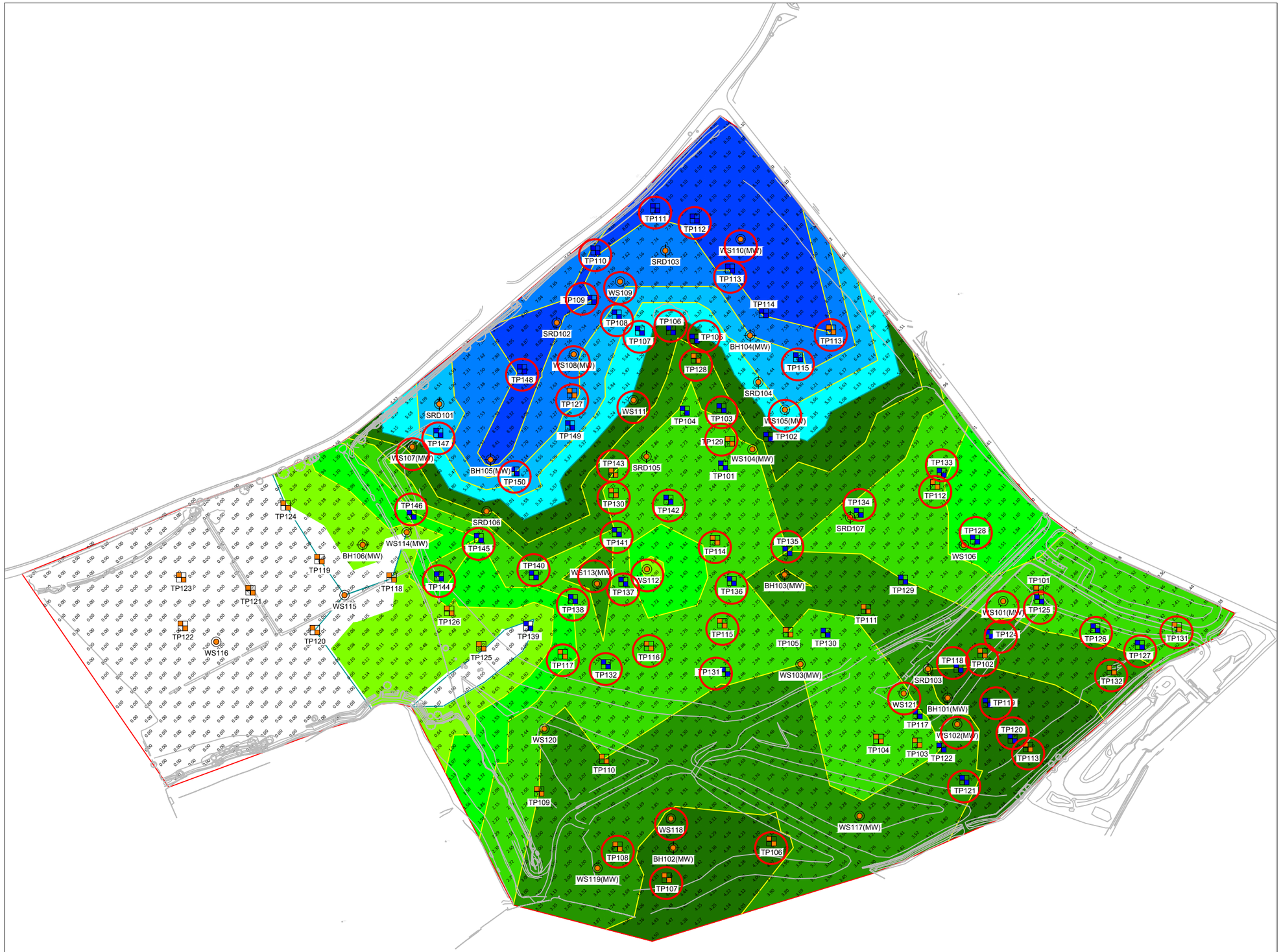

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- RB101 — Approximate Rotary Borehole Location
- SA101 — Approximate Soak Away Location
- ZL1 — Approximate Zone Load Location
- HP101 — Approximate Hand Dug Pit Location

Made Ground Depth (m)

- Made Ground in Excess of 10.00m
- Depth of Made Ground Between 9.00 - 9.99m
- Depth of Made Ground Between 8.00 - 8.99m
- Depth of Made Ground Between 7.00 - 7.99m
- Depth of Made Ground Between 6.00 - 6.99m
- Depth of Made Ground Between 5.00 - 5.99m
- Depth of Made Ground Between 4.00 - 4.99m
- Depth of Made Ground Between 3.00 - 3.99m
- Depth of Made Ground Between 2.00 - 2.99m
- Depth of Made Ground Between 1.00 - 1.99m
- Depth of Made Ground Between 0.00 - 0.99m
- Made Ground not Encountered
- Full Depth of Made Ground not Identified

Notes:

The conjectured depth mapping has been completed using 3D modelling software to produce indicative assessments that at this time are the most accurate interpretation of the Ground Investigation data. However, the conjectured nature of the model, limitations and areas of uncertainty between two proven points and the intermediary area result in uncertainties that should be considered by the reader of a drawing and incorporated in any subsequent assessment.

P1	R1	16-08-2019	REVISION	CB	MD
P1	-	05-07-2018	DRAFT	RW	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Russell Homes

Job No: 11-697

Date: 16-08-2019

Drawing No: 007

Scale: NTS @ A3

Job Title: South Heywood, Commercial

Drawing Title: Depth of Made Ground Plan

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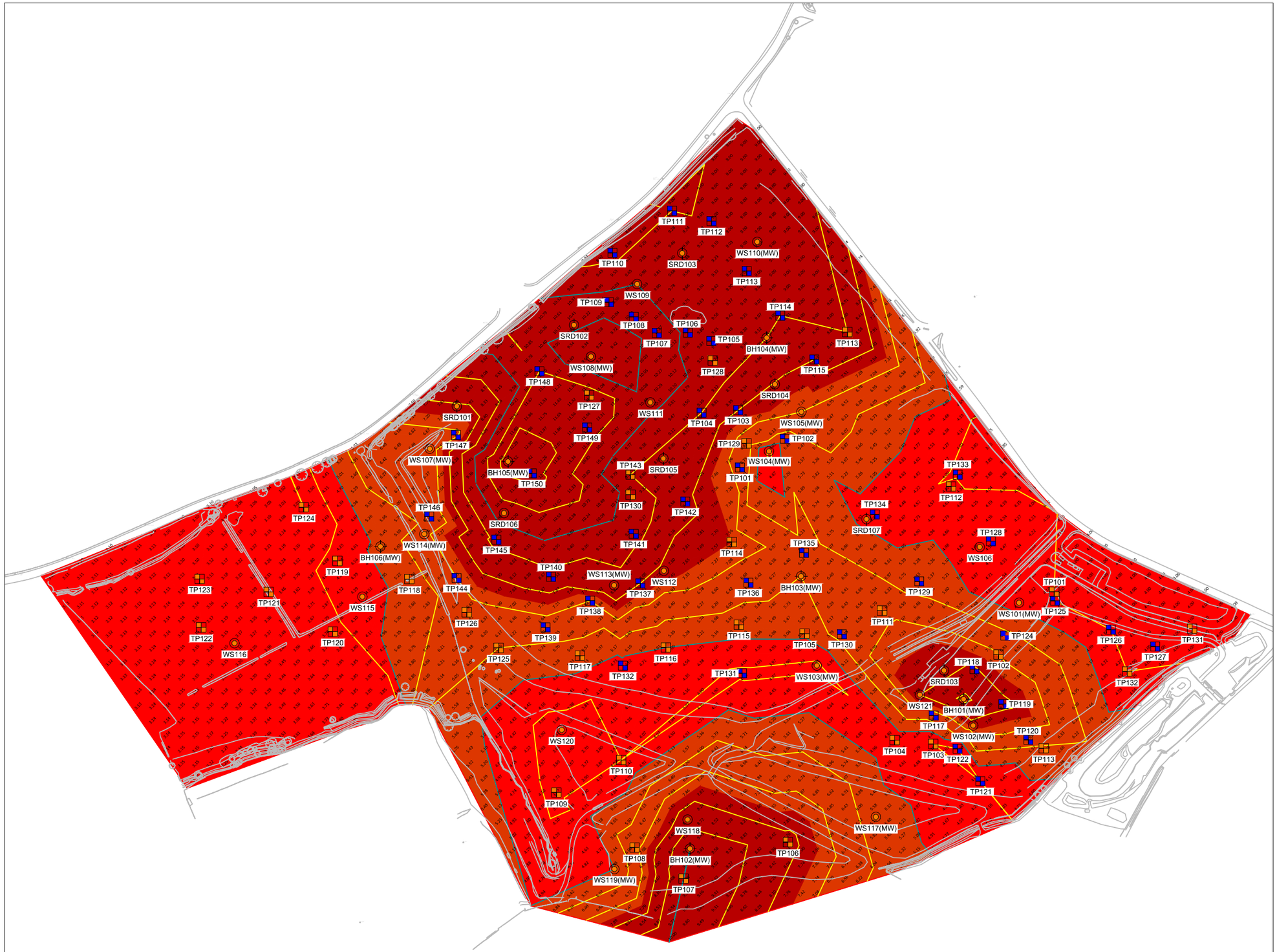

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- TP101 — Approximate Trial Pit Location
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- RB101 — Approximate Rotary Borehole Location
- SA101 — Approximate Soak Away Location
- ZL1 — Approximate Zone Load Location
- HP101 — Approximate Hand Dug Pit Location

Shallow Spread Footings

- Depth to Founding Strata 0.00 - 1.24m
- Depth to Founding Strata 1.25 - 1.49m

Mass Trench Fill Footings

- Depth to Founding Strata 1.50 - 1.74m
- Depth to Founding Strata 1.75 - 1.99m
- Depth to Founding Strata 2.00 - 2.24m

Engineered Footings

- Depth to Founding Strata 2.25 - 2.49m
- Depth to Founding Strata 2.50 - 4.99m
- Depth to Founding Strata 5.00 - 7.49m
- Depth to Founding Strata >7.50m

Notes:

The conjectured depth mapping has been completed using 3D modelling software to produce indicative assessments that at this time are the most accurate interpretation of the Ground Investigation data. However, the conjectured nature of the model, limitations and areas of uncertainty between two proven points and the intermediary area result in uncertainties that should be considered by the reader of a drawing and incorporated in any subsequent assessment.

Phase	Revision	Date	Issue	Drawn	Authorised
P1	R1	16.08.2019	REVISION	CB	MD
P1	-	05.07.2018	DRAFT	RW	MD

Client: Russell Homes	*Job No:* 11-697	*Date:* 16-08-2019
	Drawing No: 008	*Scale:* NTS @ A3
Job Title: South Heywood Commercial	*Drawing Title:* Depth to Founding Strata Plan	

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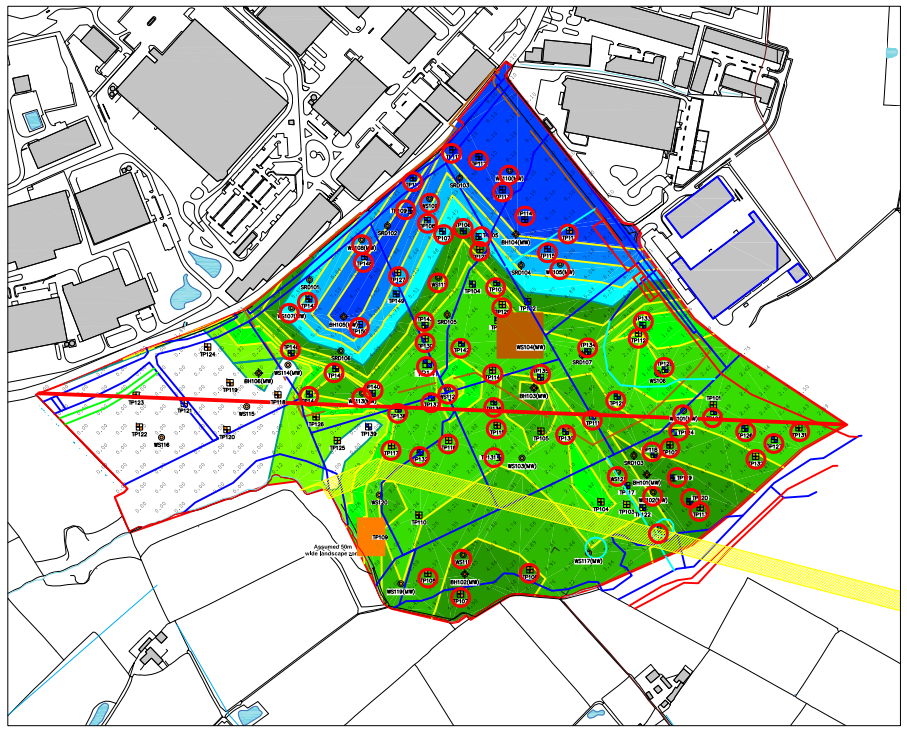
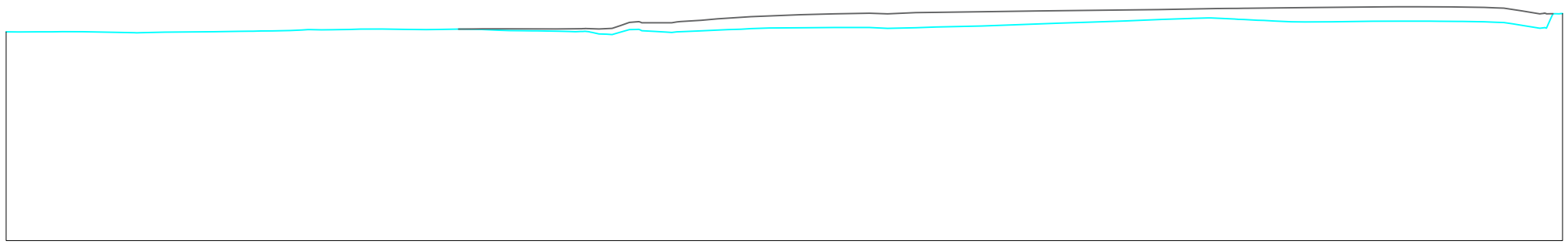
ID	SOURCE	EXPOSURE	Potential Pathway
HUMAN HEALTH			
1	Heavy Metals, heavy end Hydrocarbons & Non Volatile Polycyclic Aromatic Hydrocarbon (PAH)	Dermal Contact and Ingestion	Construction Workers &
		Consumption of Home-grown Produce	Residential End Users
2	Semi Volatile Polycyclic Aromatic, and petroleum and diesel range Hydrocarbon Compounds, Chlorinated Hydrocarbons	Volatilisation / Accumulation, Vapour Inhalation	Construction Workers &
			Residential End Users
3	Asbestos Containing Materials (ACM)	Fibre / Dust Inhalation	Construction Workers, Residential End Users &Third Party Property
4	Hazardous Ground Gases	Inhalation	Construction Workers
		Accumulation	Residential End Users
5	PCB's	Dermal Contact and Ingestion	Construction Workers &
		Consumption of Home-grown Produce	Residential End Users
CONTROLLED WATERS			
6	Water Soluble Mobile Contaminants	Vertical Migration	Secondary A Aquifer
7	Water Soluble Mobile Contaminants	Lateral Migration	Surface Water Courses
BUILDING & INFRASTRUCTURE			
8	pH & Sulphate	Corrosion of Concrete	Foundations / Concrete
9	VOC, TPH's Phenols, pH	Chemical Corrosion	Potable Water Supply





Key:

Conceptual Site Model

- Site Boundary
- Apartment Block
- Residential Dwelling
- Care Home
- Standard Industrial Unit
- Old Mill Buildings
- Chimney Base
- Coal Shaft
- Future Site Users
- Current Site Users
- Adjacent Site Users
- Construction, Demolition & Future Maintenance Workers
- Buildings, Hardstanding and Services.
- Groundwater
- Surface Water
- 1 Inhalation of Indoor/Outdoor Gas
- 2 Direct Contact
- 3 Migration of Ground Gas Through Permeable Made Ground
- 4 Former Buildings
- 5 Migration of Mobile Contaminants
- 6 Migration of Mobile Contaminants From Made Ground Soils to Adjacent Sites Along Services and Conduits
- 7 Migration of Mobile Contaminants Through Water Pipes
- Above Ground Storage Tank (AST's)
- Under Ground Storage Tank (AST's)
- Human Being
- Trees
- Infilled Material (Pond, Landfill)
- Landfill
- Made Ground
- Sand
- Clay
- Topsoil
- Gravel
- Silt
- Organic Material
- Invasive Species
- Hydrocarbon Odour
- Peat
- Pond
- Surface Water

Notes:

P1	-	05-07-2018	DRAFT	CB	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Russell Homes

Job No: 11-697

Date: 05-07-2018

Drawing No: 009

Scale: NTS @ A3

Job Title: South Heywood Commercial

Drawing Title: Diagrammatic Contaminant Conceptual Site Model

N W E S

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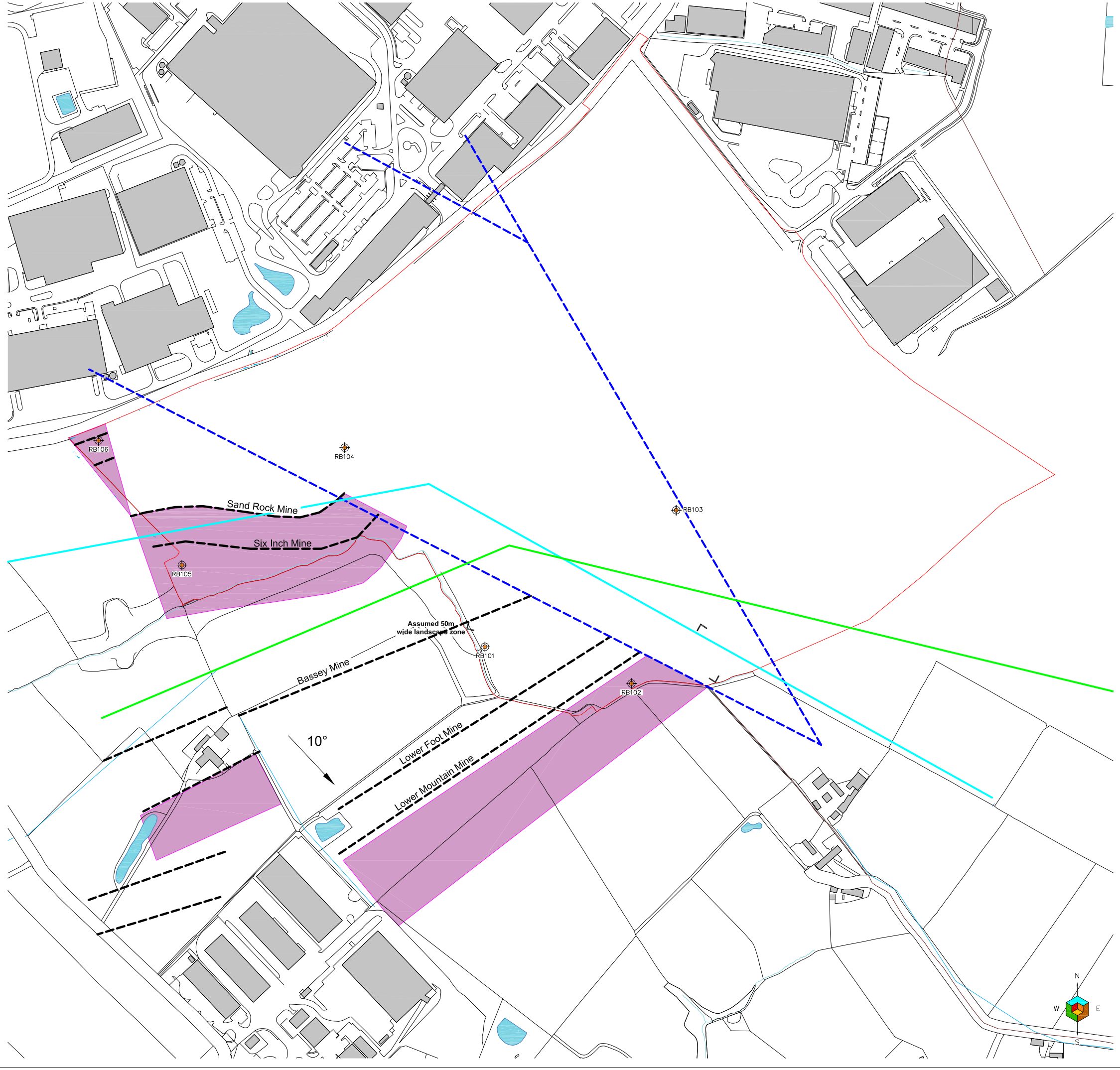

Key:

Location Symbols

RB101 — Approximate Rotary Borehole Location

Coal Mining

- Area Noted as Probable Coal Workings by Coal Authority
- Coal Outcrop
- Fault
- Dip and Direction
- Approximate Location of Water Main
- Approximate Location of Gas Main

