

Ringland, Newport

Phase 2 Ground Investigation

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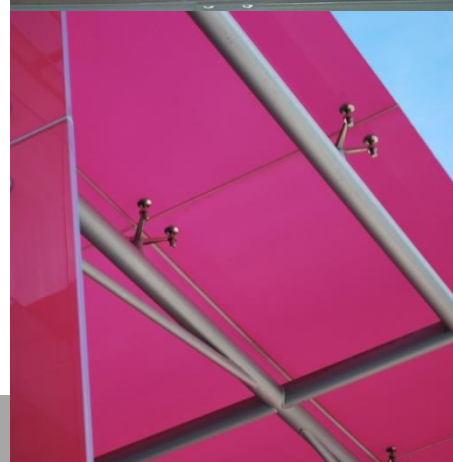
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Executive Summary

Appointment	In December 2019 Curtins were instructed by Newport City Homes to undertake a Phase 2 Intrusive Investigation in the town of Ringland. The site is centred on NGR 335730, 18882 and covers an area of approximately 3.0 Ha. This investigation addresses recommendations as presented in the Phase 1 report with the aim of the Phase 2 works to characterise geo-environmental conditions prior to redevelopment involving demolition of some buildings currently in existence at the site and the construction of a new housing estate with a range of apartments blocks, houses and small retail area. The houses are likely to have gardens while the apartments and retail areas will be communal soft landscaping.
Current Site Status	The site is set in a mixed residential and retail area of Ringland town centre. The site consists of a shopping centre/public space surrounded by shops and retail units, with residential housing comprising a multiple storey block (Milton Court) and six bungalows. There are also car parking and soft landscaped areas beyond two blocks of housing in the eastern and northern portions of the site have recently been demolished.
Summary of Phase 1	The site was set in open fields and agricultural land until the 1970s when the buildings currently in existence were constructed. There has been some demolition and construction of buildings in the intervening period with two large housing blocks on the site demolished in 2016. A garage and possible fuel station occupied the northeast corner of the site and was replaced by six residential bungalows in the 1990's The site is indicated to be underlain by the Mercia Mudstone Group with no superficial deposits indicated to be present. The site is underlain by a Secondary B Aquifer and there are no groundwater abstractions from this aquifer recorded in proximity to the site. There are no recorded mining hazards associated with the site.
Fieldworks Undertaken	Fieldworks were carried out in December 2019 and comprised four dynamic sampling/rotary boreholes advanced to a depth of up to 15.50m bgl and fifteen window sample boreholes advanced up to 4.50 m bgl, Eight trial pits were advanced up to 2.50 m bgl. Including two soakaway tests as well as four California Bearing Ratio tests. Land gas and groundwater monitoring standpipes were installed in selected boreholes with six return land gas monitoring visits undertaken. In addition, a number of structural investigations were undertaken involving hand trial pitting and breaking out of concrete and brickwork.
Encountered Ground Conditions	Made Ground was encountered across the site and comprised macadam and concrete hardstanding, reworked natural topsoil, and reworked natural clay with anthropogenic components of clinker, brick, limestone aggregate, concrete and timber. The Made Ground was underlain by the Mercia Mudstone Group. This was encountered as a firm to stiff becoming very stiff to hard with mudstone lithorelicts.
Environmental Laboratory Testing and Land Gas Monitoring Results	The majority of the site shows very low levels of contaminants. Asbestos described as Chrysotile and loose fibres was identified in WS05. Further quantification testing to determine the percentage weight of Asbestos was conducted and recorded Asbestos quantification of <0.001%. One sample from WS09 at 0.40m showed exceedance of the Poly Aromatic Hydrocarbons; Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenzo(ah)anthracene. A single elevated sulphate occurrence was found in one of the eleven groundwater samples. Six gas monitoring visits have been undertaken, with a maximum carbon dioxide concentration of 3.8% v/v and a maximum flow of 2.5 l/hr recorded. Evaluation of the 'worst possible' scenario records a gas screening value of 0.0950 l/hr for carbon dioxide.
Ground Contamination and	The chronic health risk posed to site end users by on site sources of contamination via direct contact, ingestion, inhalation is assessed as Moderate/Low in the vicinity of WS05. The remainder of the site can be considered Low risk. Risks to controlled waters have been assessed as Low to Very Low.

Phase 2 Ground Investigation

Ground Gas Assessment	The carbon dioxide gas screening value indicates a Gas Characteristic Situation 2 (CS2) gas regime, requiring CS2 gas protection measures for the proposed new development.
Geotechnical Assessment	It is recommended that shallow foundations could be adopted at the site, founding beneath any topsoil and made ground within the underlying Mercia Mudstone Formation at a minimum depth of 0.90mbgl. Due to the depth of Made Ground in the landscaped area in the north of the site, it is likely that the foundations in that area would have to be placed at depths up to 2.50m below ground level. For the remaining site locations, it is estimated that a strip foundation of 0.60m width founded at 1.00mbgl within the firm Clay would provide an allowable bearing pressure in the region of 130kPa increasing to 200kPa within the stiff Clay which would provide an adequate factor of safety against shear failure and limit settlements to within 25mm. Should greater bearing be required, it may be more economical to adopt a piled foundation solution. CBR testing for the design of hardstanding suggested that a subgrade CBR value of 5% should be adopted for design purposes. Material at the site may be assigned a Design Sulphate Class of DS-1 and the site given an ACEC class of AC-1.
Recommendations	1. This report should be forwarded to the designer to advise foundation and structural design. 2. In the location of the Asbestos detection it is recommended that upon conformation of the development plans, consideration is given to basic remedial measures such as capping by building and hardstanding or clean cover soils. Another option would be to undertake further trial pitting and shallow soil sampling to establish the extent of the impacted soils. 3. The employment of CS2 gas protection measures are recommended for the site. 4. Further investigation should be considered in currently inaccessible areas to further support the structural design. 5. It is recommended this report is forwarded to the relevant local authority environmental officer for comment prior to undertaking further work.

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1.0 Introduction

1.1 Project Background

Curtins were instructed by Newport City Homes to undertake a Phase 2 geo-environmental assessment report for a site at Newport East, Ringland.

The site is centred on NGR 335730, 18882 and covers an area of approximately 3.0ha. A site location plan is presented as *Figure 2.1*.

1.2 Scope of Services

This investigation addresses recommendations as presented in the Phase 1 report (1), with the aim of the Phase 2 works being to characterise geo-environmental conditions prior to redevelopment of the site with new health centre with associated infrastructure.

Specifically, the Phase 2 report is intended to determine:

- a) If there is a risk of the proposed end user being adversely impacted upon by potential contamination in shallow site soils that may be present on the site due to its known current, recent and historical use;
- b) If there is a risk of groundwater and/or surface water being adversely impacted upon by potential contamination that may be present on the site due to its known current, recent and historical use;
- c) If there is a risk to the end user from soil gases including methane, carbon dioxide, carbon monoxide and hydrogen sulphide;
- d) Recommendations for any remedial measures to mitigate any risk to proposed end users and environmental receptors (if applicable);
- e) Recommendations for the design of foundations and building ground floor slabs; and

Consideration of detailed flood risk, ecology and archaeological issues are outside of the scope of this report.

2.0 Phase 1 Preliminary Site Assessment Summary

This section presents a summary of the current site setting, history, geology and hydrogeology/hydrology, as presented in the Curtins Phase 1 report (1). It is not the intention of this report to duplicate the Phase 1, with the information below providing the background information to support the revised post Phase 2 site works Conceptual Site Model (CSM), as presented in *Section 8.0*.

2.1 Current Setting

The site is located within the Ringland estate on the eastern edge of the city of Newport. The site is situated at around 26m AOD and is broadly level. The eastern third of the site consists of open grassland with a single terrace of local authority housing. The western two thirds are dominated by a public courtyard surrounded by retail units with surrounding housing. There is a tower block on the western edge. This part of the site also includes car parking and open grassland some of which is the vacant site of recently demolished housing. A site location plan is shown in Figure 2-1.

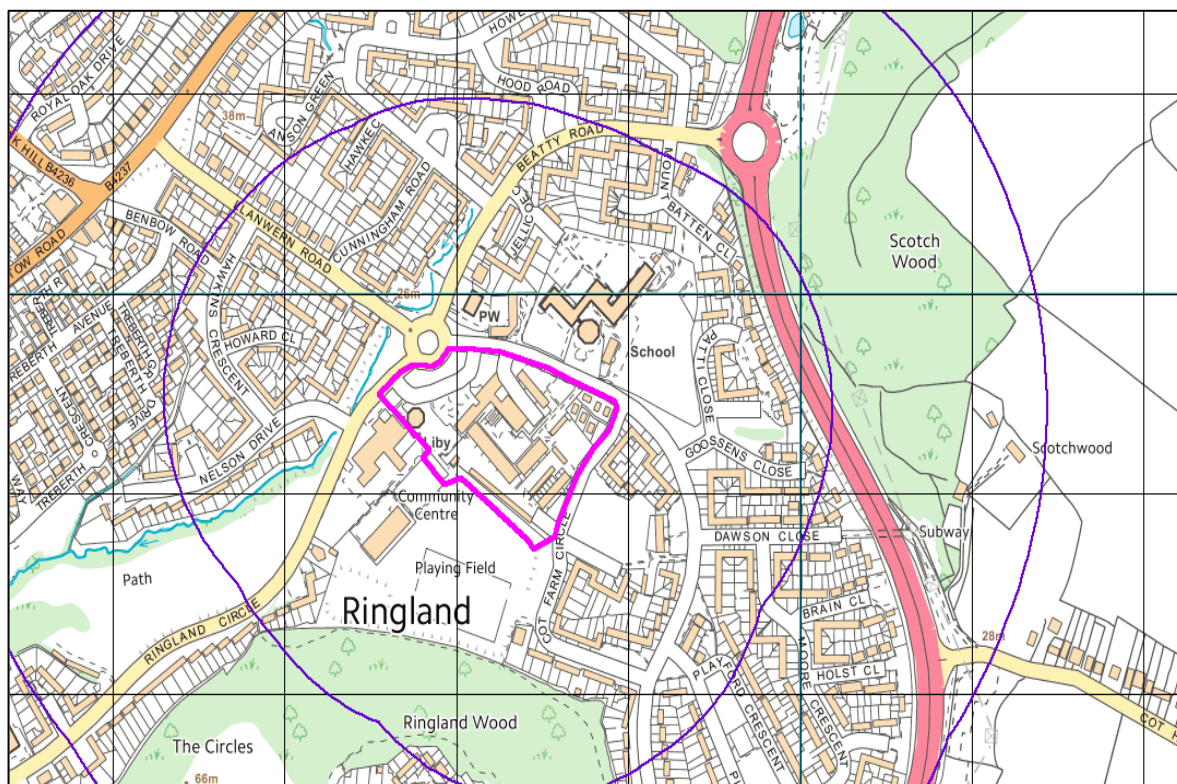


Fig 2.1 – Site Location Plan, site boundary shown in pink
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2.2 Previous Site Use

A review of the available historical mapping information for the site (as presented within Curtins Phase 1 report (1)) has been undertaken with specific reference to potential sources of contamination.

The site was set in open fields and agricultural land until the 1970s when the buildings currently in existence were constructed. There has been some demolition and construction of buildings in the intervening period with two large housing blocks on the site recently (circa 2016) demolished. A garage and possible fuel station occupied the northeast corner of the site and was replaced by six residential bungalows in the 1990's.

2.3 Published Geology

A study of the Envirocheck Report (2) purchased with the Phase 1 (1), British Geological Survey (BGS) borehole records (3) and BGS 1:50,000 mapping (Solid and Superficial Editions) for Newport (Sheet 249) (4) indicates the following geological succession underlying the site:

2.3.1 Made Ground Deposits

Made Ground deposits are not recorded on geological mapping, however given the phases of development on-site with certain areas of the site, it is likely such deposits are present on the development site.

2.3.2 Superficial Deposits

Superficial geology deposits are not recorded at the site.

2.3.3 Bedrock Deposits

Bedrock deposits are present as Mercia Mudstone Group. This unit is described in the BGS lexicon of named units as 'dominantly red, less commonly green-grey, mudstones and subordinate siltstone with thick halite-bearing units in some basinal areas. Thin beds of gypsum/anhydrite widespread; sandstones are also present'.

2.3.4 Mining and Quarrying

The site is not within a coal mining reporting area and there are no BGS recorded mineral sites within 500 m of the site boundary. Therefore, the risk from potential coal mining is considered low.

2.3.5 Other Pertinent Geological Existing Geological Records

The Envirocheck report (2) included within Curtins Phase 1 (1) reporting confirms that there is a low to no hazard from the following ground stability hazards on the site; collapsible, compressible, dissolution, landslide, running sand, and shrinking or swelling clay.

UK Radon Mapping confirms the site is situated in an area where less than 1% of homes are above the radon action level. Where the new development incorporates a basement, further monitoring may be required.

2.4 Hydrogeology and Hydrology

Environment Agency data (5) indicates that the site, corresponding with the underlying bedrock geology, overlies a Secondary B Aquifer. These are;

Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

There are no groundwater abstractions recorded within 500m of the site boundary and the site is not situated within a designated Source Protection Zone (SPZ). Groundwater vulnerability is considered unlikely due to the negligible permeability of the underlying deposits.

The nearest surface water feature is 97m north-west of the site, an inland river positioned north to south-west. There is no water quality data available for this feature.

There are no surface water abstractions recorded within 500m of the site boundary.

There are no discharge consents associated with the site.

The site is not located within an Environment Agency designated flood zone.

2.5 Landfill

There are no current operating or historical landfills located within 250m of the site boundary.

2.6 Unexploded Ordnance (UXO) Risk Assessment

The Curtins Phase 1 (1) reporting assesses the UXO risk to the site as generally **Low**. Regional UXO risk mapping for Monmouthshire (6) records 87 bombs as having been dropped on Newport during the war. Thus, the low risk rating should not be taken to mean that there is no potential for UXO at the site. Bombs were often dropped far from their targets by bombers which were off course or were unloading their bombs.

If any suspicious items are encountered during groundworks the work must cease immediately and a UXO specialist consulted.

2.7 Summary of Phase 1 Preliminary Conceptual Site Model (PCSM)

The Conceptual Site Model (CSM) and Qualitative Risk Assessment (QRA) are presented within Table 2-1 in this section. The CSM details the source-pathway-receptor linkages or potential contaminant linkages (PCL) that have been identified for the site. The QRA details the associated level of risk relating to these potential contaminant linkages. Table 2-1 below shows the primary risks to be quantified as part of the Phase 2 investigation.

Table 2-1: Summary of Phase 1 preliminary conceptual site model

Conceptual Site Model			Qualitative Risk Assessment		
Source	Pathway(s)	Receptor(s)	Consequence(s)	Likelihood of Occurrence	Risk
On-site sources of potential contamination: Made Ground resulting from construction of residential buildings during the 1970s and later demolition	Direct contact, ingestion of soils, and inhalation of vapours/dust	End users of site Site staff, visitors and trespassers	Medium Chronic Health Risk	Low	Low/Moderate
Garage in the northeast of the site, since replaced by housing in the 1990's. Potential contaminants, PAHs, Asbestos and Hydrocarbons within shallow soils.	Vertical and horizontal migration through the Made Ground and residual soils	Controlled waters (Groundwater and Surface Water)	Medium Pollution of sensitive water resources	Unlikely	Low
Off-site sources of potential contamination: Made Ground from construction of surrounding housing estates during the 1970s	Horizontal migration through the shallow soils and air (dust/particulates) Followed by... Direct contact, ingestion, inhalation (dust and vapours)	End users of site Site staff, visitors and trespassers.	Medium Chronic health risk	Unlikely	Low
On and off-site soils with the potential to generate ground gases No significant sources of ground gases have been identified. Made Ground anticipated to be less than 1.0m in thickness.	Vertical and horizontal migration through the residual (incl. Made Ground) and bedrock deposits	End users of site Residents, visitors and trespassers	Severe Acute health risk, e.g. asphyxiation or risk from explosion	Unlikely	Low to Moderate

All other risks such as mining and the associated risks from mining cavities, ground stability issues, and radon gas were deemed to be Low.

3.0 Phase 2 Investigation Scope of Works

The ground investigation fieldworks were undertaken by Ian Farmers Associates in December 2019. A summary of the scope of investigation is summarised in Table 3-1 below.

The scope of the ground investigation was designed in general accordance with current UK guidance including CLR11 (7), British Standard (BS) 10175 (8), BS5930:2010 (9), BSEN1997: Part 2:2007 Eurocode 7 (10) and Curtins SOPs.

Given the Phase 1 identified limited likely on-site source of contamination the sampling positions (boreholes) were generally located in a semi-targeted, systematic array to give adequate and representative coverage of the site accounting for the historical site use, proposed end use and the immediate environmental setting.

Window sample boreholes were undertaken in the northeast of the site in the location of the former garage although full access was restricted by the current residential housing.

Some exploratory holes were targeted in the footprint of former buildings on the site, specifically the landscape areas to the north and east of the site which were formerly occupied by residential blocks.

Table 3-1: Scope and Rationale of Fieldwork Undertaken

Exploratory Hole Type	Exploratory Hole Reference	Exploratory Hole Depth (m bgl)	Rationale
Window Sample Boreholes	BH03 (WS), WS01 to WS06, WS08, WS09, WS09A and WS10 to WS17	0.30 – 4.45	<i>Confirm ground conditions. Collect soil and water samples for chemical and geotechnical analysis. Undertake in-situ testing Gas and groundwater monitoring Determine geotechnical parameters</i>
Dynamic Sampling/Rotary Boreholes	BH01, BH02, BH05, BH06	15.14-15.50	<i>Confirm ground conditions. Collect soil and water samples for chemical and geotechnical analysis. Undertake in-situ testing Gas and groundwater monitoring Determine geotechnical parameters</i>
Machine excavated trial pits	TP03, TP04 and TP05	2.60-2.90	<i>Confirm ground conditions. Buried structures Collect soil and water samples for chemical and geotechnical analysis. Undertake in-situ testing Determine geotechnical parameters</i>

Soakaway Tests	SA01 and SA04	1.40 -1.80	<i>Establish drainage characteristics</i>
<i>In Situ CBRs</i>	CBR1 – CBR4	-	<i>To determine thickness of materials needed for proposed road / hardstanding construction to determine bearing capacity for the purposes of hardstanding design.</i>
<i>Opening up Works/ dynamic probing</i>	Ouw locations 1-8/DCP01	-	<i>Observe structural elements of buildings.</i>

An exploratory hole plan is included within Appendix A. Hole locations were subject to access, existing infrastructure, services and variables such as parked cars.

The site was in use by the public at the time of the investigation including occupation by a contractors compound for an adjacent housing project which prevented investigation to the landscape area in the east of the site which was formerly occupied by a residential block.

BH03 could not be undertaken due to restricted access and was replaced by a shallower window sample borehole BH03 (WS).

3.1 Soil Logging and Sampling

Exploratory hole arisings were logged on site by an Ian Farmers' Engineer in accordance with the requirements of BS5930 (9), including recording observed visual and olfactory indications of contamination. Copies of the exploratory hole logs are provided in Appendix B.

Representative soil samples were selected for laboratory chemical analysis, based on field observations and to provide a characterisation of the Made Ground and natural strata encountered.

Selected soil samples were placed in laboratory provided containers and stored in cool boxes prior to being transported to the nominated laboratory under the laboratory's chain of custody documentation.

A selection of samples was scheduled for environmental testing at a nominated laboratory by Curtins. The laboratory selected by Curtins for chemical analysis was Envirolab a UKAS and MCerts accredited laboratory.

3.2 In-Situ Tests

A programme of *in-situ* testing was undertaken in order to develop the preliminary ground model for the site and determine geotechnical properties of the strata revealed. In-situ testing was undertaken as detailed in Table 3-2 below.

Table 3-2: Programme of In-Situ Testing

Activity	Rationale
SPT tests within window sample boreholes	Assess relative density or consistency of various strata
CBR Testing	Advise hardstanding design
Soakaway Testing	Advise drainage design

3.3 Monitoring Well Installations

Gas and groundwater monitoring installations (50 mm OD) were installed within three boreholes and eight window sample boreholes (30 mm OD) as detailed in the table below. A bentonite seal was placed above the screened section of the borehole (and below where relevant) to minimise potential for downward migration of contaminants and the creation of a preferential migratory pathway. A gravel surround was installed in the annulus between the sides of the borehole and the slotted sections of pipe. A summary of the response zones is presented in Table 3-3 below.

Table 3.3 - Monitoring Well Response Zones

Borehole Reference	Response Zone(s) (m bgl)	Strata Description(s)
BH02	1.50-15.00	Mercia Mudstone Group
BH05	1.50-15.00	Mercia Mudstone Group
BH06	1.20-15.15	Mercia Mudstone Group
WS04	0.50 – 2.00	Mercia Mudstone Group
WS05	1.00-4.15	Made Ground/Mercia Mudstone Group
WS06	1.00-4.15	Made Ground/Mercia Mudstone Group
WS09A	1.00-3.45	Mercia Mudstone Group
WS14	1.00-2.35	Mercia Mudstone Group
WS15	1.00-2.80	Mercia Mudstone Group
WS16	1.00-4.00	Mercia Mudstone Group
WS17	1.00-3.00	Mercia Mudstone Group

Copies of borehole logs can be referred to in Appendix B of this report.

3.4 Post-Investigation Monitoring

3.4.1 Ground Gas Monitoring

A total of 6 No. gas monitoring visits between 19th December 2019 and 2nd March 2020 have been carried out to assess ground gas conditions as recommended in the Preliminary Conceptual Site Model in the Phase 1 Preliminary Site Assessment (1).

3.4.2 Groundwater Sampling

One set of groundwater samples has been obtained from the pipework installed boreholes with chemical testing subsequently undertaken on the retrieved groundwater samples.

4.0 Laboratory Analysis

Representative soil samples were selected for laboratory chemical analysis, based on field observations and to provide a characterisation of the Made Ground and natural strata encountered. Selected soil samples were placed in laboratory provided containers and stored in cool boxes prior to being transported to the nominated laboratory under the laboratory's chain of custody documentation. The laboratory selected by Curtins for chemical analysis was Envirolab a UKAS and MCERTS accredited laboratory.

4.1 Soil Analysis

The contaminants of concern potentially present on the site were considered to include, amongst others; organic matter, ash and fill, hydrocarbons (e.g. fuel/oils), heavy metals and asbestos the extent of which is captured by the broad environmental testing suite listed in Table 4-1 below.

Table 4-1 : Environmental Chemistry Analysis Suite: Soils

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen, pH and Soil Organic Matter (SOM)	-
	Arsenic, Chromium, Copper, Lead, Zinc, Nickel	1 mg/kg
	Boron (water soluble)	1 mg/kg
	Chromium VI, Selenium	1 mg/kg
	Cadmium	0.5 mg/kg
	Zinc	5 mg/kg
	Mercury	0.17 mg/kg
	Cyanide (total)	1 mg/kg
	Sulphide	5 mg/kg
	Sulphur (elemental)	5 mg/kg
	Phenols (total by HPLC)	0.2 mg/kg
	Sulphate (water soluble)	0.01 g/l
	Sulphate (acid soluble)	200 mg/kg
	PAHs (USEPA 16)	0.01 – 0.08 mg/kg
	TPH (Aro/Alk Split)	0.01 to 1 mg/kg
	BTEX, MTBE	0.01 mg/kg

Samples were taken from the topsoil, Made Ground and natural deposits.

Copies of the environmental chemistry testing certificates are presented in Appendix C.

4.2 Groundwater Analysis

Groundwater samples underwent a range of environmental testing, with the analysis presented in Table 4-2 below. Copies of the environmental testing certificates are presented Appendix C of this report.

Table 4-2: Environmental chemistry analysis suite: groundwater

Analysis	(LOD)
pH	N/A
Hardness	2 mg/l CaCO ₃
DOC	0.2mg/l
Arsenic	1 µg/l
Boron	10 µg/l
Cadmium	0.2 µg/l
Chromium	1.0 µg/l
Copper	1 µg/l
Lead	1.0 µg/l
Mercury	0.1 µg/l
Nickel	1.0 µg/l
Selenium	1.0 µg/l
Zinc	1 µg/l
Cyanide (total)	0.005 mg/l
Phenols (total by HPLC)	0.01 mg/l
Sulphide	0.1 mg/l
Sulphate	1.0 mg/l
TPH (Aro/Alk Split)	1 – 10 µg/l
Speciated PAHs	0.10 µg/l
BTEX	1 µg/l
MTBE	1 µg/l

4.3 QA/QC

The sulphide samples exceeded the recommended holding time between sampling and testing. On review it is not considered sulphide poses a significant risk to human health and the results should not affect the overall assessment.

One sample of VPH/BTEX was not provided in a separate container, however a sample was obtained from the larger sample set. This single occurrence is unlikely to affect the overall assessment.

4.4 Geotechnical Analysis

Soil samples for testing were prepared in accordance with BS1377: Part One: 1990 (11) and representative sub-samples were taken for testing. The following tests were carried out:

- 22 No. Moisture contents
- 14 No. Plasticity indices
- 4 No. Particle size distributions by wet sieving
- 5 No. Sulphate contents – water soluble
- 12 No. Point Load Determination
- 1 No. Uniaxial Compressive Strength

- 5 No. pH values
- 1 No. Total Sulphur
- 1 No. Total Sulphate

Copies of the geotechnical testing certificates are presented in Appendix D.

5.0 Encountered Ground Conditions

5.1 General

A summary of the ground conditions encountered during the ground investigation works is presented in Table 5-1 below, with detailed information presented in the exploratory hole logs included in Appendix B and a summary of each strata presented in subsequent sections.

Table 5.1: Summary of Ground Conditions Encountered

Stratum	Depth to top of strata m bgl	Thickness (m)		Description
		Min	Max	
MADE GROUND	0.00	0.00	2.30	Topsoil and firm red brown sandy gravelly clay, asphalt over gravel and cobbles, paving slabs over concrete and brick work, gravel, crushed concrete and brick rubble.
MERCIA MUDSTONE GROUP	0.20 – 2.30	At least 15*		Recovered as firm to very stiff CLAY. At greater depths recovered as MUDSTONE.

* Thickness not proved

5.2 Made Ground

Made ground was encountered to depths between 0.20m and 1.00m in the majority of the boreholes and trial pits.

However, made ground was encountered at depths up to 1.50m in WS05 & TP05 and to 2.30m and 2.20m respectively in TP03 & TP04. The deeper made ground appeared to be located in the landscaped area in the north of the site which was formerly occupied by a residential block demolished around 2016 and accordingly the made ground in this location appeared to consist of demolition material and could be infilled basements or foundations.

The made ground generally consisted of; topsoil, firm red brown sandy gravelly clay, asphalt over gravel and cobbles, paving slabs over concrete and brick work, gravel, crushed concrete and brick rubble.

Topsoil was encountered to 0.30m on the landscape area in BH02.

5.3 Superficial Deposits

Geological mapping indicates that no superficial deposits are recorded to be present at the site. However, clay was encountered beneath the topsoil and Made Ground in most locations across the site, which is considered to represent residual soils this clay is considered to be of the weathered Mercia Mudstone Group.

5.4 Bedrock Deposits

Below the made ground Mercia Mudstone was encountered which generally consisted of firm becoming very stiff red brown slightly gravelly clay which was encountered to the full depths of BH03(W), WS09A, WS17, TP03 and TP04 at between 1.91m and 3.45m below ground level. This is considered to be completely weathered Mercia Mudstone Grade IVb.