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	26-07-2018	DRAFT	CB	MD

Client: Russell Homes

Job No: 11-697

Date: 26-07-2018

Drawing No: 013

Scale: NTS @ A3

Job Title: South Heywood Commercial

Drawing Title: Coal Mining Assessment Plan

Environmental Engineering Partnerships Ltd
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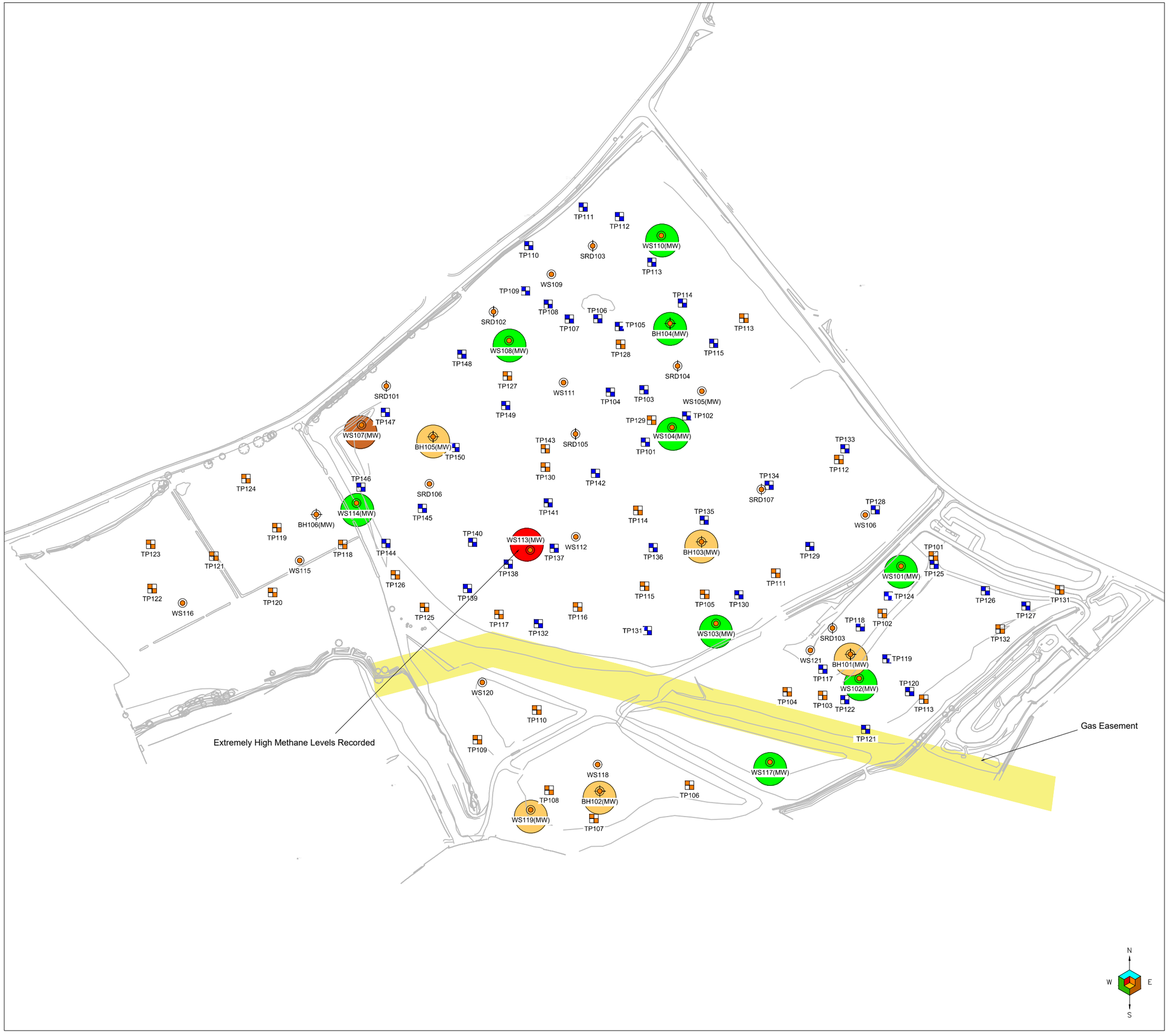

Key:

Location Symbols

- TP101 — Approximate Trial Pit Location (2017)
- WS101(MW) — Approximate Window Sample Probehole Location with Install
- TP101 — Approximate Trial Pit Location
- SRD101 — Approximate Sand Replacement Density Test
- BH101 — Approximate Cable Percussive Borehole Location
- RB101 — Approximate Rotary Borehole Location
- SA101 — Approximate Soak Away Location
- ZL1 — Approximate Zone Load Location
- HP101 — Approximate Hand Dug Pit Location

Development Constraints

- Gas Easement
- Ground Gas Assessment - CS4
- Ground Gas Assessment - CS3
- Ground Gas Assessment - CS2
- Ground Gas Assessment - CS1

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	R1	16-08-2019	REVISION	CB	MD
P1	-	08-07-2018	DRAFT	CB	MD

Client: Russell Homes

Job No: 11-697

Date: 16-08-2019

Drawing No: 014

Scale: NTS @ A3

Job Title: South Heywood Commercial

Drawing Title: Ground Gas Assessment Plan

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APPENDIX IV
PHOTOGRAPHS





PLATE 1 – A VIEW OF TP102



PLATE 2 – A VIEW EAST ACROSS THE SITE



PLATE 3 – A VIEW SOUTHWARDS ON THE SITE



PLATE 4: NATURAL CLAY AT THE BASE OF TP109



PLATE 5: LOOKING WEST ACROSS THE SITE

APPENDIX V
E3P EXPLORATORY HOLE LOGS



Trial Pit Log

Trialpit No **TP101** Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384895.42 - 409157.73 Level:	Date 15/05/2018
Location: Rochdale		Dimensions (m): Depth 3.60 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20			MADE GROUND: Soft to firm dark brown slightly sandy silty clay (Topsoil) with rootlets and rare gravel. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, sandstone and brick.
			HVP=25				MADE GROUND: Soft low strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour).
	1.00	ES	HVP=27				
	1.50	B					
	1.50	ES					
			HVP=37				
				2.30			Yellow brown gravelly fine to medium SAND. Gravel is fine to coarse sub-angular to sub-rounded of sandstone.
	2.50	B					
	2.50	ES					
	3.00	ES					
				3.60			End of pit at 3.60 m

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP102** Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384837.14 - 409092.66 Level:	Date 15/05/2018
Location: Rochdale		Dimensions (m): Depth 3.20 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Soft to firm dark brown slightly sandy silty clay (Topsoil) with rootlets and rare gravel. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, sandstone and brick.
	0.60	ES					MADE GROUND: Brown very gravelly fine to medium sand. Gravel is fine to coarse angular to sub-rounded of limestone, sandstone, concrete and brick.
				1.10			MADE GROUND: Firm low to medium strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour).
			HVP=64				
	2.00	ES	HVP=67				
	3.00	ES	HVP=36				
				3.20			End of pit at 3.20 m

1 2 3 4 5

Remarks: Complete.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP103** Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384769.56 - 408999.07 Level:	Date 15/05/2018
Location: Rochdale		Dimensions (m): Depth 4.00 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES		0.50			MADE GROUND: Soft to firm dark brown slightly sandy silty clay (Topsoil) with rootlets and rare gravel. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, sandstone and brick.
	1.50 1.50	B ES	HVP=28	2.50			MADE GROUND: Soft low strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour).
	3.00	ES	HVP=69 HVP=60 HVP=77 HVP=61	4.00			Firm to stiff medium strength light yellow grey slightly gravelly sandy CLAY. Gravel is fine to medium sub-angular to sub-rounded of mudstone. End of pit at 4.00 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP104**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384729.13 - 409003.44 Level:	Date 15/05/2018
Location: Rochdale		Dimensions (m): Depth 3.30 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES					MADE GROUND: Soft to firm brown slightly sandy gravelly clay (Topsoil). Gravel is fine to medium angular to sub-angular of concrete, brick and sandstone.
				0.40			
			HVP=81				MADE GROUND: Stiff high strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour).
	1.20	ES					
				1.50			MADE GROUND: Soft low strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour).
			HVP=22				
			HVP=65	2.30			Firm medium strength light yellow grey slightly gravelly sandy CLAY. Gravel is fine to medium sub-angular to sub-rounded of mudstone.
	2.80	ES					
			HVP=54				
			HVP=48				
				3.30			End of pit at 3.30 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP105** Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384635.42 - 409114.43 Level:	Date 15/05/2018
Location: Rochdale		Dimensions (m): 2 × 0.8 Depth 4.00	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Soft brown light grey silty clay (Topsoil) with rootlets.
							MADE GROUND: Firm medium strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour).
			HVP=46				
				1.70			MADE GROUND: Firm low strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour).
	2.00	ES	HVP=36				
			HVP=63				
			HVP=69				
				3.40			Yellow brown gravelly fine to medium SAND. Gravel is fine to coarse sub-angular to sub-rounded of sandstone.
				4.00			End of pit at 4.00 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP106**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384618.18 - 408897.30 Level:	Date 16/05/2018
Location: Rochdale		Dimensions (m): Depth 4.60 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.05	ES		0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
							MADE GROUND: Firm dark brown sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are angular to sub-angular of brick and concrete. Boulders are angular to sub-angular of concrete.
				0.70			MADE GROUND: Yellow light brown very gravelly fine to medium sand with cobbles. Gravel is fine to coarse angular to sub-angular of sandstone, concrete and brick. Cobbles are angular to sub-angular of brick and sandstone.
				1.20			MADE GROUND: Soft low strength dark brown clayey silty fine to medium sand with gravel. Gravel is fine to medium angular to sub-angular of glass and wood.
	1.50	ES					
			HVP=27				
			HVP=43				
			HVP=15				
			HVP=11				
			HVP=29				
	4.50	ES					
			HVP=19	4.60			End of pit at 4.60 m

1 2 3 4 5

Remarks: Complete.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP107**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384510.42 - 408859.20 Level:	Date 16/05/2018
Location: Rochdale		Dimensions (m): Depth 4.40 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
			HVP=33				MADE GROUND: Soft low strength dark brown sandy gravelly clay with boulders. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Boulders are angular to sub-angular of concrete.
			HVP=51	1.00			
	1.50	ES	HVP=45				MADE GROUND: Firm medium strength dark brown sandy gravelly clay with boulders. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Boulders are angular to sub-angular of concrete.
			HVP=51				
			HVP=45				
	3.00 3.00	B ES	HVP=31	3.00			MADE GROUND: Soft low strength dark brown sandy gravelly clay with boulders. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Boulders are angular to sub-angular of concrete.
			HVP=26				
			HVP=33				
	4.30	ES	HVP=26	4.40			End of pit at 4.40 m

Remarks: Complete.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP108**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384457.87 - 408891.99 Level:	Date 16/05/2018
Location: Rochdale		Dimensions (m): Depth 3.00 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.20			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
			HVP=42				MADE GROUND: Firm medium strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
			HVP=36	1.00			MADE GROUND: Soft low strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
			HVP=25				
			HVP=31				
			HVP=29				
	2.80	ES		3.00			End of pit at 3.00 m

1 2 3 4 5

Remarks: Complete.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP109** Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384376.97 - 408948.66 Level:	Date 16/05/2018
Location: Rochdale		Dimensions (m): Depth 4.10 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
			HVP=23				MADE GROUND: Soft low strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
			HVP=19				
	2.00	B					
	2.00	ES	HVP=27				
			HVP=22				
	2.90	ES		3.00			Stiff high strength brown light grey sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=75				
	3.50	B					
	3.50	ES					
	3.80	ES	HVP=77	4.10			End of pit at 4.10 m

Remarks: Complete.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP110** Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384445.33 - 408982.78 Level:	Date 16/05/2018
Location: Rochdale		Dimensions (m): Depth 4.00 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
			HVP=22				MADE GROUND: Soft low strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal (Slight ash odour).
			HVP=37				
			HVP=29	1.40			MADE GROUND: Soft low strength orange brown slightly sandy gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete, limestone and sandstone. Cobbles are sub-angular of brick.
			HVP=27	1.80			MADE GROUND: Soft low strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, ash, metal and plastic. Cobbles are sub-angular of brick (Slight ash odour).
	2.50	ES	HVP=22				
			HVP=65	2.90			Firm medium strength becoming soft low strength light yellow grey slightly gravelly sandy CLAY. Gravel is fine to medium sub-angular to sub-rounded of mudstone.
	3.50	ES	HVP=23	3.50			Soft low strength becoming soft low strength light yellow grey slightly gravelly sandy CLAY. Gravel is fine to medium sub-angular to sub-rounded of mudstone.
				4.00			End of pit at 4.00 m

Remarks: Complete.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP111**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384715.53 - 409137.90 Level:	Date 16/05/2018
Location: Rochdale		Dimensions (m): 2 × 0.8 Depth 3.80	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
			HVP=32	0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
	1.00	ES	HVP=47				MADE GROUND: Soft low strength becoming firm medium strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
			HVP=41	1.60			MADE GROUND: Light brown very gravelly fine to medium sand with cobbles. Gravel is fine to coarse angular to sub-angular of concrete and sandstone. Cobbles are rounded of sandstone.
	2.50	ES					
				3.80			End of pit at 3.80 m

1 2 3 4 5

Remarks: Complete.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP112**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384787.70 - 409266.74 Level:	Date 16/05/2018
Location: Rochdale		Dimensions (m): Depth 2.00 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
			HVP=24				MADE GROUND: Soft low strength becoming firm medium strength dark brown sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are boulders are angular to sub-angular of brick and concrete.
	1.00	ES	HVP=48				
▼				1.60			MADE GROUND: Light brown very gravelly fine to medium sand. Gravel is fine to coarse angular to sub-angular of concrete and sandstone.
				2.00			End of pit at 2.00 m

Remarks: 1. Terminated at 2.00m bgl on obstruction. 2. Water seepage encountered at 1.80m bgl.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP113**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384680.36 - 409426.95 Level:	Date 16/05/2018
Location: Rochdale		Dimensions (m): 2 × 0.8 Depth 2.50	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.05	ES		0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
			HVP=35				MADE GROUND: Soft low strength becoming firm medium strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
			HVP=28				
	1.50	ES					
			HVP=32				
			HVP=58				
				2.50			End of pit at 2.50 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP114**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384559.09 - 409209.30 Level:	Date 16/05/2018
Location: Rochdale		Dimensions (m): Depth 2.60 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
			HVP=32				MADE GROUND: Soft low strength dark brown sandy gravelly clay with boulders. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete, metal, wood and plastic. Boulders are angular to sub-angular of concrete.
			HVP=37				
	1.50 1.50	B ES	HVP=38				
				2.60			End of pit at 2.60 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP115**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384566.67 - 409122.59 Level:	Date 17/05/2018
Location: Rochdale		Dimensions (m): Depth 2.50 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Dark brown clayey silty fine to medium sand. Gravel is fine to medium angular to sub-rounded of brick, sandstone and concrete.
			HVP=35				MADE GROUND: Soft low strength brown slightly sandy gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, concrete, sandstone, glass and fabric. Cobbles are angular to sub-angular of brick and concrete (Ash odour).
	1.00	ES	HVP=33				
			HVP=21				
			HVP=62	2.00			MADE GROUND: Firm medium strength brown slightly sandy gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, concrete, sandstone, glass and fabric. Cobbles are angular to sub-angular of brick and concrete (Ash odour).
			HVP=49	2.50			End of pit at 2.50 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP116**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384490.19 - 409099.47 Level:	Date 17/05/2018
Location: Rochdale		Dimensions (m): Depth 3.00 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Dark brown clayey silty fine to medium sand with gravel. Gravel is fine to medium angular to sub-angular of brick, limestone and sandstone.
			HVP=35				MADE GROUND: Soft low strength to firm medium strength brown sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse angular to sub-angular of brick, concrete, glass, wood and pottery. Cobbles and boulders are sub-angular of brick and concrete.
				0.80			
			HVP=49				MADE GROUND: Firm medium strength brown sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse angular to sub-angular of brick, concrete, glass, wood and pottery. Cobbles and boulders are sub-angular of brick and concrete.
	1.50	ES		1.50			
			HVP=51				MADE GROUND: Soft low strength brown sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse angular to sub-angular of brick, concrete, glass, wood and pottery. Cobbles and boulders are sub-angular of brick and concrete.
			HVP=39				
			HVP=57	2.50			MADE GROUND: Firm medium strength brown sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse angular to sub-angular of brick, concrete, glass, wood and pottery. Cobbles and boulders are sub-angular of brick and concrete.
				3.00			End of pit at 3.00 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP117**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384401.95 - 409091.14 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.50 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Dark brown clayey silty sand with gravel. Gravel is fine to medium angular to sub-angular of brick, limestone and sandstone.
							MADE GROUND: Light brown very gravelly fine to medium sand. Gravel is fine to coarse of sandstone, brick and concrete.
				0.70			MADE GROUND: Very soft very low strength to soft low strength brown sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse angular to sub-angular of brick, concrete, glass, wood and pottery. Cobbles and boulders are sub-angular of brick and concrete.
			HVP=33				
▼	1.50	ES	HVP=17				
			HVP=32				
				2.50			End of pit at 2.50 m

1 2 3 4 5

Remarks: 1. Complete. 2. Water seepage encountered at 2.30m bgl.

Stability: Stable.

Trial Pit Log

Trialpit No **TP118**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384224.66 - 409170.32 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): 2 × 0.8, Depth 2.90	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Brown clayey silty fine to medium SAND (Topsoil) with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=69				Firm medium strength to stiff high strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
	1.00 1.00	D ES	HVP=61				
			HVP=55				
				1.70			Stiff high strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=87				
▼				2.40			Soft low strength brown very sandy CLAY.
			HVP=21				
	2.80	ES					
				2.90			End of pit at 2.90 m

Remarks: 1. Complete. 2. Water strike encountered at 2.40m bgl.

Stability: Stable.

Trial Pit Log

Trialpit No **TP119**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384151.27 - 409191.19 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.50 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=41	0.30			Brown clayey silty fine to medium SAND (Topsoil) with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
	1.00	ES	HVP=63				Firm medium strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
▼	1.50	D	HVP=38				
			HVP=65	2.30			Soft to firm brown very sandy CLAY.
				2.50			End of pit at 2.50 m

1 2 3 4 5

Remarks: 1. Complete. 2. Water seepage encountered at 2.30m bgl.

Stability: Stable.

Trial Pit Log

Trialpit No **TP120**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384148.39 - 409115.90 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.50 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20			Brown clayey silty fine to medium SAND (Topsoil) with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=62				Firm medium strength becoming soft low strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
	1.00	ES	HVP=65				
			HVP=47	1.80			
▼	2.00	D	HVP=20				Soft low strength becoming soft low strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
▼				2.30			Soft to firm brown very sandy CLAY.
				2.50			End of pit at 2.50 m

Remarks: 1. Terminated at 2.50m bgl due to collapse. 2. Water strike encountered at 2.00m and 2.30m bgl.

Stability: Stable.

Trial Pit Log

Trialpit No **TP121**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384077.78 - 409157.53 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.70 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Brown clayey silty fine to medium SAND (Topsoil) with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=51	0.50			Firm medium strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=59				
				1.20			Soft to firm low strength brown very sandy CLAY.
▼			HVP=36				
	1.80	ES					
			HVP=39				
				2.70			End of pit at 2.70 m

1 2 3 4 5

Remarks: 1. Complete. 2. Water seepage encountered at 1.60m bgl.

Stability: Stable.

Trial Pit Log

Trialpit No **TP122**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384007.72 - 409120.49 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.80 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Brown clayey silty fine to medium SAND (Topsoil) with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=29				Very soft very low strength to soft low strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=17				
	1.50	ES					
			HVP=20				
				2.30			Dark blue grey sandy GRAVEL. Gravel is fine to medium angular of siltstone.
	2.50	ES					
				2.80			End of pit at 2.80 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP123**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384006.47 - 409170.73 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.70 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			Brown clayey silty fine to medium SAND (Topsoil) with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=69				
	1.00	ES	HVP=41				Soft low strength to firm medium strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
				1.30			
			HVP=19				Soft low strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=27				
				2.30			Soft low strength brown very sandy CLAY.
			HVP=29	2.50			Dark blue grey sandy GRAVEL. Gravel is fine to medium angular of siltstone.
				2.70			End of pit at 2.70 m

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP124**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384114.43 - 409245.43 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 3.00 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
			HVP=75	0.20			Brown clayey silty fine to medium SAND (Topsoil) with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
	1.00 1.00	D ES	HVP=85	1.20			Stiff high strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=48				
	2.00	D	HVP=41				Firm medium strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
▼			HVP=60	2.40			Firm medium strength brown very sandy CLAY.
				3.00			End of pit at 3.00 m

1 2 3 4 5

Remarks: 1. Complete. 2. Water seepage encountered at 2.40m bgl.

Stability: Stable.

Trial Pit Log

Trialpit No **TP125**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384317.13 - 409098.77 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.50 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20			Brown clayey silty fine to medium SAND (Topsoil) with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=53				Firm medium strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
	1.00	ES	HVP=47	1.10			Light grey brown slightly clayey fine to medium SAND.
▼				1.80			Soft to firm low strength brown very sandy CLAY.
			HVP=40	2.20			Dark blue grey sandy GRAVEL. Gravel is fine to medium angular of siltstone.
				2.50			End of pit at 2.50 m

Remarks: 1. Complete. 2. Water seepage encountered at 1.80m bgl.

Stability: Stable.

Trial Pit Log

Trialpit No **TP126**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384284.22 - 409135.72 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 3.50 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown clayey silty fine to medium sand (Topsoil) with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
	0.50	ES	HVP=44				MADE GROUND: Firm medium strength dark brown black sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded of brick, concrete, glass and pottery. Cobbles and boulders are sub-angular of brick and concrete.
			HVP=43	0.90			Firm medium strength to stiff high strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=99	1.30			Stiff high strength brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
			HVP=65				
▼				2.30			Soft low strength light brown very sandy CLAY.
▼			HVP=25				
				3.50			End of pit at 3.50 m

1 2 3 4 5

Remarks: 1. Complete. 2. Water seepage encountered at 2.30m and 2.50m bgl.

Stability: Stable.

Trial Pit Log

Trialpit No **TP127**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384411.20 - 409362.40 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): 2 × 0.8 Depth 2.50	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			MADE GROUND: Brown clayey gravelly fine to medium sand. Gravel is fine to medium sub-angular of brick, pottery and concrete.
			HVP=26				MADE GROUND: Soft low strength to firm medium strength dark brown black sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded of brick, concrete, ash, glass and pottery. Cobbles and boulders are sub-angular of brick and concrete (Hydrocarbon odour).
	1.20	ES					
			HVP=60				
			HVP=43				
				2.50			End of pit at 2.50 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP128**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384540.17 - 409397.30 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.20 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			MADE GROUND: Brown clayey gravelly fine to medium sand. Gravel is fine to medium sub-angular of brick, pottery and concrete.
			HVP=37				MADE GROUND: Soft low strength dark brown black sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded of brick, concrete, glass and pottery. Cobbles and boulders are sub-angular of brick and concrete.
	1.00	ES		1.00			MADE GROUND: Firm medium strength dark brown black sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded of brick, concrete, glass and pottery. Cobbles and boulders are sub-angular of brick and concrete.
			HVP=52				
			HVP=55				
				2.20			End of pit at 2.20 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP129**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384575.12 - 409311.48 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.50 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			MADE GROUND: Brown clayey gravelly fine to medium sand. Gravel is fine to medium sub-angular of brick, pottery and concrete.
			HVP=29				MADE GROUND: Soft low strength strength dark brown black sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded of brick, concrete, glass and pottery. Cobbles and boulders are sub-angular of brick and concrete.
			HVP=41				
	1.40	ES					
	1.50	ES	HVP=38				
			HVP=100				
			HVP=49				
				2.50			End of pit at 2.50 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP130**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384453.54 - 409259.45 Level:	Date 21/05/2018
Location: Rochdale		Dimensions (m): Depth 2.40 — 2 × 0.8	Scale 1:25
Client: Russell Homes			Logged A. Allcock

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown clayey gravelly fine to medium sand. Gravel is fine to medium sub-angular of brick, pottery and concrete.
			HVP=18	1.10			MADE GROUND: Very soft very low strength dark brown black sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded of brick, concrete, glass and pottery. Cobbles and boulders are sub-angular of brick and concrete.
			HVP=80	1.60			MADE GROUND: Stiff high strength orange mottled grey slightly silty gravelly clay. Gravel is fine to medium sub-angular to sub-rounded of limestone and sandstone.
			HVP=19	2.40			MADE GROUND: Very soft very low strength dark brown black sandy gravelly clay with cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded of brick, concrete, wood, glass and pottery. Cobbles and boulders are sub-angular of brick and concrete. End of pit at 2.40 m

1 2 3 4 5

Remarks: Complete.

Stability: Stable.

Trial Pit Log

Trialpit No **TP131**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 385037.78 - 409119.31 Level:	Date
Location: Rochdale		Dimensions (m): Depth 4.00	Scale 1:25
Client: Russell Homes			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				MADE GROUND: Dark brown silty gravelly clayey sand with occasional cobbles and boulders. Gravel is angular to sub-angular of brick, clay tiles, concrete, plastic and wood. Cobbles and boulders are angular to sub-angular of brick, clay tile, concrete, plastic and wood.
				4.00			End of pit at 4.00 m

1 2 3 4 5

Remarks: Complete.

Stability:

Trial Pit Log

Trialpit No
TP132
Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384971.04 - 409074.78 Level:	Date
Location: Rochdale		Dimensions (m): Depth 4.00	Scale 1:25
Client: Russell Homes			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							MADE GROUND: Dark brown silty gravelly clayey sand with occasional cobbles and boulders. Gravel is angular to sub-angular of brick, clay tiles, concrete, plastic and wood. Cobbles and boulders are angular to sub-angular of brick, clay tile, concrete, plastic and wood.
				4.00			End of pit at 4.00 m

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Remarks: Complete.

Stability:

Trial Pit Log

Trialpit No **TP133**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: - Level:	Date
Location: Rochdale		Dimensions (m): Depth 4.00	Scale 1:25
Client: Russell Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Dark brown silty gravelly clayey sand with occasional cobbles and boulders. Gravel is angular to sub-angular of brick, clay tiles, concrete, plastic and wood. Cobbles and boulders are angular to sub-angular of brick, clay tile, concrete, plastic and wood.
				4.00			End of pit at 4.00 m

1 2 3 4 5

Remarks: Complete.

Stability:

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384858.43 - 409145.55	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 15/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				50 (25 for 40mm/50 for 30mm)	1.00			MADE GROUND: Very stiff very high strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour). End of borehole at 1.00 m

Remarks

1. Refused at 1.00m bgl. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384811.99 - 409019.45	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 15/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES	50 (25 for 65mm/50 for 70mm)	1.00			MADE GROUND: Very stiff very high strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour). End of borehole at 1.00 m

Remarks

1. Refused at 1.00m bgl. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384648.60 - 409081.71	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 15/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES					MADE GROUND: Soft to firm brown slightly sandy gravelly clay. Gravel is fine to medium angular to sub-angular of concrete, brick and sandstone.
		0.80	PP	54				
				N=12 (3,3/3,3,3,3)	1.00			
		1.20	PP	15				MADE GROUND: Stiff medium strength light grey mottled yellow slightly gravelly silty clay. Gravel is fine to medium sub-angular to sub-rounded of mudstone.
		1.30	ES					
		1.50	PP	34	1.50			MADE GROUND: Stiff medium strength brown slightly sandy gravelly clay. Gravel is fine to medium angular to sub-angular of concrete, brick and sandstone.
		1.80	PP	25				
				N=11 (2,2/2,3,3,3)				
		2.30	PP	25				
					2.50			MADE GROUND: Light grey sandy gravel. Gravel is fine to coarse of concrete.
		2.90	PP	128	2.80			Stiff high strength light grey mottled yellow sandy CLAY.
		2.90	ES	50 (6,10/50 for 55mm)	3.00			End of borehole at 3.00 m

Remarks

1. Refused at 3.00m bgl. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384598.86 - 409303.63	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 15/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.40			MADE GROUND: Soft to firm brown slightly sandy gravelly clay. Gravel is fine to medium angular to sub-angular of concrete, brick and sandstone.
		0.60	PP	123	0.50			MADE EGROUND: White gravelly fine to medium sand. Gravel is fine to coarse of concrete.
		0.90	PP	88 N=16 (4,3/4,5,3,4)				MADE GROUND: Stiff medium strength to very stiff high strength brown slightly sandy gravelly clay. Gravel is fine to medium angular to sub-angular of concrete, brick and sandstone.
		1.50	PP	88				
		1.50	ES					
		1.80	PP	74 N=17 (3,3/3,4,5,5)				
					2.50			Grey very gravelly fine to medium SAND. Gravel is fine to medium of siltstone.
				50 (6,8/50 for 64mm)	3.00			End of borehole at 3.00 m

Remarks

1. Refused at 3.00m bgl. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384631.67 - 409343.78	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 15/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.10	ES		0.20			MADE GROUND: Soft brown light grey silty clay (Topsoil) with rootlets.
		0.50	PP	103				MADE GROUND: Firm to stiff medium strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight ash odour).
				N=11 (2,2/5,0,3,3)				
		1.50	PP	49				
		1.80	ES					
				N=12 (3,3/3,3,3,3)				
		2.50	PP	54				
				N=10 (3,2/2,3,3,2)				
		3.50	PP	39				
		3.90	PP	39 50 (3,8/50 for 50mm)	4.00			End of borehole at 4.00 m

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Remarks

1. Refused at 4.00m bgl. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384817.50 - 409203.13	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 15/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES					MADE GROUND: Firm to stiff high strength dark brown black slightly silty gravelly clay with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, sandstone, metal and plastic. Cobbles are sub-angular of brick (Slight hydrocarbon odour).
		0.80	PP	113				
				50 (6,6/50 for 68mm)	1.00			End of borehole at 1.00 m

Remarks

Refused at 1.00m bgl.

Borehole Log

Borehole No. **WS107**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384245.65 - 409305.74	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
		0.30	PP	64				
		0.50	ES					
		0.60	PP	25				
				N=14 (4,4/4,4,3,3)	0.90			MADE GROUND: Soft low strength to firm medium strength black slightly sandy slightly gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete and ash.
		1.20	PP	59				
				N=4 (1,1/1,1,1,1)	2.00			MADE GROUND: Stiff medium strength dark brown sandy gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are angular of concrete. (Soft low strength from circa 2.00m to 2.80m bgl)
		2.50	PP	34				
		2.60	D					
		2.70	ES	29				
		2.80	PP	N=13 (1,1/2,3,5,3)	3.00			MADE GROUND: Soft low strength dark brown sandy gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are angular of concrete.
		3.30	PP	29				
		3.60	PP	74				
		3.90	PP	49				
				N=23 (7,7/6,6,5,6)	4.00			MADE GROUND: Stiff medium strength dark brown sandy gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are angular of concrete.
								MADE GROUND: Stiff high strength dark brown sandy gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are angular of concrete.
				N=9 (1,1/2,2,2,3)	5.00			MADE GROUND: Soft low strength dark brown sandy gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are angular of concrete.
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS108**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: -	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
				N=50 (25 for 30mm/7,9,17,17)	0.50			MADE GROUND: Firm to stiff dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
								End of borehole at 0.50 m

Remarks

Refused at 0.50m bgl.

Borehole Log

Borehole No. **WS108a**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384412.96 - 409402.34	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
		0.50	PP	118	0.70			MADE GROUND: Firm to stiff high strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
				N=13 (3,4/4,3,3,3)	0.90			
		1.20	PP	123				MADE GROUND: Firm black slightly gravelly clay. Gravel is fine to coarse angular to sub-angular of ash, sandstone, wood and concrete.
		1.40	ES					
		1.50	PP	123				
		1.50	D					
		1.80	PP	59				MADE GROUND: Firm medium strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
				N=4 (1,1/1,1,1,1)	2.00			
		2.30	PP	25				MADE GROUND: Soft low strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
		2.30	D					
				N=12 (2,2/3,3,3,3)	3.00			MADE GROUND: Firm medium strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
	▼			N=0 (0,0/0,0,0,0)	4.00			MADE GROUND: Very soft extremely low strength becoming stiff medium strength brown black silty clay with rare gravel. Gravel is fine to medium angular to sub-rounded of mudstone, glass, ash and wood.
				N=16 (2,2/3,4,4,5)	5.00			MADE GROUND: Stiff high strength brown black silty clay with rare gravel. Gravel is fine to medium angular to sub-rounded of mudstone, glass, ash and wood.
					5.45			End of borehole at 5.00 m

Remarks

1. Complete. 2. Monitoring well installed. 3. Water strike encountered at 4.00m bgl.

Borehole Log

Borehole No. **WS109**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384460.58 - 409476.62	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
		0.60	PP	83	0.50			MADE GROUND: Firm dark brown black slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete, coal and limestone.
		0.80	ES					
		0.90	PP	39				
		0.90	D	N=4 (1,1/1,1,1,1)				MADE GROUND: Soft low strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
	▼	1.50	PP	10				
		1.80	PP	49				
				N=30 (6,7/7,9,6,8)	2.00			MADE GROUND: Very stiff high strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
		2.20	PP	0				
		2.50	U					
				N=14 (4,3/2,4,4,4)				
					3.20			MADE GROUND: Firm medium strength dark brown black slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete, coal and limestone.
		3.50	PP	39				
		3.50	ES					
				N=11 (1,2/4,1,2,4)	4.00			MADE GROUND: Firm medium strength dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal (Slight hydrocarbon odour).
		4.30	PP	20				
		4.60	PP	15				
		4.80	ES					
		4.90	PP	25				
				N=21 (3,3/4,6,6,5)	5.00			End of borehole at 5.00 m

Remarks

1. Complete. 2. Water strike encountered at 1.50m bgl.

Borehole Log

Borehole No. **WS110**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384586.72 - 409521.07	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
		0.80	PP	123				MADE GROUND: Firm low strength dark brown sandy gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are angular of brick.
		0.80	ES	N=4 (1,1/1,1,1,1)				
		1.50	PP	59				
		1.80	PP	69				
		1.80	ES	N=20 (3,4/4,4,5,7)	2.00			MADE GROUND: Stiff high strength dark brown sandy gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are angular of brick.
				N=30 (4,5/10,10,5,5)				
		3.50	PP	59				
		3.80	PP	44				
				N=19 (5,5/5,6,4,4)				
		4.50	U					
				N=8 (2,2/2,2,2,2)	5.00			MADE GROUND: Firm low strength dark brown sandy gravelly clay with cobbles. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal. Cobbles are angular of brick.
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS111**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384474.66 - 409354.98	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				50 (25 for 15mm/50 for 10mm)	0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
					0.30			MADE GROUND: Firm to stiff dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
								End of borehole at 0.30 m

Remarks

Refused at 0.30m bgl on obstruction.

Borehole Log

Borehole No. **WS111a**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: -	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
				50 (5,5/50 for 25mm)	0.50			MADE GROUND: Firm to stiff dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
								End of borehole at 0.50 m

Remarks

Terminated at 0.50m bgl due to refusal on obstruction.

Borehole Log

Borehole No. **WS111b**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: -	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	PP	88	0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
		0.30	ES	152				MADE GROUND: Firm to stiff dark brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, slate, concrete and metal.
		0.50	PP		0.60			MADE GROUND: Black very gravelly fine to medium sand. Gravel is fine to coarse angular to sub-angular of brick and concrete.
		0.50	D	50 (25 for 50mm/50 for 45mm)	0.70			End of borehole at 0.70 m

Remarks

Terminated due to refusal on obstruction.

Borehole Log

Borehole No. **WS112**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384489.19 - 409178.01	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
				50 (25 for 10mm/50 for 15mm)	0.05 0.20			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets. MADE GROUND: Light brown very gravelly fine to medium sand. Gravel is fine to coarse angular to sub-angular of sandstone, brick and concrete. End of borehole at 0.20 m

Remarks

Refused at 0.20m bgl.

Borehole Log

Borehole No. **WS112a**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: -	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				50 (25 for 20mm/50 for 10mm)	0.05			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
					0.20			MADE GROUND: Light brown very gravelly fine to medium sand. Gravel is fine to coarse angular to sub-angular of sandstone, brick and concrete.
								End of borehole at 0.20 m

Remarks

Refused at 0.20m bgl.

Borehole Log

Borehole No. **WS112b**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: -	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
				50 (25 for 1mm/50 for 50mm)	0.05 0.20			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets. MADE GROUND: Light brown very gravelly fine to medium sand. Gravel is fine to coarse angular to sub-angular of sandstone, brick and concrete. End of borehole at 0.20 m

Remarks

Refused at 0.20m bgl.

Borehole Log

Borehole No. **WS112c**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: -	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 17/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
				50 (25 for 30mm/50 for 50mm)	0.05 0.20			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets. MADE GROUND: Light brown very gravelly fine to medium sand. Gravel is fine to coarse angular to sub-angular of sandstone, brick and concrete. End of borehole at 0.20 m

Remarks

Refused at 0.20m bgl.

Borehole Log

Borehole No. **WS113**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384439.06 - 409165.42	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	PP	162				MADE GROUND: Firm low strength brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete and limestone.
				N=7 (1,1/1,2,2,2)	1.20			
		1.70	ES					MADE GROUND: Very stiff high strength black very gravelly clay. Gravel is fine to medium angular to sub-angular of brick, concrete, glass and pottery (Hydrocarbon odour).
				N=23 (2,3/4,4,6,9)	2.50			
				N=6 (1,1/1,1,2,2)				MADE GROUND: Firm low strength to very stiff very high strength brown sandy gravelly clay. Gravel is fine to medium angular to sub-angular of brick, mudstone and concrete.
		3.50	PP	64				
				50 (7,10/50 for 25mm)	4.00			End of borehole at 4.00 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS114**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384240.67 - 409217.40	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			Brown sandy gravelly CLAY. Gravel is fine to medium angular to sub-angular of siltstone.
		0.50	PP	83	0.40			Dark brown gravelly fine to medium SAND. Gravel is fine to medium sub-angular to sub-rounded of mudstone, sandstone and siltstone.
				N=7 (2,2/2,1,2,2)				
		1.50	PP	152				Firm low strength to stiff high strength light brown mottled orange sandy gravelly CLAY. Gravel is fine to medium sub-rounded to rounded of mudstone.
	▼			N=1 (1,1/0,0,0,1)	2.00			Very soft very low strength brown very sandy CLAY.
				N=31 (4,5/8,8,7,8)	3.00			Very stiff high strength brown very sandy CLAY.
				50 (6,9/50 for 60mm)	4.00			End of borehole at 4.00 m

Remarks

1. Complete. 2. Water strike encountered at 2.00m bgl. 3. Monitoring well installed.

Borehole Log

Borehole No. **WS115**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384175.64 - 409152.46	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.20			Brown sandy gravelly CLAY. Gravel is fine to medium of siltstone.
		0.50	PP	83				Stiff medium strength light brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
				N=8 (1,1/2,2,2,2)				
		1.50	PP	149				
	▼			N=9 (1,1/2,2,2,3)	2.00			Stiff medium strength dark brown sandy CLAY.
				N=24 (2,3/5,5,6,8)				
				50 (5,7/50 for 60mm)	4.00			End of borehole at 4.00 m

Remarks

1. Complete. 2. Water strike encountered at 2.00m bgl.

Borehole Log

Borehole No. **WS116**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384042.64 - 409103.85	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.20			Brown sandy gravelly CLAY. Gravel is fine to medium of siltstone.
		0.80	PP	74 N=15 (2,3/4,3,3,5)				Stiff to very stiff high strength light brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
		1.50	PP	98				
	▼			N=16 (2,3/3,3,4,6)	2.00			Stiff medium strength to very stiff very high strength dark brown sandy CLAY.
				N=50 (5,9/12,15,14,9)	2.70			End of borehole at 2.70 m

Remarks

1. Refused at 2.70m bgl. 2. Water strike encountered at 2.00m bgl.

Borehole Log

Borehole No. **WS117**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384710.26 - 408923.55	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				N=4 (1,1/1,1,1,1)				MADE GROUND: Soft low strength brown slightly gravelly sandy clay. Gravel is fine to medium angular to sub-rounded of brick, concrete, sandstone and mudstone.
		1.50	ES					
				N=10 (1,1/1,4,3,2)	2.00			MADE GROUND: Stiff medium strengh dark brown very gravelly slightly sandy clay. Gravel is fine to medium sub-angular to sub-rounded of mudstone.
		2.20	PP	211				
					2.50			MADE GROUND: Firm brown slightly gravelly sandy clay. Gravel is fine to medium angular to sub-rounded of brick, concrete, sandstone and mudstone.
				N=11 (2,2/3,3,2,3)				
		3.30	PP	147	3.20			Stiff medium strength brown CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone and organic material.
		3.50	U					
				N=14 (3,4/4,3,3,4)				
				N=18 (2,4/4,4,5,5)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS118**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384515.60 - 408920.53	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
				50 (25 for 25mm/50 for 45mm)	1.00			MADE GROUND: Firm to stiff dark brown sandy gravelly clay. Gravel is fine to medium angular to sub-angular of brick, sandstone and concrete.
								End of borehole at 1.00 m

Remarks

Refused at 1.00m bgl.

Borehole Log

Borehole No. **WS118a**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: -	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
				50 (25 for 65mm/50 for 50mm)	1.00			MADE GROUND: Firm to stiff dark brown sandy gravelly clay. Gravel is fine to medium angular to sub-angular of brick, sandstone and concrete.
								End of borehole at 1.00 m

Remarks

Refused at 1.00m bgl.

Borehole Log

Borehole No. **WS118b**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: -	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Dark brown clayey silty fine to medium sand (Topsoil) with rootlets.
				50 (25 for 80mm/50 for 50mm)	1.00			MADE GROUND: Firm to stiff dark brown sandy gravelly clay. Gravel is fine to medium angular to sub-angular of brick, sandstone and concrete.
								End of borehole at 1.00 m

Remarks

Refused at 1.00m bgl.