The firm becoming very stiff red brown slightly gravelly clay was encountered to between 1.00m and 3.40m in the remaining boreholes and trial pits with an average depth of 2.29m. However, these residual clay soils were absent in BH01, BH02, WS02, SA01 and TP05 where mudstone gravel was encountered beneath the topsoil and made ground which is considered to be the top of the partially weathered Grade II Mercia Mudstone.

The Grade II mudstone was encountered to the full depths of WS01 to WS06, WS08, WS10, WS12 to WS16, SA01, SA04 and TP05 at between 0.65m and 4.15m below ground level. The Grade II Mercia Mudstone was encountered to the full depths of the BH01, BH02, BH05 and BH06 at approximately 15m below ground level.

5.5 Obstructions Encountered

Exploratory Hole WS09 was terminated at 0.30mbgl due to the presence of a possible service. The hole was moved and re-drilled as WS09A.

Although not encountered during the ground investigation, there is the possibility of remnant foundation structures in the landscape areas in the north and east of the site which were formerly occupied by residential blocks.

5.6 Observed Potential Contamination

While Made Ground containing anthropogenic materials typical of human occupation such as clinker slag and ash were encountered in the majority of exploratory holes, no obvious signs of gross contamination were noted.

It's possible that contamination or buried structures exist on the site that were not encountered during the ground investigation. If such occurrences are encountered or suspected, the environmental consultant should be contacted for further advice.

5.7 Groundwater

During drilling, groundwater was encountered at depths of 11.97m, 2.37m and 7.37m in BH01, BH02 and BH06 respectively. Groundwater was not encountered in BH5.

During drilling, groundwater was encountered at between 0.40m and 2.30m in WS13 to WS17 SA04, TP03, TP04 and TP05 and appeared to be standing in the bottom of the made ground in the majority of cases.

Ground water was also encountered at 0.40m in BH03(W.S) but this was likely to be surface water.

A summary of the subsequent groundwater monitoring levels are given in Table 5-2 below. Full details of the water levels recorded during the monitoring visits are presented in Appendix B.

Table 5-2: Groundwater Levels

Exploratory Hole Location Ref.	Installation Strata	Monitored Water Levels	
		Base of Pipe (m bgl)	Depth (m bgl)
BH02	Mercia Mudstone Group	14.48	1.79-2.42
BH05	Mercia Mudstone Group	15.35	0.75-1.20
BH06	Mercia Mudstone Group	15.10	1.62-2.24
WS04	Made Ground/Mercia Mudstone Group	1.85	0.42-0.46
WS05	Made Ground/Mercia Mudstone Group	3.95	0.86-1.58
WS06	Mercia Mudstone Group	4.40	1.36-2.05
WS09A	Mercia Mudstone Group	3.37	1.36-2.48
WS14	Mercia Mudstone Group	1.85	0.55-1.25
WS15	Mercia Mudstone Group	3.05	0.55-1.01
WS16	Mercia Mudstone Group	4.26	1.43-2.28
WS17	Mercia Mudstone Group	3.30	0.25-0.40

Groundwater levels are expected to vary seasonally and with weather conditions.

5.8 Structural Inspection Work

Opening up works were undertaken to reveal the structural details of selected existing buildings and structures.

The works generally involved:

- Remove paving slabs and undertake dynamic probe drilling to retained soil to contact base of the retaining wall to establish top of concrete level to retaining wall heel. Probing to continue at regular intervals away from building perimeter to establish lateral extent of retaining wall heel.
- Lift paving slabs and undertake trial pits to establish foundation extents as well as detail to head of retaining wall and presence of concrete slab or otherwise to underside of paving.

- Remove bricks to verify wall construction and confirm presence or otherwise of basement to rear side of wall.

The work involved hand digging eight inspection locations, with a ninth location subject to dynamic probing.

A detailed interpretation of the findings is beyond the scope of this report, however the factual information including inspection locations, dynamic probe logs and photographs are provided in Appendix F.

6.0 Ground and Groundwater Contamination Assessment

This section of the report includes the assessment of the potential contamination, solid, liquid and gas, identified on the subject site which may present a risk to the proposed end users, associated utilities and the wider environment.

In guidance published by the Environment Agency, the risk to human health or controlled waters is determined through an assessment of pollutant linkages between a source of contamination (within the ground or groundwater either on or off site) and a sensitive receptor such as end users of the site, building materials, edible plants grown in gardens or groundwater abstracted for drinking. This is termed a source-pathway-receptor relationship. The same model is applied to the assessment of risk arising from ground gases as detailed within BS8576:2013 (13).

These models have a common approach, which is one of a tiered assessment. At each stage of the assessment further detail can be applied to the conceptual site model to provide a detailed interpretation on a site by site basis. As part of the planning process this approach is adopted to establish either if the site is 'suitable for use' or whether additional work or else remedial work is required for the site to be deemed so.

The sub-sections hereafter therefore incorporate the first tier (Tier 1) of this approach otherwise referred to as the Generic Quantitative Risk Assessment (GQRA). The GQRA builds on the qualitative risk assessment presented in the Phase 1 Desk Study in conjunction with observations made during the ground investigation and is based solely on the results of the chemical and other testing data obtained as part of Curtins ground investigation. The GQRA is used to build/refine the Conceptual Site Model (CSM) for the site as detailed and presented in *Section 8.0* of this report.

The following sections present more detail on the risk assessment methodology rationale for the main receptors.

6.1 Human Health GQRA

Detailed guidance on human health risk assessment is available within several documents, published by both the Environment Agency and Defra. Guidance includes Contaminated Land Exposure Assessment (CLEA) v1.071 model (14), Report SC050021/SR2: Human Health Toxicological Assessment of Contaminants in Soil (15) and Report SC059921/SR3: Updated Technical Background to the CLEA Model (16).

A generic quantitative risk assessment (GQRA) has been carried out for the Potential Contaminant Linkages (PCLs) investigated by screening of soil contamination data against relevant Generic Assessment Criteria (GAC) where available, including:

- i) **Soil Guideline Values (SGVs):** These have been published by the Environment Agency and are trigger values for screening out low risk areas of land contamination. SGV's give an indication of representative average concentrations of chemicals in soil, below which long-term

health risks are likely to be minimal. SGVs have been published for several contaminants including arsenic, cadmium, mercury, nickel, selenium, BTEX, phenols and dioxins, furans and dioxin-like PCB substances for land uses including residential, allotments and commercial. The SGVs have been developed for a sandy loam soil with 1% soil organic matter (SOM) content;

- ii) **Supplementary Screening Values (SSVs):** In addition to the SGVs developed by the EA, other third-party organisations have derived SSVs for a wider range of contaminants and land uses using the CLEA Model. Curtins have adopted these numbers where applicable, including those developed by Atkins AtriskSoil™, the LQM/CIEH Suitable for Use Levels (S4UL) and EIC/AGS/CL:AIRE published thresholds;
- iii) **Category 4 Screening Levels (C4SLs):** In March 2014 Defra published C4SLs for arsenic, benzene, benzo(a)pyrene, cadmium, hexavalent chromium and lead. These values were derived to support the revised Part 2A Statutory Guidance issued in 2012 (17) in which four categories of contaminated land are included, ranging from Category 1 (significant/high risk) to Category 4 (low risk). C4SLs are not representative of significant possibility of significant harm (SPoSH) and are low risk levels which, and therefore where the C4SLs are not exceeded, land can be demonstrated to be in Category 4 and cannot be determined as contaminated land.

6.1.1 Adopted Soil Human Health GACs Screening Methodology

The proposed site use is mostly noted as residential with associated infrastructure potentially with some soft landscaping; it is anticipated the apartments will have communal landscape areas and the housing private gardens. Private gardens are most analogous with a *residential with home grown produce* end-use scenario and so assessment has been undertaken against the following GACs, in order of preference:

1. Environment Agency Soil Guideline Values,
2. CL:AIRE, AGS, EIC. Soil Generic Assessment Criteria for Human Health Risk Assessments,
3. LQM/CIEH 2015 S4ULs for Human Health Risk Assessment, and
4. DEFRA Category 4 Screening Levels.

The soil organic matter (SOM) content has an influence on the volatilisation of organic contaminants (i.e. the higher the SOM, the lower the volatilisation rate and therefore inhalation exposure risk). Soil organic matter (SOM) values for the site soils ranged significantly from 0.5% to 10.8%. The high organic content encountered in several soils is representative of organic rich topsoil and/or Made Ground features.

A comparison against Tier 1 thresholds for a conservative SOM of 1.0% for a *residential* end use has been adopted for both Made Ground and natural soil features.

The adopted GAC's are listed in Appendix E.

Many of the exposure pathways considered in the CLEA model assume that the adult or child is in contact with the contaminated ground or that such contamination is easily mobilised from the surface. (Updated technical background to the CLEA model - SC050021/SR3 (16)).

6.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results

The results of the environmental testing can be referred to in Appendix C.

The soils generally showed very low levels of contaminants from the 25 soil samples taken from across the site. With respect to the proposed end use of the site, the exceedances in table 6.1 below were noted within recovered soil samples.

Table 6-1 – Soil Exceedances for a Residential End Use

Exploratory Hole ID	Depth (m bgl)	Stratum	Determinant	Concentration (Mg/Kg)	GAC (mg/kg)
WS05	0.40	Made Ground	Asbestos (Chrysotile)	<0.001%	NA
WS09	0.20	Made Ground	Benzo(a)pyrene Benzo(b)fluoranthene Dibenzo(ah)anthracene	9.09 14.10 1.77	2.20 2.60 0.24

Selected soil samples were screened for asbestos, and as detailed in Table 6-1 above, asbestos containing materials (ACMs), described as Chrysotile (loose fibres) was identified in WS05 at 0.4 m bgl and quantification analysis recorded <0.001% w/w.

Three exceedances of Polyaromatic Hydrocarbons (PAH) were noted in WS09 at 0.20m.

No other contaminant of concern analysed was detected above the adopted Tier I assessment criteria. The above results indicate that the majority of soils at site are not considered to be contaminated with respect to the proposed end use of the site.

6.2 Controlled Waters - GQRA

A model for assessing the potential for pollution of controlled waters and for deriving a safe concentration in ground and groundwater is the Environment Agency's publication "Remedial Targets Methodology - Hydrogeological Risk Assessment for Land Contamination (18).

In relation to the standards for controlled waters, there are currently no generic groundwater standards or surface water standards that are necessarily applicable to all sites. However, dependant on the receptor identified as being at risk, see *Section 6.0*, the UK Drinking Water Standards (19), Surface Water (Abstraction for Drinking Water) and/or Water Framework Directive Water Quality Standards (WFD WQS) can be utilised as primary screening values in a Level 1 assessment. These can also be

supplemented by World Health Organisation (WHO) guidelines where WFD or DWS water quality standards (WQS) do not exist.

6.2.1 Generic Assessment Criteria Screening of Groundwater Laboratory Results

The controlled waters GQRA has been designed to assess the risks posed to any identified controlled waters receptors; the site is underlain by a Secondary B aquifer in the Mercia Mudstone bedrock deposits. Post siteworks monitoring revealed the presence of groundwater as detailed in Section 5.7.

There are no groundwater abstractions recorded within 500m of the site boundary and the site is not situated within a designated Source Protection Zone (SPZ). Groundwater vulnerability is not considered to be an issue due to the negligible permeability of the underlying deposits.

However, due to groundwater being encountered in several boreholes, groundwater is considered the most sensitive receptor and as a result, Drinking Water Standards (DWS) (20) have been utilised for this assessment.

The adopted screening values are listed in Appendix E.

A single groundwater sample was retrieved from both BH01 and BH02 and scheduled for testing as discussed in Section 6.2 above.

The chemical test results of screening the 11 groundwater samples compared against DWS values (20) identified elevations in the following determinands above the adopted thresholds, these are detailed in Table 6.2 below:

Table 6.2 – Groundwater Exceedances

Exploratory Hole ID	Depth (m bgl)	Stratum	Determinant	Concentration (mg/l)	DWS (mg/l)
WS04	-	Mercia Mudstone	Sulphate	641	250

6.3 Discussion of Potential Risk – Human Health

6.3.1 Risks to End Users – Ingestion/Dermal Contact of Soils

With only one exceedance of residential GAC's for PAH's and only a single Asbestos detection recorded in the shallow site soils and based on the proposed development currently to comprise residential housing and landscaping, it is considered a possible pollutant linkage exists.

No exceedances were recorded for volatile contaminants (i.e. TPH, VOCs and SVOCs) within the Made Ground and natural soils as part of the Tier 1 screening suggesting vapour sources are unlikely to represent a significant risk.

6.3.2 Asbestos

A total of 21 No. samples obtained as part of the investigation were submitted for Asbestos presence and screening; Within a single sample (WS05 at 0.30 m bgl.) Asbestos described as Chrysotile and loose fibres was detected, further quantification testing to determine the percentage weight of Asbestos was conducted and recorded Asbestos quantification of <0.001%.

Based on the quantification results, Asbestos at the level recorded is not considered to pose a significant risk to site users; however, remedial works around WS05 are recommended which could include removal or capping of the affected Made Ground around WS05 either with hardstanding or 'clean' capping soils.

6.3.3 Poly Aromatic Hydrocarbons

One sample from WS09 at 0.40m showed exceedance of the Poly Aromatic Hydrocarbons Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenzo(ah)anthracene.

The exceedance appears isolated when compared to the generally very low levels encountered in the site soils and is most likely limited in its extent and may be the result of asphalt fragments in the sample.

It is not considered the single isolated exceedance would pose a significant risk to human health or the environment.

6.4 Discussion of Potential Risk - Controlled Waters

Overall the groundwater shows very low levels of contaminants.

The risk to the underlying Secondary B Aquifer is considered to be low owing to the fact that only residual amounts of mobile contamination in soils samples were detected on site and only one minor exceedance was noted in the groundwater samples tested. Furthermore, soakaway testing conducted on the site also confirmed the bedrock deposits are highly impermeable which likely limits the movement of any contaminants. There are no groundwater abstractions within close proximity to the site, nor does the site pose a risk to any source protection zones for potable groundwater.

On this basis, no further investigation/assessment or specific remedial action is recommended.

6.6 Materials Management

6.5.1 Re-use of Site Soils

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

The re-use of site-won soils may therefore be undertaken if the following principles are met: i) the geotechnical suitability of the material needs to be confirmed; ii) the re-use of the material needs to be covered as part of the planning approval, e.g. site levels maintained within agreed limits; iii) the volume of the material being re-used needs to be confirmed and traceable and iv) regulatory approval from the relevant authorities has been sought. These principles are outlined within the CL;AIRE Definition of Waste Code of Practice (v2) (21) and if and where the re-use of site-won soils is proposed as part of the development works it is recommended that a Materials Management Plan is produced in line with the Definition of Waste Code of Practice to detail and document the process.

7.0 Ground Gas Assessment

The assessment of risk presented by ground gases is assessed with reference to guidance published by CIRIA (Assessing Risks Posed by Hazardous Ground Gases to Buildings, C665 (21), BSI Publication (Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings BS8485:2015 (22) and other broadly accepted references such as the Ground Gas Handbook 2009 (23).

The gas risk assessment adopts a tiered approach. In the first instance, this involves a re-evaluation of the Conceptual Site Model described within the Phase 1 Preliminary Site Assessment (1) and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

7.1 Land Gas Monitoring Results

To characterise the site's ground gas regime and validate the qualitative assessment of ground gas risk standpipe installations were incorporated within the cable percussive borehole location and within three of the window sample locations as detailed in *Section 3.0*.

A total of six gas monitoring visits were carried out between 19th December 2019 and 2nd March 2020 With barometric pressure recorded between 995 and 1042 mb. The results log sheets are contained within Appendix B and summarised in Table 7-1 below:

Table 7-1 - Summary of Ground Gas Monitoring Results

Exploratory Hole ID	Maximum Methane Concentration (%)	Maximum Steady Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum gas flow (l/hr)
BH02	0.0	2.3	14.8	2.5 (-4.7)
BH05	0.0	1.7	10.9	1.1 (-1.8)
BH06	0.0	3.8	3.3	0.1 (-0.1)
WS04	0.0	0.1	20.1	0.2
WS05	0.0	2.7	8.3	0.3
WS06	0.0	3.5	8.3	1.2
WS09	0.0	3.3	9.0	0.3
WS14	0.0	2.1	13.4	0.4
WS15	0.0	1.0	19.5	0.0
WS16	0.0	0.2	19.9	0.2
WS17	0.0	0.4	17.9	1.5

Methane (CH₄) and hydrogen sulphide (H₂S) were recorded below the instrument's detection limit within all the monitoring wells throughout the monitoring period.

Occasional trace amounts of carbon monoxide (CO) between 1 and 2ppm were recorded and can likely be attributed to vehicles and combustion engines.

Carbon Dioxide was recorded in steady flow concentrations between 0.1% and 3.8%. Maximum positive gas flow was recorded as 2.5 litres/hour in BH02.

Some negative flows were recorded and may be attributed to vacuum effects and atmospheric pressure on the boreholes.

7.2 Land Gas Assessment

The Conceptual Site Model presented within the Phase I Preliminary Site Assessment identified possible Made Ground deposits as a potential source of Ground Gas generation both on-site and off-site resulting from historical development and land use. The report suggests no records of organic rich drift deposits (e.g. peat) being present. Additionally, coal deposits are noted to not underlie the site. Noxious and asphyxiate gases were attributed to include, but not limited to, carbon dioxide, carbon monoxide, methane and hydrogen sulphide. The consequence was evaluated as Moderate/Low risk.

Made Ground soils were encountered to depths of up to 2.30 m bgl but with limited putrescible content generally. The ground investigation revealed a ground model generally consistent with the preliminary conceptual site model. Natural deposits were generally clay thought to represent a residual soil derived from the underlying Mercia Mudstone Group.

Consideration of the recorded soil gas flow rates, presented above, enables hazardous gas flow rates to be evaluated. Q_{hg} can be derived for both 'representative' and 'worst possible' scenarios and a comparison made in support of an appropriate assessment of ground gas risk. For a 'representative' scenario steady state flow rates are adopted, whilst for a 'worst possible' scenario peak flows are adopted.

Evaluation of the 'representative' scenario (highest hazardous gas flow rate that is realistically possible, i.e. in a single borehole) records a maximum Q_{hg} of 0.0575 l/hr for carbon dioxide.

Evaluation of the 'worst possible' scenario (highest Q_{hg} across the entire dataset irrespective of location and discrete monitoring events) records a maximum Q_{hg} of 0.0950 l/hr for carbon dioxide.

Therefore, the worst possible scenario has been adopted as the sites Gas Screening Value (GSV) and in accordance with an assessment by CIRIA C665 the GSV indicates a Characteristic Situation 2 (CS2) gas regime requiring basic gas protection measures.

The potential risks from ground gases to the excavations are to be dealt with by the Contractor, in accordance with the Confined Space Regulations, during construction. Appropriate ground gas monitoring and safety measures should be in place during the works, as the potential presence of ground gases could pose a risk in any confined spaces of deep excavations.

8.0 Revised Conceptual Site Model

The Preliminary Conceptual Site Model (PCSM) presented in the Phase 1 report and discussed in *Section 2.7* of this report has been revised following the GQRA in *Section 6.0* above. The Revised Conceptual Site Model (CSM) is summarised in the table overleaf.

The CSM details the source-pathway-receptor linkages or potential pollutant linkages (PPL) that have been identified as relevant for the site. The GQRA details the associated level of risk relating to these potential pollutant linkages.

The CSM follows the framework outlined within CIRIA C552 (24) which is summarised within Appendix G.

The 'risk rating' within the CSM refers to the risk that the source, pathway, receptor linkage or PPL is complete. Unless specifically stated it does not necessarily refer to an immediate risk and is intended to be used as a tool to assess the necessity for further assessment/investigation.

Risks presented by Unexploded Ordnance are discussed and assessed in *Section 2.6*.

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations, 2015 (25) which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk. It has been assumed that any future construction works on site will be undertaken in compliance with these requirements and therefore construction workers involved in the building works at the site have been discounted as a human receptor in the conceptual site model. Reference should be given to the environmental testing results discussed within *Section 6.0* and presented within the appendices.

Qualitative Risk
AssessmentGeneric
Quantitative Risk
AssessmentDetailed
Quantitative Risk
Assessment or;
Remedial Action

- The table below represents the Second stage in the land quality risk assessment process; the Revised Conceptual Site Model following the Quantitative Risk Assessment.
- For a development site to be deemed 'suitable for use' the level of risk needs to be brought down to acceptable levels, i.e. low to very low risk. The purpose of each stage of risk assessment is ultimately to establish if there is a requirement for additional levels of assessment to be made to have sufficient confidence to support a risk characterisation or management decision, e.g. remedial action.

Conceptual Site Model			Qualitative Risk Assessment			Recommended Actions
Source	Pathway(s)	Receptor(s)	Consequence (with explanations, if applicable)	Likelihood of Occurrence (with explanations if applicable)	Risk Rating	
On-site sources of potential contamination: Asbestos within Made Ground around WS05 PAH around WS09	Direct contact, ingestion, inhalation (dust and vapours)	Site end users Residents and visitors	Medium Chronic health risk	Low Likelihood Low levels of contaminants are recorded on site, with only a single Asbestos and PAH detection.	Moderate/Low	Remedial action around WS05 and WS09 if proposed for development
	Vertical migration through the weathered bedrock (soils) May occur due to processes including; capillary action, burrowing animals inducing soil mixing and downwards into the natural deposits through infiltration.	Water Environment Underlying bedrock is classified as a Secondary B Aquifer and is classified as a non-aquifer from the perspective of groundwater vulnerability.	Mild Pollution of non-sensitive water resources	Unlikely There is limited mobile contamination on site and the underlying aquifer is classified as being of low vulnerability. Low permeability clay deposits encountered on site.	Very Low	No further action required.
	Horizontal migration through preferential pathways in the underlying bedrock May occur due to the influence of perched or natural groundwater flow patterns and natural or man-made high permeability zones, e.g. fractures or drainage runs.	Water Environment Nearest surface water is an unnamed stream 23m to the north west of the site.	Mild Pollution of non sensitive water resources	Unlikely There is limited mobile contamination on site. The near surface deposits comprise relatively impermeable clays.	Very Low	No further action required.
Off-site sources of potential contamination: Made Ground	Horizontal migration through the superficial deposits and air (dust/particulates) Followed by... Direct contact, ingestion, inhalation (dust and vapours)	Site end users Residents and visitors	Medium Chronic health risk	Unlikely There are limited sources of mobile contamination noted in the surrounding area	Low	No further action required.
On and off-site soils with the potential to generate ground gases	Vertical and horizontal migration through the made ground and bedrock deposits	Site end users Residents and visitors	Severe Chronic health risk	Low Based upon gas monitoring undertaken at the site the site is indicated to be a CS2 gas regime.	Moderate	Use of gas protection measures to mitigate a CS2 situation.

8.1 Summary of Significant Pollutant Linkages

The chronic health risk posed to site end users by on site sources of contamination via direct contact, ingestion, inhalation is assessed as **Moderate/Low**. The only potential pollution linkage recorded is Asbestos in the Made Ground around WS05.

The potential for on and offsite soils to generate ground gases is **Moderate** due to elevated Carbon Dioxide levels and gas flows across the site.

9.0 Engineering Assessment and Recommendations

9.1 Introduction

This section will assess the relevant geotechnical issues for the proposed commercial development. The proposed development plan is not currently available to Curtins. The engineering assessment considers foundation design, ground floor slabs, pavement assessment, excavations and aggressive ground conditions for the site. Structural details and loadings have not yet been provided and therefore the following recommendations fall outside of the Eurocode 7 guidance. It should be noted that details may change in the development of designs beyond the issue of this Phase 2 Report and the Construction designer should satisfy themselves regarding the adequacy of their design and proposed approach to construction by reference to the on-going project design proposals, the ground investigation information and their own examination of the site.

9.2 Summary of Ground Conditions

The ground conditions at the site generally comprised a nominal thickness of Made Ground/Topsoil overlying the Mercia Mudstone which was mainly recovered as firm becoming very stiff red brown slightly gravelly CLAY at shallow depths.

Work undertaken by Stroud, determined a relationship between SPT 'N' values and the undrained shear strengths of many clays and soft rocks.

The relationship was of the form:

- $c_u = F1 \times N$
- $mv = 1/(F2 \times N)$
- c_u = Undrained shear strength
- mv = Coefficient of compressibility
- $F1$ and $F2$ = Factors

It was determined by Stroud that $F1$ varied between 4kPa for material of high plasticity and 6kPa for material of low plasticity. Similarly, $F2$ varied between 400kPa and 600kPa.

It is considered that for the Mercia Mudstone encountered on this site a value of $F1 = 5\text{kPa}$ and $F2 = 500\text{kPa}$ would be appropriate.

Standard Penetration Tests were undertaken and where full penetration was achieved, recorded 'N' values of between 11 and 54, with an average of 26, which when using the correlations and relationships indicated in paragraph 7.3 above suggests c_u values of between 55kPa and 250kPa, averaging 130kPa

The Standard Penetration Test blows per 300mm in the mudstone varied from 25 to greater than 50 but were generally 50 or greater. The presumed bearing value for Grade II Mercia Mudstone is between 500kPa and 750Kpa from BS8004.

Only one uniaxial compressive strength (UCS) could be carried out as the other samples scheduled were too fractured. The results indicated a strength of 12200kPa. The point load test results varied between 20kPa and 446kPa with an average of 153kPa. Applying a conservative conversion factor of 22 to estimate UCS from point load tests a minimum strength of 440kPa may be obtained

Groundwater was encountered during subsequent monitoring at levels ranging from 0.25 to 2.48mbgl.

9.3 Volume Change Potential

Laboratory testing for the Mercia Mudstone Group recorded natural moisture contents of between 13% and 25% and plasticity indices of between 11% and 27%, with an average of 19%. The plastic index test results are presented on the plasticity classification chart in Appendix D.

The results indicate the Mercia Mudstone Group is of intermediate to high plasticity and of low to medium volume change potential as defined by the National House Building Council and other published data.

It is recommended that for foundation design purposes the Mercia Mudstone should be considered to be of medium volume change potential. Changes in moisture content may result in moderate changes in volume, seasonal changes being exacerbated by the presence of tree

9.4 Foundation Recommendations

On the basis of observations made on site together with results of in-situ and laboratory tests, together with empirical correlations, consideration could be given to the adoption of shallow spread foundations to support the proposed structures.

It is recommended that shallow foundations are taken through any topsoil and made ground and founded within the underlying Mercia Mudstone Formation.

Outside the zone of influence of existing and proposed trees, it is recommended that conventional shallow spread footings should be taken through any Made Ground and placed in the underlying clay or mudstone at a minimum depth of 0.90m.

Due to the depth of Made Ground in the landscaped area in the north of the site, it is likely that the foundations in that area would have to be placed at depths up to 2.50m below ground level.

For the remaining site locations, it is estimated that a strip foundation of 0.6m width founded at 1.00mbgl within the firm Clay would provide an allowable bearing pressure in the region of 130kPa increasing to approximately 200kPa in the stiff Clay which would provide an adequate factor of safety against shear

failure and limit settlements to within 25mm. It is recommended that bearing pressures and settlement calculations are undertaken as the foundation design progresses.

Where foundations are placed into the mudstone which was encountered at between 1.00m and 3.40m with an average depth of 2.90m foundations, assuming a 1.0m wide strip/pad foundation at the minimum depth of 0.90m, may be designed to an allowable bearing pressure of 400kPa, which would provide an adequate factor of safety against shear failure. Settlements are likely to be less than 25mm, however, these should be checked when the final structural loading is known.