Borehole Log

Borehole No. **WS119**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384437.66 - 408869.94	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Dark brown clayey silty sand (Topsoil) with rootlets.
		0.50	PP	88				MADE GROUND: Stiff medium strength dark brown sandy gravelly clay. Gravel is fine to medium angular to sub-angular of brick, sandstone and concrete.
				N=13 (2,3/5,3,2,3)				
		1.50	PP	83				
				N=8 (2,1/2,2,2,2)	2.00			MADE GROUND: Loose light brown orange very gravelly fine to medium sand. Gravel is fine to medium angular to sub-angular of brick and concrete.
		3.00	PP	124	3.00			Firm low strength to stiff medium strength brown mottled yellow sandy CLAY.
				N=6 (1,0/1,2,1,2)				
		3.50	PP	69				
	▼			N=7 (1,1/0,2,3,2)				
		4.50	PP	98				
				N=16 (3,4/4,4,4,4)	5.00			Stiff high strength brown mottled yellow sandy CLAY.
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed. 3. Water strike encountered at 4.00m bgl.

Borehole Log

Borehole No. **WS120**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384382.54 - 409013.48	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Brown clayey gravelly fine to medium sand. Gravel is fine to medium sub-angular to sub-rounded of brick, concrete and sandstone.
		0.50	PP	59				MADE GROUND: Firm medium strength dark brown black slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete, plastic, sandstone and limestone.
		0.90	PP	113 N=8 (3,3/2,2,2,2)				
		1.50	PP	123				
				N=16 (4,4/5,4,3,4)	1.80			MADE GROUND: Stiff high strength dark brown black slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete, plastic, sandstone and limestone.
		2.50	PP	126				
				N=16 (4,4/4,4,4,4)	3.20			Stiff medium strength to very stiff very high strength light brown mottled orange sandy CLAY with rare gravel. Gravel is fine to medium sub-rounded to rounded of mudstone.
		3.80	PP	195 N=11 (3,2/3,3,2,3)				
		4.50	PP	167				
		4.90	PP	98 50 (6,6/50 for 50mm)	5.00			End of borehole at 5.00 m

Remarks

Complete.

Borehole Log

Borehole No. **WS121**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No.: 11-697	Co-ords: 384775.08 - 409050.70	Hole Type: WS
Location: Rochdale		Level:	Scale: 1:50
Client: Russell Homes		Dates: 18/05/2018 -	Logged By: A. Allcock

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			MADE GROUND: Brown clayey gravelly fine to medium sand (Topsoil) with rootlets. Gravel is fine to medium angular to sub-angular of concrete.
				N=30 (4,6/6,7,8,9)	0.80			MADE GROUND: Firm brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, sandstone and concrete.
				50 (25 for 60mm/50 for 15mm)	2.00			MADE GROUND: Dense brown very gravelly fine to medium sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick and concrete. Cobbles are sub-angular to sub-rounded of concrete and brick.
								End of borehole at 2.00 m

Remarks

Refused at 2.00m bgl.

Borehole Log

Borehole No. **BH101**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384801.09 - 409046.30	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: -	Logged By A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Firm brown sandy clay.
		1.00		N=10 (2,3/2,3,2,3)				MADE GROUND: Firm medium strength dark brown slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete and glass. Clay observed to be well compacted with no voiding.
		2.00		N=15 (2,3/3,4,4,4)	2.00			MADE GROUND: Stiff high strength dark brown slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete and glass.
		3.00		N=14 (3,4/3,3,4,4)				
		4.00		N=9 (2,2/3,2,2,2)	4.00			MADE GROUND: Firm medium strength dark brown slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete and glass.
					4.60			Stiff high strength brown sandy gravelly CLAY with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of sandstone. Cobbles are sub-angular to sub-rounded of sandstone.
		5.00		N=17 (2,3/3,4,5,5)				
		6.00		N=14 (3,4/3,2,4,5)				
		7.50		50 (7,10/50 for 10mm)	7.50			Very stiff very high strength brown sandy CLAY with gravel. Gravel is sub-rounded of sandstone.
					8.00			Dense grey sandy GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded of sandstone.
		9.00		50 (5,10/50 for 60mm)	9.00			Very dense grey silty GRAVEL. Gravel is medium to coarse of mudstone (Weathered bedrock).
		9.50		50 (10,15/50 for 50mm)	9.50			End of borehole at 9.50 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **BH102**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384516.48 - 408889.43	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: -	Logged By A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Firm brown sandy clay.
		1.00		N=12 (3,3/3,3,3,3)				MADE GROUND: Firm medium strength dark brown slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete and glass. Clay observed to be well compacted with no voiding.
		2.00		N=13 (2,3/3,3,4,3)				
		3.00		N=14 (1,1/3,3,4,4)				
		4.00		N=15 (3,3/3,4,4,4)				
					4.50			Firm medium strength light brown mottled grey sandy CLAY.
	▼	6.00		N=12 (2,3/3,3,3,3)	6.00			Firm medium strength brown sandy CLAY with occasional gravel. Gravel is fine to coarse sub-angular to sub-rounded of mudstone.
		7.50		N=15 (1,2/4,5,3,3)	7.50			Stiff high strength brown sandy CLAY with occasional gravel. Gravel is fine to coarse sub-angular to sub-rounded of mudstone.
		9.00		50 (25 for 70mm/50 for 20mm)	8.90			Firm light brown sandy CLAY.
		9.50		50 (25 for 50mm/50 for 10mm)	9.50			Very dense light brown sandy GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded of sandstone (Weathered bedrock).
					9.95			End of borehole at 9.95 m

Remarks

1. Complete. 2. Monitoring well installed. 3. Water strike encountered at 6.00m bgl.

Borehole Log

Borehole No. **BH103**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384630.92 - 409173.40	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: -	Logged By A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00 1.00	B	N=16 (4,4/5,4,3,4)				MADE GROUND: Stiff medium strength dark brown slightly sandy gravelly clay with boulders. Gravel is fine to coarse angular to sub-angular of brick, concrete and glass. Boulders are sub-angular to sub-rounded of brick, concrete and timber.
		2.00		N=15 (3,4/5,4,3,3)				
		2.50	B					
		3.50	D					
		4.00 4.00	B	N=7 (2,2/2,3,1,1)	4.00			MADE GROUND: Firm medium strength dark brown slightly sandy gravelly clay with boulders. Gravel is fine to coarse angular to sub-angular of brick, concrete and glass. Boulders are sub-angular to sub-rounded of brick, concrete and timber.
		5.00		50 (10,11/50 for 5mm)	4.80 5.00 5.45			Stiff dark brown slightly sandy CLAY with gravel and cobbles. Gravel is fine to coarse angular to sub-angular of sandstone and ash. Cobbles are angular to sub-angular of sandstone. Very dense light brown sandy GRAVEL with cobbles. Gravel is fine to coarse sub-angular to sub-rounded of sandstone. Cobbles are sub-angular to sub-rounded of sandstone. End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **BH104**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384597.25 - 409422.03	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: -	Logged By A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00		N=16 (3,3/4,5,3,4)				MADE GROUND: Firm to stiff medium strength dark brown slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete and glass. Clay observed to be well compacted with no voiding.
		2.00		N=11 (3,3/4,3,2,2)				
		2.50	B					
		3.00		N=11 (2,2/3,3,3,2)				
		4.00		N=12 (2,3/4,3,2,3)				
		5.00		N=16 (3,3/4,3,5,4)				
		7.00	D					
		8.00		N=33 (4,6/9,9,8,7)	8.10			Very dense grey silty GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded of mudstone (weathered bedrock).
					8.45			End of borehole at 8.45 m

1 2 3 4 5 6 7 8 9 10

Remarks
1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **BH105**

Sheet 1 of 2

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384327.59 - 409291.95	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: -	Logged By A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Firm brown sandy clay.
		0.50	B					MADE GROUND: Firm medium strength dark brown slightly sandy gravelly clay. Gravel is fine to coarse angular to sub-angular of brick, concrete and glass.
		1.00		N=11 (2,3/3,3,2,3)				
		2.00		N=10 (2,2/3,3,2,2)				
		3.00		N=11 (2,2/3,3,2,3)				
		4.00		N=9 (2,2/3,2,2,2)				
		5.00		N=9 (1,1/2,3,2,2)				
		6.00		N=12 (1,2/3,3,3,3)				
		7.50		N=10 (1,2/3,2,3,2)				
		9.00		N=8 (1,2/2,2,2,2)	9.00			Firm medium strength light brown CLAY.
								Continued on next sheet

Remarks
1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **BH105**
Sheet 2 of 2

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384327.59 - 409291.95	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: -	Logged By A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					11.50			Dense grey silty GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded of mudstone (weathered bedrock).
		12.00		50 (5,10/50 for 10mm)				
		13.00		50 (25 for 20mm/50 for 50mm)	13.00			End of borehole at 13.00 m

Remarks
1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **BH106**

Sheet 1 of 1

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384194.09 - 409204.47	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: -	Logged By A. Allcock

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Firm brown sandy clay.
		1.00	U	Ublow=17				Firm medium strength light brown mottled grey sandy CLAY.
		2.00		N=8 (1,2/2,2,2,2)				
					2.50			Firm medium strength grey brown slightly gravelly CLAY. Gravel is fine to medium sub-rounded to rounded of mudstone.
		3.00		N=9 (1,1/2,3,2,2)				
		4.00		50 (5,10/50 for 60mm)	4.00			Very dense light brown sandy GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded of sandstone (Weathered bedrock).
		4.50		50 (25 for 50mm/50 for 60mm)				
					4.95			End of borehole at 4.95 m

Remarks
1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **RB101**

Sheet 1 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384388.38 - 408892.16	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 03/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				MADE GROUND: Brown sandy gravel.
					3.00			Light brown grey SANDSTONE.
								Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No. **RB101**

Sheet 2 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384388.38 - 408892.16	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 03/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					16.80			Light brown MUDSTONE.
								Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No. **RB101**

Sheet 3 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384388.38 - 408892.16	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 03/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					26.00			End of borehole at 26.00 m

21 22 23 24 25 26 27 28 29 30

Remarks
Complete.

Borehole Log

Borehole No. **RB102**

Sheet 1 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384568.61 - 408884.30	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 04/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Brown sandy gravel.
					4.00			Light brown grey SANDSTONE.
								Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No. **RB102**

Sheet 2 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384568.61 - 408884.30	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 04/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					15.50			Light brown MUDSTONE.

Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No.
RB102
Sheet 3 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384568.61 - 408884.30	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 04/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					30.00			End of borehole at 30.00 m

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Remarks
Complete.

Borehole Log

Borehole No. **RB103**

Sheet 1 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384685.15 - 409085.55	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 05/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				MADE GROUND: Brown sandy gravel.
					1.00			Light brown clayey SAND.
					5.20			Light brown grey SANDSTONE.
								Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No. **RB103**

Sheet 2 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384685.15 - 409085.55	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 05/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					15.50			Light brown MUDSTONE.
								Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No.
RB103
Sheet 3 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384685.15 - 409085.55	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 05/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					30.00			End of borehole at 30.00 m

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Remarks
Complete.

Borehole Log

Borehole No.
RB104
Sheet 1 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384199.65 - 409160.97	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 06/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			Brown gravelly CLAY (Topsoil).
								Light brown clayey SAND.
					4.30			Light brown MUDSTONE.
					7.50			Light brown SANDSTONE.
					9.60			Dark grey MUDSTONE.
								Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks
Complete.

Borehole Log

Borehole No. **RB104**

Sheet 2 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384199.65 - 409160.97	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 06/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				

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Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No.
RB104
Sheet 3 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384199.65 - 409160.97	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 06/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					30.00			End of borehole at 30.00 m

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Remarks
Complete.

Borehole Log

Borehole No. **RB105**

Sheet 1 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384026.79 - 409003.63	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 06/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			Brown gravelly CLAY (Topsoil).
								Light brown clayey SAND.
					3.50			Light brown MUDSTONE.
					3.90			Dark grey black MUDSTONE.
								Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks
Complete.

Borehole Log

Borehole No. **RB105**

Sheet 2 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384026.79 - 409003.63	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 06/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					13.80			Light grey MUDSTONE.
								Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks
Complete.

Borehole Log

Borehole No.
RB105
Sheet 3 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 384026.79 - 409003.63	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 06/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					30.00			End of borehole at 30.00 m

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Remarks
Complete.

Borehole Log

Borehole No. **RB106**

Sheet 1 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 383901.52 - 409151.75	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 08/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			Brown gravelly CLAY (Topsoil).
								Light brown clayey SAND.
					1.50			Light grey MUDSTONE.
								Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No.
RB106
Sheet 2 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 383901.52 - 409151.75	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 08/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				

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Continued on next sheet

Remarks
Complete.

Borehole Log

Borehole No. **RB106**

Sheet 3 of 3

Project Name: South Heywood Commercial	Project No. 11-697	Co-ords: 383901.52 - 409151.75	Hole Type BH
Location: Rochdale		Level:	Scale 1:50
Client: Russell Homes		Dates: 08/07/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					30.00			End of borehole at 30.00 m

21 22 23 24 25 26 27 28 29 30

Remarks
Complete.

APPENDIX VI
CHEMICAL TESTING RESULTS



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Analytical Report Number : 18-86237

Project / Site name:	South Heywood	**Samples received on:**	17/05/2018
Your job number:	11-697	**Samples instructed on:**	22/05/2018
Your order number:	11.697-8794-SE	**Analysis completed by:**	29/05/2018
Report Issue Number:	1	**Report issued on:**	29/05/2018
Samples Analysed:	1 leachate sample - 7 soil samples		

Signed:

Jordan Hill
Reporting Manager
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

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 18-86237

Project / Site name: South Heywood
Your Order No: 11.697-8794-SE

Lab Sample Number				965028	965029	965030	965031	965032
Sample Reference				TP101	TP102	TP106	TP107	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	2.00	0.05	1.50	0.50
Date Sampled				15/05/2018	15/05/2018	16/05/2018	16/05/2018	15/05/2018
Time Taken				None Supplied	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	40
Moisture Content	%	N/A	NONE	16	19	48	11	7.6
Total mass of sample received	kg	0.001	NONE	0.46	0.49	0.37	0.48	0.53
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile - Loose Fibres	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.3	7.8	-	8.7	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	1400	3400	-	2800	690
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1200	920	-	2400	470
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.62	0.46	-	1.2	0.24
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	625	459	-	1190	237
Sulphide	mg/kg	1	MCERTS	13	100	-	14	12
Total Sulphur	mg/kg	50	MCERTS	940	2000	-	1400	690
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.50	1.0	< 0.05	0.59	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.29	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.50	1.9	< 0.05	0.41	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.40	1.8	< 0.05	0.39	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	4.4	17	0.38	2.5	0.63
Anthracene	mg/kg	0.05	MCERTS	1.2	4.6	< 0.05	0.65	0.16
Fluoranthene	mg/kg	0.05	MCERTS	8.4	22	0.77	4.0	0.73
Pyrene	mg/kg	0.05	MCERTS	7.4	18	0.64	3.8	0.73
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.9	9.7	0.40	2.2	0.32
Chrysene	mg/kg	0.05	MCERTS	2.8	7.0	0.37	1.5	0.47
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.7	8.2	0.34	1.9	0.39
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.7	4.2	0.25	1.0	0.18
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.5	7.4	0.31	1.8	0.34
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.9	4.0	0.18	0.90	0.17
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.43	0.98	< 0.05	0.23	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.2	4.6	0.22	1.2	0.25
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	42.8	113	3.86	23.0	4.37
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	75	18	14	5.3
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	150	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	-	1.1	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.5	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	25	-	20	130
Copper (aqua regia extractable)	mg/kg	1	MCERTS	42	82	53	43	40
Lead (aqua regia extractable)	mg/kg	1	MCERTS	64	190	54	74	20
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4	1.5	1.0	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18	23	23	17	38
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	3.3	< 1.0	1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	28	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	85	120	79	81	52

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Analytical Report Number: 18-86237

Project / Site name: South Heywood
Your Order No: 11.697-8794-SE

Lab Sample Number				965028	965029	965030	965031	965032
Sample Reference				TP101	TP102	TP106	TP107	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	2.00	0.05	1.50	0.50
Date Sampled				15/05/2018	15/05/2018	16/05/2018	16/05/2018	15/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	2.8	4.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	22	34	< 4.0	13	5.2
TPH (C16 - C21)	mg/kg	1	MCERTS	120	180	5.3	62	20
TPH (C21 - C35)	mg/kg	1	MCERTS	360	370	45	230	160
TPH (C35 - C40)	mg/kg	10	MCERTS	69	72	< 10	62	88
TPH (C5 - C40)	**mg/kg**	**10**	**MCERTS**	**580**	**660**	**50**	**370**	**280**

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Analytical Report Number: 18-86237

Project / Site name: South Heywood
Your Order No: 11.697-8794-SE

Lab Sample Number				965033	965034			
Sample Reference				WS105	TP111			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.10	1.00			
Date Sampled				15/05/2018	16/05/2018			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	13			
Moisture Content	%	N/A	NONE	22	13			
Total mass of sample received	kg	0.001	NONE	0.44	0.46			
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-			
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected			
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	-	9.0			
Total Cyanide	mg/kg	1	MCERTS	< 1	3			
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	-	1100			
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.56			
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	556			
Sulphide	mg/kg	1	MCERTS	-	30			
Total Sulphur	mg/kg	50	MCERTS	-	1300			
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0			
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.35	0.67			
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Acenaphthene	mg/kg	0.05	MCERTS	0.50	0.65			
Fluorene	mg/kg	0.05	MCERTS	0.35	0.55			
Phenanthrene	mg/kg	0.05	MCERTS	3.9	5.4			
Anthracene	mg/kg	0.05	MCERTS	1.1	1.8			
Fluoranthene	mg/kg	0.05	MCERTS	6.5	11			
Pyrene	mg/kg	0.05	MCERTS	6.0	9.4			
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.3	5.8			
Chrysene	mg/kg	0.05	MCERTS	2.6	4.0			
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.5	5.2			
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.9	2.3			
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.5	4.3			
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.2	2.2			
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.36	0.60			
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.7	2.6			
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	34.7	56.0			
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	28	36			
Barium (aqua regia extractable)	mg/kg	1	MCERTS	190	-			
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.6	-			
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2			
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0			
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	50			
Copper (aqua regia extractable)	mg/kg	1	MCERTS	130	84			
Lead (aqua regia extractable)	mg/kg	1	MCERTS	160	200			
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.5	0.4			
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	29	27			
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.1	2.0			
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	34	-			
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	230			

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Analytical Report Number: 18-86237

Project / Site name: South Heywood
Your Order No: 11.697-8794-SE

Lab Sample Number				965033	965034			
Sample Reference				WS105	TP111			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.10	1.00			
Date Sampled				15/05/2018	16/05/2018			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0			
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1			
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1			
TPH (C10 - C12)	mg/kg	2	MCERTS	3.7	< 2.0			
TPH (C12 - C16)	mg/kg	4	MCERTS	24	14			
TPH (C16 - C21)	mg/kg	1	MCERTS	93	110			
TPH (C21 - C35)	mg/kg	1	MCERTS	360	360			
TPH (C35 - C40)	mg/kg	10	MCERTS	120	89			
TPH (C5 - C40)	**mg/kg**	**10**	**MCERTS**	**600**	**580**			

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Analytical Report Number: 18-86237

Project / Site name: South Heywood

Your Order No: 11.697-8794-SE

Lab Sample Number				965035				
Sample Reference				TP109				
Sample Number				None Supplied				
Depth (m)				2.90				
Date Sampled				16/05/2018				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation 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	< 1.0				
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
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	< 0.2				
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	6.6				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	NONE	< 5.0				
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Copper (dissolved)	µg/l	0.7	ISO 17025	22				
Lead (dissolved)	µg/l	1	ISO 17025	4.0				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.9				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Zinc (dissolved)	µg/l	0.4	ISO 17025	13				

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Analytical Report Number: 18-86237

Project / Site name: South Heywood

Your Order No: 11.697-8794-SE

Lab Sample Number				965035				
Sample Reference				TP109				
Sample Number				None Supplied				
Depth (m)				2.90				
Date Sampled				16/05/2018				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
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				
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10				
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	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10				

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Project / Site name: South Heywood

* 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 *
965028	TP101	None Supplied	1.00	Brown loam and clay with vegetation and gravel
965029	TP102	None Supplied	2.00	Brown clay and sand with vegetation and gravel
965030	TP106	None Supplied	0.05	Brown sandy loam with vegetation and gravel
965031	TP107	None Supplied	1.50	Brown clay and sand with rubble and gravel
965032	WS103	None Supplied	0.50	Brown loam and clay with stones and brick.
965033	WS105	None Supplied	0.10	Brown clay and loam with vegetation and gravel
965034	TP111	None Supplied	1.00	Brown loam and clay with stones and gravel

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Analytical Report Number : 18-86237

Project / Site name: South Heywood

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
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
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
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
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
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
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	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
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	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
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
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 based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
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

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Analytical Report Number : 18-86237

Project / Site name: South Heywood

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
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
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
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 based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE

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 30oC.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number : 18-86541

Project / Site name:	South Heywood	**Samples received on:**	23/05/2018
Your job number:	11-697	**Samples instructed on:**	23/05/2018
Your order number:	11697-8813-AA	**Analysis completed by:**	01/06/2018
Report Issue Number:	1	**Report issued on:**	01/06/2018
Samples Analysed:	4 leachate samples - 23 soil samples		

Signed:

Jordan Hill
Reporting Manager
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