It is possible that shallow foundations within the same structure could be supported on both the mudstone and the firm/stiff clay. In these circumstances it is recommended that an allowable bearing pressure of 200kPa is adopted. Strip foundation should be reinforced to accommodate any differential settlement in these cases.

Within the zone of influence of recently removed, existing or proposed trees, foundations should be designed by an engineer taking into account that the founding soils are of medium volume change potential. Compressible material should be placed below and on the inside faces of pile caps and beams, as specified by the NHBC.

It may be considered that for foundations over a certain depth it may be more economical to adopt piles. The carrying capacity of piles depends not only on their size and the ground conditions but also on their method of installation. Therefore, it is recommended that specialist Piling Contractors be contacted as to the suitability and carrying capacity of their piles in the ground conditions pertaining to the site.

9.5 Ground Floor Slabs

On the basis of observations on site together with the results of laboratory tests, it is recommended that outside the zone of influence of trees, consideration is given to constructing the ground floor slab on formation prepared in the clay or mudstone. Any soft or deleterious material should be removed and replaced with properly compacted granular fill.

Within the zone of influence of trees, consideration should be given to the floor slabs being should be suspended over a void, in accordance with NHBC guidelines. However, for the retail units the clay could be excavated to half the depth defined by the NHBC for a foundation at that location and the resulting void filled with properly compacted inert granular sub-base and the floor slab placed thereon.

For the residential units where the final levels dictate that the depth of sub floor fill exceeds 600mm, ground floor slabs should be suspended in accordance with NHBC requirements.

9.6 Excavations

The safety of all excavations should be assessed and managed in accordance with Regulation 22 of CDM 2015 Managing Health and Safety in Construction.

However, on the basis of observations on site together with the results of insitu and laboratory tests, it is considered that shallow excavations for foundations and services encountering the clay or mudstone are likely to be stable in the short term. Where deeper made ground is encountered side support will be required.

Groundwater should be expected in shallow excavations for foundations or services. Perched groundwater could be present in the Made Ground overlying the Mercia Mudstone. It is considered that this could be dealt with by the use of a small pump. It is recommended that final excavation levels are kept clear of water due to the potential for heave in the underlying clay material.

9.7 Roads and Hard Standing

Experience has indicated that the measurement of the in-situ CBR may not reflect equilibrium sub-grade values because of the influence of the moisture content of the materials.

The CBR tests recorded values of between 1.7% and 35% on the clay, silt and mudstone samples. On the basis of laboratory classification tests, it is recommended that for formation prepared in the clay, an equilibrium subgrade CBR value of 5% be adopted for design purposes. The assessment assumes there to be a low water table, average construction conditions and a thin pavement construction. Any areas of soft or deleterious material, as suggested by the locally low in-situ CBR values, should be excavated and replaced with a properly compacted granular fill.

The results of the plasticity index tests on the shallower samples indicate that the Mercia Mudstone and clay may be frost susceptible.

9.8 Chemical Attack on Buried Concrete

The site has been classified in accordance with BRE Special Digest 1 (12) as natural ground without the presence of pyrite and laboratory testing undertaken accordingly. It is recommended that the guidelines given in Special Digest 1 be adopted.

It is recommended that for conventional shallow foundations the groundwater should be regarded as mobile.

On the basis of these results it is considered that a Design Sulphate Class for this material may be taken as DS-1. The site conditions would suggest that an ACEC class for the site of AC-1 would be appropriate.

9.9 Soakaway Testing

In-situ permeability tests in general accordance with BRE365 were carried out in SA01 and SA04. Neither soakaway tests showed any substantial decrease in head over a period of several hours suggesting the clay is impermeable for practical purposes. It is recommended that these results are passed onto a drainage engineer for further consideration.

9.10 Potential Further Investigation

Some locations were not accessible primarily due to the existing infrastructure, therefore consideration should be given to further investigation in specific locations during or post site clearance if required by the designer.

The landscape area to the east of the site was occupied by a construction compound at the time of the investigation therefore further investigation in this location is recommended when access is available. This area of the site was occupied by a residential block historically and has the possibility of foundations/demolition material remaining in the ground.

The area of the former garage in the northeast corner of the site is currently occupied by six residential bungalows which prevented free access during the ground investigation. There is no record of the garage demolition or removal of infrastructure such as underground storage tanks. It is recommended that this area is further investigated during or post demolition by trial pitting to inspect for any hydrocarbon impacted soils or subsurface infrastructure.

The proposed site levels show a considerable thickness of fill to be placed in certain areas of the site. Testing of the formation layer prior to filling is recommended and could include shear strength testing of the soils with plate bearing load tests loaded to the required bearing capacity to measure the immediate settlement. Characterisation of the proposed fill material would also be required such as gradings, plasticity testing and MCV testing.

10.0 Conclusion and Recommendations

10.1 Conclusions

A revised tabulated revised Conceptual Site Model has been derived following the findings on the Generic Quantitative Risk Assessment risk assessment and is presented in *Section 8.0*.

10.1.1 Geotechnical Assessment

It is recommended that shallow foundations could be adopted at the site founding beneath any topsoil and made ground within the underlying Mercia Mudstone Formation at a minimum depth of 0.90mbgl.

Due to the depth of Made Ground in the landscaped area in the north of the site, it is likely that the foundations in that area would have to be placed at depths up to 2.50m below ground level. For the remaining site locations, it is estimated that a strip foundation of 0.60m width founded at 1.00mbgl within the firm Clay would provide an allowable bearing pressure in the region of 130kPa increasing to 200kPa within the stiff clay, which would provide an adequate factor of safety against shear failure and limit settlements to within 25mm. It is recommended that bearing pressures and settlement calculations are undertaken as the foundation design progresses.

Within the zone of influence of recently removed, existing or proposed trees, foundations should be taken through the Made Ground and placed at depths recommended by an engineer taking into account that the founding soils are of medium volume change potential. Compressible material should be placed on the inside faces of foundations as specified by the NHBC in the housing areas.

It is considered that construction of ground floor slabs on formation prepared in the Mercia Mudstone Group will be appropriate outside the zone of influence of trees.

Material at the site may be assigned a Design Sulphate Class of DS-1 and the site given an ACEC class of AC-1.

10.1.2 Ground Contamination

The environmental chemistry soil results have been compared with the Tier 1 criteria for soils with respect to human health against *'residential with home grown produce'* thresholds.

Asbestos

With respect to the proposed end use of the site no exceedances of Tier 1 thresholds have been recorded in the single Made Ground samples. However, an occurrence of Asbestos was

noted in WS05 at 0.20 m bgl, where Asbestos described as Chrysotile loose fibres was identified. Further quantification testing to determine the percentage weight of Asbestos was conducted and recorded Asbestos quantification of <0.001.

It is not clear if any new development is proposed in this part of the site, if so, good working practices should be employed during site clearance to ensure Asbestos fibres do not become airborne.

Given the isolated nature of the occurrence and the low percentage weight, it is not considered to pose a significant risk to end users of the site, however it is recommended some mitigation is considered in any proposed development in this area of the site such as coverage by hardstanding or clean cover soils.

Poly Aromatic Hydrocarbons

One sample from WS09 at 0.40m showed exceedance of the Poly Aromatic Hydrocarbons Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenzo(ah)anthracene.

The exceedance appears isolated when compared to the generally very low levels encountered in the site soils and is most likely limited in its extent.

It is not considered the exceedance would pose a significant risk to human health.

10.1.3 Groundwater Contamination

The site is underlain by a Secondary B Aquifer, therefore groundwater is the most sensitive receptor as a result. A single exceedance of sulphate was noted in one of the groundwater samples.

The risk to the underlying Secondary B Aquifer (bedrock) is considered to be low owing to the fact that no mobile contaminants in soils were detected on site. Furthermore, soakaway testing conducted on the site also confirmed the bedrock deposits are highly impermeable which would limit the movement of any contaminants. There are no groundwater abstractions within close proximity to the site, nor does the site pose a risk to any source protection zones for potable groundwater. On this basis, no further investigation/assessment or specific remedial action is recommended.

10.1.4 Ground Gas Assessment

Six gas monitoring visits have been undertaken, with a maximum carbon dioxide concentration of 3.8% v/v and a maximum flow of 2.5 l/hr recorded. Evaluation of the 'worst possible' scenario (highest Q_{hg} across the entire dataset irrespective of location and discrete monitoring events) records a maximum Q_{hg} of 0.0950 l/hr for carbon dioxide.

Therefore, the worst possible scenario has been adopted as the sites Gas Screening Value (GSV) and in accordance with an assessment by CIRIA C665 the GSV indicates a Characteristic Situation 2 (CS2) gas regime requiring basic gas protection measures.

The BGS Radon Mapping (33) confirms the site is situated in an area where less than 1% of homes are above the radon action level. Radon protection measures are therefore not considered necessary within the proposed development. However, where the new development incorporates a basement the advice of a specialist Radon assessor must be obtained.

10.2 Recommendations

Based on the findings of the ground investigation, the following recommendations are made:

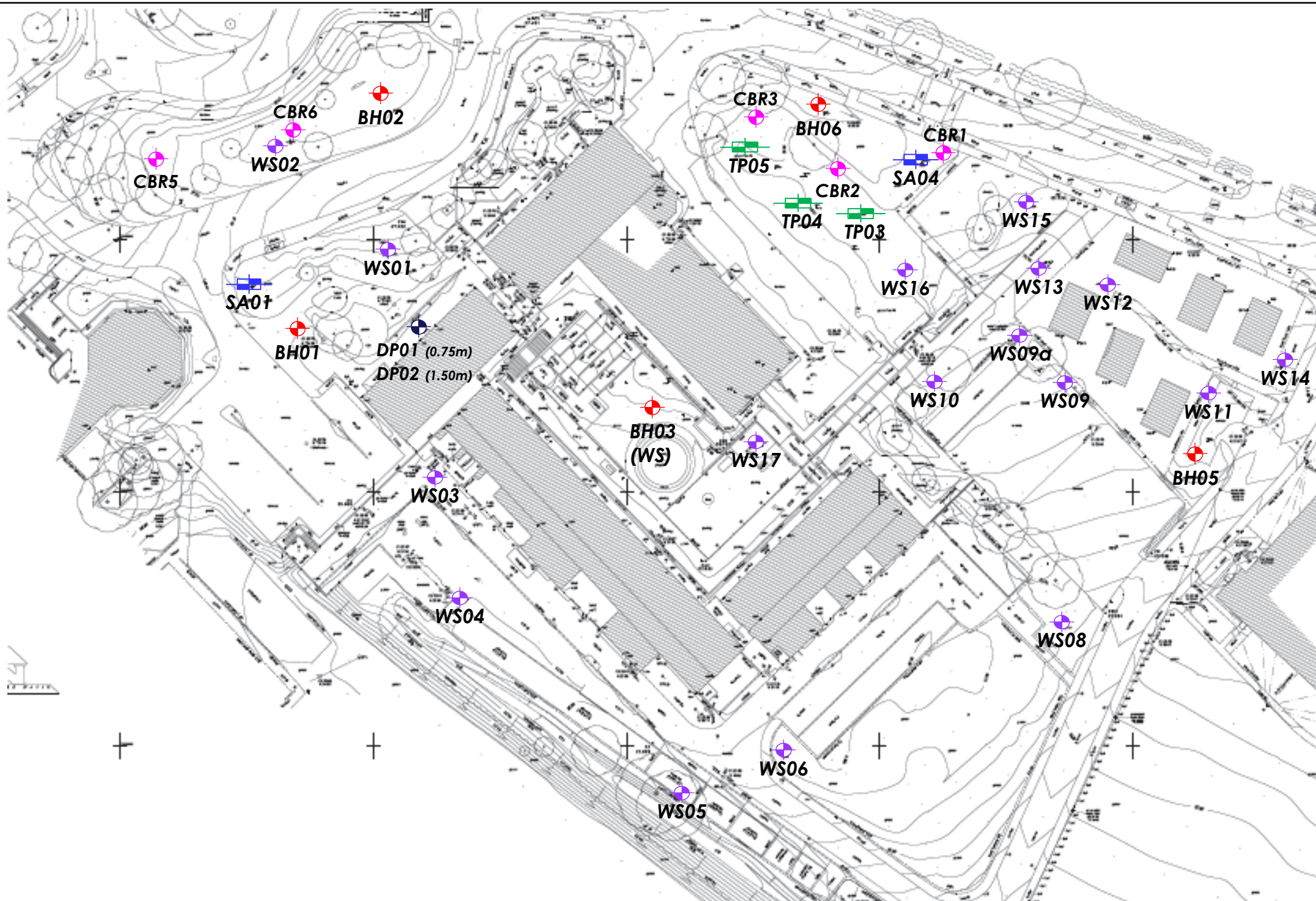
- 1) This report should be forwarded to the designer to advise foundation and structural design.
- 2) In the location of the Asbestos detection it is recommended that upon conformation of the development plans, consideration is given to basic remedial measures such as capping by building and hardstanding or clean cover soils. Another option would be to undertake further trial pitting and shallow soil sampling to establish the extent of the impacted soils.
- 3) The employment of CS2 gas protection measures are recommended for the site.
- 4) Further investigation should be considered in currently inaccessible areas to further support the structural design.
- 5) It is recommended this report is forwarded to the relevant local authority environmental officer for comment prior to undertaking further work.

11.0 References

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Appendix A – Drawings



Date Drawn:
23-02-2020

Scale: NTS

Title: Exploratory Hole Location Plan

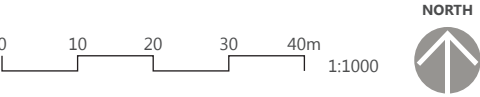
Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A1.2

NOTE:
THIS ILLUSTRATIVE MASTERPLAN DEMONSTRATES
HOW THE CONCEPT MASTERPLAN COULD
BE DEVELOPED IN LINE WITH THE PROPOSED
PARAMETERS. ITS PURPOSE IS PURELY INDICATIVE
AND IT IS INTENDED A DETAILED SCHEME WILL
BE FULLY DEVELOPED FOR A RESERVED MATTERS
APPLICATION IN DUE COURSE.



Figured dimensions and levels to be used.
Any inaccuracies must be notified to the
architect.
Detail drawings and large scale drawings
take precedence over smaller drawings.

Rev:

Rev:

Rev:

Rev:

PRELIMINARY	
PLANNING	✓
DESIGN	
TENDER	
CONSTRUCTION	

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ARCHITECTS

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Contract: Newport City Homes
Ringland Regeneration
Title: Proposed Masterplan

Drawing No. 17095(05)101
Rev. /

Scale: 1:1000 @A3
Date: 30/10/2018
Drawn: AJP
Checked: BK

Appendix B – Exploratory Hole Logs, Soakaway Testing, Photographs and Monitoring

Contract: Ringlands, Newport			Client: Curtins		Borehole: BH1
Contract Ref: C2260193	Start: 11.12.20 End: 12.12.20	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 5	

Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Backfill	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)							
1.00-1.15	1	SPT	16,9/50 for 62mm	↑	↑	↑		100% return			Concrete paving slabs. (MADE GROUND)		0.05	
1.20-2.60				↑	↑	↑		100% return			MADE GROUND: Weak light brown grey CONCRETE. (Pavement bedding) (MADE GROUND)		0.25	
2.60-4.10	2	SPT(c)	NP	↑	↑	↑		100% return			MADE GROUND: Brick and concrete foundations with a little soft red brown sandy clay below 0.50m. (MERCIA MUDSTONE GROUP)		(0.75)	
2.60-2.69				↑	↑	↑		100% return			Weak greyish red MUDSTONE (MERCIA MUDSTONE GROUP)	1(i)		
4.10-5.70	3	SPT(c)	NP	↑	↑	↑		100% return			... Between 1.20 - 1.33 mbgl: Non Intact. Recovered as a light grey angular fine to coarse GRAVEL of weak mudstone with low cobble content. Cobbles are angular weak mudstone <80mm diameter.	2(i)		
4.10-4.21				↑	↑	↑		100% return			... Between 1.33 - 2.03 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone.	3(i)		
5.70-7.20	4	SPT(c)	N=71	↑	↑	↑		100% return			... Between 2.07 - 2.33 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone with occasional pockets of light grey sandy clay.	4(i)		
5.70-6.15				↑	↑	↑		100% return			... Between 2.60 - 2.75 mbgl: Non Intact. Recovered as a reddish brown angular fine to coarse GRAVEL of weak mudstone.	5(i)		
7.20-8.60	5	SPT(c)	18,7/100 for 69mm	↑	↑	↑		100% return			... Between 3.00 - 3.14 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone with low cobble content. Cobbles are angular weak mudstone <80mm diameter.	6(i)		
7.20-7.35				↑	↑	↑		100% return			... Between 3.60 - 3.75 mbgl: Non Intact. Recovered as a reddish brown clayey COBBLES angular weak mudstone <100mm diameter.	7(i)		
8.60-9.20	6	SPT(c)	21,4/50	↑	↑	↑		100% return			... Between 3.75 - 3.88 mbgl: Non Intact. Recovered as a reddish brown clayey gravelly COBBLES angular weak mudstone <100mm diameter. Gravel is angular fine to coarse weak mudstone.	8(i)		
8.60-8.72				↑	↑	↑		100% return			... Between 3.88 - 3.88 mbgl: No recovery.	9(i)		
				↑	↑	↑		100% return			... Between 5.16 - 5.39 mbgl: Non Intact. Recovered as a reddish brown angular fine to coarse	10(i)		
				↑	↑	↑		100% return				11(i)		
				↑	↑	↑		100% return				12(i)		
				↑	↑	↑		100% return				13(i)		
				↑	↑	↑		100% return				14(i)		
				↑	↑	↑		100% return				15(i)		
				↑	↑	↑		100% return				16(i)		
				↑	↑	↑		100% return				17(i)		
				↑	↑	↑		100% return				18(i)		
				↑	↑	↑		100% return				19(i)		
				↑	↑	↑		100% return				20(i)		
				↑	↑	↑		100% return				21(i)		
				↑	↑	↑		100% return				22(i)		
				↑	↑	↑		100% return				23(i)		
				↑	↑	↑		100% return				24(i)		
				↑	↑	↑		100% return				25(i)		
				↑	↑	↑		100% return				26(i)		

Boring Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth		
11/12/19		12.00	1.20	94	11.97	1. Inspection pit hand dug to 0.40m depth. 2. Groundwater encountered at 11.97 mbgl. 3. Exploratory hole backfilled with bentonite pellets. 4. Inspection pit hand dug to 0.40m depth. 5. Groundwater encountered at 11.97 mbgl. 6. Exploratory hole backfilled with bentonite pellets.	
12/12/19		12.00	1.20	94	4.12		
12/12/19		15.00	1.20	94	7.76		
						All dimensions in metres	Scale: 1:50
Method Used:	Dynamic sampling + Rotary Cored			Plant Used:	Comacchio GEO 205	Drilled By:	CJA
						Logged By:	OGLuck
						Checked By:	AGS

Contract: Ringlands, Newport			Client: Curtins		Borehole: BH1
Contract Ref: C2260193	Start: 11.12.20	Ground Level: ---	Co-ordinates: ---	Sheet: 2 of 5	
	End: 12.12.20				

Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Backfill	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)							
9.20-10.80			for 41mm	53	33	20		100% return			GRAVEL of weak mudstone ... Between 5.39 - 5.53 mbgl: Non Intact. Recovered as a reddish brown sandy gravelly COBBLES angular weak mudstone <70mm diameter. Gravel is angular fine to coarse weak mudstone. ... Between 5.65 - 5.70 mbgl: Non Intact. Recovered as a reddish brown angular fine to coarse GRAVEL of weak mudstone ... Between 5.70 - 6.04 mbgl: Non Intact. Recovered as a reddish brown very clayey angular fine to coarse GRAVEL of weak mudstone with low cobble content. Cobbles are angular weak mudstone <70mm diameter. ... Between 6.04 - 6.24 mbgl: Non Intact. Recovered as a reddish brown mottled very clayey angular fine to coarse GRAVEL of weak mudstone. ... Between 6.70 - 6.76 mbgl: Non Intact. Recovered as a reddish brown mottled grey clayey gravelly COBBLES angular weak mudstone <80mm diameter. Gravel is angular fine to coarse weak mudstone. ... Between 6.76 - 6.84 mbgl: Non Intact. Recovered as a reddish brown angular fine to coarse sandy GRAVEL of weak mudstone ... Between 6.84 - 6.88 mbgl: Non Intact. Recovered as a reddish purplish brown mottled grey COBBLES of weak angular mudstone <80mm diameter. ... Between 6.88 - 7.02 mbgl: Non Intact. Recovered as a reddish purplish brown mottled grey very clayey GRAVEL of weak angular fine to coarse mudstone. ... Between 7.20 - 7.36 mbgl: Non Intact. Recovered as a reddish brown very clayey sandy angular fine to medium GRAVEL of weak mudstone. ... Between 7.47 - 7.77 mbgl: Non Intact. Recovered as a reddish brownish grey clayey sandy angular fine to coarse GRAVEL of weak mudstone with single 80mm cobble of angular weak mudstone. ... Between 7.88 - 7.97 mbgl: Non Intact. Recovered as a reddish	27(i) 28(i) 30(i) 29(i) 31(i) 32(i) 33(i) 34(i) 35(i) 36(i) 37(i) 38(i) 39(i) 40(i) 41(i) 42(i) 43(i) 44(i) 45(i) 46(i) 47(i) 48(i) 49(i) 50(i) 51(i) 52(i) 53(i) 54(i) 55(i) 56(i) 57(i) 58(i) 59(i) 60(i) 61(i) 62(i) 63(i) 64(i) 65(i) 66(i)		
10.80-12.00	7	SPT(c)	25,47/3 for 1mm	92	60	31		100% return						
10.80-10.94				93	56	18		100% return						
12.00-13.50	8	SPT(c)	NP	85	50	39		100% return						
12.00-12.11								100% return						
13.50-15.00	9	SPT(c)	1,4/42,8 for 9mm	73	24	20		100% return						
13.50-13.73								100% return						
15.00-15.25	10	SPT(c)	3,7/28,22 for 26mm										15.25	

Boring Progress and Water Observations						General Remarks									
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth										
						Fig A2.1									
						All dimensions in metres		Scale:	1:50						
Method Used:	Dynamic sampling + Rotary Cored			Plant Used:	Comacchio GEO 205		Drilled By:	CJA		Logged By:	OGLuck		Checked By:		

Contract: Ringlands, Newport			Client: Curtins			Borehole: BH1		
Contract Ref: C2260193		Start: 11.12.20	Ground Level: ---		Co-ordinates: ---		Sheet: 3 of 5	
End: 12.12.20								

Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Backfill	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)							
											brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. . . . Between 8.08 - 8.10 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. . . . Between 8.77 - 8.89 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone. Weak greyish red MUDSTONE (MERCIA MUDSTONE GROUP) (<i>stratum copied from 1.00m from previous sheet</i>) . . . Between 9.20 - 9.25 mbgl: Non Intact. Recovered as a reddish brown angular fine to coarse GRAVEL of weak mudstone. . . . Between 9.64 - 9.71 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. . . . Between 9.77 - 9.81 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone. . . . Between 9.88 - 9.93 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. . . . Between 10.01 - 10.06 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. . . . Between 10.14 - 10.32 mbgl: Non Intact. Recovered as a reddish brownish grey clayey sandy angular fine to coarse GRAVEL of weak mudstone with single 80mm cobble of angular weak mudstone. . . . Between 10.65 - 10.71 mbgl: Non Intact. Recovered as a reddish brown COBBLES of weak angular mudstone <80mm diameter. . . . Between 10.83 - 10.91 mbgl: Non Intact. Recovered as a reddish brown angular fine to coarse GRAVEL of weak mudstone. . . . Between 11.13 - 11.20 mbgl: Non Intact. Recovered as a reddish brown sandy angular fine to coarse GRAVEL of weak mudstone.			

Boring Progress and Water Observations						General Remarks						
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth							
						Fig A2.1						
						All dimensions in metres		Scale: 1:50				
Method Used:	Dynamic sampling + Rotary Cored			Plant Used:	Comacchio GEO 205		Drilled By:	CJA	Logged By:	OGLuck	Checked By:	 AGS

Contract: Ringlands, Newport			Client: Curtins			Borehole: BH1		
Contract Ref: C2260193		Start: 11.12.20	Ground Level: ---		Co-ordinates: ---		Sheet: 4 of 5	
End: 12.12.20								

Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Backfill	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)							
											... Between 11.41 - 11.49 mbgl: Non Intact. Recovered as a reddish brown gravelly COBBLES of weak angular mudstone <80mm diameter. Gravel is angular fine to coarse mudstone. ... Between 11.13 - 11.20 mbgl: Non Intact. Recovered as a reddish brown sandy angular fine to coarse GRAVEL of weak mudstone with medium cobble content. Cobbles are weak angular mudstone (<80 mm) ... Between 12.00 - 12.13 mbgl: Non Intact. Recovered as a reddish brown sandy angular fine to coarse GRAVEL of weak mudstone with medium cobble content. Cobbles are weak angular mudstone (<80 mm) ... Between 12.13 - 12.38 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. ... Between 12.46 - 12.54 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to medium GRAVEL of weak mudstone. ... Between 12.76 - 12.80 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone with medium cobble content. Cobbles are weak angular mudstone (<80 mm) ... Between 13.09 - 13.14 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to medium GRAVEL of weak mudstone. ... Between 13.50 - 13.65 mbgl: Non Intact. Recovered as a reddish brown gravelly COBBLES of weak angular mudstone <80mm diameter. Gravel is angular fine to coarse mudstone. ... Between 13.65 - 13.84 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. ... Between 14.10 - 14.16 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak			

Boring Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth				
						Fig A2.1			
Method Used: Dynamic sampling + Rotary Cored			Plant Used: Comacchio GEO 205			All dimensions in metres		Scale: 1:50	
						Drilled By: CJA	Logged By: OGLuck	Checked By:	



BOREHOLE LOG

Contract: Ringlands, Newport			Client: Curtins			Borehole: BH1			
Contract Ref: C2260193		Start: 11.12.20 End: 12.12.20		Ground Level: ---		Co-ordinates: ---		Sheet: 5 of 5	

Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Backfill	Water	Description of Strata	Fracture Log	Depth (Thick ness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)							
											mudstone. ... Between 14.26 - 14.59 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone with high cobble content. Cobbles are weak angular mudstone (<80 mm) ... Between 14.59 - 15.25 mbgl: No recovery Borehole terminated at 15.25m depth.			

Boring Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth				
						Fig A2.1			
Method Used: Dynamic sampling + Rotary Cored			Plant Used: Comacchio GEO 205			All dimensions in metres		Scale: 1:50	
						Drilled By: CJA	Logged By: OGLuck	Checked By:	

Contract: Ringlands, Newport			Client: Curtins		Borehole: BH2
Contract Ref: C2260193	Start: 12.12.19 End: 13.12.19	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 4	

Depth (m)	Samples & Testing			Mechanical Log				Backfill & Instrumentation	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)						
0.50-1.50	0.71	SPT	12,13/39,11 for 14mm	↑	↑	↑				Soft, brown, sandy, gravelly clay TOPSOIL. Gravel is subangular mudstone.		0.30	
0.50-0.71				90	55	55				Brownish red and reddish white, clayey, sandy GRAVEL of subangular fine to coarse of mudstone.		0.50	
1.50-3.00	1.63	SPT(c)	NP	↑	↑	↑				Weak greyish reddish brown MUDSTONE. (MERCIA MUDSTONE GROUP)			
1.50-1.63				77	47	47				... Between 0.50 - 0.70 mbgl: Non Intact. Recovered as a greyish reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone.			
3.00-4.50	3.13	SPT(c)	NP	↑	↑	↑				... Between 1.25 - 1.65 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone.			
3.00-3.14				73	27	23				... Between 1.40 - 1.50 mbgl: No recovery			
4.50-6.00	4.66	SPT(c)	20,5/46,4 for 4mm	↑	↑	↑				... Between 1.80 - 2.05 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone.			
4.50-4.67				33	20	9				... Between 2.50 - 2.55 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone.			
6.00-7.20	6.3	SPT(c)	6,17/33,17 for 75mm	↑	↑	↑				... Between 2.65 - 3.00 mbgl: No recovery			
6.00-6.30				100	67	67				... Between 3.00 - 3.65 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone with high cobble content. Cobble is angular <80mm weak mudstone.			
7.20-8.70	7.31	SPT(c)	NP	↑	↑	↑				... Between 3.77 - 3.80 mbgl: Non Intact. Recovered as a reddish brown clayey sandy fine to medium GRAVEL of weak mudstone.			
7.20-7.32				97	47	30				... Between 3.93 - 3.95 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to medium GRAVEL of weak mudstone.			
8.70-10.20	8.81	SPT(c)	NP	↑	↑	↑				... Between 4.57 - 4.61 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone.			
8.70-8.81				98	55	49				... Between 4.74 - 4.79 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone.			
										... Between 4.82 - 4.89 mbgl: Non Intact. Recovered as a reddish brown angular fine to coarse GRAVEL of weak mudstone.			
										... Between 4.96 - 5.00 mbgl: Non Intact. Recovered as a reddish brown clayey			

Boring Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth		
12/12/19		3.00	1.40	94	3.00	1. Inspection pit hand dug to 0.50m depth. 2. Groundwater encountered at 2.37 mbgl. 3. 50mm diameter gas/groundwater monitoring well complete with flush protective cover installed to 15.00m depth on completion. Response zone 1.50m to 15.00m depth.	
13/12/19		4.50	1.40	94	2.37		
13/12/19		15.00	7.20	94	2.66		
						Fig A2.2	
						All dimensions in metres	Scale: 1:50
Method Used:	Inspection pit + Dynamic sampling + Rotary Corer			Plant Used:	Comacchio GEO 205	Drilled By:	CJA
						Logged By:	OGLuck
						Checked By:	AGS

GINT_LIBRARY_v8_07.GLB LibVersion: v8_07_001 PriVersion: v8_07 | Log COMPOSITE LOG - A4P | C260193_RINGLANDS NEWPORT GPJ - v8_07
RISK Environment Ltd, The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB Tel: 0117 947 1006 Fax: 0117 947 1009 Web: www.rsk.co.uk 02/03/20 - 11:34 | S95 |

GINT_LIBRARY_v8_07.GLB LibVersion: v8_07_001 PriVersion: v8_07 | Log COMPOSITE LOG - A4P | C260193_RINGLANDS NEWPORT GPJ - v8_07
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GINT_LIBRARY_v8_07.GLB LibVersion: v8_07_001 PriVersion: v8_07 | Log COMPOSITE LOG - A4P | C260193_RINGLANDS NEWPORT GPJ - v8_07
RISK Environment Ltd, The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB Tel: 0117 947 1006 Fax: 0117 947 1009 Web: www.rsk.co.uk 02/03/20 - 11:34 | S95 |

Contract: Ringlands, Newport			Client: Curtins			Borehole: BH2		
Contract Ref: C2260193		Start: 12.12.19	Ground Level: ---		Co-ordinates: ---		Sheet: 3 of 4	
End: 13.12.19								

Depth (m)	Samples & Testing			Mechanical Log				Backfill & Instrumentation	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)						
										angular fine to coarse weak mudstone. ... Between 9.34 - 9.37 mbgl: Non Intact. Recovered as a reddish brown clayey angular medium to coarse GRAVEL of weak mudstone. ... Between 9.42 - 9.45 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone. ... Between 9.55 - 9.63 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. ... Between 9.78 - 9.86 mbgl: Non Intact. Recovered as a reddish brown sandy gravelly clay. Gravel is angular fine to coarse weak mudstone. ... Between 10.08 - 10.20 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone with medium cobble content. Cobble is angular <70mm weak mudstone. ... Between 10.20 - 10.43 mbgl: Non Intact. Recovered as a reddish brown gravelly COBBLES of angular <80mm medium strong mudstone. Gravel is angular fine to coarse weak mudstone. ... Between 10.52 - 10.60 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. ... Between 11.30 - 11.35 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to medium GRAVEL of weak mudstone. ... Between 11.44 - 11.60 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. ... Between 11.70 - 11.94 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone with low cobble content Cobble is angular <90mm weak mudstone. ... Between 12.14 - 12.30 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone with low cobble content Cobble is angular <80mm weak mudstone. ... Between 12.68 - 12.74 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone.			

Boring Progress and Water Observations						General Remarks					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth						
						Fig A2.2					
						All dimensions in metres		Scale: 1:50			
Method Used: Inspection pit + Dynamic sampling + Rotary Cored		Plant Used: Comacchio GEO 205				Drilled By: CJA		Logged By: OGluck		Checked By: 	



BOREHOLE LOG

Contract: Ringlands, Newport			Client: Curtins			Borehole: BH2			
Contract Ref: C2260193		Start: 12.12.19 End: 13.12.19		Ground Level: ---		Co-ordinates: ---		Sheet: 4 of 4	

Depth (m)	Samples & Testing			Mechanical Log				Backfill & Instrumentation	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)						
										. . . Between 12.88 - 13.00 mbgl: Non Intact. Recovered as a reddish brown sandy angular fine to coarse GRAVEL of weak mudstone. . . . Between 13.14 - 13.20 mbgl: No recovery . . . Between 13.20 - 13.27 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone. . . . Between 13.38 - 15.00 mbgl: No recovery			

Boring Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth				
						Fig A2.2			
						All dimensions in metres		Scale:	1:50
Method Used:	Inspection pit + Dynamic sampling + Rotary Cored		Plant Used:	Comacchio GEO 205		Drilled By:	CJA	Logged By:	OGLuck
						Checked By:			



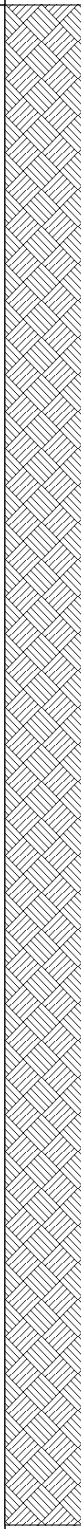
	Contract Name: Ringlands			Client: Curtins			Borehole ID: BH5				
	Contract Number: C2260193	Date Started: 20/12/2019	Logged By: HW	Checked By: OAS	Status: FINAL	Sheet 1 of 2					
Rotary Core Drilling Log	Easting:	Northing:	Ground Level:	Plant Used: Comacchio Geo-205	Print Date: 02/03/2020	Scale: 1:50					
	Weather:			Termination: Scheduled depth							
Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	FI	Samples / Tests	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
							0.25		MADE GROUND - comprising 50mm of macadam overlying subbase.		
							0.50		MADE GROUND: (Dense) grey brown silty sandy very angular to angular fine to coarse GRAVEL and COBBLES of limestone aggregate, slag and crushed concrete with some pockets of soft red brown sandy clay below 0.40m.		
							(1.50)		Stiff red brown locally mottled green grey slightly sandy slightly gravelly silty CLAY. Gravel is angular to sub-angular fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	1	
							2.00			2	
2.00 - 3.00	85	60	36	5			2.20		Extremely weak, reddish brown mottled greenish grey MUDSTONE recovered as sandy, gravelly clay. Gravel is weak, angular to subrounded mudstone		
									Weak, reddish brown occasionally mottled greenish grey MUDSTONE		
									Between 2.20m and 2.50m: Becomes greenish grey		
									Between 2.90m to 3.00m: Non-intact recovered as sandy, clayey gravel. Gravel is weak, angular to subrounded mudstone	3	
3.00 - 4.20	100	90	75	9						4	
									Between 4.20m to 4.25m: Non intact recovered as gravelly cobbles. Gravel and cobbles are weak, subrounded mudstone	5	
4.20 - 5.20	100	96	66	4						6	
5.20 - 5.40	60	60	0	3						7	
5.40 - 5.90	25	12	12	3					Between 5.60m to 5.80m: Non intact recovered as clayey, sandy gravel. Gravel is weak, angular to subrounded mudstone	8	
									Between 5.80m to 6.80m: Assumed zone of core loss	9	
5.90 - 7.30	36	19	14	5			(13.30)			10	
									Between 6.80m to 6.95m: Non intact recovered as clayey, sandy gravel. Gravel is weak, angular to subrounded mudstone		
									Between 7.30m to 7.38m: Non intact recovered as clayey, sandy gravel. Gravel is weak, angular to subrounded mudstone		
7.30 - 8.80	87	64	60	5					Between 7.42m to 7.48m: Non intact recovered as clayey, sandy gravel. Gravel is weak, angular to subrounded mudstone		
									Between 8.30m to 8.80m: Becomes greenish grey		
8.80 - 9.80	95	89	81	6							
									Continued next sheet		
Start & End of Shift Observations						Borehole Diameter		Casing Diameter		Remarks:	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Groundwater not encountered. Backfilled with arisings upon completion.		
Flush Information						Installation		Water Strikes			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)
									Time (mins)	Rose to (m)	Remarks
Fracture Index reported as number per metre. TCR, SCR and RQD reported in %											
HBSI RC Issue Number: 3 Issue Date: 10/05/16											

Fig A2.3

 Geotechnical & Environmental Specialists	Contract Name: Ringlands				Client: Curtins				Borehole ID: BH5					
	Contract Number: C2260193		Date Started: 20/12/2019		Logged By: HW		Checked By: OAS		Status: FINAL					
Rotary Core Drilling Log	Easting:		Northing:		Ground Level:		Plant Used: Comacchio Geo-205		Print Date: 02/03/2020		Scale: 1:50			
	Weather:				Termination: Scheduled depth									
Samples & In Situ Testing						Strata Details						Groundwater		
Depth	TCR	SCR	RQD	FI	Samples / Tests	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description			Water Strike	Backfill/ Installation	
9.80 - 11.20	99	94	81	6							11			
11.20 - 12.50	100	81	49	8										
12.50 - 13.25	93	73	53	3										
13.25 - 14.00	100	100	64	5										
14.00 - 15.50	97	93	25	9										
						15.50			End of Borehole at 15.500m			16		
											17			
											18			
											19			
											20			
Start & End of Shift Observations						Borehole Diameter		Casing Diameter		Remarks:				
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Groundwater not encountered. Backfilled with arisings upon completion.					
Flush Information						Installation				Water Strikes				
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
Fracture Index reported as number per metre. TCR, SCR and RQD reported in %														
HBSI RC Issue Number: 3 Issue Date: 10/05/16														

Fig A2.3

Contract: Ringlands, Newport			Client: Curtins		Borehole: BH6
Contract Ref: C2260193	Start: 16.12.19	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 3	
	End: 17.12.19				

Depth (m)	Samples & Testing			Mechanical Log				Backfill	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)						
0.25-0.50	1	B								TOPSOIL: Grass over soft brown organic slightly sandy slightly gravelly silty CLAY with rootlets. Gravel is angular to sub-angular fine to coarse of sandstone. (TOPSOIL)		0.20	
0.50-1.00	2	B										0.50	
1.00-1.45	1.45	SPT	N=17							MADE GROUND: Firm brown to red brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to sub-angular fine to coarse of sandstone and siltstone. Occasional fragments of brick and limestone aggregate. Occasional roots. (MERCIA MUDSTONE GROUP)		(2.10)	
2.00-2.45	2.45	SPT	N=22									2.60	
2.60-3.50										Stiff to very stiff red brown locally mottled green grey slightly sandy slightly gravelly silty CLAY. Gravel is angular to sub-angular fine to medium of extremely weak mudstone and very weak siltstone lithorelicts. Some residual rock fabric. (MERCIA MUDSTONE GROUP)		(0.57)	
3.50-5.00	3.61	SPT(c)	21,4/50 for 29mm								1(i)	3.17	
3.50-3.61										Highly weathered MUDSTONE recovered as very stiff reddish brown CLAY. (MERCIA MUDSTONE GROUP)	2(i)		
											3(i)		
5.00-6.00	5.12	SPT(c)	NP							Weak reddish brown MUDSTONE. (MERCIA MUDSTONE GROUP)	4(i)		
5.00-5.13											6(i)		
6.00-6.50	6.56	SPT(c)	NP							... Between 3.17 - 3.75 mbgl: Non Intact. Recovered as a reddish brown angular fine to coarse GRAVEL of weak mudstone.	7(i)		
6.50-6.56											8(i)		
7.00-8.00										... Between 3.82 - 3.90 mbgl: Non Intact. Recovered as a grey clayey gravelly angular COBBLES (<70 mm) of weak mudstone. Gravel is angular fine to coarse mudstone.	9(i)		
											10(i)		
8.00-9.50	8.06	SPT(c)	NP							... Between 5.08 - 5.13 mbgl: Non Intact. Recovered as a reddish brown angular medium to coarse GRAVEL of weak mudstone.	11(i)		
8.00-8.06											12(i)		
										... Between 7.23 - 7.29 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone.	13(i)		
											14(i)		
											15(i)		
											16(i)		
											17(i)		
											18(i)		
											19(i)		
											20(i)		
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											28(i)		
											29(i)		
											30(i)		
											31(i)		
											32(i)		
											33(i)		
											34(i)		
											35(i)		
											36(i)		
											37(i)		

Boring Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth		
16/12/19		12.00	1.60	94	7.37	1. Inspection pit hand dug to 1.00m depth. 2. Groundwater encountered at 7.37 mbgl. 3. 50mm diameter gas/groundwater monitoring well complete with flush protective cover installed to 15.15m depth on completion. Response zone 1.20m to 15.15m depth.	
17/12/20		12.00	1.60	94	1.84		
						All dimensions in metres Scale: 1:50	
Method Used:	Inspection pit + Dynamic sampling + Rotary Corer		Plant Used:	Comacchio GEO 205		Drilled By:	CJA
						Logged By:	OGLuck
						Checked By:	

Fig A2.4

Contract: Ringlands, Newport			Client: Curtins		Borehole: BH6
Contract Ref: C2260193	Start: 16.12.19	Ground Level: ---	Co-ordinates: ---		Sheet: 2 of 3
	End: 17.12.19				

Depth (m)	Samples & Testing			Mechanical Log				Backfill	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)						
9.50-10.40	9.55	SPT(c)	NP	88	88	78				Weak reddish brown MUDSTONE. (MERCIA MUDSTONE GROUP) ... Between 3.17 - 3.75 mbgl: Non Intact. Recovered as a reddish brown angular fine to coarse GRAVEL of weak mudstone. (<i>stratum copied from 3.17m from previous sheet</i>) ... Between 9.50 - 9.79 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of mudstone with high cobble content of weak mudstone (<70 mm). ... Between 9.92 - 9.95 mbgl: Non Intact. Recovered as a stiff reddish brown sandy gravelly CLAY. Gravel is angular fine to coarse GRAVEL of weak mudstone. ... Between 10.35 - 10.40 mbgl: Non Intact. Recovered as a reddish brown clayey gravelly angular COBBLES (<70 mm) of weak mudstone. Gravel is angular fine to coarse mudstone. ... Between 10.40 - 10.50 mbgl: Non Intact. Recovered as a reddish brown clayey sandy angular fine to coarse GRAVEL of weak mudstone. ... Between 10.85 - 10.94 mbgl: Non Intact. Recovered as a reddish brown clayey gravelly angular COBBLES (<70 mm) of weak mudstone. Gravel is angular fine to coarse mudstone. ... Between 10.94 - 11.00 mbgl: No recovery ... Between 11.00 - 11.16 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of mudstone with high cobble content. Cobbles are <70mm weak mudstone. ... Between 11.66 - 11.80 mbgl: Non Intact. Recovered as a reddish brown clayey angular COBBLES (<70 mm) of weak mudstone. ... Between 12.00 - 12.20 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of mudstone. ... Between 12.49 - 12.54 mbgl: Non Intact. Recovered as a reddish brown clayey angular fine to coarse GRAVEL of weak mudstone. ... Between 13.10 - 13.14 mbgl: Non Intact. Recovered as a reddish brown gravelly angular COBBLES (<80 mm) of weak mudstone. Gravel is angular fine to coarse mudstone. ... Between 13.42 - 13.50 mbgl: No recovery	38[i] 39[i] 40[i]	(12.07)	
9.50-9.56				100	59	59					41[i] 42[i]		
10.40-11.00	11.1	SPT(c)	NP	90	58	58							
11.00-12.00				80	50	50							
11.00-11.10	12.09	SPT(c)	NP	91	71	58					43[i] 44[i] 45[i] 46[i] 47[i] 48[i] 49[i] 50[i]		
12.00-13.50				100	40	0					51[i] 52[i] 53[i] 54[i] 55[i] 56[i] 57[i] 58[i] 59[i] 60[i] 61[i] 62[i]		
12.00-12.09	13.58	SPT(c)	NP	83	83	61					63[i] 64[i] 65[i] 66[i] 67[i] 68[i] 69[i] 70[i] 71[i] 72[i] 73[i] 74[i] 75[i]		
13.50-14.20													
13.50-13.59	15.24	SPT(c)	NP										
14.20-15.15													
15.15-15.24													

Boring Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth		
						Fig A2.4	
All dimensions in metres						Scale:	1:50
Method Used:	Inspection pit + Dynamic sampling + Rotary Corer		Plant Used:	Comacchio GEO 205		Drilled By:	CJA
						Logged By:	OGLuck
						Checked By:	AGS



BOREHOLE LOG

Contract: Ringlands, Newport			Client: Curtins			Borehole: BH6			
Contract Ref: C2260193		Start: 16.12.19	Ground Level: ---		Co-ordinates: ---		Sheet: 3 of 3		
End: 17.12.19									

Depth (m)	Samples & Testing			Mechanical Log				Backfill	Water	Description of Strata	Fracture Log	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)						
										... Between 13.50 - 13.64 mbgl: Non Intact. Recovered as a reddish brown gravelly angular COBBLES (<80 mm) of weak mudstone. Gravel is angular fine to coarse mudstone. ... Between 13.80 - 13.86 mbgl: Non Intact. Recovered as a reddish brown gravelly angular COBBLES (<80 mm) of weak mudstone. Gravel is angular fine to coarse mudstone. ... Between 13.89 - 14.11 mbgl: Non Intact. Recovered as a reddish brown gravelly angular COBBLES (<80 mm) of weak mudstone. Gravel is angular fine to coarse mudstone. Borehole terminated at 15.24m depth.			

Boring Progress and Water Observations						General Remarks		
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth			
						Fig A2.4		
						All dimensions in metres		
						Scale: 1:50		
Method Used: Inspection pit + Dynamic sampling + Rotary Cored			Plant Used: Comacchio GEO 205			Drilled By: CJA		Logged By: OGLuck
						Checked By:		

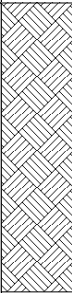
 Geotechnical & Environmental Specialists		Contract Name: Ringlands		Client: Curtins			Borehole ID: BH03 (WS)			
		Contract Number: C2260193	Date Started: 18/12/2020	Logged By:	Checked By: OAS	Status: FINAL	Sheet 1 of 1			
Dynamic Sample Borehole Log		Easting:	Northing:	Ground Level:	Plant Used:	Print Date: 02/03/2020	Scale: 1:50			
		Termination: Refusal				SPT Hammer: N/R, Energy Ratio: N/R				
Samples & In Situ Testing				Strata Details				Groundwater		
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation		
0.30	ES1	SPT(S) N=34 (4,6/7,7,9,11)		0.25		MADE GROUND: Grass over soft to firm brown organic slightly sandy slightly gravelly silty clay topsoil with rootlets. Gravel is angular to sub-angular fine to coarse of sandstone, with rare fragments of brick and limestone aggregate.				
0.70	ES2			0.50						
1.00 1.10	D3			(1.41)						
1.65 1.80	D4	SPT(S) 50 (11,14/50 for 150mm)		1.91		MADE GROUND: Firm brown to red brown slightly sandy slightly gravelly to gravelly silty CLAY with some angular to sub-angular cobbles of limestone aggregate. Gravel is angular to sub-angular fine to coarse of limestone aggregate, sandstone and siltstone. Stiff becoming very stiff red brown locally mottled green grey slightly sandy slightly gravelly silty CLAY. Gravel is angular to sub-angular fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP] Very stiff friable gravelly below 0.75m. Some sub-ordinate beds (<200mm thickness) of very weak to weak red brown stained black siltstone below 1.10m. End of Borehole at 1.91m				
Borehole Diameter		Installation		Remarks: Groundwater at 0.40m (likely to be due to the proximity to the covered fountain). Backfilled with arisings.						
Depth (m)	Dia (m)	Depth Top	Base (m)						Diameter	Pipe Type
Water Strikes										
Depth Strike	Depth Casing	Depth Sealed	Time (mins)						Rose to (m)	Remarks
0.40			0	0.40						

Fig A2.5

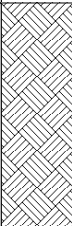
 Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Borehole ID: WS01							
	Contract Number: C2260193	Date Started: 11/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1							
Dynamic Sample Borehole Log	Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50							
Weather:		Termination: Refusal			SPT Hammer: N/R, Energy Ratio: N/R								
Samples & In Situ Testing			Strata Details				Groundwater						
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike						
0.10	ES1	SPT(S) N=25 (2,2/3,3,5,14)		0.20	 MADE GROUND - comprising grass over soft, brown, organic, slightly sandy, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular fine to coarse of sandstone, with occasional fragments of clinker/slag, brick and limestone aggregate. (Topsoil)	1							
0.30	D1			0.40									
0.50	ES2			0.60									
0.70	ES3 D2			0.80									
0.90				1.00									
1.50	SPT(S) 50 (10,15/50 for 150mm)		0.50	 MADE GROUND: Soft to firm, brown to reddish brown, slightly sandy, slightly gravelly, silty clay with occasional brick cobbles. Gravel is angular to sub-angular fine to medium of mudstone, siltstone, sandstone. Occasional fragments of brick, clinker and limestone aggregate.	2								
			1.50										
							 Stiff to very stiff, friable, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	3					
									 Extremely weak becoming very weak, friable, reddish brown mottled greenish grey MUDSTONE recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP]	4			
											End of Borehole at 1.50m	5	
													6
			7										
			8										
			9										
			10										
Borehole Diameter		Installation		Remarks:									
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	Inspection pit GL to 0.70m. Groundwater not encountered. Backfilled with arisings upon completion.							
Water Strikes													
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks								

Fig A2.6

 Geotechnical & Environmental Specialists		Contract Name: Ringlands		Client: Curtins			Borehole ID: WS02			
		Contract Number: C2260193	Date Started: 11/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1			
Dynamic Sample Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50			
Weather:			Termination: Refusal			SPT Hammer: N/R, Energy Ratio: N/R				
Samples & In Situ Testing				Strata Details				Groundwater		
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation		
0.10 0.20	ES1	SPT(S) 62 (1,5/62 for 225mm)		0.20 (0.45) 0.65	    	MADE GROUND - comprising grass over soft, brown, organic, slightly sandy, slightly gravelly,, silty clay with rootlets. Gravel is angular to sub-angular fine to coarse of sandstone, with occasional fragments of clinker/slag, brick and limestone aggregate. (Topsoil) Extremely weak becoming very weak friable red brown mottled green grey MUDSTONE; recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP] End of Borehole at 0.65m				
							1			
							2			
							3			
							4			
							5			
							6			
							7			
							8			
							9			
							10			
Borehole Diameter		Installation		Remarks: Inspection pit GL to 0.20m. Groundwater not encountered. Backfilled with arisings upon completion.						
Depth (m)	Dia (m)	Depth Top	Base (m)						Diameter	Pipe Type
Water Strikes						Fig A2.7				
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks					
IFA DS Template						Issue Number: 3 Issue Date: 07-09-16				

		Contract Name: Ringlands			Client: Curtins			Borehole ID: WS03					
		Contract Number: C2260193		Date Started: 16/12/2019		Logged By: AF		Checked By: OAS		Status: FINAL			
		Easting:		Northing:		Ground Level:		Plant Used: Dando		Print Date: 02/03/2020			
Dynamic Sample Borehole Log										Scale: 1:50			
Weather:				Termination: Obstruction - cobbles and boulders									
Samples & In Situ Testing				Strata Details						Groundwater			
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description					Water Strike	Backfill/Installation	
0.50	ES1			0.10		MADE GROUND: Macadam							
				0.25 (0.35) 0.60		MADE GROUND: Dense, light pinkish grey, silty, sandy gravel. Gravel is very angular to angular fine to coarse limestone aggregate (Sub Base)							
						MADE GROUND: Macadam MADE GROUND: Dense to very dense, light grey gravel and cobbles. Gravel and cobbles are very angular to angular fine to coarse limestone aggregate and crushed concrete <i>Below 0.50m: Silty sand and occasional boulders of limestone aggregate</i> End of Borehole at 0.60m							
											1		
											2		
											3		
											4		
											5		
											6		
											7		
											8		
											9		
											10		
Borehole Diameter		Installation		Remarks: Inspection pit GL to 0.60m. Groundwater not encountered. Backfilled with arisings upon completion.									
Depth (m)	Dia (m)	Depth Top	Base (m)									Diameter	Pipe Type
Water Strikes													
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks								

Fig A2.8

IFA DS Template Issue Number: 3 Issue Date: 07-09-16

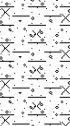
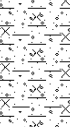
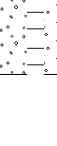
IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists						Contract Name: Ringlands							Client: Curtins								Borehole ID: WS04			
Dynamic Sample Borehole Log						Contract Number:		Date Started:		Logged By:		Checked By:		Status:		Sheet 1 of 1 Scale: 1:50								
						C2260193		16/12/2019		AF		OAS		FINAL										
						Easting:		Northing:		Ground Level:		Plant Used:		Print Date:										
												Dando		02/03/2020										
Weather:						Termination: Refusal						SPT Hammer: N/R, Energy Ratio: N/R												
Samples & In Situ Testing						Strata Details										Groundwater								
Depth		Sample ID		Test Result		Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description					Water Strike	Backfill/Installation									
0.35		ES1		SPT(S) N=28 (3,3/5,8,7,8)			0.13 0.25 (0.30) 0.55		MADE GROUND: Macadam															
0.90 1.00 1.00		ES2 D1					(0.75)		MADE GROUND: Dense, light pinkish grey, silty, sandy gravel. Gravel is very angular to angular fine to coarse limestone aggregate (Sub Base)					1										
1.50 1.50		D2					1.30		MADE GROUND: Dense, light brownish grey, silt, sandy, cobbly gravel. Gravel and cobbles are very angular to angular fine to coarse limestone aggregate, sandstone and crushed concrete <i>Below 0.40m: Occasional pockets of soft, reddish brown, sandy clay</i>															
							(0.70)		Stiff becoming very stiff, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP] <i>Below 1.00m: Very stiff, friable gravel</i>					2										
				SPT(S) N=50 (10,10/10,15,15,10)			2.00		Extremely weak, friable, reddish brown MUDSTONE recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP]					3										
									End of Borehole at 2.00m															
														4										
														5										
														6										
														7										
														8										
														9										
														10										
Borehole Diameter				Installation		Remarks:																		
Depth (m)		Dia (m)		Depth Top		Base (m)		Diameter		Pipe Type		Inspection pit GL to 1.00m.												
				0.00		0.50		35		Slotted		Groundwater not encountered.												
				0.50		2.00		35		Plain														
Water Strikes																								
Depth Strike		Depth Casing		Depth Sealed		Time (mins)		Rose to (m)		Remarks														
IFA DS Template Issue Number: 3 Issue Date: 07-09-16																								