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967041	967042	967043	967044	967045
Sample Reference				TP101	TP103	TP104	TP104	TP107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	1.50	0.20	1.20	0.10
Date Sampled				15/05/2018	15/05/2018	15/05/2018	15/05/2018	16/05/2018
Time Taken				None Supplied	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	< 0.1
Moisture Content	%	N/A	NONE	43	13	38	15	30
Total mass of sample received	kg	0.001	NONE	0.44	1.8	0.37	0.49	0.44
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	Chrysotile	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	< 0.001	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.6	-	7.2	7.9	7.0
Total Cyanide	mg/kg	1	MCERTS	< 1	-	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	1100	-	1000	1200	960
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1100	-	150	1100	230
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.54	-	0.077	0.57	0.11
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	538	-	76.5	568	115
Sulphide	mg/kg	1	MCERTS	3.1	-	1.6	76	2.5
Total Sulphur	mg/kg	50	MCERTS	850	-	1500	1200	790
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	1.5	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
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	-	0.45	0.21	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	0.30	0.19	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.81	-	2.7	2.0	0.54
Anthracene	mg/kg	0.05	MCERTS	0.22	-	0.68	0.56	0.15
Fluoranthene	mg/kg	0.05	MCERTS	1.6	-	4.7	3.2	1.2
Pyrene	mg/kg	0.05	MCERTS	1.5	-	4.1	3.0	1.0
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.82	-	2.1	1.5	0.48
Chrysene	mg/kg	0.05	MCERTS	0.84	-	2.1	1.4	0.64
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.0	-	2.2	1.6	0.58
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.34	-	1.3	0.80	0.32
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.89	-	2.3	1.5	0.56
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.47	-	1.1	0.71	0.30
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.59	-	1.3	0.89	0.36
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	9.13	-	25.2	17.5	6.12
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	-	23	11	16
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	0.9	0.4	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	-	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	-	34	21	36
Copper (aqua regia extractable)	mg/kg	1	MCERTS	54	-	110	77	46
Lead (aqua regia extractable)	mg/kg	1	MCERTS	70	-	150	95	63
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.8	-	1.0	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	-	31	22	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.2	-	1.0	1.3	1.5
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	86	-	180	630	78

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967041	967042	967043	967044	967045
Sample Reference				TP101	TP103	TP104	TP104	TP107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	1.50	0.20	1.20	0.10
Date Sampled				15/05/2018	15/05/2018	15/05/2018	15/05/2018	16/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
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	-	4.9	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	-	19	7.7	4.7
TPH (C16 - C21)	mg/kg	1	MCERTS	16	-	61	47	9.4
TPH (C21 - C35)	mg/kg	1	MCERTS	74	-	220	200	33
TPH (C35 - C40)	mg/kg	10	MCERTS	15	-	27	49	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	110	-	330	310	51

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967041	967042	967043	967044	967045
Sample Reference				TP101	TP103	TP104	TP104	TP107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	1.50	0.20	1.20	0.10
Date Sampled				15/05/2018	15/05/2018	15/05/2018	15/05/2018	16/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967041	967042	967043	967044	967045
Sample Reference				TP101	TP103	TP104	TP104	TP107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	1.50	0.20	1.20	0.10
Date Sampled				15/05/2018	15/05/2018	15/05/2018	15/05/2018	16/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation 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	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967046	967047	967048	967049	967050
Sample Reference				TP108	TP109	TP110	TP110	TP114
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.50	0.10	2.50	3.50	1.50
Date Sampled				16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Time Taken				None Supplied	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	31	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	14	19	11	11	19
Total mass of sample received	kg	0.001	NONE	0.46	0.42	0.54	0.53	0.44
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	-	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	< 0.001
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.8	7.7	8.9	5.2	8.0
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	880	690	2100	300	1000
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	500	140	1800	72	530
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.25	0.071	0.91	0.036	0.26
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	251	70.5	907	36.0	264
Sulphide	mg/kg	1	MCERTS	14	1.1	21	< 1.0	26
Total Sulphur	mg/kg	50	MCERTS	540	460	1100	110	850
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.6	-	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	2.3	< 0.05	< 0.05	< 0.05	0.46
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	1.8	< 0.05	< 0.05	< 0.05	0.68
Fluorene	mg/kg	0.05	MCERTS	1.7	< 0.05	< 0.05	< 0.05	0.46
Phenanthrene	mg/kg	0.05	MCERTS	11	1.1	0.52	< 0.05	3.9
Anthracene	mg/kg	0.05	MCERTS	2.1	0.33	< 0.05	< 0.05	1.1
Fluoranthene	mg/kg	0.05	MCERTS	12	2.5	0.95	< 0.05	6.3
Pyrene	mg/kg	0.05	MCERTS	11	2.3	0.82	< 0.05	5.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.6	1.2	0.40	< 0.05	2.5
Chrysene	mg/kg	0.05	MCERTS	5.0	1.0	0.47	< 0.05	2.8
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	5.1	1.3	0.41	< 0.05	2.5
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.4	0.51	0.28	< 0.05	1.8
Benzo(a)pyrene	mg/kg	0.05	MCERTS	4.6	1.1	0.45	< 0.05	2.7
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	2.1	0.59	0.23	< 0.05	1.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.61	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.9	0.73	0.27	< 0.05	1.7
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	67.4	12.7	4.80	< 0.80	33.5
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	12	5.3	2.4	11
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	24	25	170	18	31
Copper (aqua regia extractable)	mg/kg	1	MCERTS	52	33	66	17	44
Lead (aqua regia extractable)	mg/kg	1	MCERTS	89	56	36	8.0	62
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.6	0.3	< 0.3	0.9
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	24	15	23	14	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.3	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	61	67	25	92

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967046	967047	967048	967049	967050
Sample Reference				TP108	TP109	TP110	TP110	TP114
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.50	0.10	2.50	3.50	1.50
Date Sampled				16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	6.8	< 2.0	< 2.0	< 2.0	2.2
TPH (C12 - C16)	mg/kg	4	MCERTS	26	5.0	4.3	< 4.0	15
TPH (C16 - C21)	mg/kg	1	MCERTS	100	25	24	< 1.0	58
TPH (C21 - C35)	mg/kg	1	MCERTS	280	80	150	< 1.0	210
TPH (C35 - C40)	mg/kg	10	MCERTS	59	< 10	56	< 10	70
TPH Total C5 - C40	mg/kg	10	MCERTS	490	110	240	< 10	360

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967046	967047	967048	967049	967050
Sample Reference				TP108	TP109	TP110	TP110	TP114
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.50	0.10	2.50	3.50	1.50
Date Sampled				16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967046	967047	967048	967049	967050
Sample Reference				TP108	TP109	TP110	TP110	TP114
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.50	0.10	2.50	3.50	1.50
Date Sampled				16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation 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	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967051	967052	967053	967054	967055
Sample Reference				WS107	WS109	WS113	TP116	WS115
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	4.80	1.75	1.50	0.10
Date Sampled				17/05/2018	17/05/2018	18/05/2018	18/05/2018	18/05/2018
Time Taken				None Supplied	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	18	< 0.1
Moisture Content	%	N/A	NONE	19	14	53	14	33
Total mass of sample received	kg	0.001	NONE	0.47	0.48	0.45	0.43	0.33
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	-	-	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.4	-	-	-	6.0
Total Cyanide	mg/kg	1	MCERTS	< 1	-	-	-	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	1800	-	-	-	970
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1400	-	-	-	26
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.71	-	-	-	0.013
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	706	-	-	-	12.9
Sulphide	mg/kg	1	MCERTS	6.6	-	-	-	< 1.0
Total Sulphur	mg/kg	50	MCERTS	1600	-	-	-	640
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	2.1	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	-	-	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.97	-	-	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.43	-	-	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.31	-	-	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	2.7	-	-	-	0.25
Anthracene	mg/kg	0.05	MCERTS	0.57	-	-	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	3.8	-	-	-	0.51
Pyrene	mg/kg	0.05	MCERTS	3.5	-	-	-	0.48
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.0	-	-	-	0.28
Chrysene	mg/kg	0.05	MCERTS	1.8	-	-	-	0.26
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.2	-	-	-	0.33
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.78	-	-	-	0.16
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.8	-	-	-	0.29
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.86	-	-	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.20	-	-	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.1	-	-	-	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	23.1	-	-	-	2.56
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	23	-	-	-	18
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.9	-	-	-	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	-	-	-	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	240	-	-	-	25
Copper (aqua regia extractable)	mg/kg	1	MCERTS	95	-	-	-	47
Lead (aqua regia extractable)	mg/kg	1	MCERTS	89	-	-	-	86
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.8	-	-	-	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	25	-	-	-	23
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	-	-	1.7
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	100	-	-	-	93

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967051	967052	967053	967054	967055
Sample Reference				WS107	WS109	WS113	TP116	WS115
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	4.80	1.75	1.50	0.10
Date Sampled				17/05/2018	17/05/2018	18/05/2018	18/05/2018	18/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	-	-	-	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	-	-	-	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	-	-	-	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	5.1	-	-	-	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	13	-	-	-	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	60	-	-	-	13
TPH (C21 - C35)	mg/kg	1	MCERTS	230	-	-	-	61
TPH (C35 - C40)	mg/kg	10	MCERTS	29	-	-	-	12
TPH Total C5 - C40	mg/kg	10	MCERTS	340	-	-	-	88

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967051	967052	967053	967054	967055
Sample Reference				WS107	WS109	WS113	TP116	WS115
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	4.80	1.75	1.50	0.10
Date Sampled				17/05/2018	17/05/2018	18/05/2018	18/05/2018	18/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
Chloroethane	µg/kg	1	NONE	-	< 1.0	< 1.0	-	-
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	< 1.0	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	< 1.0	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	< 1.0	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	< 1.0	-	-
Benzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	< 1.0	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Styrene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Tribromomethane	µg/kg	1	NONE	-	< 1.0	< 1.0	-	-
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	< 1.0	-	-

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967051	967052	967053	967054	967055
Sample Reference				WS107	WS109	WS113	TP116	WS115
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	4.80	1.75	1.50	0.10
Date Sampled				17/05/2018	17/05/2018	18/05/2018	18/05/2018	18/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation 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	-	0.34	< 0.05	-	-
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	< 0.1	-	-
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	-	< 0.05	< 0.05	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	0.34	< 0.05	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	< 0.2	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	< 0.2	-	-
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	-	0.27	< 0.05	-	-
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	-	1.7	< 0.05	-	-
Anthracene	mg/kg	0.05	MCERTS	-	0.52	< 0.05	-	-
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	< 0.3	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	< 0.2	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	< 0.3	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	2.1	< 0.05	-	-
Pyrene	mg/kg	0.05	MCERTS	-	2.0	< 0.05	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	< 0.3	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	0.97	< 0.05	-	-
Chrysene	mg/kg	0.05	MCERTS	-	0.88	< 0.05	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	1.1	< 0.05	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	0.45	< 0.05	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	0.90	< 0.05	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	0.46	< 0.05	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	0.55	< 0.05	-	-

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967056	967057	967058	967059	967060
Sample Reference				TP119	TP120	TP125	TP126	TP126
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	0.10	0.10	0.50	1.20
Date Sampled				18/05/2018	18/05/2018	18/05/2018	18/05/2018	18/05/2018
Time Taken				None Supplied	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	< 0.1
Moisture Content	%	N/A	NONE	11	20	19	15	13
Total mass of sample received	kg	0.001	NONE	0.55	0.44	0.45	0.50	0.54
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	Chrysotile	-
Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	Not-detected	Detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	< 0.001	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	5.1	6.1	7.7	7.9	7.2
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	200	870	730	880	390
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	29	25	43	200	130
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.015	0.013	0.022	0.099	0.065
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	14.6	12.7	21.5	98.5	64.6
Sulphide	mg/kg	1	MCERTS	1.6	1.0	3.5	12	2.2
Total Sulphur	mg/kg	50	MCERTS	73	540	470	530	130
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	1.1	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.31	0.93	1.6	0.38
Fluorene	mg/kg	0.05	MCERTS	< 0.05	0.22	0.68	1.0	0.33
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	2.3	5.2	7.4	1.8
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.58	1.4	1.6	0.52
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	3.7	6.5	7.7	1.4
Pyrene	mg/kg	0.05	MCERTS	< 0.05	3.2	5.5	7.4	1.2
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	1.6	2.8	3.2	0.48
Chrysene	mg/kg	0.05	MCERTS	< 0.05	1.8	3.1	3.8	0.42
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	1.7	3.2	3.6	0.38
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.82	1.1	1.3	0.30
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	1.4	2.7	3.5	0.36
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.71	1.4	1.5	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.33	0.40	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.86	1.6	1.9	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	19.3	36.5	47.1	7.63
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	4.0	23	11	9.6	2.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	48	20	22	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	14	40	50	15
Lead (aqua regia extractable)	mg/kg	1	MCERTS	13	17	64	85	9.9
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.5	< 0.3	< 0.3	0.5	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	29	16	18	14
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	1.4	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	43	64	77	110	29

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967056	967057	967058	967059	967060
Sample Reference				TP119	TP120	TP125	TP126	TP126
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	0.10	0.10	0.50	1.20
Date Sampled				18/05/2018	18/05/2018	18/05/2018	18/05/2018	18/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	3.4	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	8.8	13	7.5
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	28	24	38	15
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	76	130	150	18
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	12	36	36	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	120	200	250	44

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967056	967057	967058	967059	967060
Sample Reference				TP119	TP120	TP125	TP126	TP126
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	0.10	0.10	0.50	1.20
Date Sampled				18/05/2018	18/05/2018	18/05/2018	18/05/2018	18/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967056	967057	967058	967059	967060
Sample Reference				TP119	TP120	TP125	TP126	TP126
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	0.10	0.10	0.50	1.20
Date Sampled				18/05/2018	18/05/2018	18/05/2018	18/05/2018	18/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation 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	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967061	967062	967063		
Sample Reference				TP127	TP128	TP130		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.20	1.00	1.40		
Date Sampled				18/05/2018	18/05/2018	18/05/2018		
Time Taken				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		
Moisture Content	%	N/A	NONE	12	9.3	11		
Total mass of sample received	kg	0.001	NONE	0.44	0.51	0.50		
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-		
Asbestos in Soil	Type	N/A	ISO 17025	-	-	Not-detected		
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-		
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	-	-	8.1		
Total Cyanide	mg/kg	1	MCERTS	-	-	< 1		
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	-	360		
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	200		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	0.10		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	100		
Sulphide	mg/kg	1	MCERTS	-	-	2.9		
Total Sulphur	mg/kg	50	MCERTS	-	-	130		
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	1.6	-		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	-	-	< 0.05		
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	< 0.05		
Acenaphthene	mg/kg	0.05	MCERTS	-	-	< 0.05		
Fluorene	mg/kg	0.05	MCERTS	-	-	< 0.05		
Phenanthrene	mg/kg	0.05	MCERTS	-	-	< 0.05		
Anthracene	mg/kg	0.05	MCERTS	-	-	< 0.05		
Fluoranthene	mg/kg	0.05	MCERTS	-	-	0.87		
Pyrene	mg/kg	0.05	MCERTS	-	-	0.73		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	0.51		
Chrysene	mg/kg	0.05	MCERTS	-	-	0.39		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	0.51		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	0.25		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	0.46		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	0.23		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	< 0.05		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	0.28		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	-	4.23		
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	-	7.3		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	-	< 0.2		
Chromium (hexavalent)	mg/kg	4	MCERTS	-	-	< 4.0		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	29		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	-	16		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	-	17		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	-	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	-	19		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	< 1.0		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	-	39		

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967061	967062	967063		
Sample Reference				TP127	TP128	TP130		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.20	1.00	1.40		
Date Sampled				18/05/2018	18/05/2018	18/05/2018		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

Petroleum Hydrocarbons

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	-	-	< 2.0		
TPH (C12 - C16)	mg/kg	4	MCERTS	-	-	< 4.0		
TPH (C16 - C21)	mg/kg	1	MCERTS	-	-	3.5		
TPH (C21 - C35)	mg/kg	1	MCERTS	-	-	8.1		
TPH (C35 - C40)	mg/kg	10	MCERTS	-	-	< 10		
TPH Total C5 - C40	mg/kg	10	MCERTS	-	-	14		

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967061	967062	967063		
Sample Reference				TP127	TP128	TP130		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.20	1.00	1.40		
Date Sampled				18/05/2018	18/05/2018	18/05/2018		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	-	-		
Chloroethane	µg/kg	1	NONE	< 1.0	-	-		
Bromomethane	µg/kg	1	ISO 17025	< 1.0	-	-		
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-	-		
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-	-		
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-	-		
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	-	-		
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	-	-		
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-		
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-		
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-		
Trichloromethane	µg/kg	1	MCERTS	< 1.0	-	-		
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-		
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-		
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	-	-		
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-	-		
Benzene	µg/kg	1	MCERTS	< 1.0	-	-		
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	-	-		
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-		
Trichloroethene	µg/kg	1	MCERTS	< 1.0	-	-		
Dibromomethane	µg/kg	1	MCERTS	< 1.0	-	-		
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	-	-		
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-		
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-		
Toluene	µg/kg	1	MCERTS	< 1.0	-	-		
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-		
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	-	-		
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	-	-		
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-	-		
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	-	-		
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-		
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-		
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-		
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	-	-		
Styrene	µg/kg	1	MCERTS	< 1.0	-	-		
Tribromomethane	µg/kg	1	NONE	< 1.0	-	-		
o-Xylene	µg/kg	1	MCERTS	< 1.0	-	-		
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-		
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	-	-		
Bromobenzene	µg/kg	1	MCERTS	< 1.0	-	-		
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-		
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-		
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-		
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-		
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-		
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-		
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-		
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-		
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	-	-		
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-		
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-		
Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-		
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	-	-		
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-		
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	-	-		
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-		

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Analytical Report Number: 18-86541

Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Lab Sample Number				967061	967062	967063		
Sample Reference				TP127	TP128	TP130		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.20	1.00	1.40		
Date Sampled				18/05/2018	18/05/2018	18/05/2018		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	-	-		
Phenol	mg/kg	0.2	ISO 17025	< 0.2	-	-		
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	-		
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	-	-		
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	-		
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	-	-		
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	-		
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	-	-		
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	-	-		
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	-	-		
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-		
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	-	-		
Isophorone	mg/kg	0.2	MCERTS	< 0.2	-	-		
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	-	-		
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	-	-		
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	-	-		
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-		
Naphthalene	mg/kg	0.05	MCERTS	0.92	-	-		
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	-	-		
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	-	-		
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	-	-		
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	-	-		
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	-		
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	-	-		
2-Methylnaphthalene	mg/kg	0.1	NONE	1.0	-	-		
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	-	-		
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	-	-		
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	-	-		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Acenaphthene	mg/kg	0.05	MCERTS	3.3	-	-		
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	-	-		
Dibenzofuran	mg/kg	0.2	MCERTS	2.0	-	-		
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	-	-		
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	-		
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	-	-		
Fluorene	mg/kg	0.05	MCERTS	3.3	-	-		
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-		
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	-	-		
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-		
Phenanthrene	mg/kg	0.05	MCERTS	25	-	-		
Anthracene	mg/kg	0.05	MCERTS	6.4	-	-		
Carbazole	mg/kg	0.3	MCERTS	2.7	-	-		
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	-		
Anthraquinone	mg/kg	0.3	MCERTS	0.8	-	-		
Fluoranthene	mg/kg	0.05	MCERTS	28	-	-		
Pyrene	mg/kg	0.05	MCERTS	22	-	-		
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	-	-		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	10	-	-		
Chrysene	mg/kg	0.05	MCERTS	9.8	-	-		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	9.3	-	-		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	5.7	-	-		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	9.4	-	-		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	4.3	-	-		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.83	-	-		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	5.3	-	-		

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 18-86541
Project / Site name: South Heywood
Your Order No: 11697-8813-AA

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
967044	TP104	1.20	174	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**
967050	TP114	1.50	101	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**
967059	TP126	0.50	100	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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Analytical Report Number: 18-86541

Project / Site name: South Heywood

Your Order No: 11697-8813-AA

Lab Sample Number				967064	967065	967066	967067	
Sample Reference				TP103	TP105	TP109	TP121	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				3.00	2.00	3.50	1.80	
Date Sampled				15/05/2018	15/05/2018	16/05/2018	18/05/2018	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	6.6	7.9	5.5	6.3	
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Total Phenols								
Total Phenols (monohydric)	µg/l	1	ISO 17025	5.3	1.9	4.6	2.1	
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1	5.8	< 1.1	< 1.1	
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08	
Chromium (hexavalent)	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4	< 0.4	1.4	
Copper (dissolved)	µg/l	0.7	ISO 17025	4.0	9.7	5.0	3.2	
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.8	0.9	2.8	2.3	
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	
Zinc (dissolved)	µg/l	0.4	ISO 17025	3.4	3.9	9.7	9.1	

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 18-86541

Project / Site name: South Heywood

Your Order No: 11697-8813-AA

Lab Sample Number				967064	967065	967066	967067	
Sample Reference				TP103	TP105	TP109	TP121	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				3.00	2.00	3.50	1.80	
Date Sampled				15/05/2018	15/05/2018	16/05/2018	18/05/2018	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10	< 10	
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	

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Analytical Report Number : 18-86541

Project / Site name: South Heywood

* 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 *
967041	TP101	None Supplied	0.10	Brown loam and clay with vegetation.
967042	TP103	None Supplied	1.50	Brown loam and clay with gravel.
967043	TP104	None Supplied	0.20	Brown loam and clay with vegetation.
967044	TP104	None Supplied	1.20	Brown clay and sand with rubble.
967045	TP107	None Supplied	0.10	Brown loam and clay with gravel and vegetation.
967046	TP108	None Supplied	2.50	Brown clay and sand with gravel and vegetation.
967047	TP109	None Supplied	0.10	Brown loam and clay with vegetation.
967048	TP110	None Supplied	2.50	Brown clay and sand with gravel and stones.
967049	TP110	None Supplied	3.50	Brown clay and sand.
967050	TP114	None Supplied	1.50	Brown clay and sand with gravel.
967051	WS107	None Supplied	0.50	Brown loam and clay with gravel and vegetation.
967052	WS109	None Supplied	4.80	Brown clay with gravel.
967053	WS113	None Supplied	1.75	Grey clay.
967054	TP116	None Supplied	1.50	Brown clay and sand with rubble and stones.
967055	WS115	None Supplied	0.10	Brown loam and clay with vegetation.
967056	TP119	None Supplied	1.00	Brown clay and sand.
967057	TP120	None Supplied	0.10	Brown loam with vegetation.
967058	TP125	None Supplied	0.10	Brown loam with vegetation.
967059	TP126	None Supplied	0.50	Brown clay and loam.
967060	TP126	None Supplied	1.20	Beige clay and sand.
967061	TP127	None Supplied	1.20	Brown clay and loam with gravel.
967062	TP128	None Supplied	1.00	Brown clay and loam with gravel and rubble.
967063	TP130	None Supplied	1.40	Brown clay and sand.