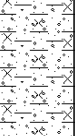
 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Borehole ID: WS05	
	Contract Number: C2260193	Date Started: 16/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Dynamic Sample Borehole Log	Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50	
	Weather:		Termination: Refusal		SPT Hammer: N/R, Energy Ratio: N/R		

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation	
0.05	ES1			0.15		Grass and leaf litter over soft, dark brown, organic, slightly sandy, slightly gravelly, silty clay with tree roots and rootlets.			
0.40	ES2			(0.70)		Gravel is angular to sub-angular, fine to coarse of sandstone, with rare fragments of clinker/slag, brick and limestone aggregate. Occasional fragments of glass and paper/plastic litter. (Topsoil)			
0.90	ES3	SPT(S) N=10 (1,2/3,2,2,3)		0.85		MADE GROUND: Dense, light brownish grey, silty, sandy, cobbly gravel. Gravel and cobbles are very angular to angular fine to coarse limestone aggregate, sandstone and crushed concrete Occasional fragments of slag and brick.	1		
1.00	D1			(0.65)					
1.20				1.50		Below 0.50m: Occasional pockets of soft, reddish brown, sandy clay.			
1.70	D2			(0.40)		MADE GROUND: Firm to stiff, brown to reddish brown, slightly sandy, slightly gravelly, silty clay. Gravel is angular to sub-angular, fine to coarse of sandstone and siltstone. Occasional fragments of brick and clinker.	2		
1.80	ES4			1.90					
2.00	D3	SPT(S) N=18 (2,2/4,5,4,5)		(1.50)		Firm, brown becoming greyish brown mottled orangish brown, slightly sandy, silty CLAY with occasional rootlets.			
2.00						Below 1.50m: Becoming brown and organic			
3.00	D4	SPT(S) N=33 (4,5/7,9,8,9)		3.40		Stiff becoming very stiff, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	3		
3.00				(0.75)		Below 2.20m: Very stiff and friable			
3.60	D5	SPT(S) N=50 (10,10/50 for 235mm)		4.15		Extremely weak, friable, reddish brown MUDSTONE recovered as angular,, fine to coarse gravel. [MERCIA MUDSTONE GROUP]	4		
3.70						End of Borehole at 4.15m			
							5		
							6		
							7		
							8		
							9		
							10		

Borehole Diameter		Installation				Remarks: Inspection pit GL to 1.00m Groundwater not encountered.
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	
		0.00 1.00	1.00 4.15	35 35	Plain Slotted	
Water Strikes						
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks	

Fig A2.10

		Contract Name: Ringlands			Client: Curtins			Borehole ID: WS06	
		Contract Number: C2260193	Date Started: 17/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1		
Dynamic Sample Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50		
Weather:			Termination: Refusal			SPT Hammer: N/R, Energy Ratio: N/R			
Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation	
0.20	ES1			0.18		Grass over MADE GROUND: Soft, brown, organic, slightly sandy, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular fine to coarse of sandstone, with rare fragments of clinker/slag, brick and limestone aggregate. (Topsoil)	1		
0.40	D1								
0.50	ES2								
1.00	ES3	SPT(S) N=20 (3,5/4,5,6,5)		1.00		MADE GROUND: Firm to stiff,, brown to reddish brown, locally mottled greenish grey, slightly sandy, slightly gravelly, silty clay. Gravel is angular to sub-angular fine to coarse of sandstone and siltstone. Occasional fragments of solidified, tar, brick and limestone aggregate.	2		
1.10									
1.25									
1.40	D2	SPT(S) N=27 (2,4/6,6,6,9)		(0.35)		Firm, brown,, slightly sandy, silty CLAY with occasional rootlets.	2		
1.60									
1.80									
2.00	D3	SPT(S) N=28 (3,3/7,6,7,8)		(1.80)		Stiff becoming very stiff, reddish brown locally mottled greenish grey, slightly sandy,, slightly gravelly, silty CLAY. Gravel is angular to sub-angular fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	3		
2.80									
3.00									
3.40	D4	SPT(S) N=34 (3,3/6,7,9,12)		(0.75)		Extremely weak,, friable, reddish brown mottled greenish grey MUDSTONE recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP]	4		
3.80									
4.00									
4.20	D6	SPT(S) 50 (15,10/50 for 225mm)		4.15		End of Borehole at 4.15m	5		
4.40									
Borehole Diameter		Installation		Remarks:					
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	Inspection pit GL to 1.00m. Groundwater not encountered.			
		0.00	1.00	35	Plain				
		1.00	4.40	35	Slotted				
Water Strikes									
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks				
Fig A2.11									
IFA DS Template Issue Number: 3 Issue Date: 07-09-16									

 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Borehole ID: WS08	
	Contract Number: C2260193	Date Started: 17/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Dynamic Sample Borehole Log	Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50	
	Weather:		Termination: Refusal		SPT Hammer: N/R, Energy Ratio: N/R		
Samples & In Situ Testing			Strata Details				Groundwater
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike
0.25	D1	SPT(S) N=20 (3,5/6,5,4,5)		0.15		Grass over MADE GROUND: Soft to firm, brown, organic, slightly sandy, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular, fine to coarse of sandstone, with rare fragments of clinker/slag, brick and limestone aggregate. (Topsoil)	
0.30	ES1			(0.35)			
0.80	ES2			0.50			
1.00	D2			(1.35)			
1.00							
1.90	D3	SPT(S) N=50 (6,9/14,13,11,12)		1.85		MADE GROUND: Firm to stiff, brown to reddish brown, slightly sandy, slightly gravelly, silty clay. Gravel is angular to sub-angular, fine to coarse of sandstone and siltstone. Occasional fragments of clinker/slag, brick and limestone aggregate.	1
1.90				(0.60)			
				2.45			
						Stiff to very stiff, friable, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular, fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	2
						Extremely weak, friable, reddish brown mottled greenish grey MUDSTONE recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP]	3
						End of Borehole at 2.45m	
							4
							5
							6
							7
							8
							9
							10
Borehole Diameter		Installation		Remarks:			
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	Inspection pit GL to 1.00m. Groundwater not encountered. Backfilled with arisings upon completion.	
Water Strikes							
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks		
Fig A2.12 IFA DS Template Issue Number: 3 Issue Date: 07-09-16							

		Contract Name: Ringlands		Client: Curtins			Borehole ID: WS09			
		Contract Number: C2260193	Date Started: 18/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1			
Dynamic Sample Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50			
Weather:			Termination: Refusal							
Samples & In Situ Testing				Strata Details				Groundwater		
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation		
0.20	ES1			(0.30) 0.30		Grass and leaf litter over MADE GROUND: Soft, dark brown becoming brown, organic, slightly sandy, slightly gravelly, silty clay with tree roots and rootlets. Gravel is angular to sub-angular, fine to coarse of sandstone, concrete with rare fragments of clinker/slag, brick and limestone aggregate. Occasional fragments of glass and paper/plastic litter. (Topsoil) Terminated due to possible service.				
						End of Borehole at 0.30m				
							1			
							2			
							3			
							4			
							5			
							6			
							7			
							8			
							9			
							10			
Borehole Diameter		Installation		Remarks: Inspection pit GL to 0.30m. Groundwater not encountered. Backfilled with arisings upon completion.						
Depth (m)	Dia (m)	Depth Top	Base (m)						Diameter	Pipe Type
Water Strikes						Fig A2.13				
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks					
IFA DS Template						Issue Number: 3 Issue Date: 07-09-16				

		Contract Name: Ringlands			Client: Curtins			Borehole ID: WS09A	
		Contract Number: C2260193	Date Started: 18/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1		
Dynamic Sample Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50		
Weather:			Termination: Refusal			SPT Hammer: N/R, Energy Ratio: N/R			
Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation	
0.10	ES1	SPT(S) N=24 (3,2/4,7,6,7)		0.20		Grass and leaf litter over MADE GROUND: Soft, dark brown becoming brown, organic, slightly sandy, slightly gravelly, silty clay with tree roots and rootlets. Gravel is angular to sub-angular, fine to coarse of sandstone, concrete with rare fragments of clinker/slag, brick and limestone aggregate. Occasional fragments of glass and paper/plastic litter. (Topsoil) Stiff becoming very stiff, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular, fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP] <i>Below 0.75m: Very stiff, friable and locally gravelly</i> <i>Below 2.10m: Occasional sub-ordinate beds (<200mm thickness) of extremely weak to very weak siltstone</i>	1		
0.50	D1								
0.60	ES2								
0.80	D2								
1.00									
2.00	D3	SPT(S) N=41 (3,5/9,13,9,10)		(3.25)			2		
2.00									
3.00		SPT(S) N=54 (3,8/9,13,14,18)		3.45		End of Borehole at 3.45m	3		
							4		
							5		
							6		
							7		
							8		
							9		
							10		
Borehole Diameter		Installation		Remarks: Inspection pit GL to 1.00m. Groundwater not encountered. Standpipe with response zone 1.00m to 3.45m installed					
Depth (m)	Dia (m)	Depth Top	Base (m)						Diameter	Pipe Type
						Water Strikes			
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks				

Fig A2.14

IFA DS Template Issue Number: 3 Issue Date: 07-09-16

 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Borehole ID: WS10	
	Contract Number: C2260193	Date Started: 13/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Dynamic Sample Borehole Log	Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50	
	Weather:		Termination: Refusal		SPT Hammer: N/R, Energy Ratio: N/R		
Samples & In Situ Testing			Strata Details				Groundwater
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike
0.30	ES1	SPT(S) N=17 (2,3/4,3,4,6)		0.20		Grass over MADE GROUND: Soft, brown, organic, slightly sandy,, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular, fine to coarse of sandstone, with rare fragments of clinker/slag, brick and limestone aggregate. Occasional fragments of plastic and foil. (Topsoil)	1
0.40	D1			(0.30)			
0.80	ES2			0.50			
1.00	D2			(1.20)			
1.00				1.70		Stiff becoming very stiff, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular, fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	2
1.90	D3	(0.30)					
2.00		SPT(S) N=48 (5,6/10,10,12,16)		2.00		Extremely weak becoming very weak, friable, reddish brown mottled green grey MUDSTONE recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP]	3
						Below 1.00m: Very stiff and friable	
						End of Borehole at 2.00m	
							4
							5
							6
							7
							8
							9
							10
Borehole Diameter		Installation		Remarks:			
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	Inspection pit GL to 1.00m. Groundwater not encountered. Backfilled with arisings upon completion.	
Water Strikes							
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks		

Fig A2.15

 Geotechnical & Environmental Specialists		Contract Name: Ringlands		Client: Curtins			Borehole ID: WS11	
		Contract Number: C2260193	Date Started: 17/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Dynamic Sample Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50	
Weather:			Termination: Refusal					
Samples & In Situ Testing				Strata Details				Groundwater
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation
0.40	ES1			0.25	  	Grass over MADE GROUND: Very soft, brown, organic, slightly sandy, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular, fine to coarse of sandstone (Topsoil)		
0.80	ES2			(0.75)		MADE GROUND: Firm, reddish brown, slightly sandy, slightly gravelly, silty clay. Gravel is angular to sub-angular, fine to coarse of sandstone and siltstone. Occasional fragments of slag, brick and limestone aggregate.	1	
				1.00		MADE GROUND: Medium dense to dense, brownish grey and reddish brown, silty, sandy gravel. Gravel is very angular to angular fine to coarse limestone aggregate, slag and crushed concrete with some pockets of soft red brown sandy clay.	2	
						End of Borehole at 1.00m	3	
							4	
							5	
							6	
							7	
							8	
							9	
							10	
Borehole Diameter		Installation		Remarks:				
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	Inspection pit GL to 0.80m. Groundwater not encountered. Backfilled with arisings upon completion.		
Water Strikes								
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks			

Fig A2.16

 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Borehole ID: WS12	
	Contract Number: C2260193	Date Started: 17/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Dynamic Sample Borehole Log	Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50	
	Weather:		Termination: Refusal		SPT Hammer: N/R, Energy Ratio: N/R		

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation	
0.10	ES1			0.15		Grass over MADE GROUND: Very soft, brown, organic, slightly sandy, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular fine to coarse of sandstone. (Topsoil)			
0.30	ES2			0.25					
0.80	D1	SPT(S) N=20 (3,5/6,5,4,5)		(1.25)		Firm, reddish brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular, fine to medium of extremely weak mudstone lithorelicts. [MERCIA MUDSTONE GROUP]	1		
1.00									
1.60	D2	SPT(S) N=50 (6,12/10,14,15,11)		1.50		Stiff to very stiff, friable, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular, fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	2		
1.65					(0.50)				
				2.00		Extremely weak, friable, reddish brown MUDSTONE recovered as angular, fine to coarse gravel. [MERCIA MUDSTONE GROUP]			
						End of Borehole at 2.00m	3		
							4		
							5		
							6		
							7		
							8		
							9		
							10		

Borehole Diameter		Installation		Remarks:	
Depth (m)	Dia (m)	Depth Top	Base (m)			Pipe Type
					Inspection pit GL to 1.00m. Groundwater not encountered. Backfilled with arisings upon completion.
Water Strikes					
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	

Fig A2.17

IFA DS Template Issue Number: 3 Issue Date: 07-09-16

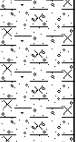
 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Borehole ID: WS13			
	Contract Number: C2260193	Date Started: 13/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1			
Dynamic Sample Borehole Log	Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50			
	Weather:		Termination: Refusal		SPT Hammer: N/R, Energy Ratio: N/R				
Samples & In Situ Testing			Strata Details				Groundwater		
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike		
0.30	ES1	SPT(S) N=18 (1,2/3,3,5,7)		0.20		Grass over MADE GROUND: Soft, brown, organic, slightly sandy, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular, fine to coarse of sandstone, with rare fragments of clinker/slag, brick and limestone aggregate. Occasional fragments of plastic and foil. (Topsoil)			
0.70	ES2			0.30					
0.90	D1			0.50					
1.00									
				(1.30)		MADE GROUND: Firm, brown to reddish brown, slightly sandy, slightly gravelly, silty clay with occasional brick cobbles. Gravel is angular to sub-angular, fine to coarse of sandstone and siltstone. Occasional fragments of brick, clinker and limestone aggregate. Occasional roots.	1		
1.90	D2	SPT(S) N=41 (6,8/7,7,10,17)	1.80					Stiff becoming very stiff, greenish grey mottled reddish brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular, fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	2
2.00			2.00						
						Below 0.80m: Very stiff and friable Extremely weak becoming very weak, friable, reddish brown mottled greenish grey MUDSTONE recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP]	3		
						End of Borehole at 2.00m			
							4		
							5		
							6		
							7		
							8		
							9		
							10		
Borehole Diameter		Installation		Remarks:					
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	Inspection pit GL to 1.00m. Backfilled with arisings upon completion.			
Water Strikes									
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks				
0.80			0	0.80					

Fig A2.18

 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Borehole ID: WS14	
	Contract Number: C2260193	Date Started: 13/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Dynamic Sample Borehole Log	Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50	
	Weather:		Termination: Refusal		SPT Hammer: N/R, Energy Ratio: N/R		

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation	
0.30	ES1	SPT(S) N=50 (6,7/12,9,17,12)		0.15 (0.40)		Grass over MADE GROUND: Soft, brown, organic, slightly sandy, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular fine to coarse of sandstone, with rare fragments of clinker/slag, brick and limestone aggregate. (Topsoil)			
0.70	ES2			0.55		MADE GROUND: Soft to firm becoming firm, brown to reddish brown, slightly sandy, slightly gravelly, silty clay. Gravel is angular to sub-angular, fine to coarse of sandstone and siltstone. Occasional fragments of concrete, brick and limestone aggregate.			
0.90	D1			(1.35)		Between 0.35m to 0.55m: Tabular sandstone boulder Between 0.40m to 0.50m: Strong hydrocarbon odour			
1.00									
1.90	D2		1.90 (0.45)		Stiff to very stiff, friable, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular, fine to medium of extremely weak and very weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	1			
			2.35		Extremely weak, friable, reddish brown mottled greenish grey MUDSTONE recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP]	2			
					End of Borehole at 2.35m	3			
						4			
						5			
						6			
						7			
						8			
						9			
						10			

Borehole Diameter		Installation		Remarks:	
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type
Inspection pit GL to 1.00m. Backfilled with arisings upon completion. Standpipe with response zone 1.00m to 2.35m installed					
Water Strikes Depth Strike | Depth Casing | Depth Sealed | Time (mins) | Rose to (m) | Remarks					
0.40			0	0.40	

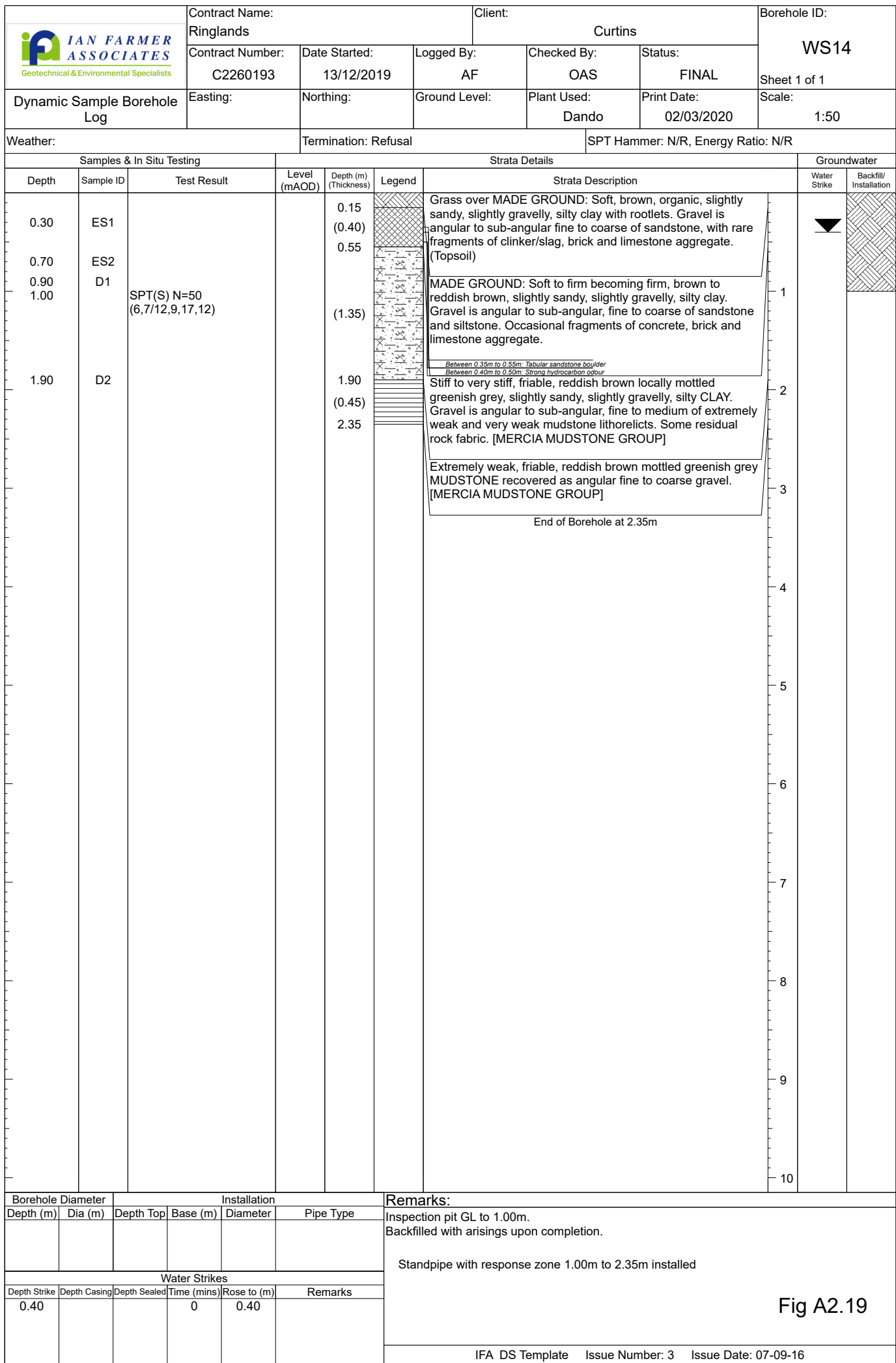


Fig A2.19

IFA DS Template Issue Number: 3 Issue Date: 07-09-16

 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Borehole ID: WS15	
	Contract Number: C2260193	Date Started: 13/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Dynamic Sample Borehole Log	Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50	
	Weather:		Termination: Refusal		SPT Hammer: N/R, Energy Ratio: N/R		
Samples & In Situ Testing			Strata Details				Groundwater
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike
0.10	ES1			0.25		Grass over MADE GROUND: Soft, brown, organic, slightly sandy, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular fine to coarse of sandstone, with rare fragments of clinker/slag, brick and limestone aggregate. (Topsoil)	
0.60	ES2			0.45			
0.70	D1			(0.35)		MADE GROUND: Loose, brown, silty fine to medium sand with occasional angular brick cobbles.	1
0.90	ES3			0.80			
1.00	D2	SPT(S) N=18 (2,2/3,5,6,4)				MADE GROUND: Firm, brown to reddish brown, slightly sandy, slightly gravelly, silty clay. Gravel is angular to sub-angular, fine to coarse of sandstone and siltstone. Occasional fragments of brick, clinker and limestone aggregate. Occasional roots.	2
1.50	D3			(1.70)			
2.00	D4	SPT(S) N=27 (1,2/4,6,7,10)				Stiff becoming very stiff, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CL. Gravel is angular to sub-angular, fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	
2.00				2.50			
2.70	D5	SPT(S) N=50 (5,8/10,15,15,10)		(0.30)		Below 1.20m: Very stiff and friable Extremely weak becoming very weak, friable, reddish brown MUDSTONE recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP]	3
2.80				2.80			
						End of Borehole at 2.80m	
							4
							5
							6
							7
							8
							9
							10
Borehole Diameter		Installation		Remarks:			
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	Inspection pit GL to 1.00m.	
		0.00	1.00	35	Plain		
		1.00	2.80	35	Slotted	Standpipe with response zone 1.00m to 2.80m installed	
Water Strikes							
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks		
0.85			0	0.85			

Fig A2.20

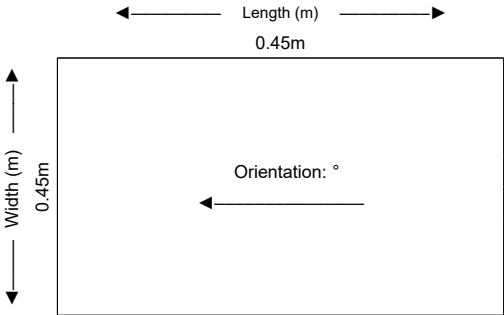
		Contract Name: Ringlands			Client: Curtins			Borehole ID: WS16	
		Contract Number: C2260193	Date Started: 13/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1		
Dynamic Sample Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50		
Weather:			Termination: Refusal			SPT Hammer: N/R, Energy Ratio: N/R			
Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation	
0.40	ES1	SPT(S) N=14 (1,1/5,3,3,3)		(0.45)		Grass over MADE GROUND: Soft to firm, brown, slightly sandy,, gravelly, silty clay with rootlets. Gravel is angular to sub-angular, fine to coarse of sandstone, siltstone, brick, concrete and limestone aggregate.	1		
1.00	D1			0.45		MADE GROUND: Dense, light grey, very angular to angular,, fine to coarse gravel and cobbles of limestone aggregate and crushed concrete			
1.00	ES2			0.70					
1.00	D2								
1.50	D2	SPT(S) N=19 (5,4/4,4,5,6)		(2.30)		Stiff becoming very stiff, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly,, silty CLAY. Gravel is angular to sub-angular, fine to medium of extremely weak mudstone and weak sandstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]	2		
2.00									
3.00	D3			3.00		Extremely weak becoming very weak, friable, reddish brown mottled greenish grey interbedded MUDSTONE and SILTSTONE recovered as angular fine to coarse gravel. [MERCIA MUDSTONE GROUP]			
3.00									
4.00	D4	SPT(S) N=44 (2,5/7,14,17,6)		(1.45)		3			
4.00									
				4.45	End of Borehole at 4.45m			4	
							5		
							6		
							7		
							8		
							9		
							10		
Borehole Diameter		Installation		Remarks:					
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	Inspection pit GL to 1.00m.			
		0.00	1.00	35	Plain				
		1.00	4.45	35	Slotted				
Water Strikes									
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks				
0.70			0	0.70					
Fig A2.21									
IFA DS Template Issue Number: 3 Issue Date: 07-09-16									

 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Borehole ID: WS17		
	Contract Number: C2260193	Date Started: 18/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1		
Dynamic Sample Borehole Log	Easting:	Northing:	Ground Level:	Plant Used: Dando	Print Date: 02/03/2020	Scale: 1:50		
	Weather:		Termination: Refusal		SPT Hammer: N/R, Energy Ratio: N/R			
Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	
0.10	ES1	SPT(S) N=11 (2,2/2,5,2,2)		0.25	 Grass over MADE GROUND: Soft to firm, brown, organic, slightly sandy, slightly gravelly, silty clay with rootlets. Gravel is angular to sub-angular fine to coarse of sandstone, with rare fragments of limestone aggregate. (Topsoil)	 MADE GROUND: Firm to stiff, brown to reddish brown, slightly sandy, slightly gravelly, silty clay with occasional angular to sub-angular cobbles of limestone aggregate. Gravel is angular to sub-angular, fine to coarse of limestone aggregate, sandstone and siltstone.		
0.30	ES2			0.50				
0.90	D1			(2.95)				 Stiff becoming very stiff, reddish brown locally mottled greenish grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-angular, fine to medium of extremely weak mudstone lithorelicts. Some residual rock fabric. [MERCIA MUDSTONE GROUP]
1.00	ES3							
1.00								
1.50	D2	SPT(S) N=39 (4,5/7,13,10,9)	 Below 1.70m: Very stiff and friable Below 2.20m: Occasional sub-ordinate beds (<150mm thickness) of extremely weak to very weak mudstone and siltstone					
2.00								
2.50	D3							
3.00		SPT(S) N=50 (6,19/20,15,10,5)	3.45	End of Borehole at 3.45m				
Borehole Diameter			Installation		Remarks:			
Depth (m)	Dia (m)	Depth Top	Base (m)	Diameter	Pipe Type	Inspection pit GL to 1.00m.		
		0.00	1.00	35	Plain			
		1.00	4.15	35	Slotted			
Water Strikes								
Depth Strike	Depth Casing	Depth Sealed	Time (mins)	Rose to (m)	Remarks			
0.50			0	0.50				

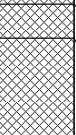
Fig A2.22

	Contract Name: Ringlands		Client: Curtins			Trial Pit ID: OUW2	
	Contract Number: C2260193	Date: 09/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: Hand Tools	Date Printed: 02/03/2020	Scale: 1:40	
	Weather:		Hole Termination: Refusal		Stability: Stable		

Samples & In Situ Testing			Strata Details				Water
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description	
				0.05 0.10		Concrete paving slab MADE GROUND: (Strong) light brown grey CONCRETE (Pavement bedding) End of Trial Pit at 0.10m	
							1
							2
							3
							4
							5
							6

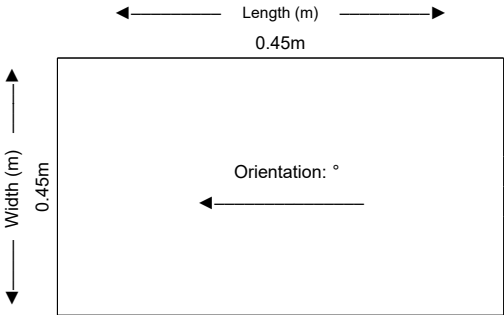
Dimensions: Final Depth: 0.10m 		General Remarks: Refusal on concrete. Paving slabs reinstated following excavation. <table border="1"> <thead> <tr> <th colspan="4">Water Strikes</th> </tr> <tr> <th>Strike (m)</th> <th>Time (mins)</th> <th>Rose to (m)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td colspan="4" style="text-align: center;">Fig A2.23</td> </tr> </tbody> </table>		Water Strikes				Strike (m)	Time (mins)	Rose to (m)	Remarks	Fig A2.23			
Water Strikes															
Strike (m)	Time (mins)	Rose to (m)	Remarks												
Fig A2.23															
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16															

	Contract Name: Ringlands		Client: Curtins			Trial Pit ID: OUW3	
	Contract Number: C2260193	Date: 09/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: Hand Tools	Date Printed: 02/03/2020	Scale: 1:40	
	Weather:		Hole Termination: Hole collapsing		Stability: Unstable		

Samples & In Situ Testing			Strata Details				Water
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description	
				0.05		Concrete paving slab	1 2 3 4 5 6
				0.23		MADE GROUND: (Moderately weak) light brown grey CONCRETE (Pavement bedding)	
				(0.52)		MADE GROUND: (Dense) light grey very angular to angular fine to coarse GRAVEL and COBBLES of limestone aggregate and crushed concrete with some silty sand and occasional pockets of soft red brown sandy clay above 0.50m. Occasional fragments of steel re-bar and brick.	
				0.75		End of Trial Pit at 0.75m	

Dimensions:

Final Depth: 0.75m



General Remarks:

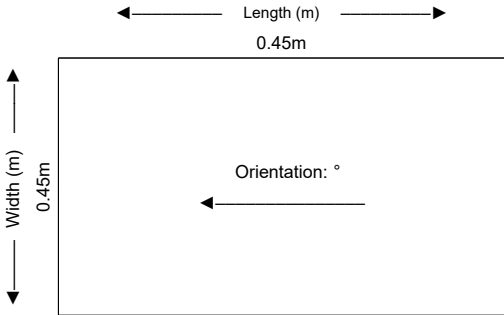
Groundwater not encountered. Backfilled with arisings upon completion.

Water Strikes			
Strike (m)	Time (mins)	Rose to (m)	Remarks
Fig A2.24			

HBSI TP Template

Issue Number: 2

Issue Date: 27/04/16

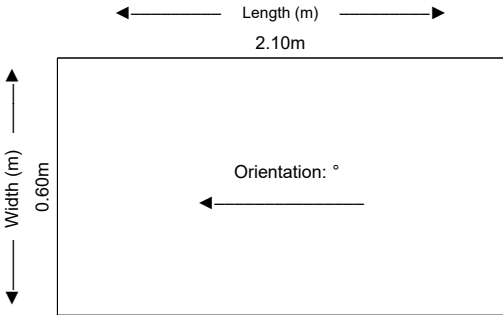
 Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Trial Pit ID: OUW4		
	Contract Number: C2260193	Date: 09/12/2019	Logged By: AF	Checked By: OAS	Status: FINAL	Sheet 1 of 1		
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: Hand Tools	Date Printed: 02/03/2020	Scale: 1:40		
	Weather:		Hole Termination: Hole collapsing		Stability: Unstable			
Samples & In Situ Testing			Strata Details					Water
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description		
				0.05		Concrete paving slab		1
				0.25		MADE GROUND: (Moderately weak) light brown grey CONCRETE (Pavement bedding)		
				(0.55)		MADE GROUND: (Dense) light grey very angular to angular fine to coarse GRAVEL and COBBLES of limestone aggregate and crushed concrete with some silty sand and occasional pockets of soft red brown sandy clay above 0.50m.		
				0.80		Foundations - Brick wall onto concrete footings GL - >0.80m bgl. Foundations typically flush with external wall; 20mm thick lip at 0.12mbgl.		
						End of Trial Pit at 0.80m		
								2
								3
								4
								5
								6
Dimensions:					General Remarks:			
Final Depth: 0.80m					Groundwater not encountered. Backfilled with arisings upon completion.			
								
					Water Strikes			
					Strike (m)	Time (mins)	Rose to (m)	Remarks
								Fig A2.25
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16								

 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Trial Pit ID: SA01	
	Contract Number: C2260193	Date: 09/12/2019	Logged By: HW	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 02/03/2020	Scale: 1:40	
	Weather:		Hole Termination: Refusal		Stability: Stable		

Samples & In Situ Testing			Strata Details				Water	
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description		
0.10	ES1			(0.30)		MADE GROUND: Brown, gravelly, sandy, clay with occasional crop pockets of glass (Topsoil)	1	
0.60	ES2			0.30		Brownish red occasionally mottled white, sandy, clayey GRAVEL. Gravel is subrounded mudstone		
				(0.40)				
				0.70		Weathered bedrock recovered as greyish white and brownish red, clayey, sandy GRAVEL. Gravel is subangular mudstone (MERCIA MUDSTONE GROUP)	2	
				(1.10)				
				1.80		End of Trial Pit at 1.80m		3
							4	
								6

Dimensions:

Final Depth: 1.80m



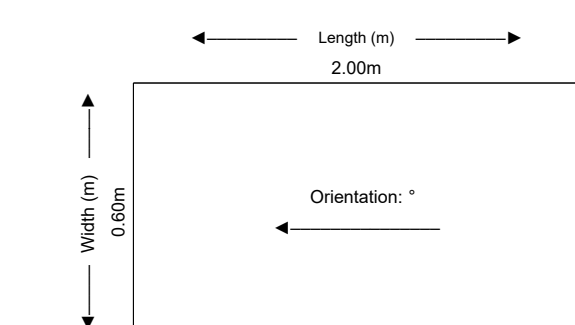
General Remarks:

Groundwater not encountered.
 Backfilled with arisings upon completion.

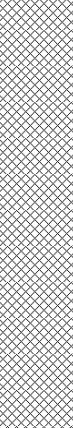
Water Strikes			
Strike (m)	Time (mins)	Rose to (m)	Remarks

Fig A2.26

HBSI TP Template Issue Number: 2 Issue Date: 27/04/16

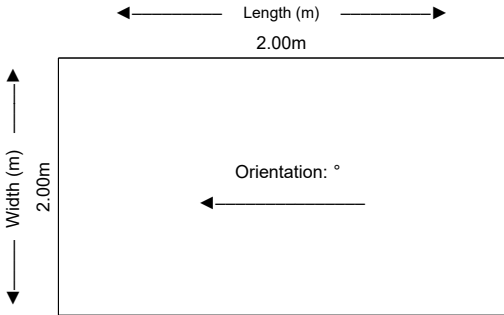
		Contract Name: Ringlands		Client: Curtins		Trial Pit ID: SA04													
		Contract Number: C2260193	Date: 09/12/2019	Logged By: HW	Checked By: OAS	Status: FINAL	Sheet 1 of 1												
Trial Pit Log		Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 02/03/2020	Scale: 1:40												
		Weather:			Hole Termination: Water inflow		Stability: Stable												
Samples & In Situ Testing				Strata Details			Water												
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description													
0.20	ES1			(0.45)		MADE GROUND: Brown, gravelly, sandy clay (Topsoil)	1												
0.50	ES2			0.45		Firm to stiff, brownish red occasioanlly white, gravelly, sandy CLAY													
				(0.55)															
1.00	B1			1.00		Brownish red, sandy, clayey GRAVEL. Gravel is subangular mudstone													
				(0.40)															
				1.40		End of Trial Pit at 1.40m													
							2												
							3												
							4												
							5												
							6												
Dimensions:				General Remarks:															
Final Depth: 1.40m				Backfilled with arisings															
				<table border="1"> <thead> <tr> <th colspan="4">Water Strikes</th> </tr> <tr> <th>Strike (m)</th> <th>Time (mins)</th> <th>Rose to (m)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>1.15</td> <td>0</td> <td>1.15</td> <td></td> </tr> </tbody> </table>				Water Strikes				Strike (m)	Time (mins)	Rose to (m)	Remarks	1.15	0	1.15	
Water Strikes																			
Strike (m)	Time (mins)	Rose to (m)	Remarks																
1.15	0	1.15																	
				Fig A2.27															
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16																			

 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Trial Pit ID: TP03	
	Contract Number: C2260193	Date: 09/12/2019	Logged By: HW	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 02/03/2020	Scale: 1:40	
	Weather:		Hole Termination: Trail pit collapsing		Stability: Unstable		

Samples & In Situ Testing			Strata Details				Water
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description	
0.20	ES1			(2.30)		MADE GROUND: Brown becoming reddish brown, clayey, sandy, cobbly gravel with demolition waste, concrete blocks, crushed concrete, rebar and occasional crushed pipe. Strong hydrocarbon odour	1
2.50	ES2			2.30 (0.30) 2.60		Brownish red, sandy, gravelly CLAY	2
						End of Trial Pit at 2.60m	3
							4
							5
							6

Dimensions:

Final Depth: 2.60m



General Remarks:

Backfilled with arisings upon completion.

Water Strikes			
Strike (m)	Time (mins)	Rose to (m)	Remarks
2.30	0	2.30	

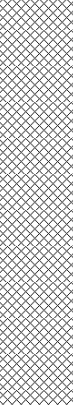
Fig A2.28

HBSI TP Template

Issue Number: 2

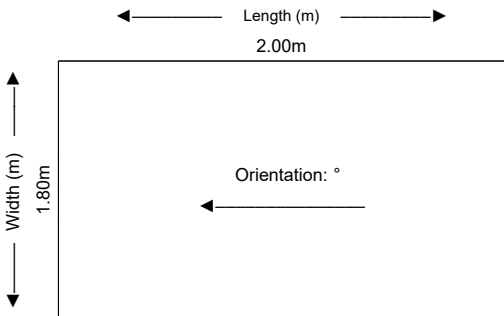
Issue Date: 27/04/16

	Contract Name: Ringlands		Client: Curtins			Trial Pit ID: TP04	
	Contract Number: C2260193	Date: 09/12/2019	Logged By: HW	Checked By: OAS	Status: FINAL	Sheet 1 of 1	
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 02/03/2020	Scale: 1:40	
	Weather:		Hole Termination: Trial pit collapsing		Stability: Unstable		

Samples & In Situ Testing			Strata Details				Water
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description	
0.10	ES1			(2.20)		MADE GROUND: Brown becoming reddish brown, clayey, sandy, cobbly gravel with demolition waste, concrete blocks, crushed concrete, rebar and occasional crushed pipe. Strong hydrocarbon odour	1
2.30	ES2			2.20 (0.30)		Brownish red, sandy, gravelly CLAY <i>Below 2.20m: Becoming more gravelly with depth with occasional cobbles</i>	2
				2.50		End of Trial Pit at 2.50m	3
							4
							5
							6

Dimensions:

Final Depth: 2.50m



General Remarks:

Backfilled with arisings upon completion.

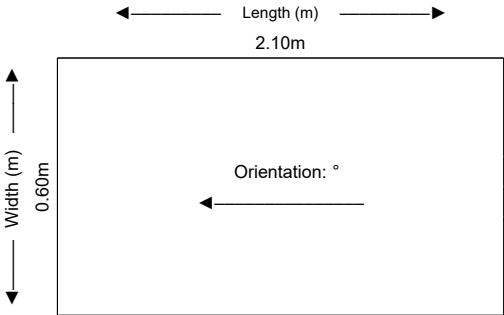
Water Strikes			
Strike (m)	Time (mins)	Rose to (m)	Remarks
2.20	0	2.20	

Fig A2.29

HBSI TP Template

Issue Number: 2

Issue Date: 27/04/16

 Geotechnical & Environmental Specialists	Contract Name: Ringlands		Client: Curtins			Trial Pit ID: TP05		
	Contract Number: C2260193	Date: 09/12/2019	Logged By: HW	Checked By: OAS	Status: FINAL	Sheet 1 of 1		
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 02/03/2020	Scale: 1:40		
	Weather:		Hole Termination: Trial pit collapsing			Stability: Unstable		
Samples & In Situ Testing			Strata Details					Water
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description		
0.30	ES1			0.25		MADE GROUND: Brownish red, cobbly, sandy, clayey gravel		1
				(1.25)		MADE GROUND: Pinkish grey, clayey, cobbly, sandy gravel with demolition waste with crushed concrete, imported stone and broken pipe work		
1.60	ES2			1.50		Brownish red and brownish yellow, sandy, clayey GRAVEL. Gravel is subangular mudstone		2
				(1.40)				
				2.90		End of Trial Pit at 2.90m		3
								4
								5
								6
Dimensions:			General Remarks:					
Final Depth: 2.90m			Backfilled with arisings upon completion.					
			Water Strikes					
			Strike (m)	Time (mins)	Rose to (m)	Remarks		
			1.50	0	1.50	Fig A2.30		
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16								

Probe Log

Borehole No.

DCP01

Sheet 1 of 2

Project Name: Ringlands Centre

Project No.
C62260193

Co-ords: -

Hole Type
DCP

Location: Newport

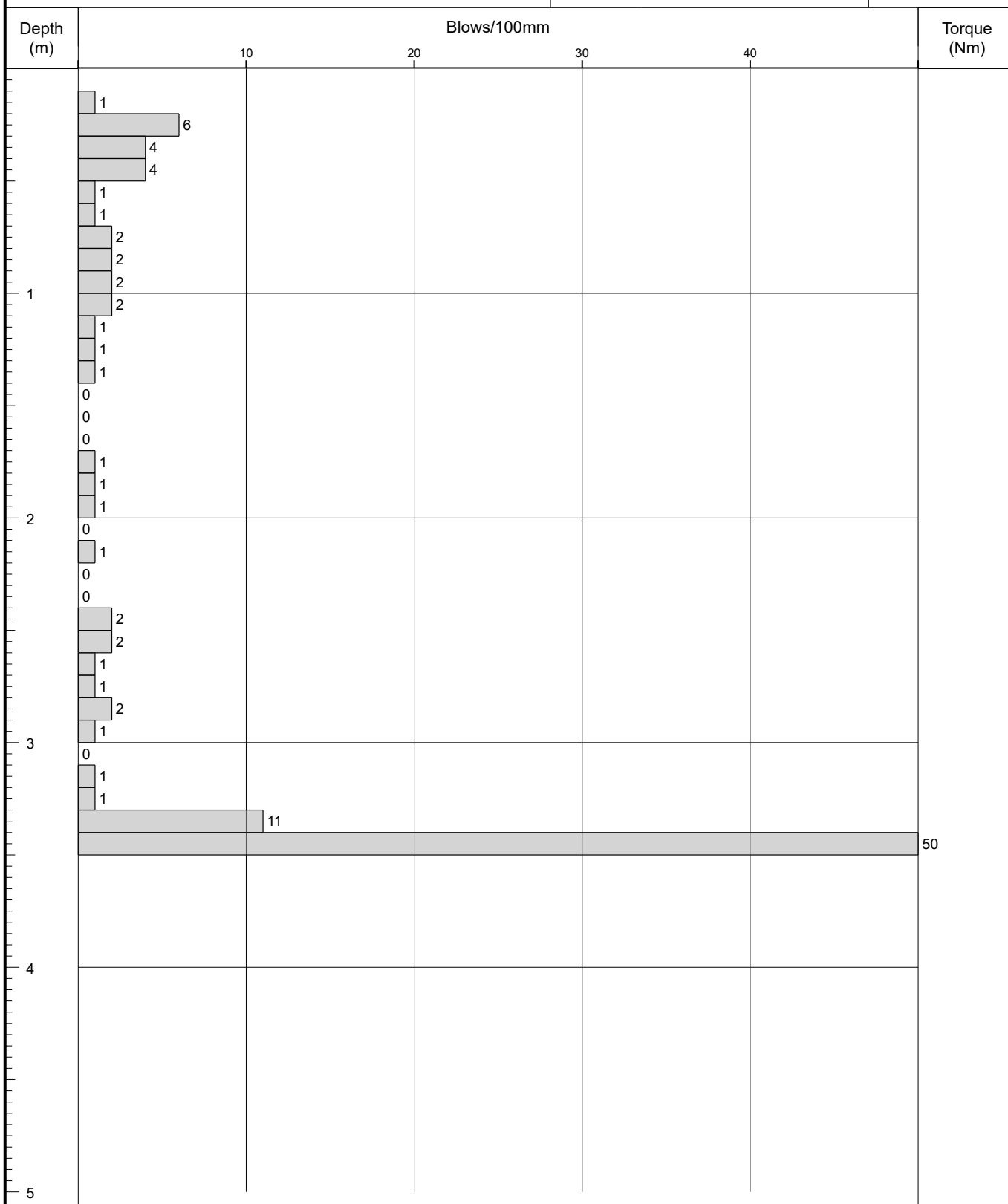
Level:

Scale
1:25

Client: Curtins

Dates: 18/12/19

Logged By



Remarks

Located 0.75m off the wall

Fall Height 750

Hammer Wt 64

Probe Type DPSH-B

Cone Base Diameter

Final Depth 3.50

Log Scale 1:25



Probe Log

Borehole No.

DCP02

Sheet 2 of 2

Project Name: Ringland Centre

Project No.
C2260193

Co-ords: -

Hole Type
DCP

Location: Newport

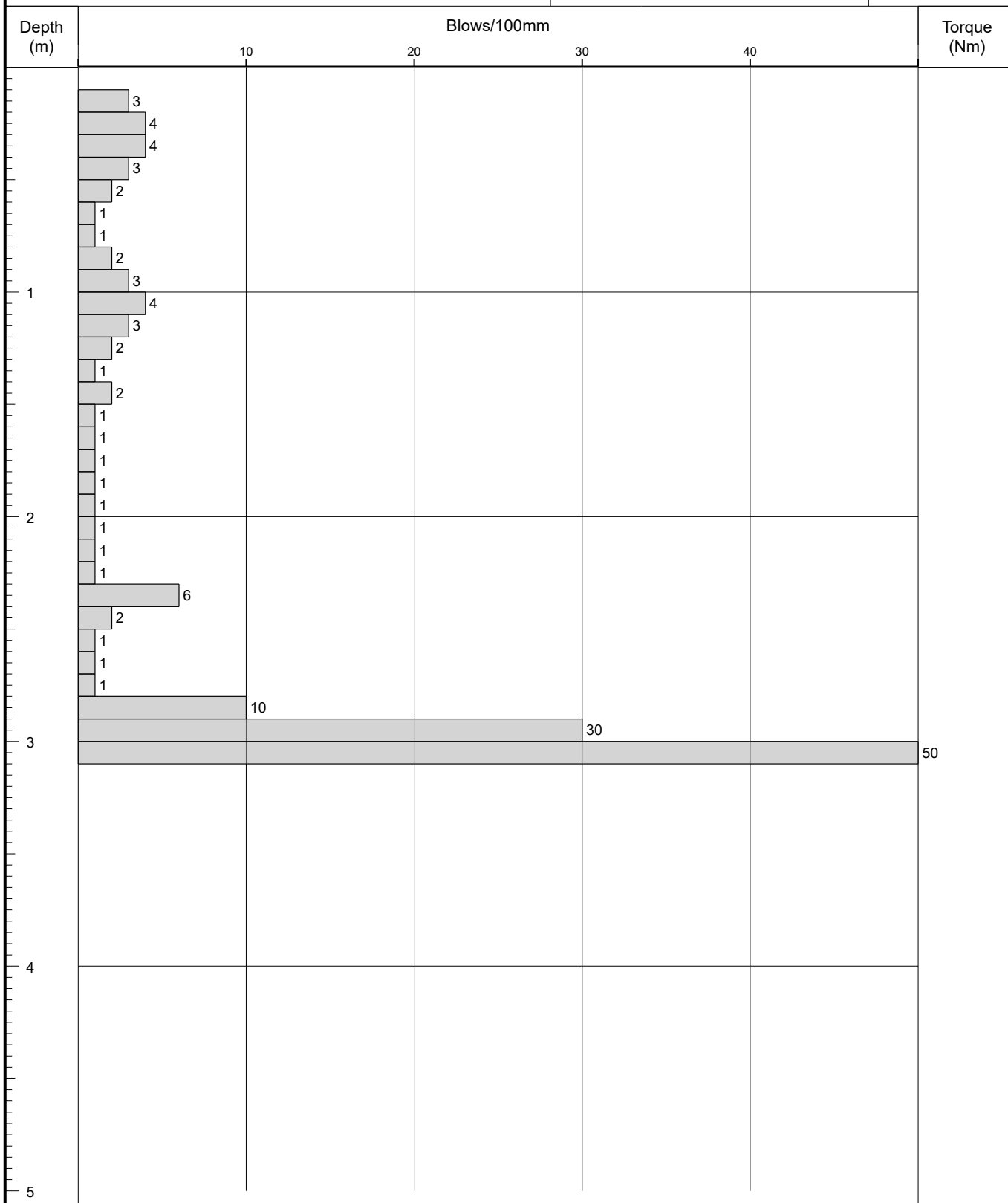
Level:

Scale
1:25

Client: Curtins

Dates: 18/12/2019

Logged By



Remarks

Located 1.50m off the wall

Fall Height 750

Hammer Wt 64

Probe Type DPSH-B

Cone Base Diameter

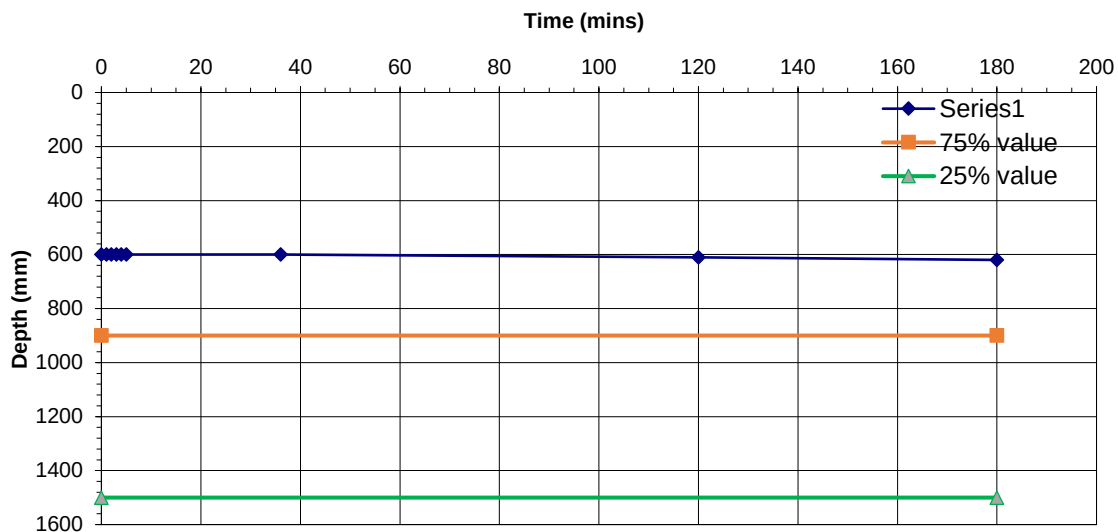
Final Depth 3.10

Log Scale 1:25



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007
BRE Digest 365, Figure 2, Page 5

Client:	Curtins		
Site:	Ringlands		
Job No:	C2260193	Test No:	SA01 - Test 1
Date	13/01/2020		
CALCULATION OF SOIL INFILTRATION RATE			
Time (min)	Depth (mm)	Size of Soakaway	Length (m) = 2.10
0	600		Width (m) = 0.60
1	600		Depth (m) = 1.80
2	600		
3	600	Depth to water at start of test = 600mm	
4	600	Depth to base of pit = 1800mm	
5	600	Depth to water at 75% level = 900mm	
36	600	Depth to water at 50% level = 1200mm	
120	610	Depth to water at 25% level = 1500mm	
180	620		
		Base area of pit (m ²) = 1.260	
		Eff area of loss 75 - 25% (m ²) = 4.500	
		Volume outflow 75 - 25% (m ³) = 0.756	
		From the graph:	
		tp 75 (min) =	
		tp 25 (min) =	
		Soil infiltration rate, f, (m/s) =	N/A normal test
			pit with stone
		Tested by: HW	Date: 09/12/2019
		Checked by: OS	Date: 13/01/2020

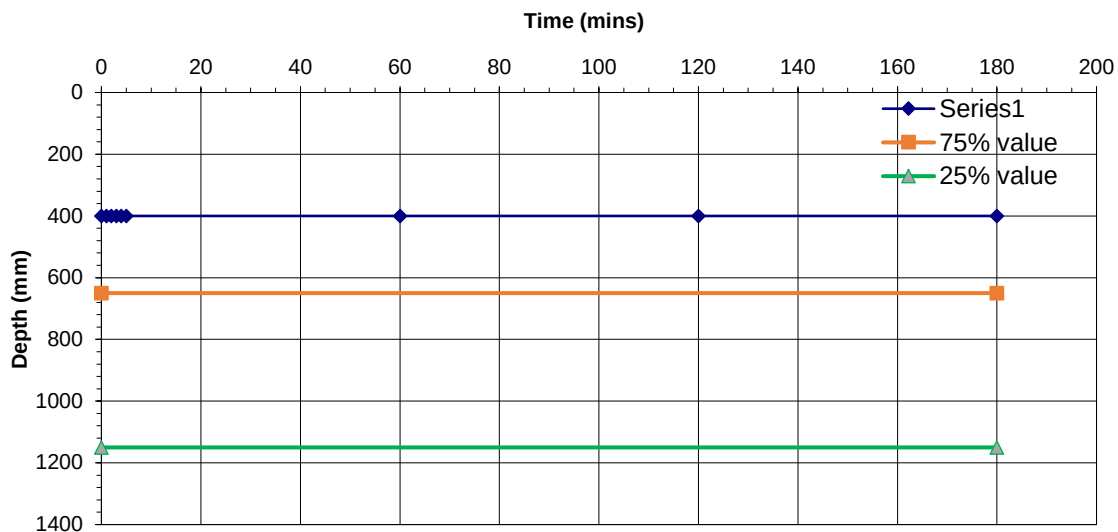


Notes

Fig A2.31

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007
BRE Digest 365, Figure 2, Page 5

Client:	Curtins		
Site:	Ringlands		
Job No:	C2260193	Test No:	SA04 - Test 1
Date	13/01/2020		
CALCULATION OF SOIL INFILTRATION RATE			
Time (min)	Depth (mm)	Size of Soakaway	Length (m) = 2.00
0	400		Width (m) = 0.60
1	400		Depth (m) = 1.40
2	400		
3	400	Depth to water at start of test = 400mm	
4	400	Depth to base of pit = 1400mm	
5	400	Depth to water at 75% level = 650mm	
60	400	Depth to water at 50% level = 900mm	
120	400	Depth to water at 25% level = 1150mm	
180	400		
		Base area of pit (m ²) = 1.200	
		Eff area of loss 75 - 25% (m ²) = 3.800	
		Volume outflow 75 - 25% (m ³) = 0.600	
		From the graph:	
		tp 75 (min) =	
		tp 25 (min) =	
		Soil infiltration rate, f, (m/s) =	N/A normal test
			pit with stone
		Tested by: HW	Date: 09/12/2019
		Checked by: OS	Date: 13/01/2020