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Analytical Report Number : 18-86541

Project / Site name: South Heywood

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
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
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
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
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
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
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
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	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
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-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
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

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Analytical Report Number : 18-86541

Project / Site name: South Heywood

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
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 based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
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
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
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
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
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 based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	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 30oC.

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Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
TP101		S	18-86541	967041	c	Sulphide in soil	L010-PL	c
TP101		S	18-86541	967041	c	Total cyanide in soil	L080-PL	c
TP104		S	18-86541	967043	c	Sulphide in soil	L010-PL	c
TP104		S	18-86541	967043	c	Total cyanide in soil	L080-PL	c
TP104		S	18-86541	967044	c	Sulphide in soil	L010-PL	c
TP104		S	18-86541	967044	c	Total cyanide in soil	L080-PL	c
TP107		S	18-86541	967045	c	Total cyanide in soil	L080-PL	c
TP108		S	18-86541	967046	c	Total cyanide in soil	L080-PL	c
TP109		S	18-86541	967047	c	Total cyanide in soil	L080-PL	c
TP110		S	18-86541	967048	c	Total cyanide in soil	L080-PL	c
TP110		S	18-86541	967049	c	Total cyanide in soil	L080-PL	c
TP114		S	18-86541	967050	c	Total cyanide in soil	L080-PL	c

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

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Analytical Report Number : 18-88544

Project / Site name:	South Heywood	**Samples received on:**	05/06/2018
Your job number:	11-697	**Samples instructed on:**	11/06/2018
Your order number:	11697-8952-AA	**Analysis completed by:**	15/06/2018
Report Issue Number:	1	**Report issued on:**	18/06/2018
Samples Analysed:	4 water samples		

Signed:

Jordan Hill
Reporting Manager
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

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 18-88544

Project / Site name: South Heywood

Your Order No: 11697-8952-AA

Lab Sample Number				978787	978788	978789	978790	
Sample Reference				WS108	CP105	WS104	WS110	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				08/06/2018	08/06/2018	08/06/2018	08/06/2018	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.2	7.6	7.6	7.2	
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	14	< 1.0	14	< 1.0	
Total Phenols								
Total Phenols (monohydric)	µg/l	1	ISO 17025	< 1.0	< 1.0	13	4.8	
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.63	1.63	12.0	7.82	
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	0.02	0.03	< 0.02	
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3	0.4	0.5	0.8	
Copper (dissolved)	µg/l	0.5	ISO 17025	2.5	1.6	4.5	4.4	
Lead (dissolved)	µg/l	0.2	ISO 17025	0.4	2.6	0.6	1.6	
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	0.12	< 0.05	
Nickel (dissolved)	µg/l	0.5	ISO 17025	8.4	4.5	8.1	10	
Selenium (dissolved)	µg/l	0.6	ISO 17025	5.9	5.6	7.8	6.4	
Zinc (dissolved)	µg/l	0.5	ISO 17025	4.8	3.7	1.8	5.8	
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	

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Analytical Report Number: 18-88544

Project / Site name: South Heywood

Your Order No: 11697-8952-AA

Lab Sample Number				978787	978788	978789	978790	
Sample Reference				WS108	CP105	WS104	WS110	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				08/06/2018	08/06/2018	08/06/2018	08/06/2018	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 18-88544

Project / Site name: South Heywood

Your Order No: 11697-8952-AA

Lab Sample Number				978787	978788	978789	978790	
Sample Reference				WS108	CP105	WS104	WS110	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				08/06/2018	08/06/2018	08/06/2018	08/06/2018	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	4.6	< 0.05	
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	2.3	< 0.05	
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	8.4	0.83	
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	1.8	< 0.05	
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	4.0	1.9	
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	1.8	
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	1.1	
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	

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

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 18-88544

Project / Site name: South Heywood

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

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 30oC.

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Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP105		W	18-88544	978788	c	pH at 20oC in water (automated)	L099-PL	c
WS104		W	18-88544	978789	c	pH at 20oC in water (automated)	L099-PL	c
WS108		W	18-88544	978787	c	pH at 20oC in water (automated)	L099-PL	c
WS110		W	18-88544	978790	c	pH at 20oC in water (automated)	L099-PL	c

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

APPENDIX VII
ORIGIN OF TIER I GENERIC ASSESSMENT CRITERIA



Constituent	Origin of Risk Assessment Value
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	2014 LQM/CIEH S4ULs
Mercury	2014 LQM/CIEH S4ULs - methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide - Total	2014 LQM/CIEH S4ULs
Phenols - Total.	2014 LQM/CIEH S4ULs
Naphthalene	General Assessment Criteria (GAC) developed by CIEH / LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene(	
Chrysene	
Benzo(b/k)Fluoranthene (iii)	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C_5-C_6 (aliphatic)	
TPH C_6-C_8 (aliphatic)	
TPH C_8-C_{10} (aliphatic)	
TPH C_{10}-C_{12} (aliphatic)	
TPH C_{12}-C_{16} (aromatic)	
TPH C_{16}-C_{21} (aromatic)	
TPH C_{21}-C_{35} (aromatic)	

APPENDIX VIII
GEOTECHNICAL TESTING RESULTS



LABORATORY REPORT

REPORT

4043

Contract Number: PSL17/4670

Report Date: 07 November 2017

Client's Reference: 11-697

Client Name: E3P
Heliport Business Park
Liverpool Road
Eccles
Manchester
M30 7RU

For the attention of: Holly Castigan

Contract Title: South Heywood

Date Received: 26/9/2017
Date Commenced: 26/9/2017
Date Completed: 7/11/2017

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:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	C Marshall (Laboratory Manager)	A Fry (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP105		Bulk	2.00		MADE GROUND brown gravelly very sandy clay.
TP145		Bulk	1.40		Dark brown very gravelly very sandy CLAY.
TP115		Bulk	2.00		Dark brown very gravelly very clayey SAND.
TP118		Bulk	2.50		Dark brown very gravelly very clayey SAND.
TP120		Bulk	2.00		MADE GROUND brown very gravelly very sandy clay.
TP130		Bulk	1.00		MADE GROUND dark brown very gravelly very sandy clay.
TP137		Bulk	1.80		MADE GROUND dark brown very gravelly very clayey sand.
TP144		Bulk	2.20		Dark brown very gravelly very sandy CLAY.
TP149		Bulk	0.80		Dark brown very gravelly very sandy CLAY.
TP134		Bulk	1.50		Dark brown very gravelly sandy CLAY.
TP147		Bulk	1.30		Dark brown very gravelly very clayey SAND with cobbles.

UKAS TESTING
4043

PSL
Professional Soils Laboratory

South Heywood

Contract No:
PSL17/4670
Client Ref:
11-697

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP105		Bulk	2.00		13							
TP145		Bulk	1.40		15							
TP115		Bulk	2.00		21							
TP118		Bulk	2.50		21							
TP120		Bulk	2.00		14							
TP130		Bulk	1.00		23							
TP137		Bulk	1.80		22							
TP144		Bulk	2.20		20							
TP149		Bulk	0.80		15							
TP134		Bulk	1.50		16							
TP147		Bulk	1.30		19							

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

South Heywood

Contract No:

PSL17/4670

Client Ref:

11-697

PARTICLE SIZE DISTRIBUTION TEST

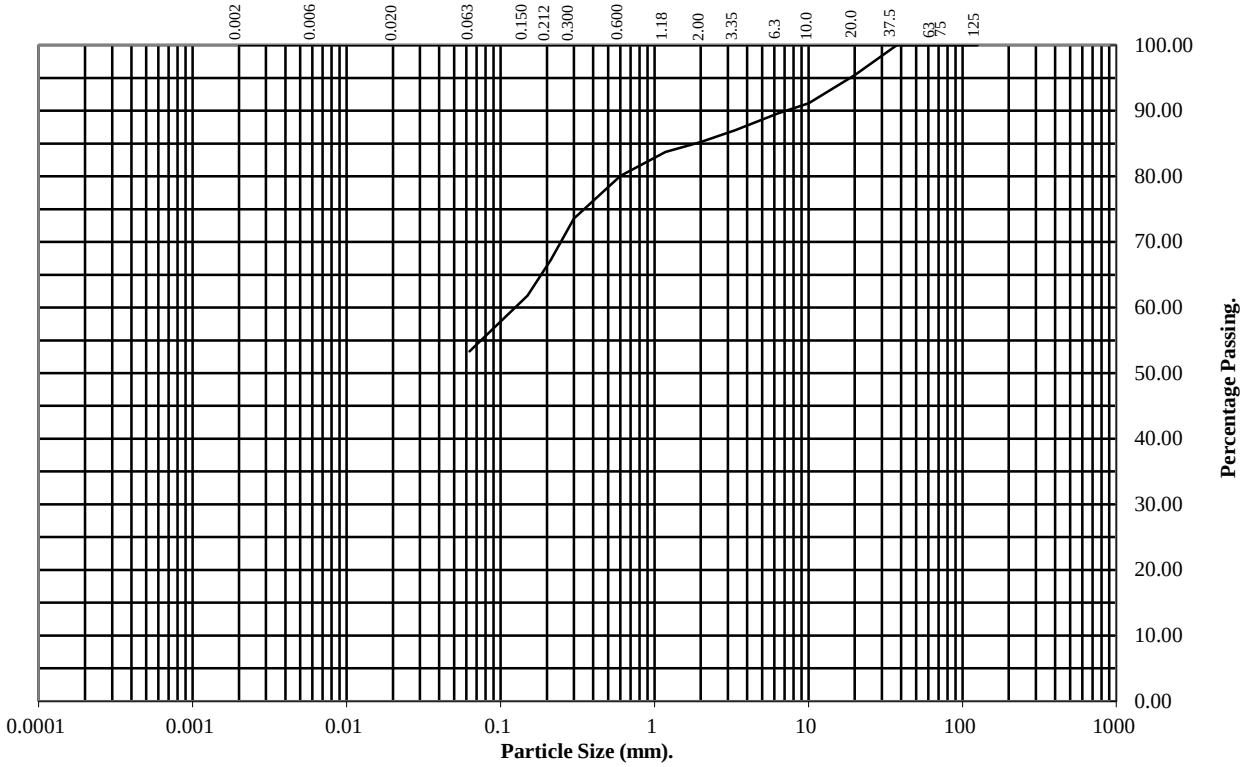
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP105** **Top Depth (m):** **2.00**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	95
10	91
6.3	90
3.35	87
2	85
1.18	84
0.6	80
0.3	74
0.212	67
0.15	62
0.063	53

Soil Fraction	Total Percentage
Cobbles	0
Gravel	15
Sand	32
Silt/Clay	53

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

South Heywood

Contract No: **PSL17/4670**

Client Ref: **11-697**

PARTICLE SIZE DISTRIBUTION TEST

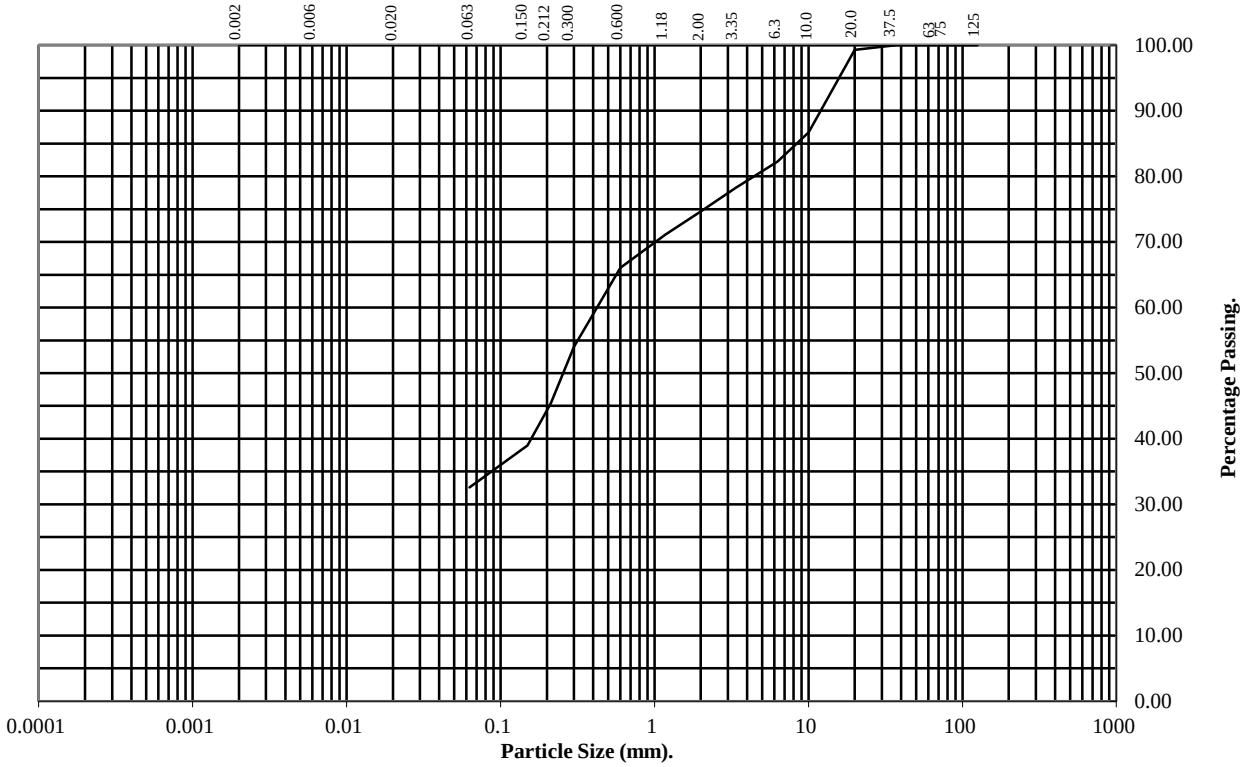
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP115** **Top Depth (m):** **2.00**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	99
10	87
6.3	82
3.35	78
2	75
1.18	71
0.6	66
0.3	54
0.212	45
0.15	39
0.063	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	25
Sand	42
Silt/Clay	33

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	**South Heywood**	**Contract No:** PSL17/4670 **Client Ref:** 11-697

PARTICLE SIZE DISTRIBUTION TEST

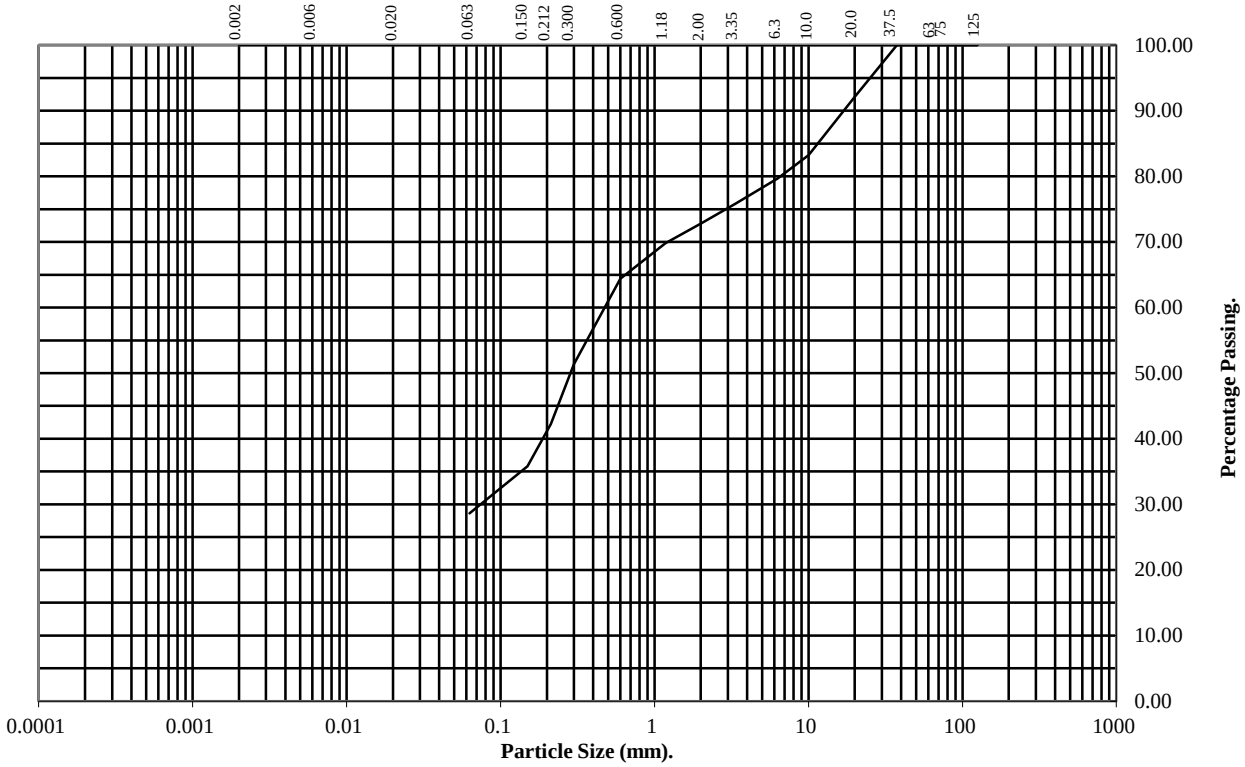
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP118** **Top Depth (m):** **2.50**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	92
10	83
6.3	80
3.35	76
2	73
1.18	70
0.6	64
0.3	51
0.212	42
0.15	36
0.063	29

Soil Fraction	Total Percentage
Cobbles	0
Gravel	27
Sand	44
Silt/Clay	29

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	**South Heywood**	**Contract No:** PSL17/4670 **Client Ref:** 11-697

PARTICLE SIZE DISTRIBUTION TEST

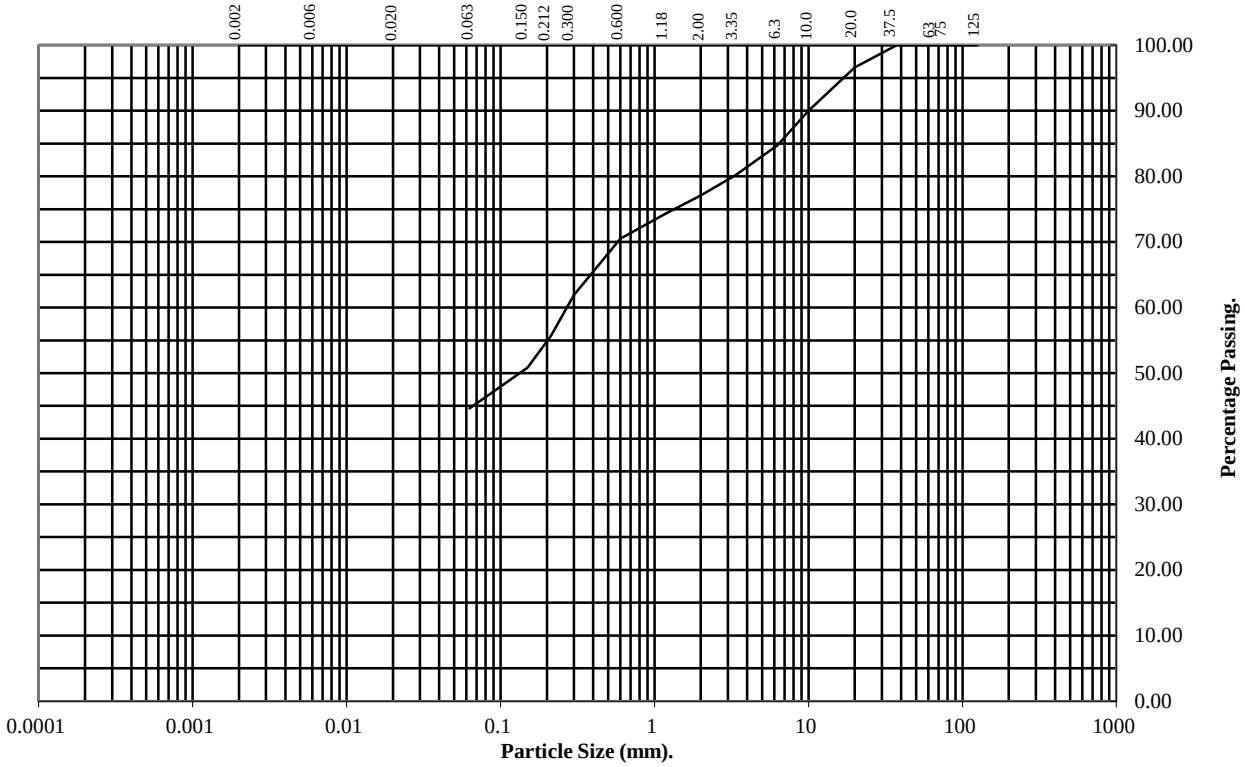
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP120** **Top Depth (m):** **2.00**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	97
10	90
6.3	85
3.35	80
2	77
1.18	74
0.6	70
0.3	62
0.212	56
0.15	51
0.063	45