Notes

Fig A2.32



Date Drawn:
14-02-2020

Scale: NTS

Title: BH01 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.33



Date Drawn:
14-02-2020

Scale: NTS

Title: BH01 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.34



Date Drawn:
14-02-2020

Scale: NTS

Title: BH01 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.35



Date Drawn:
14-02-2020

Scale: NTS

Title: BH02 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.36



Date Drawn:
14-02-2020

Scale: NTS

Title: BH02 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.37



Date Drawn:
14-02-2020

Scale: NTS

Title: BH02 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.38



Date Drawn: 14-02-2020	Scale: NTS	Title: BH02 Core Photographs	
 Geotechnical & Environmental Specialists		Site: Ringlands Centre, Newport	
		Client: Curtins	Job No: C2260193
		Figure: A2.39	



Date Drawn:
14-02-2020

Scale: NTS

Title: BH05 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.40



Date Drawn:
14-02-2020

Scale: NTS

Title: BH05 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.41



Date Drawn:
14-02-2020

Scale: NTS

Title: BH05 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.42



Date Drawn:
14-02-2020

Scale: NTS

Title: BH05 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.43



Date Drawn:
14-02-2020

Scale: NTS

Title: BH06 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.44



Date Drawn: 14-02-2020	Scale: NTS	Title: BH06 Core Photographs	
		Site: Ringlands Centre, Newport	
		Client: Curtins	Job No: C2260193
		Figure: A2.45	



Date Drawn:
14-02-2020

Scale: NTS

Title: BH06 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.46



Date Drawn:
14-02-2020

Scale: NTS

Title: BH06 Core Photographs

Site: Ringlands Centre, Newport

Client: Curtins

Job No: C2260193

Figure: A2.47

						Gas and Groundwater Monitoring Results					
Contract No:		C2260193									
Contract Name:		Ringlands									
Date:		19/12/2019									
Background Readings:	O ₂ % v/v					CO ₂ %v/v					
	H ₂ S ppm					CO ppm					
	Weather Conditions					Overcast					
	Ground Conditions (dry/wet etc.)					Damp					
	Atmospheric Pressure (Start):					995					
	Atmospheric Pressure (Finish):					989					
Hole No:	Time (hh:mm)	O ₂ % v/v Lowest	CO ₂ % v/v Steady	CH ₄ % v/v Steady	H ₂ S ppm Steady	CO ppm Steady	Gas Flow Rate (l/hr) Steady	Base of Pipe mBGL	Groundwater mBGL	CH4 GSV (l/hr)	CO2 GSV (l/hr)
BH02		14.8	2.1	0.0	0.0	0.0	2.5	14.48	1.95	0.0000	0.0525
BH05		15.7	0.9	0.0	0.0	0.0	1.1	15.35	1.20	0.0000	0.0099
BH06		3.3	3.8	0.0	0.0	0.0	0.1	15.10	1.85	0.0000	0.0038
WS04		20.1	0.1	0.0	0.0	0.0	0.2	1.85	0.42	0.0000	0.0002
WS05		17.8	1.0	0.0	0.0	0.0	-0.3	3.95	1.05	0.0000	-0.0030
WS06		9.5	3.4	0.0	0.0	0.0	0.1	4.40	1.55	0.0000	0.0034
WS09		9.0	2.4	0.0	0.0	1.0	0.2	3.37	1.40	0.0000	0.0048
WS14		15.9	0.90	0.0	0.0	0.0	0.4	1.85	0.55	0.0000	0.0036
WS15		19.5	1.0	0.0	0.0	0.0	-0.2	3.05	0.86	0.0000	-0.0020
WS16		20.3	0.1	0.0	0.0	0.0	0.2	4.26	1.9	0.0000	0.0002
WS17		19.4	0.2	0.0	0.0	0.0	0.1	3.30	0.32	0.0000	0.0002
Remarks: Monitored immediately after completion of field work											
ND = Below detection limit of instrument. NR = Not Read.											
Readings are taken over a 60 second period.											
Readings Taken By:		HW									
Checked By:		OAS									

Fig A2.48

						Gas and Groundwater Monitoring Results					
Contract No:		C2260193									
Contract Name:		Ringlands									
Date:		07/01/2020									
Background Readings:	O ₂ % v/v				CO ₂ %v/v						
	H ₂ S ppm				CO ppm						
	Weather Conditions				Showers						
	Ground Conditions (dry/wet etc.)				Damp						
	Atmospheric Pressure (Start):				1024						
	Atmospheric Pressure (Finish):				1018						
Hole No:	Time (hh:mm)	O ₂ % v/v Lowest	CO ₂ % v/v Steady	CH ₄ % v/v Steady	H ₂ S ppm Steady	CO ppm Steady	Gas Flow Rate (l/hr) Steady	Base of Pipe mBGL	Groundwater mBGL	CH4 GSV (l/hr)	CO2 GSV (l/hr)
BH02	12:23	15.9	1.8	0.0	1.0	0.0	-4.6	14.48	2.30	0.0000	-0.0828
BH05	09:32	20.2	0.2	0.0	0.0	0.0	-0.1	15.35	1.09	0.0000	-0.0002
BH06	11:55	4.2	3.4	0.0	0.0	0.0	-0.2	15.10	2.20	0.0000	-0.0068
WS04	07:50	20.3	0.1	0.0	0.0	0.0	0.1	1.85	0.46	0.0000	0.0001
WS05	08:04	18.9	0.8	0.0	0.0	0.0	-0.1	3.95	0.86	0.0000	-0.0008
WS06	08:30	9.3	3.4	0.0	0.0	0.0	-0.1	4.40	1.36	0.0000	-0.0034
WS09	09:50	9.0	2.3	0.0	0.0	0.0	0.2	3.37	1.39	0.0000	0.0046
WS14	10:12	18.6	0.70	0.0	0.0	0.0	-0.2	1.85	0.62	0.0000	-0.0014
WS15	10:37	19.7	0.9	0.0	0.0	0.0	-0.1	3.05	1.01	0.0000	-0.0009
WS16	11:05	19.9	0.2	0.0	0.0	0.0	-0.1	4.26	2.27	0.0000	-0.0002
WS17	09:02	20.4	0.1	0.0	0.0	0.0	0.0	3.30	0.40	0.0000	0.0000
Remarks:											
ND = Below detection limit of instrument. NR = Not Read.											
Readings are taken over a 60 second period.											
Readings Taken By:		HW									
Checked By:		OAS									

Fig A2.49

						Gas and Groundwater Monitoring Results					
Contract No:		C2260193									
Contract Name:		Ringlands									
Date:		21/01/2020									
Background Readings:	O ₂ % v/v					CO ₂ %v/v					
	H ₂ S ppm					CO ppm					
	Weather Conditions					Showers					
	Ground Conditions (dry/wet etc.)					Damp					
	Atmospheric Pressure (Start):					1042					
	Atmospheric Pressure (Finish):					1041					
Hole No:	Time (hh:mm)	O ₂ % v/v Lowest	CO ₂ % v/v Steady	CH ₄ % v/v Steady	H ₂ S ppm Steady	CO ppm Steady	Gas Flow Rate (l/hr) Steady	Base of Pipe mBGL	Groundwater mBGL	CH4 GSV (l/hr)	CO2 GSV (l/hr)
BH02	10:15	16.7	1.6	0.0	1.0	0.0	-4.7	14.48	2.38	0.0000	-0.0752
BH05	07:55	20.9	0.1	0.0	0.0	0.0	-0.1	15.35	1.14	0.0000	-0.0001
BH06	09:43	4.3	3.0	0.0	0.0	0.0	-0.2	15.10	2.24	0.0000	-0.0060
WS04	12:04	20.8	0.1	0.0	0.0	0.0	0.1	1.83	0.45	0.0000	0.0001
WS05	11:49	19.9	0.90	0.0	0.0	0.0	-0.1	3.92	0.86	0.0000	-0.0009
WS06	10:59	9.3	3.3	0.0	0.0	0.0	-0.1	4.40	1.40	0.0000	-0.0033
WS09	08:03	9.2	2.1	0.0	0.0	0.0	0.2	3.37	1.36	0.0000	0.0042
WS14	08:58	18.5	0.60	0.0	0.0	0.0	-0.2	1.85	0.59	0.0000	-0.0012
WS15	09:18	20.1	1.0	0.0	0.0	0.0	-0.1	3.05	0.95	0.0000	-0.0010
WS16	08:26	20.9	0.1	0.0	0.0	0.0	-0.1	4.26	2.23	0.0000	-0.0001
WS17	10:39	20.9	0.1	0.0	0.0	0.0	0.0	3.30	0.36	0.0000	0.0000
Remarks: Monitoring undertaken by Structural Soils											
ND = Below detection limit of instrument. NR = Not Read.											
Readings are taken over a 60 second period.											
Readings Taken By:		SO									
Checked By:		OAS									

Fig A2.50

						Gas and Groundwater Monitoring Results					
Contract No:		C2260193									
Contract Name:		Ringlands									
Date:		04/02/2020									
Background Readings:	O ₂ % v/v				CO ₂ %v/v						
	H ₂ S ppm				CO ppm						
	Weather Conditions				Overcast						
	Ground Conditions (dry/wet etc.)				Damp						
	Atmospheric Pressure (Start):				1022						
	Atmospheric Pressure (Finish):				1036						
Hole No:	Time (hh:mm)	O ₂ % v/v Lowest	CO ₂ % v/v Steady	CH ₄ % v/v Steady	H ₂ S ppm Steady	CO ppm Steady	Gas Flow Rate (l/hr) Steady	Base of Pipe mBGL	Groundwater mBGL	CH4 GSV (l/hr)	CO2 GSV (l/hr)
BH02	10:44	15.3	2.3	0.0	0.0	0.0	2.5	14.48	2.42	0.0000	0.0575
BH05	07:35	10.9	1.7	0.0	0.0	1.0	-1.8	15.35	1.10	0.0000	-0.0306
BH06	09:27	3.3	3.7	0.0	0.0	0.0	0.0	15.10	2.18	0.0000	0.0000
WS04	10:50	20.7	0.1	0.0	0.0	0.0	0.0	1.83	0.46	0.0000	0.0000
WS05	10:01	18.4	2.70	0.0	0.0	2.0	0.1	3.92	0.97	0.0000	0.0027
WS06	12:30	9.9	3.7	0.0	0.0	2.0	-0.3	4.40	1.37	0.0000	-0.0111
WS09	14:23	9.6	2.5	0.0	0.0	0.0	-0.1	3.37	1.38	0.0000	-0.0025
WS14	13:27	17.7	1.40	0.0	0.0	2.0	-0.1	1.85	0.60	0.0000	-0.0014
WS15	09:06	20	0.9	0.0	0.0	0.0	0.0	3.05	0.66	0.0000	0.0000
WS16	07:49	20.9	0.1	0.0	0.0	0.0	0.0	4.26	2.38	0.0000	0.0000
WS17	07:25	19.5	0.2	0.0	0.0	1.0	0.0	3.29	0.25	0.0000	0.0000
Remarks: Monitoring undertaken by Structural Soils											
ND = Below detection limit of instrument. NR = Not Read.											
Readings are taken over a 60 second period.											
Readings Taken By:		SO									
Checked By:		OAS									

Fig A2.51

		Gas and Groundwater Monitoring Results									
Contract No:		C2260193									
Contract Name:		Ringlands									
Date:		21/02/2020									
Background Readings:	O ₂ % v/v			CO ₂ %v/v							
	H ₂ S ppm			CO ppm							
	Weather Conditions				Overcast						
	Ground Conditions (dry/wet etc.)				Damp						
	Atmospheric Pressure (Start):				1020						
	Atmospheric Pressure (Finish):				1016						
Hole No:	Time (hh:mm)	O ₂ % v/v Lowest	CO ₂ % v/v Steady	CH ₄ % v/v Steady	H ₂ S ppm Steady	CO ppm Steady	Gas Flow Rate (l/hr) Steady	Base of Pipe mBGL	Groundwater mBGL	CH4 GSV (l/hr)	CO2 GSV (l/hr)
BH02	06:59	15.4	2.0	0.0	0.0	0.0	1.5	14.47	1.98	0.0000	0.0300
BH05	10:21	12.5	0.8	0.0	0.0	1.0	0.1	15.35	0.79	0.0000	0.0008
BH06	07:32	6.1	3.3	0.0	0.0	1.0	0.1	15.10	1.79	0.0000	0.0033
WS04	09:24	20.7	0.1	0.0	0.0	0.0	0.0	1.83	0.44	0.0000	0.0000
WS05	09:43	10.7	2.20	0.0	0.0	0.0	0.2	3.92	1.51	0.0000	0.0044
WS06	09:00	13.5	3.5	0.0	0.0	0.0	1.2	4.40	2.05	0.0000	0.0420
WS09	09:59	15.5	2.7	0.0	0.0	0.0	0.1	3.37	2.48	0.0000	0.0027
WS14	08:30	13.4	1.80	0.0	0.0	0.0	0.1	1.85	1.25	0.0000	0.0018
WS15	08:20	20.9	0.1	0.0	0.0	0.0	0.0	3.05	0.55	0.0000	0.0000
WS16	07:42	20.9	0.1	0.0	0.0	0.0	0.1	4.26	1.5	0.0000	0.0001
WS17	08:00	18.7	0.3	0.0	0.0	1.0	1.5	3.29	0.25	0.0000	0.0045
Remarks: Monitoring undertaken by Structural Soils											
ND = Below detection limit of instrument. NR = Not Read.											
Readings are taken over a 60 second period.											
Readings Taken By:		SO									
Checked By:		OAS									

Fig A2.52

 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists		Gas and Groundwater Monitoring Results									
Contract No:		C2260193									
Contract Name:		Ringlands									
Date:		02/03/2020									
Background Readings:		O ₂ % v/v				CO ₂ %v/v					
		H ₂ S ppm				CO ppm					
		Weather Conditions					Sun and showers				
		Ground Conditions (dry/wet etc.)					Damp				
		Atmospheric Pressure (Start):					995				
		Atmospheric Pressure (Finish):					998				
Hole No:	Time (hh:mm)	O ₂ % v/v Lowest	CO ₂ % v/v Steady	CH ₄ % v/v Steady	H ₂ S ppm Steady	CO ppm Steady	Gas Flow Rate (l/hr) Steady	Base of Pipe mBGL	Groundwater mBGL	CH4 GSV (l/hr)	CO2 GSV (l/hr)
BH02	07:00	14.9	2.0	0.0	0.0	0.0	1.0	14.47	1.79	0.0000	0.0200
BH05	10:21	18.7	0.7	0.0	0.0	1.0	-0.2	15.35	0.75	0.0000	-0.0014
BH06	07:15	6.0	3.2	0.0	0.0	0.0	-0.1	15.10	1.62	0.0000	-0.0032
WS04	09:24	20.9	0.1	0.0	0.0	0.0	0.1	1.83	0.45	0.0000	0.0001
WS05	08:00	11.8	1.90	0.0	0.0	0.0	0.3	3.92	1.58	0.0000	0.0057
WS06	07:35	8.3	3.4	0.0	0.0	0.0	1.6	4.40	1.92	0.0000	0.0544
WS09	08:45	9.4	3.3	0.0	0.0	0.0	0.3	3.37	2.27	0.0000	0.0099
WS14	08:30	13.8	2.10	0.0	0.0	0.0	-0.1	1.85	1.19	0.0000	-0.0021
WS15	09:45	20.1	0.2	0.0	0.0	0.0	-0.1	3.05	0.57	0.0000	-0.0002
WS16	09:05	20.9	0.0	0.0	0.0	0.0	0.2	4.26	1.43	0.0000	0.0000
WS17	08:20	17.9	0.4	0.0	0.0	1.0	-0.9	3.29	0.31	0.0000	-0.0036
Remarks: Monitoring undertaken by Structural Soils											
ND = Below detection limit of instrument. NR = Not Read.											
Readings are taken over a 60 second period.											
Readings Taken By:		SO									
Checked By:		OAS									

Fig A2.53



Date Drawn: 23-02-2020	Scale: NTS	Title: Exploratory Hole Photographs SA01	
		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.54	



Date Drawn: 23-02-2020	Scale: NTS	Title: Exploratory Hole Photographs SA04	
		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.55	



Date Drawn: 23-02-2020	Scale: NTS	Title: Exploratory Hole Photographs SA04	
		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.56	



Date Drawn: 23-02-2020	Scale: NTS	Title: Exploratory Hole Photographs TP05	
		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.57	



Date Drawn: 23-02-2020	Scale: NTS	Title: Exploratory Hole Photographs TP05 & TP04	
		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.58	



Date Drawn: 23-02-2020	Scale: NTS	Title: Exploratory Hole Photographs TP04	
		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.59	



Date Drawn: 23-02-2020	Scale: NTS	Title: Exploratory Hole Photographs TP03	
		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.60	

Appendix C – Environmental Chemistry Laboratory Results

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/12018
Issue Number: 1

Date: 23 December, 2019

Client: Curtins Consulting (Bristol)
Quayside
40-58 Hotwell Road
Bristol
BS8 4UQ

Project Manager: Graham Behrens
Project Name: Ringland, Newport
Project Ref: B066799
Order No: EBBR157
Date Samples Received: 13/12/19
Date Instructions Received: 18/12/19
Date Analysis Completed: 23/12/19

Prepared by:



Sophie France
Admin Assistant

Approved by:



John Gustafson
Managing Director

Envirolab Job Number: 19/12018

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12018/1	19/12018/2	19/12018/3	19/12018/4	19/12018/5	19/12018/7	19/12018/9	Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2	1	1	1			
Client Sample ID	SA01	SA01	SA04	SA04	TP03	TP04	TP05			
Depth to Top	0.10	0.60	0.20	0.50	0.30	0.10	0.30			
Depth To Bottom										
Date Sampled	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	4A	4AE	5A	5AE	5A	5AE			
% Stones >10mm _A	<0.1	2.4	<0.1	<0.1	29.4	35.2	30.5	% w/w	0.1	A-T-044
pH _D ^{M#}	7.18	7.99	7.28	7.93	8.51	8.34	8.30	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	-	310	-	<200	-	-	-	mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Sulphide _A	-	6	-	<5	-	-	-	mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	-	<5	-	<5	-	-	-	mg/kg	5	A-T-029s
Organic matter _D ^{M#}	6.0	2.9	10.5	0.6	5.4	3.8	3.1	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	<1	<1	<1	<1	<1	2	<1	mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.2	0.8	1.1	1.2	1.1	0.8	1.3	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	18	10	35	8	28	12	9	mg/kg	1	A-T-024s
Chromium _D ^{M#}	25	22	25	35	44	29	13	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	44	17	38	15	55	41	27	mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	23	22	23	35	15	13	11	mg/kg	1	A-T-024s
Selenium _D ^{M#}	2	<1	2	1	1	1	1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	86	58	97	78	134	72	74	mg/kg	5	A-T-024s

Envirolab Job Number: 19/12018

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12018/1	19/12018/2	19/12018/3	19/12018/4	19/12018/5	19/12018/7	19/12018/9	Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2	1	1	1			
Client Sample ID	SA01	SA01	SA04	SA04	TP03	TP04	TP05			
Depth to Top	0.10	0.60	0.20	0.50	0.30	0.10	0.30			
Depth To Bottom										
Date Sampled	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	4A	4AE	5A	5AE	5A	5AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A	N/A	N/A			A-T-045

Envirolab Job Number: 19/12018

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12018/1	19/12018/2	19/12018/3	19/12018/4	19/12018/5	19/12018/7	19/12018/9	Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2	1	1	1			
Client Sample ID	SA01	SA01	SA04	SA04	TP03	TP04	TP05			
Depth to Top	0.10	0.60	0.20	0.50	0.30	0.10	0.30			
Depth To Bottom										
Date Sampled	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	4A	4AE	5A	5AE	5A	5AE			
PAH-16MS										
Acenaphthene _A ^{M#}	0.06	<0.01	0.01	<0.01	0.10	0.02	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	0.02	0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.05	<0.02	<0.02	<0.02	0.13	0.05	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.53	0.04	0.19	<0.04	0.90	0.37	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.52	0.04	0.22	<0.04	0.87	0.42	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.79	0.08	0.30	<0.05	1.26	0.54	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.33	<0.05	0.13	<0.05	0.61	0.30	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.27	<0.07	0.10	<0.07	0.39	0.16	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.70	0.08	0.27	<0.06	1.09	0.42	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.10	<0.04	<0.04	<0.04	0.17	0.08	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	0.76	<0.08	0.27	<0.08	1.47	0.47	<0.08	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.04	<0.01	<0.01	<0.01	0.06	0.02	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.42	0.04	0.18	<0.03	0.74	0.36	<0.03	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.29	<0.03	0.10	<0.03	0.60	0.17	<0.03	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	0.58	<0.07	0.22	<0.07	1.14	0.39	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	5.44	0.28	1.99	<0.08	9.58	3.78	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/12018

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12018/1	19/12018/2	19/12018/3	19/12018/4	19/12018/5	19/12018/7	19/12018/9	Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2	1	1	1			
Client Sample ID	SA01	SA01	SA04	SA04	TP03	TP04	TP05			
Depth to Top	0.10	0.60	0.20	0.50	0.30	0.10	0.30			
Depth To Bottom										
Date Sampled	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19	09-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	4A	4AE	5A	5AE	5A	5AE			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C21-C35 _A	4	-	3	-	12	9	<1	mg/kg	1	A-T-055s
Total Aliphatics _A	4	-	3	-	14	11	<1	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	<1	-	<1	-	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16 _A	<1	-	<1	-	2	1	<1	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	3	-	1	-	11	6	<1	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	22	-	9	-	47	34	<1	mg/kg	1	A-T-055s
Total Aromatics _A	24	-	10	-	61	42	<1	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	28	-	13	-	74	52	<1	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/12018

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12018/10	19/12018/11	19/12018/12	19/12018/13				Units	Limit of Detection	Method ref
Client Sample No	2	1	1	2						
Client Sample ID	TP05	BH02	WS01	WS01						
Depth to Top	1.60	0.30	0.10	0.50						
Depth To Bottom										
Date Sampled	09-Dec-19	10-Dec-19	11-Dec-19	11-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AE	5AE	6AE	5AE						
% Stones >10mm _A	<0.1	7.1	<0.1	3.8				% w/w	0.1	A-T-044
pH _D ^{M#}	7.88	7.75	6.61	8.13				pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	<0.01	<0.01	<0.01				g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	<200	-	-	-				mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1				mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2				mg/kg	0.2	A-T-050s
Sulphide _A	<5	-	-	-				mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	<5	-	-	-				mg/kg	5	A-T-029s
Organic matter _D ^{M#}	0.4	3.4	11.6	3.2				% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	<1	<1	<1	<1				mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0	<1.0				mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.4	1.4	1.0	1.1				mg/kg	0.5	A-T-024s
Copper _D ^{M#}	8	27	17	12				mg/kg	1	A-T-024s
Chromium _D ^{M#}	36	31	23	25				mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1				mg/kg	1	A-T-040s
Lead _D ^{M#}	16	27	39	22				mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	<0.17	<0.17				mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	36	27	20	23				mg/kg	1	A-T-024s
Selenium _D ^{M#}	2	2	<1	<1				mg/kg	1	A-T-024s
Zinc _D ^{M#}	77	76	92	66				mg/kg	5	A-T-024s

Envirolab Job Number: 19/12018

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12018/10	19/12018/11	19/12018/12	19/12018/13				Units	Limit of Detection	Method ref
Client Sample No	2	1	1	2						
Client Sample ID	TP05	BH02	WS01	WS01						
Depth to Top	1.60	0.30	0.10	0.50						
Depth To Bottom										
Date Sampled	09-Dec-19	10-Dec-19	11-Dec-19	11-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AE	5AE	6AE	5AE						
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A						A-T-045

Envirolab Job Number: 19/12018

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12018/10	19/12018/11	19/12018/12	19/12018/13				Units	Limit of Detection	Method ref
Client Sample No	2	1	1	2						
Client Sample ID	TP05	BH02	WS01	WS01						
Depth to Top	1.60	0.30	0.10	0.50						
Depth To Bottom										
Date Sampled	09-Dec-19	10-Dec-19	11-Dec-19	11-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AE	5AE	6AE	5AE						
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	0.01	0.04	<0.01				mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02	<0.02	<0.02				mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	0.09	0.20	0.06				mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	0.09	0.22	0.06				mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	0.13	0.32	0.08				mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05	0.14	<0.05				mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	<0.07	<0.07				mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	0.13	0.31	0.07				mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04				mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	0.16	0.32	<0.08				mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	0.07	0.18	0.06				mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03				mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	0.07	0.13	<0.03				mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	0.13	0.25	<0.07				mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	0.88	2.11	0.33				mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/12018

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12018/10	19/12018/11	19/12018/12	19/12018/13				Units	Limit of Detection	Method ref
Client Sample No	2	1	1	2						
Client Sample ID	TP05	BH02	WS01	WS01						
Depth to Top	1.60	0.30	0.10	0.50						
Depth To Bottom										
Date Sampled	09-Dec-19	10-Dec-19	11-Dec-19	11-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AE	5AE	6AE	5AE						
TPH CWG										
Ali >C5-C6 _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	-	<1	<1	<1				mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	-	<1	<1	<1				mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	-	<1	<1	<1				mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	-	<1	<1	<1				mg/kg	1	A-T-055s
Ali >C21-C35 _A	-	1	16	<1				mg/kg	1	A-T-055s
Total Aliphatics _A	-	1	16	<1				mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	-	<1	<1	<1				mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	-	<1	<1	<1				mg/kg	1	A-T-055s
Aro >C12-C16 _A	-	<1	<1	<1				mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	-	<1	4	<1				mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	-	5	40	1				mg/kg	1	A-T-055s
Total Aromatics _A	-	5	43	1				mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	-	7	58	1				mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
MTBE _A [#]	-	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s

REPORT NOTES

General

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

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

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

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

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

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

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

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

Soil chemical analysis:

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

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

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

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

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

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

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

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

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

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

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

Predominant Matrix Codes:

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

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

Secondary Matrix Codes:

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

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

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

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

Please contact us if you need any further information.