Soil Fraction	Total Percentage
Cobbles	0
Gravel	23
Sand	32
Silt/Clay	45

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	**South Heywood**	**Contract No:** PSL17/4670 **Client Ref:** 11-697

PARTICLE SIZE DISTRIBUTION TEST

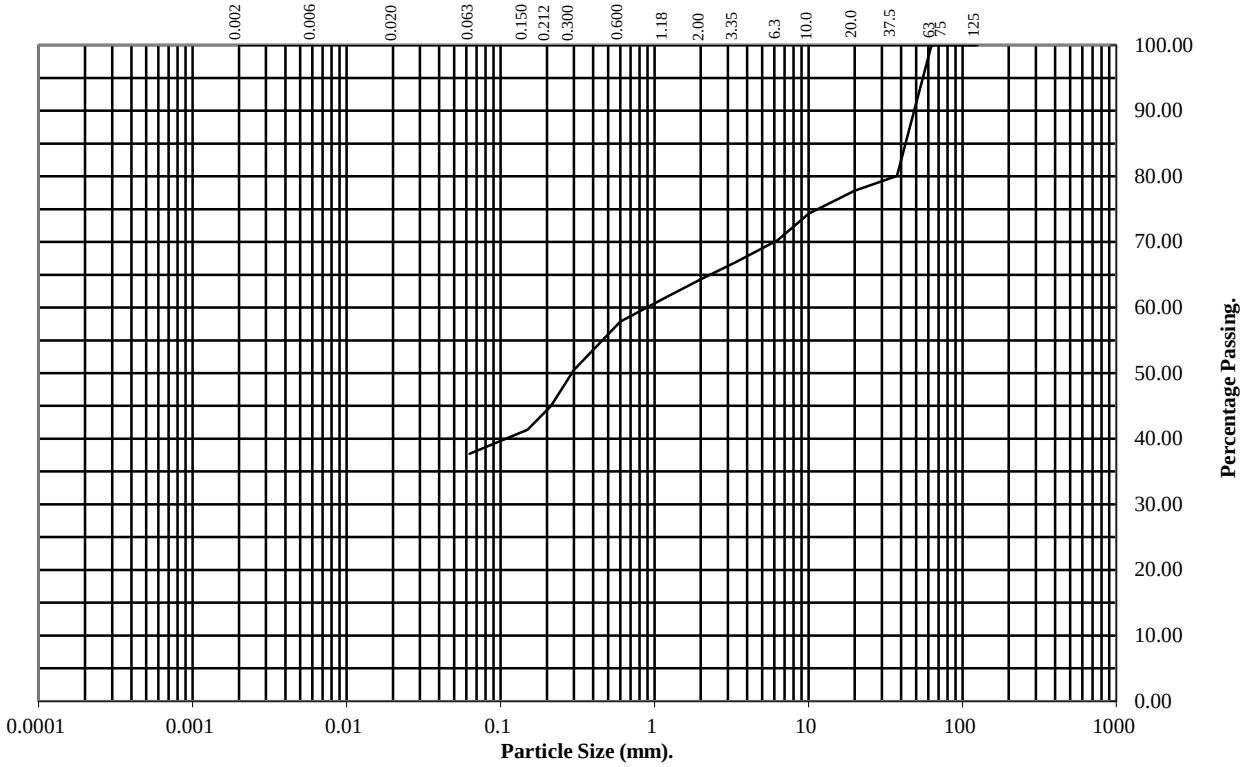
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP130** **Top Depth (m):** **1.00**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	80
20	78
10	74
6.3	70
3.35	67
2	64
1.18	62
0.6	58
0.3	50
0.212	45
0.15	41
0.063	38

Soil Fraction	Total Percentage
Cobbles	0
Gravel	36
Sand	26
Silt/Clay	38

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

South Heywood

Contract No:
PSL17/4670
Client Ref:
11-697

PARTICLE SIZE DISTRIBUTION TEST

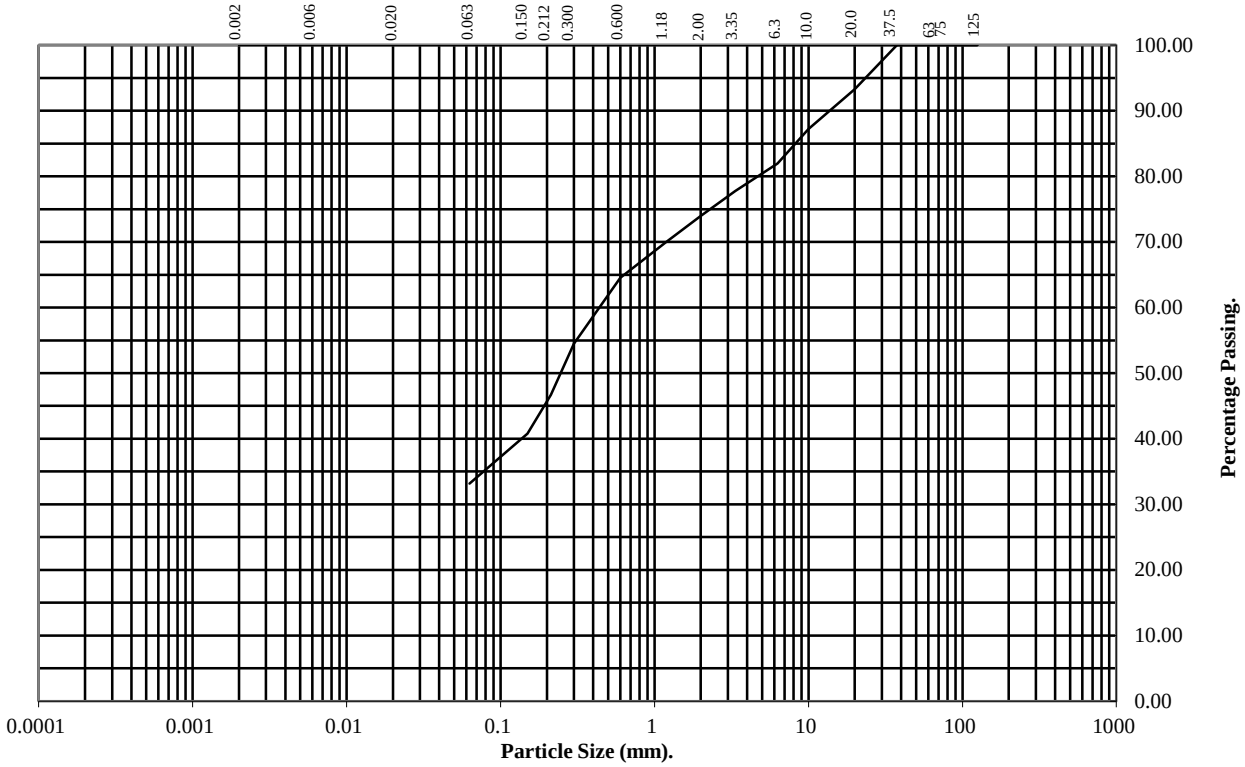
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP137** **Top Depth (m):** **1.80**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	93
10	87
6.3	82
3.35	78
2	74
1.18	70
0.6	65
0.3	54
0.212	47
0.15	41
0.063	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	26
Sand	41
Silt/Clay	33

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

South Heywood

Contract No:
PSL17/4670
Client Ref:
11-697

PARTICLE SIZE DISTRIBUTION TEST

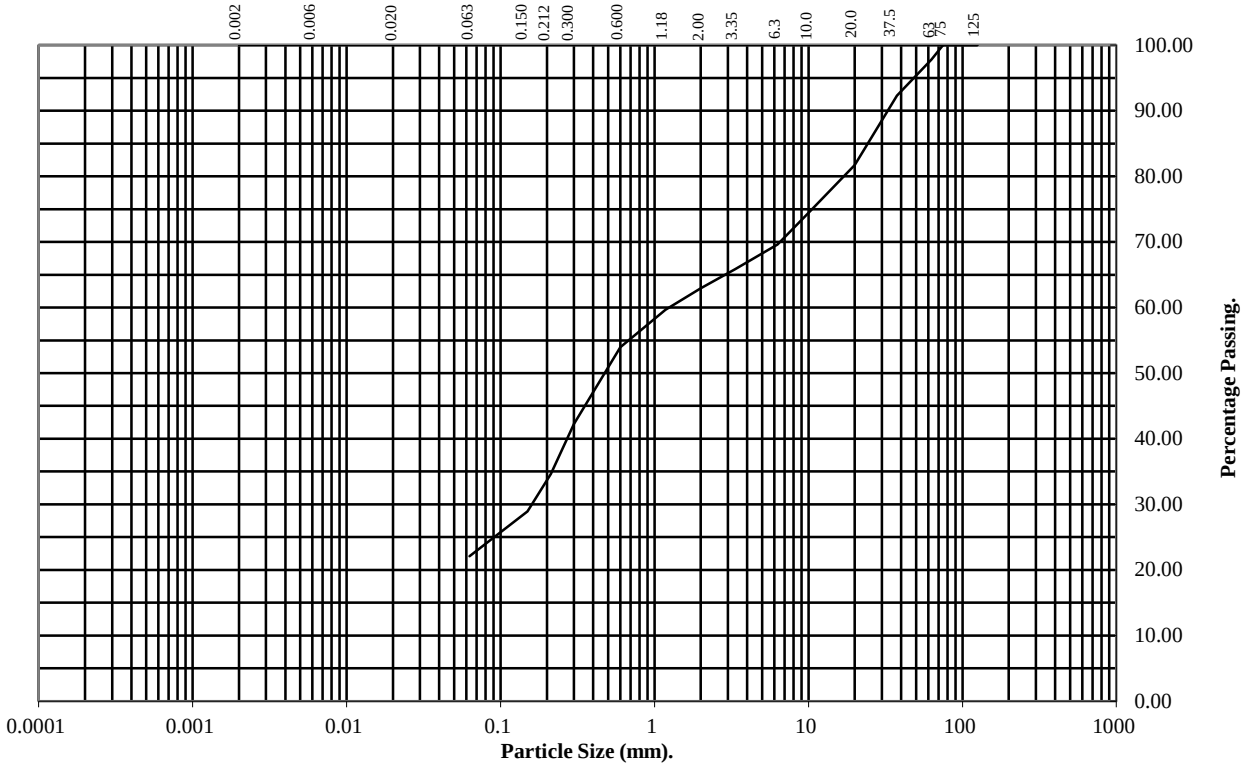
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP147** **Top Depth (m):** **1.30**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	98
37.5	92
20	82
10	74
6.3	70
3.35	66
2	63
1.18	60
0.6	54
0.3	42
0.212	35
0.15	29
0.063	22

Soil Fraction	Total Percentage
Cobbles	2
Gravel	35
Sand	41
Silt/Clay	22

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

South Heywood

Contract No:
PSL17/4670
Client Ref:
11-697

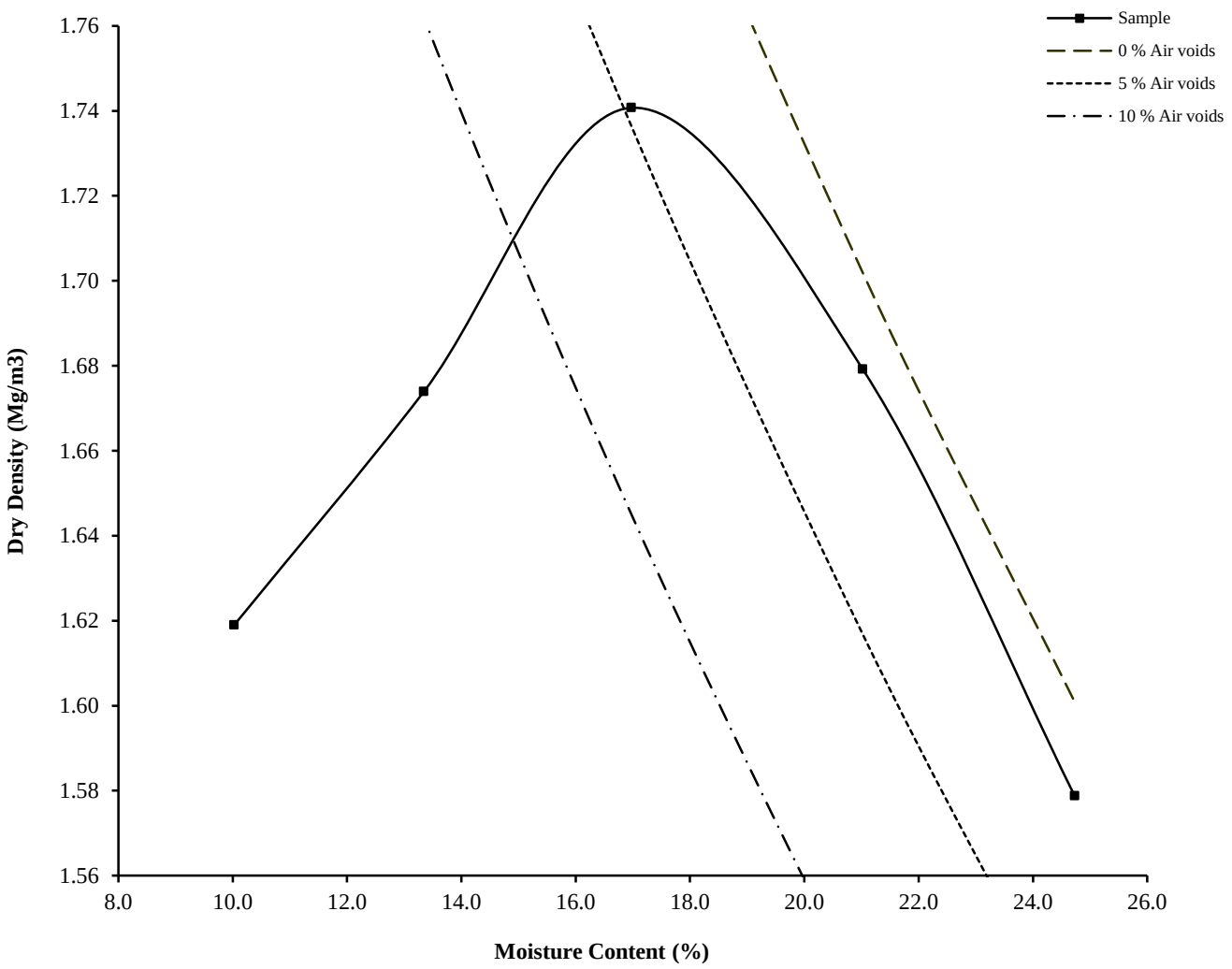
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP115 **Top Depth (m) :** 2.00

Sample Number: **Base Depth (m) :**

Sample Type: Bulk



Initial Moisture Content:		21	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.74	Material Retained on 20.0 mm Test Sieve (%):		1
Optimum Moisture Content (%):		17			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**South Heywood**	**Contract** **PSL17/4670** **Client Ref** **11-697**

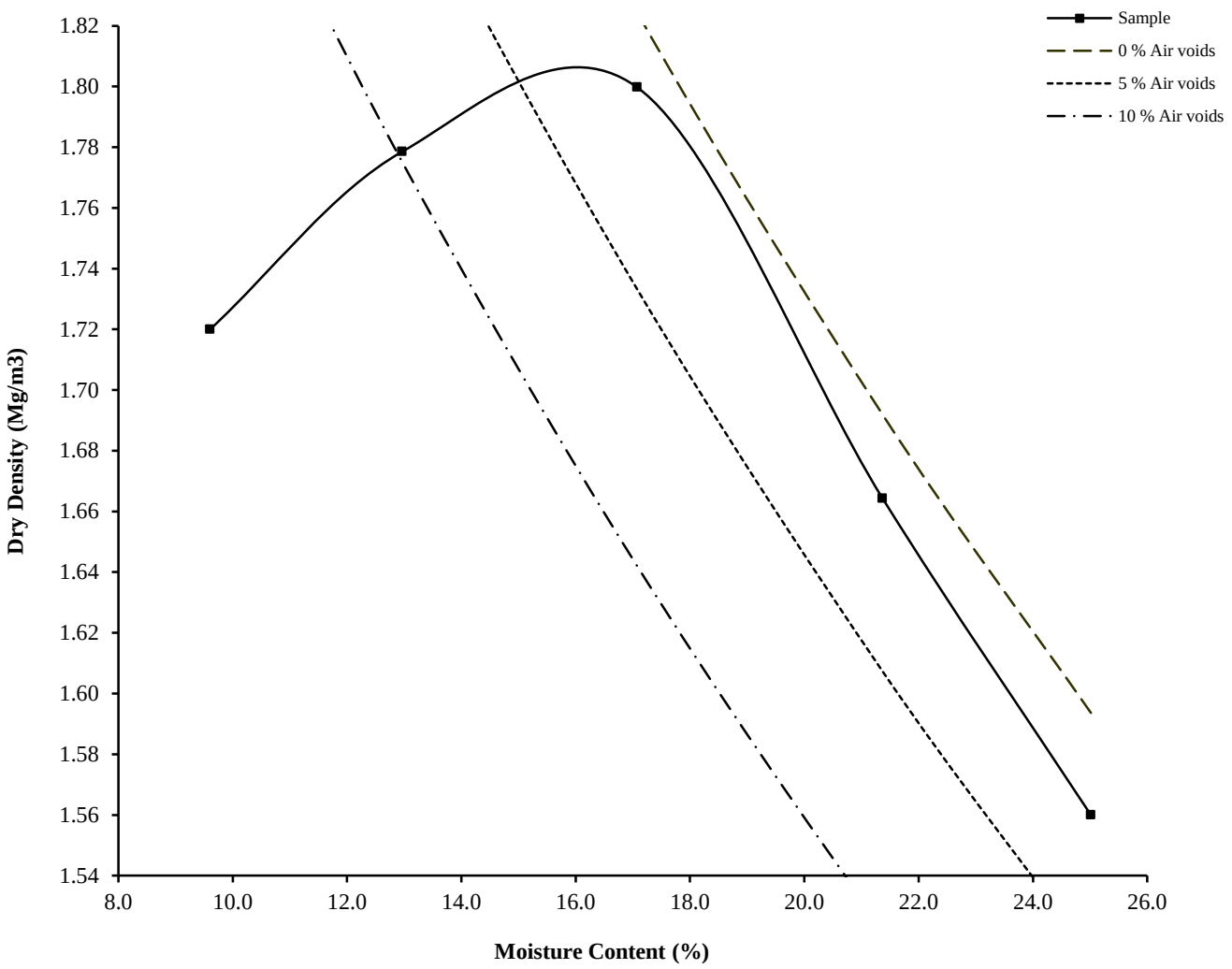
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP118 **Top Depth (m) :** 2.50

Sample Number: **Base Depth (m) :**

Sample Type: Bulk



Initial Moisture Content:		21	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.80	Material Retained on 20.0 mm Test Sieve (%):		8
Optimum Moisture Content (%):		16			
Remarks See summary of soil descriptions.					

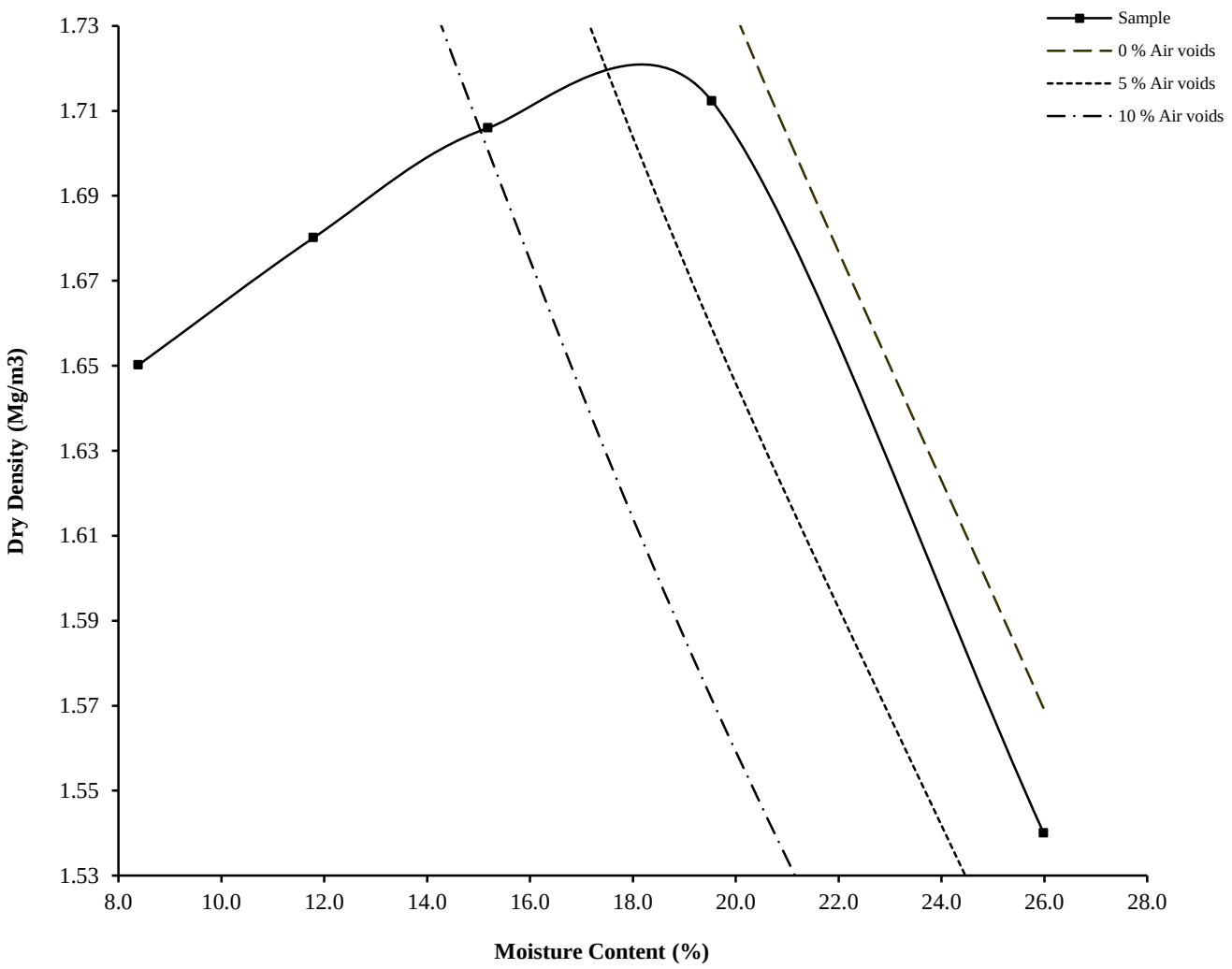
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: TP130 **Top Depth (m) :** 1.00

Sample Number: **Base Depth (m) :**

Sample Type: Bulk



Initial Moisture Content:		23	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):		20
Maximum Dry Density (Mg/m3):		1.72	Material Retained on 20.0 mm Test Sieve (%):		2
Optimum Moisture Content (%):		18			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**South Heywood**	**Contract** **PSL17/4670** **Client Ref** **11-697**

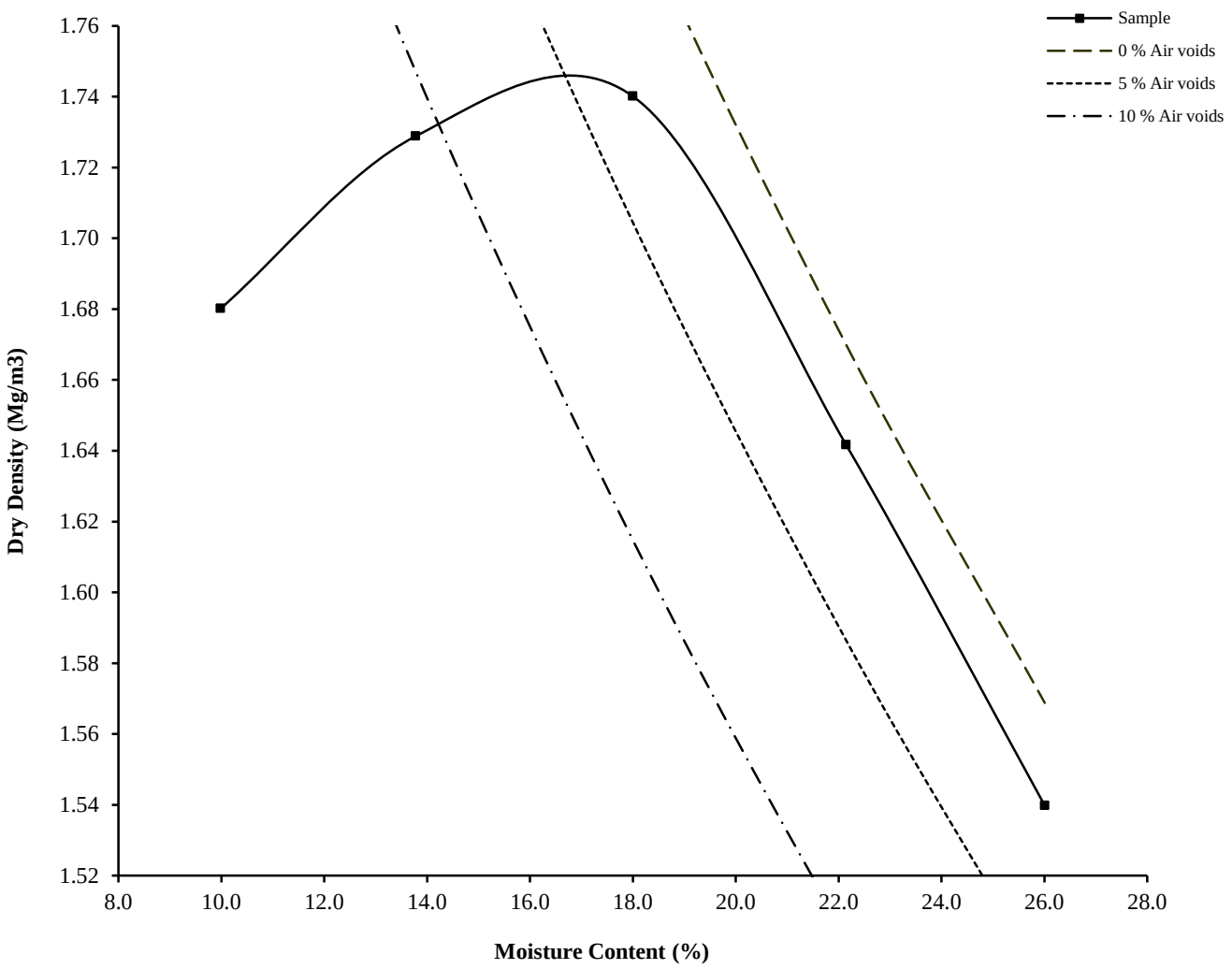
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP137 **Top Depth (m) :** 1.80

Sample Number: **Base Depth (m) :**

Sample Type: Bulk



Initial Moisture Content:		22	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.74	Material Retained on 20.0 mm Test Sieve (%):		7
Optimum Moisture Content (%):		17			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**South Heywood**	**Contract** **PSL17/4670** **Client Ref** **11-697**

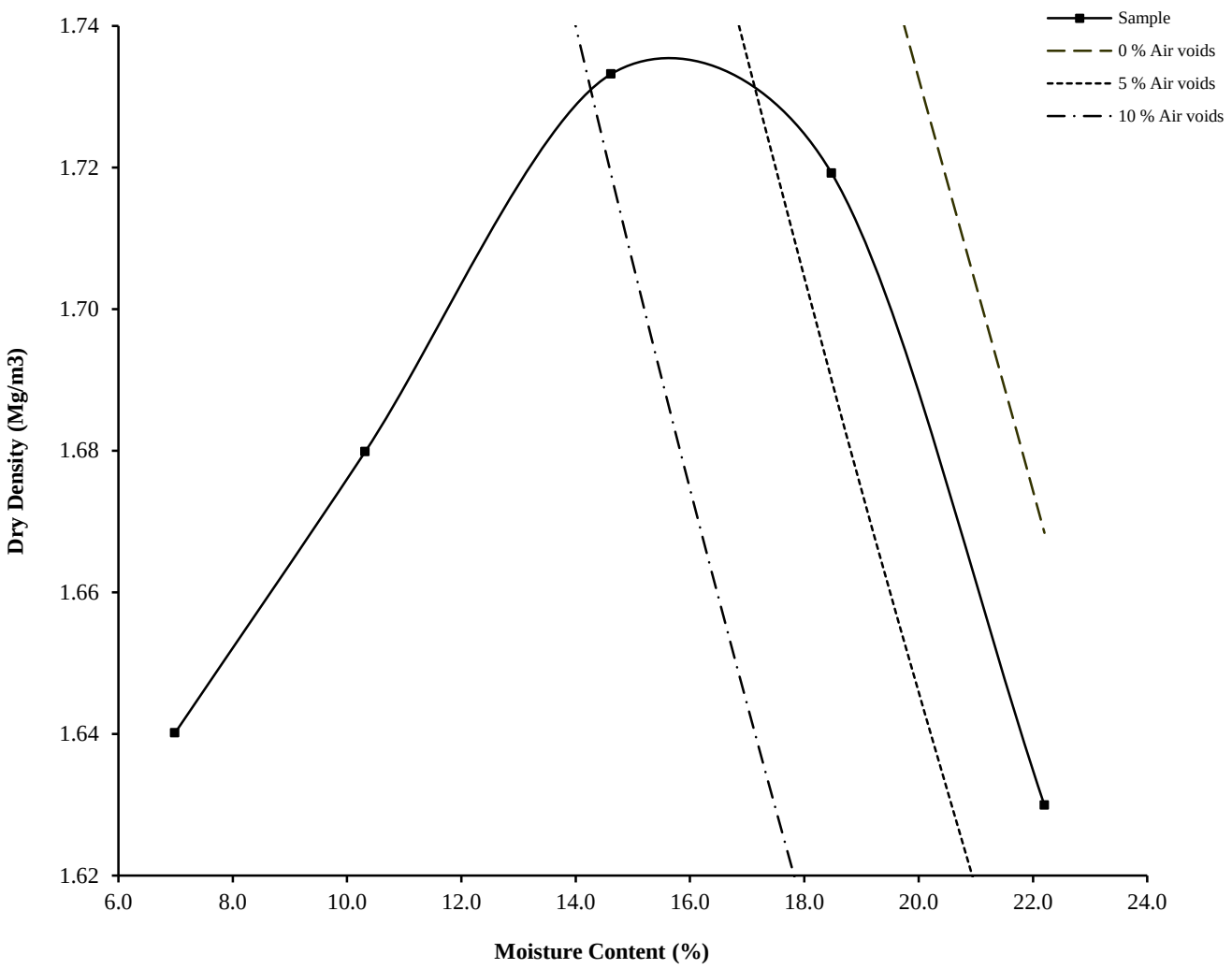
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP147 **Top Depth (m) :** 1.30

Sample Number: **Base Depth (m) :**

Sample Type: Bulk



Initial Moisture Content:		18	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):		8
Maximum Dry Density (Mg/m3):		1.74	Material Retained on 20.0 mm Test Sieve (%):		10
Optimum Moisture Content (%):		16			
Remarks See summary of soil descriptions.					

APPENDIX IX
ZONE LOAD TESTING RESULTS



E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 21-08-2018 6th VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.349	409146.107	132.306	
Z1B	384524.359	409147.221	132.309	
Z1C	384524.963	409147.222	132.303	
Z1D	384524.954	409146.100	132.292	
Z2A	384532.425	409367.194	131.503	
Z2B	384533.058	409366.286	131.509	
Z2C	384532.924	409367.526	131.485	
Z2D	384533.554	409366.622	131.506	
Z3A	384667.850	409360.003	132.542	
Z3B	384666.793	409359.748	132.533	
Z3C	384666.931	409359.169	132.534	
Z3D	384668.013	409359.431	132.534	
Z4A	384540.422	408881.936	127.004	
Z4B	384540.050	408882.972	126.995	
Z4C	384539.479	408882.778	126.995	
Z4D	384539.857	408881.735	127.016	

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Email: scott@avoinmaasurveys.com Web: www.avoinmaasurveys.com Company No. 7065044 Registered address: Wheatside, Dark Lane, Barnsley, S706RE

E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 04-07-2018 1ST VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.367	409146.122	132.306	
Z1B	384524.376	409147.237	132.308	
Z1C	384524.980	409147.230	132.296	
Z1D	384524.973	409146.108	132.286	
Z2A	384532.411	409367.170	131.506	
Z2B	384533.044	409366.262	131.512	
Z2C	384532.910	409367.508	131.488	
Z2D	384533.542	409366.604	131.510	
Z3A	384667.851	409360.016	132.567	
Z3B	384666.795	409359.759	132.559	
Z3C	384666.933	409359.170	132.561	
Z3D	384668.015	409359.432	132.559	
Z4A	384540.409	408881.922	126.944	
Z4B	384540.040	408882.959	126.940	
Z4C	384539.460	408882.764	126.941	
Z4D	384539.836	408881.721	126.960	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 08-08-2018 5th VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.352	409146.130	132.296	
Z1B	384524.360	409147.246	132.298	
Z1C	384524.959	409147.249	132.292	
Z1D	384524.952	409146.126	132.280	
Z2A	384532.419	409367.176	131.498	
Z2B	384533.052	409366.268	131.504	
Z2C	384532.921	409367.517	131.482	
Z2D	384533.551	409366.612	131.504	
Z3A	384667.856	409360.004	132.547	
Z3B	384666.798	409359.750	132.538	
Z3C	384666.934	409359.162	132.542	
Z3D	384668.016	409359.425	132.541	
Z4A	384540.405	408881.926	126.986	
Z4B	384540.034	408882.963	126.979	
Z4C	384539.460	408882.772	126.976	
Z4D	384539.837	408881.729	126.998	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 10th VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.350	409146.119	132.296	
Z1B	384524.358	409147.233	132.299	
Z1C	384524.959	409147.232	132.293	
Z1D	384524.953	409146.110	132.281	
Z2A	384532.420	409367.181	131.508	
Z2B	384533.053	409366.273	131.515	
Z2C	384532.917	409367.516	131.486	
Z2D	384533.548	409366.612	131.508	
Z3A	384667.853	409360.008	132.546	
Z3B	384666.796	409359.753	132.536	
Z3C	384666.933	409359.170	132.536	
Z3D	384668.014	409359.433	132.536	
Z4A	384540.400	408881.932	126.993	
Z4B	384540.028	408882.968	126.982	
Z4C	384539.454	408882.773	126.978	
Z4D	384539.831	408881.731	127.002	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 05-09-2018 7th VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.354	409146.119	132.284	
Z1B	384524.362	409147.233	132.286	
Z1C	384524.966	409147.235	132.281	
Z1D	384524.960	409146.113	132.269	
Z2A	384532.422	409367.185	131.521	
Z2B	384533.056	409366.277	131.527	
Z2C	384532.920	409367.520	131.505	
Z2D	384533.551	409366.616	131.526	
Z3A	384667.849	409360.019	132.550	
Z3B	384666.791	409359.764	132.541	
Z3C	384666.929	409359.176	132.542	
Z3D	384668.011	409359.438	132.542	
Z4A	384540.410	408881.919	126.994	
Z4B	384540.037,	408882.954	126.985	
Z4C	384539.466	408882.761	126.986	
Z4D	384539.843	408881.718	127.007	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 11-07-2018 1ST VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.364	409146.140	132.319	
Z1B	384524.372	409147.255	132.321	
Z1C	384524.975	409147.255	132.310	
Z1D	384524.968	409146.133	132.300	
Z2A	384532.418	409367.185	131.520	
Z2B	384533.050	409366.277	131.525	
Z2C	384532.918	409367.521	131.499	
Z2D	384533.548	409366.618	131.520	
Z3A	384667.854	409360.009	132.559	
Z3B	384666.797	409359.754	132.550	
Z3C	384666.931	409359.169	132.549	
Z3D	384668.013	409359.433	132.547	
Z4A	384540.407	408881.919	127.001	
Z4B	384540.037	408882.955	126.995	
Z4C	384539.462	408882.766	126.994	
Z4D	384539.840	408881.724	127.012	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 11-07-2018 1ST VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.364	409146.140	132.319	
Z1B	384524.372	409147.255	132.321	
Z1C	384524.975	409147.255	132.310	
Z1D	384524.968	409146.133	132.300	
Z2A	384532.418	409367.185	131.520	
Z2B	384533.050	409366.277	131.525	
Z2C	384532.918	409367.521	131.499	
Z2D	384533.548	409366.618	131.520	
Z3A	384667.854	409360.009	132.559	
Z3B	384666.797	409359.754	132.550	
Z3C	384666.931	409359.169	132.549	
Z3D	384668.013	409359.433	132.547	
Z4A	384540.407	408881.919	127.001	
Z4B	384540.037	408882.955	126.995	
Z4C	384539.462	408882.766	126.994	
Z4D	384539.840	408881.724	127.012	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 12-10-2018 9th VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.356	409146.107	132.242	
Z1B	384524.366	409147.224	132.246	
Z1C	384524.967	409147.223	132.236	
Z1D	384524.962	409146.103	132.227	
Z2A	384532.420	409367.182	131.507	
Z2B	384533.053	409366.274	131.513	
Z2C	384532.919	409367.523	131.486	
Z2D	384533.549	409366.619	131.509	
Z3A	384667.853	409360.009	132.550	
Z3B	384666.795	409359.755	132.543	
Z3C	384666.931	409359.167	132.542	
Z3D	384668.013	409359.430	132.541	
Z4A	384540.408	408881.937	126.970	
Z4B	384540.036	408882.974	126.962	
Z4C	384539.462	408882.781	126.954	
Z4D	384539.839	408881.738	126.981	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 18-07-2018 3rd VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.380	409146.120	132.315	
Z1B	384524.389	409147.236	132.317	
Z1C	384524.990	409147.237	132.312	
Z1D	384524.983	409146.117	132.301	
Z2A	384532.421	409367.180	131.546	
Z2B	384533.054	409366.271	131.554	
Z2C	384532.907	409367.513	131.527	
Z2D	384533.538	409366.609	131.550	
Z3A	384667.848	409360.007	132.558	
Z3B	384666.791	409359.753	132.549	
Z3C	384666.925	409359.168	132.550	
Z3D	384668.006	409359.432	132.549	
Z4A	384540.404	408881.922	127.006	
Z4B	384540.034	408882.960	126.998	
Z4C	384539.462	408882.769	126.999	
Z4D	384539.839	408881.726	127.018	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 18-07-2018 3rd VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.380	409146.120	132.315	
Z1B	384524.389	409147.236	132.317	
Z1C	384524.990	409147.237	132.312	
Z1D	384524.983	409146.117	132.301	
Z2A	384532.421	409367.180	131.546	
Z2B	384533.054	409366.271	131.554	
Z2C	384532.907	409367.513	131.527	
Z2D	384533.538	409366.609	131.550	
Z3A	384667.848	409360.007	132.558	
Z3B	384666.791	409359.753	132.549	
Z3C	384666.925	409359.168	132.550	
Z3D	384668.006	409359.432	132.549	
Z4A	384540.404	408881.922	127.006	
Z4B	384540.034	408882.960	126.998	
Z4C	384539.462	408882.769	126.999	
Z4D	384539.839	408881.726	127.018	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 25-07-2018 4th VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.361	409146.107	132.320	
Z1B	384524.368	409147.221	132.322	
Z1C	384524.969	409147.220	132.315	
Z1D	384524.962	409146.098	132.304	
Z2A	384532.415	409367.163	131.521	
Z2B	384533.050	409366.255	131.529	
Z2C	384532.911	409367.498	131.502	
Z2D	384533.543	409366.595	131.528	
Z3A	384667.855	409360.001	132.560	
Z3B	384666.798	409359.747	132.552	
Z3C	384666.936	409359.165	132.554	
Z3D	384668.018	409359.428	132.554	
Z4A	384540.408	408881.907	127.009	
Z4B	384540.036	408882.943	127.002	
Z4C	384539.463	408882.757	126.996	
Z4D	384539.841	408881.712	127.018	

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E3P XYZ DATA HARESHILL ROAD, ROCHDALE OL10 2TD 28-09-2018 8th VISIT

Point ID	East	North	Elevation	Comments
Z1A	384524.356	409146.108	132.261	
Z1B	384524.364	409147.223	132.264	
Z1C	384524.966	409147.225	132.258	
Z1D	384524.961	409146.104	132.247	
Z2A	384532.420	409367.182	131.517	
Z2B	384533.053	409366.274	131.523	
Z2C	384532.919	409367.523	131.495	
Z2D	384533.549	409366.619	131.517	
Z3A	384667.850	409360.010	132.557	
Z3B	384666.793	409359.755	132.548	
Z3C	384666.931	409359.167	132.551	
Z3D	384668.013	409359.429	132.550	
Z4A	384540.407,	408881.938	126.985	
Z4B	384540.034	408882.973	126.974	
Z4C	384539.459	408882.781	126.970	
Z4D	384539.837	408881.739	126.994	

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