Envirolab Deviating Samples Report

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

Client: Curtins Consulting (Bristol), Quayside, 40-58 Hotwell Road, Bristol, BS8 4UQ

Project No: 19/12018

Project: Ringland, Newport

Date Received: 18/12/2019 (am)

Clients Project No: B066799

Cool Box Temperatures (°C): 8.8 & 9.1

Lab Sample ID	19/12018/2	19/12018/4	19/12018/10
Client Sample No	2	2	2
Client Sample ID/Depth	SA01 0.60m	SA04 0.50m	TP05 1.60m
Date Sampled	09/12/19	09/12/19	09/12/19
Deviation Code			
F	✓	✓	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	19/12018/2	19/12018/4	19/12018/10
Client Sample No	2	2	2
Client Sample ID/Depth	SA01 0.60m	SA04 0.50m	TP05 1.60m
Date Sampled	09/12/19	09/12/19	09/12/19
Sulphide	✓	✓	✓

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

FINAL ANALYTICAL TEST REPORT

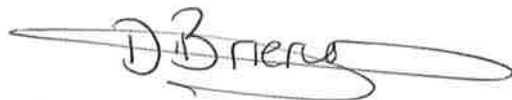
Envirolab Job Number: 19/12029
Issue Number: 1

Date: 24 December, 2019

Client: Curtins Consulting (Bristol)
Quayside
40-58 Hotwell Road
Bristol
BS8 4UQ

Project Manager: Graham Behrens
Project Name: Ringland, Newport
Project Ref: B066799
Order No: EBBR157
Date Samples Received: 18/12/19
Date Instructions Received: 18/12/19
Date Analysis Completed: 24/12/19

Prepared by:



Danielle Brierley
Client Manager

Approved by:



John Gustafson
Managing Director

Envirolab Job Number: 19/12029

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12029/1	19/12029/4	19/12029/5	19/12029/6	19/12029/7	19/12029/8	19/12029/10	Units	Limit of Detection	Method ref
Client Sample No	1	2	3	1	2	1	1			
Client Sample ID	WS16	WS15	WS15	WS13	WS13	WS10	WS02			
Depth to Top	0.40	0.60	0.90	0.30	0.70	0.30	0.10			
Depth To Bottom										
Date Sampled	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	11-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	5AE	5A	5AE	5AE	4AE	5AE			
% Stones >10mm _A	23.4	<0.1	<0.1	<0.1	<0.1	6.8	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	8.42	8.08	7.90	7.93	7.88	7.56	6.66	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.02	<0.01	-	<0.01	-	<0.01	<0.01	g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	-	-	<200	-	<200	-	-	mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Sulphide _A	-	-	11	-	<5	-	-	mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	-	-	<5	-	<5	-	-	mg/kg	5	A-T-029s
Organic matter _D ^{M#}	3.5	2.7	0.4	3.9	0.5	5.2	7.7	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	<1	3	<1	4	<1	2	3	mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.0	1.1	1.1	1.0	0.6	1.1	1.3	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	10	17	12	24	58	19	26	mg/kg	1	A-T-024s
Chromium _D ^{M#}	36	29	39	26	35	28	34	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	29	24	12	41	<1	42	42	mg/kg	1	A-T-024s
Mercury _D	0.43	0.19	<0.17	<0.17	<0.17	0.23	<0.17	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	18	30	41	25	34	24	30	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	2	2	1	<1	2	mg/kg	1	A-T-024s
Zinc _D ^{M#}	71	84	96	84	89	95	106	mg/kg	5	A-T-024s

Envirolab Job Number: 19/12029

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12029/1	19/12029/4	19/12029/5	19/12029/6	19/12029/7	19/12029/8	19/12029/10	Units	Limit of Detection	Method ref
Client Sample No	1	2	3	1	2	1	1			
Client Sample ID	WS16	WS15	WS15	WS13	WS13	WS10	WS02			
Depth to Top	0.40	0.60	0.90	0.30	0.70	0.30	0.10			
Depth To Bottom										
Date Sampled	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	11-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	5AE	5A	5AE	5AE	4AE	5AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A	N/A	N/A			A-T-045

Envirolab Job Number: 19/12029

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12029/1	19/12029/4	19/12029/5	19/12029/6	19/12029/7	19/12029/8	19/12029/10	Units	Limit of Detection	Method ref
Client Sample No	1	2	3	1	2	1	1			
Client Sample ID	WS16	WS15	WS15	WS13	WS13	WS10	WS02			
Depth to Top	0.40	0.60	0.90	0.30	0.70	0.30	0.10			
Depth To Bottom										
Date Sampled	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	11-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	5AE	5A	5AE	5AE	4AE	5AE			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01	<0.01	0.01	<0.01	0.09	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02	<0.02	<0.02	<0.02	0.07	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.15	<0.04	<0.04	0.11	<0.04	0.47	0.08	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.17	<0.04	<0.04	0.10	<0.04	0.46	0.08	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.22	<0.05	<0.05	0.14	<0.05	0.67	0.11	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.12	<0.05	<0.05	<0.05	<0.05	0.27	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.07	<0.07	<0.07	<0.07	<0.07	0.24	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.20	<0.06	<0.06	0.15	<0.06	0.67	0.12	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	0.07	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	0.22	<0.08	<0.08	0.18	<0.08	0.89	0.14	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.13	<0.03	<0.03	0.06	<0.03	0.31	0.05	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.07	<0.03	<0.03	0.08	<0.03	0.40	0.06	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	0.20	<0.07	<0.07	0.14	<0.07	0.66	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	1.55	<0.08	<0.08	0.97	<0.08	5.32	0.64	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/12029

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12029/1	19/12029/4	19/12029/5	19/12029/6	19/12029/7	19/12029/8	19/12029/10	Units	Limit of Detection	Method ref
Client Sample No	1	2	3	1	2	1	1			
Client Sample ID	WS16	WS15	WS15	WS13	WS13	WS10	WS02			
Depth to Top	0.40	0.60	0.90	0.30	0.70	0.30	0.10			
Depth To Bottom										
Date Sampled	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	13-Dec-19	11-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	5AE	5A	5AE	5AE	4AE	5AE			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	-	<1	-	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	-	<1	-	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1	-	<1	-	<1	<1	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	<1	-	<1	-	<1	<1	mg/kg	1	A-T-055s
Ali >C21-C35 _A	2	<1	-	<1	-	10	5	mg/kg	1	A-T-055s
Total Aliphatics _A	2	<1	-	<1	-	10	5	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	<1	-	<1	-	<1	<1	mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	<1	<1	-	<1	-	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16 _A	<1	<1	-	<1	-	1	<1	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	<1	<1	-	<1	-	6	2	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	4	<1	-	<1	-	31	17	mg/kg	1	A-T-055s
Total Aromatics _A	5	<1	-	<1	-	37	18	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	7	<1	-	<1	-	47	25	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s

REPORT NOTES

General

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

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

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

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

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

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

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

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

Soil chemical analysis:

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

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

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

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

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

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

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

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

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

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

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

Predominant Matrix Codes:

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

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

Secondary Matrix Codes:

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

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

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

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

Please contact us if you need any further information.

Envirolab Deviating Samples Report

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

Client: Curtins Consulting (Bristol), Quayside, 40-58 Hotwell Road, Bristol, BS8 4UQ

Project No: 19/12029

Project: Ringland, Newport

Date Received: 18/12/2019 (am)

Clients Project No: B066799

Cool Box Temperatures (°C): 8.1

Lab Sample ID	19/12029/5	19/12029/7
Client Sample No	3	2
Client Sample ID/Depth	WS15 0.90m	WS13 0.70m
Date Sampled	13/12/19	13/12/19
Deviation Code		
F	✓	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	19/12029/5	19/12029/7
Client Sample No	3	2
Client Sample ID/Depth	WS15 0.90m	WS13 0.70m
Date Sampled	13/12/19	13/12/19
Sulphide	✓	✓

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

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/12133
Issue Number: 1

Date: 07 January, 2020

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

Project Manager: Graham Behrens
Project Name: Ringland, Newport
Project Ref: B066799
Order No: EBBR157
Date Samples Received: 20/12/19
Date Instructions Received: 23/12/19
Date Analysis Completed: 07/01/20

Prepared by:



Sophie France
Admin Assistant

Approved by:



Iain Haslock
Analytical Consultant

Envirolab Job Number: 19/12133

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12133/1	19/12133/3	19/12133/4	19/12133/7	19/12133/9	19/12133/10	19/12133/13	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	2	4	1	1			
Client Sample ID	BH06	WS03	WS04	WS05	WS05	WS06	WS08			
Depth to Top	0.40	0.50	0.35	0.40	1.80	0.20	0.30			
Depth To Bottom										
Date Sampled	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19	17-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	4A	5AE	4A	5AE	5AE	5AE			
% Stones >10mm _A	18.8	24.4	13.6	<0.1	<0.1	6.8	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	8.26	9.72	8.34	8.83	7.68	8.38	8.21	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	0.08	0.09	0.02	-	<0.01	<0.01	g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	-	-	-	-	<200	-	-	mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Sulphide _A	-	-	-	-	<5	-	-	mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	-	-	-	-	7	-	-	mg/kg	5	A-T-029s
Organic matter _D ^{M#}	1.6	10.8	5.5	8.0	0.5	5.0	1.5	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	4	2	3	4	2	4	3	mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.6	<0.5	0.6	0.6	0.9	0.7	0.8	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	9	2	6	11	3	20	8	mg/kg	1	A-T-024s
Chromium _D ^{M#}	23	8	29	20	40	29	42	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	23	5	11	38	12	22	15	mg/kg	1	A-T-024s
Mercury _D	0.24	0.51	<0.17	0.17	<0.17	0.29	<0.17	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	19	5	25	15	30	20	38	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	2	2	2	<1	1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	58	28	60	69	95	76	104	mg/kg	5	A-T-024s

Envirolab Job Number: 19/12133

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12133/1	19/12133/3	19/12133/4	19/12133/7	19/12133/9	19/12133/10	19/12133/13	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	2	4	1	1			
Client Sample ID	BH06	WS03	WS04	WS05	WS05	WS06	WS08			
Depth to Top	0.40	0.50	0.35	0.40	1.80	0.20	0.30			
Depth To Bottom										
Date Sampled	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19	17-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	4A	5AE	4A	5AE	5AE	5AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	Chrysotile	NAD	NAD	NAD			A-T-045
Asbestos Matrix (microscope) _D	-	-	-	Loose fibres	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A	N/A	N/A			A-T-045

Envirolab Job Number: 19/12133

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12133/1	19/12133/3	19/12133/4	19/12133/7	19/12133/9	19/12133/10	19/12133/13	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	2	4	1	1			
Client Sample ID	BH06	WS03	WS04	WS05	WS05	WS06	WS08			
Depth to Top	0.40	0.50	0.35	0.40	1.80	0.20	0.30			
Depth To Bottom										
Date Sampled	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19	17-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	4A	5AE	4A	5AE	5AE	5AE			
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing)	-	-	-	<0.001	-	-	-	% w/w	0.001	A-T-054

Envirolab Job Number: 19/12133

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12133/1	19/12133/3	19/12133/4	19/12133/7	19/12133/9	19/12133/10	19/12133/13	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	2	4	1	1			
Client Sample ID	BH06	WS03	WS04	WS05	WS05	WS06	WS08			
Depth to Top	0.40	0.50	0.35	0.40	1.80	0.20	0.30			
Depth To Bottom										
Date Sampled	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19	17-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	4A	5AE	4A	5AE	5AE	5AE			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	0.25	<0.01	0.02	<0.01	0.02	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	0.24	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	0.62	0.09	0.11	<0.04	0.08	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.05	0.49	0.08	0.11	<0.04	0.08	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.06	0.66	0.13	0.18	<0.05	0.11	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	0.29	0.08	0.11	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	0.21	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	0.64	0.10	0.19	<0.06	0.10	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	0.13	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	1.34	0.13	0.21	<0.08	0.15	<0.08	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	0.13	<0.01	0.02	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.04	0.39	0.10	0.13	<0.03	0.06	<0.03	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	0.06	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	1.49	0.07	0.11	<0.03	0.08	<0.03	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	0.96	0.10	0.16	<0.07	0.11	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	0.15	7.94	0.88	1.35	<0.08	0.79	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/12133

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12133/1	19/12133/3	19/12133/4	19/12133/7	19/12133/9	19/12133/10	19/12133/13	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	2	4	1	1			
Client Sample ID	BH06	WS03	WS04	WS05	WS05	WS06	WS08			
Depth to Top	0.40	0.50	0.35	0.40	1.80	0.20	0.30			
Depth To Bottom										
Date Sampled	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19	17-Dec-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	4A	5AE	4A	5AE	5AE	5AE			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	<1	<1	-	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	2	<1	6	-	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	9	9	59	-	<1	<1	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	3	5	37	73	-	1	<1	mg/kg	1	A-T-055s
Ali >C21-C35 _A	6	198	192	217	-	5	4	mg/kg	1	A-T-055s
Total Aliphatics _A	8	214	237	353	-	6	4	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	<1	<1	<1	-	1	<1	mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	<1	2	<1	1	-	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16 _A	<1	14	6	16	-	<1	<1	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	<1	21	18	27	-	<1	<1	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	3	178	188	162	-	2	5	mg/kg	1	A-T-055s
Total Aromatics _A	5	216	213	206	-	4	5	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	12	430	449	560	-	11	9	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/12133

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12133/15	19/12133/17	19/12133/18	19/12133/19				Units	Limit of Detection	Method ref
Client Sample No	1	1	2	1						
Client Sample ID	WS12	WS11	WS11	WS14						
Depth to Top	0.10	0.40	0.80	0.40						
Depth To Bottom										
Date Sampled	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AE	5AE	5AE	5AE						
% Stones >10mm _A	2.5	6.7	18.5	6.6				% w/w	0.1	A-T-044
pH _D ^{M#}	7.35	8.15	9.54	8.24				pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	<0.01	-	<0.01				g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	-	-	2800	-				mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1				mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2				mg/kg	0.2	A-T-050s
Sulphide _A	-	-	<5	-				mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	-	-	47	-				mg/kg	5	A-T-029s
Organic matter _D ^{M#}	5.8	2.0	1.7	2.1				% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	7	3	<1	4				mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	1.3	<1.0	4.6	<1.0				mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.2	1.2	0.6	0.9				mg/kg	0.5	A-T-024s
Copper _D ^{M#}	18	11	6	10				mg/kg	1	A-T-024s
Chromium _D ^{M#}	34	35	18	28				mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1				mg/kg	1	A-T-040s
Lead _D ^{M#}	43	40	19	29				mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	0.30	0.19				mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	26	35	18	30				mg/kg	1	A-T-024s
Selenium _D ^{M#}	2	<1	2	<1				mg/kg	1	A-T-024s
Zinc _D ^{M#}	120	111	55	89				mg/kg	5	A-T-024s

Envirolab Job Number: 19/12133

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12133/15	19/12133/17	19/12133/18	19/12133/19				Units	Limit of Detection	Method ref
Client Sample No	1	1	2	1						
Client Sample ID	WS12	WS11	WS11	WS14						
Depth to Top	0.10	0.40	0.80	0.40						
Depth To Bottom										
Date Sampled	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AE	5AE	5AE	5AE						
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A						A-T-045

Envirolab Job Number: 19/12133

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12133/15	19/12133/17	19/12133/18	19/12133/19				Units	Limit of Detection	Method ref
Client Sample No	1	1	2	1						
Client Sample ID	WS12	WS11	WS11	WS14						
Depth to Top	0.10	0.40	0.80	0.40						
Depth To Bottom										
Date Sampled	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AE	5AE	5AE	5AE						
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	0.02	0.02	<0.01				mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	0.02	0.38	<0.02				mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	0.13	0.14	<0.04				mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	0.12	0.07	<0.04				mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.08	0.17	0.13	<0.05				mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	0.08	0.05	<0.05				mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	<0.07	<0.07				mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	0.16	0.17	<0.06				mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04				mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	0.10	0.22	1.32	<0.08				mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	0.01	0.02	<0.01				mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	0.10	0.06	<0.03				mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03				mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.05	0.12	0.16	<0.03				mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	0.17	1.33	<0.07				mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	0.23	1.32	3.85	<0.08				mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/12133

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12133/15	19/12133/17	19/12133/18	19/12133/19				Units	Limit of Detection	Method ref
Client Sample No	1	1	2	1						
Client Sample ID	WS12	WS11	WS11	WS14						
Depth to Top	0.10	0.40	0.80	0.40						
Depth To Bottom										
Date Sampled	17-Dec-19	17-Dec-19	17-Dec-19	17-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AE	5AE	5AE	5AE						
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	-	<1				mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	-	<1				mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1	-	<1				mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	1	<1	-	4				mg/kg	1	A-T-055s
Ali >C21-C35 _A	9	3	-	3				mg/kg	1	A-T-055s
Total Aliphatics _A	10	3	-	8				mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	<1	-	<1				mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	<1	<1	-	<1				mg/kg	1	A-T-055s
Aro >C12-C16 _A	1	<1	-	<1				mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	3	1	-	2				mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	21	5	-	4				mg/kg	1	A-T-055s
Total Aromatics _A	25	7	-	7				mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	35	10	-	14				mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	-	<0.01				mg/kg	0.01	A-T-022s

REPORT NOTES

General

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

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

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

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

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

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

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

Soil chemical analysis:

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

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

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

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

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

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

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

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

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

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

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

Predominant Matrix Codes:

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

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

Secondary Matrix Codes:

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

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

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

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

Please contact us if you need any further information.

Envirolab Deviating Samples Report

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

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

Project: Ringland, Newport

Clients Project No: B066799

Project No: 19/12133

Date Received: 23/12/2019 (am)

Cool Box Temperatures (°C): 9.1, 9.3, 7.2

Lab Sample ID	19/12133/9	19/12133/10
Client Sample No	4	1
Client Sample ID/Depth	WS05 1.80m	WS06 0.20m
Date Sampled	16/12/19	17/12/19
Deviation Code		
B1 (no VPH)		✓
F	✓	

Key

B1 (no VPH)

F Separate container not supplied for VPH/BTEX analysis

Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	19/12133/9
Client Sample No	4
Client Sample ID/Depth	WS05 1.80m
Date Sampled	16/12/19
Sulphide	✓

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

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/12215
Issue Number: 1

Date: 07 January, 2020

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

Project Manager: Graham Behrens
Project Name: Ringland, Newport
Project Ref: B066799
Order No: EBBR157
Date Samples Received: 24/12/19
Date Instructions Received: 24/12/19
Date Analysis Completed: 07/01/20

Prepared by:



Sophie France
Admin Assistant

Approved by:



Holly Neary-King
Deputy Admin & Client Services Supervisor

Envirolab Job Number: 19/12215

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12215/1	19/12215/5	19/12215/7	19/12215/8				Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2						
Client Sample ID	WS09	WS17	WSBH03	WSBH03						
Depth to Top	0.20	0.30	0.30	0.70						
Depth To Bottom										
Date Sampled	18-Dec-19	18-Dec-19	18-Dec-19	18-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	5A	5AB	5A						
% Stones >10mm _A	1.3	5.5	19.7	<0.1				% w/w	0.1	A-T-044
pH _D ^{M#}	8.51	8.47	8.53	8.83				pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.04	<0.01	<0.01	-				g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	-	-	-	220				mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1				mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2				mg/kg	0.2	A-T-050s
Sulphide _A	-	-	-	<5				mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	-	-	-	<5				mg/kg	5	A-T-029s
Organic matter _D ^{M#}	6.5	0.9	0.9	1.2				% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	18	5	3	2				mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0	<1.0				mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.8	0.6	<0.5	0.7				mg/kg	0.5	A-T-024s
Copper _D ^{M#}	53	9	11	7				mg/kg	1	A-T-024s
Chromium _D ^{M#}	47	35	29	35				mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1				mg/kg	1	A-T-040s
Lead _D ^{M#}	81	18	11	14				mg/kg	1	A-T-024s
Mercury _D	0.26	0.21	<0.17	<0.17				mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	19	34	26	34				mg/kg	1	A-T-024s
Selenium _D ^{M#}	2	<1	<1	2				mg/kg	1	A-T-024s
Zinc _D ^{M#}	112	86	60	73				mg/kg	5	A-T-024s

Envirolab Job Number: 19/12215

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12215/1	19/12215/5	19/12215/7	19/12215/8				Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2						
Client Sample ID	WS09	WS17	WSBH03	WSBH03						
Depth to Top	0.20	0.30	0.30	0.70						
Depth To Bottom										
Date Sampled	18-Dec-19	18-Dec-19	18-Dec-19	18-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	5A	5AB	5A						
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A						A-T-045

Envirolab Job Number: 19/12215

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12215/1	19/12215/5	19/12215/7	19/12215/8				Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2						
Client Sample ID	WS09	WS17	WSBH03	WSBH03						
Depth to Top	0.20	0.30	0.30	0.70						
Depth To Bottom										
Date Sampled	18-Dec-19	18-Dec-19	18-Dec-19	18-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	5A	5AB	5A						
PAH-16MS										
Acenaphthene _A ^{M#}	3.95	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.11	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	2.03	<0.02	<0.02	<0.02				mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	11.4	0.06	<0.04	<0.04				mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	9.09	0.07	<0.04	<0.04				mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	14.1	0.09	<0.05	<0.05				mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	5.74	<0.05	<0.05	<0.05				mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	4.60	<0.07	<0.07	<0.07				mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	12.2	0.08	<0.06	<0.06				mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	1.77	<0.04	<0.04	<0.04				mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	22	<0.08	<0.08	<0.08				mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	2.31	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	7.72	0.06	<0.03	<0.03				mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.22	<0.03	<0.03	<0.03				mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	13.9	<0.03	<0.03	<0.03				mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	15.7	<0.07	<0.07	<0.07				mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	127	0.36	<0.08	<0.08				mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/12215

Client Project Name: Ringland, Newport

Client Project Ref: B066799

Lab Sample ID	19/12215/1	19/12215/5	19/12215/7	19/12215/8				Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2						
Client Sample ID	WS09	WS17	WSBH03	WSBH03						
Depth to Top	0.20	0.30	0.30	0.70						
Depth To Bottom										
Date Sampled	18-Dec-19	18-Dec-19	18-Dec-19	18-Dec-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	5A	5AB	5A						
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	<1	-				mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	<1	-				mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	10	<1	<1	-				mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	24	<1	<1	-				mg/kg	1	A-T-055s
Ali >C21-C35 _A	41	2	<1	-				mg/kg	1	A-T-055s
Total Aliphatics _A	75	2	<1	-				mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	4	<1	<1	-				mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	2	<1	<1	-				mg/kg	1	A-T-055s
Aro >C12-C16 _A	36	1	<1	-				mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	151	<1	<1	-				mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	467	3	<1	-				mg/kg	1	A-T-055s
Total Aromatics _A	662	6	2	-				mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	736	8	2	-				mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	-				mg/kg	0.01	A-T-022s

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

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

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

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

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

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

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

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

Predominant Matrix Codes:

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

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

Secondary Matrix Codes:

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

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

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

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

Please contact us if you need any further information.

Envirolab Deviating Samples Report

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

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

Project: Ringland, Newport

Clients Project No: B066799

Project No: 19/12215

Date Received: 24/12/2019 (am)

Cool Box Temperatures (°C): 7.2

Lab Sample ID	19/12215/8
Client Sample No	2
Client Sample ID/Depth	WSBH03 0.70m
Date Sampled	18/12/19
Deviation Code	
F	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	19/12215/8
Client Sample No	2
Client Sample ID/Depth	WSBH03 0.70m
Date Sampled	18/12/19
Sulphide	✓

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

FINAL ANALYTICAL TEST REPORT

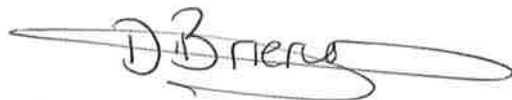
Envirolab Job Number: 20/01254
Issue Number: 1

Date: 12 February, 2020

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

Project Manager: Graham Behrens
Project Name: Ringland
Project Ref: B066799
Order No: EBBR157
Date Samples Received: 06/02/20
Date Instructions Received: 07/02/20
Date Analysis Completed: 12/02/20

Prepared by:



Danielle Brierley
Client Manager

Approved by:



Iain Haslock
Analytical Consultant

Envirolab Job Number: 20/01254

Client Project Name: Ringland

Client Project Ref: B066799

Lab Sample ID	20/01254/1	20/01254/2	20/01254/3	20/01254/4	20/01254/5	20/01254/6	20/01254/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS05	WS04	BH05	WS06	WS14	WS9	WS17			
Depth to Top	0.97	0.47	1.10	1.37	0.61	1.39	0.25			
Depth To Bottom										
Date Sampled	04-Feb-20	04-Feb-20	04-Feb-20	04-Feb-20	04-Feb-20	04-Feb-20	05-Feb-20			
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW			
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
pH (w) _A [#]	7.68	8.04	7.76	7.64	8.07	7.76	7.93	pH	0.01	A-T-031w
Hardness Total _A [#]	479	724	408	469	511	414	169	mg/l Ca CO ₃	2	A-T-049w
Sulphate (w) _A [#]	47	642	30	29	85	18	22	mg/l	1	A-T-026w
Cyanide (total) (w) _A [#]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	0.005	A-T-042wTCN
Phenols - Total by HPLC (w) _A	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	0.01	A-T-050w
Sulphide (w) _A	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/l	0.1	A-T-S2-w
DOC (w) _A [#]	4.1	9.7	1.9	3.6	4.1	2.3	3.7	mg/l	0.2	A-T-032w
Arsenic (dissolved) _A [#]	2	3	2	2	6	4	1	µg/l	1	A-T-025w
Boron (dissolved) _A [#]	39	80	29	42	30	38	42	µg/l	10	A-T-025w
Cadmium (dissolved) _A [#]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	µg/l	0.2	A-T-025w
Calcium (dissolved) _A [#]	107	190	69	83	69	86	54	mg/l	1	A-T-049w
Copper (dissolved) _A [#]	<1	4	2	6	4	1	10	µg/l	1	A-T-025w
Chromium (dissolved) _A [#]	34	27	12	36	26	31	20	µg/l	1	A-T-025w
Lead (dissolved) _A [#]	<1	2	<1	1	2	1	2	µg/l	1	A-T-025w
Mercury (dissolved) _A [#]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	µg/l	0.1	A-T-025w
Nickel (dissolved) _A [#]	2	3	<1	3	2	14	3	µg/l	1	A-T-025w
Selenium (dissolved) _A [#]	<1	<1	<1	<1	<1	<1	1	µg/l	1	A-T-025w
Zinc (dissolved) _A [#]	2	3	3	4	3	5	7	µg/l	1	A-T-025w

Envirolab Job Number: 20/01254

Client Project Name: Ringland

Client Project Ref: B066799

Lab Sample ID	20/01254/1	20/01254/2	20/01254/3	20/01254/4	20/01254/5	20/01254/6	20/01254/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS05	WS04	BH05	WS06	WS14	WS9	WS17			
Depth to Top	0.97	0.47	1.10	1.37	0.61	1.39	0.25			
Depth To Bottom										
Date Sampled	04-Feb-20	04-Feb-20	04-Feb-20	04-Feb-20	04-Feb-20	04-Feb-20	05-Feb-20			
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW			
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
PAH 16MS (w)										
Acenaphthene (w) _A [#]	<0.01	0.02	<0.01	<0.01	<0.01	0.01	<0.01	µg/l	0.01	A-T-019w
Acenaphthylene (w) _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Anthracene (w) _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Benzo(a)anthracene (w) _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Benzo(a)pyrene (w) _A [#]	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (w) _A [#]	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Benzo(ghi)perylene (w) _A [#]	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (w) _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Chrysene (w) _A [#]	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (w) _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Fluoranthene (w) _A [#]	0.02	0.04	0.02	<0.01	<0.01	0.02	<0.01	µg/l	0.01	A-T-019w
Fluorene (w) _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (w) _A [#]	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Naphthalene (w) _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Phenanthrene (w) _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	µg/l	0.01	A-T-019w
Pyrene (w) _A [#]	0.02	0.03	0.03	<0.01	<0.01	0.01	<0.01	µg/l	0.01	A-T-019w
Total PAH 16MS (w) _A [#]	0.04	0.18	0.05	<0.01	<0.01	0.06	<0.01	µg/l	0.01	A-T-019w

Envirolab Job Number: 20/01254

Client Project Name: Ringland

Client Project Ref: B066799

Lab Sample ID	20/01254/1	20/01254/2	20/01254/3	20/01254/4	20/01254/5	20/01254/6	20/01254/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS05	WS04	BH05	WS06	WS14	WS9	WS17			
Depth to Top	0.97	0.47	1.10	1.37	0.61	1.39	0.25			
Depth To Bottom										
Date Sampled	04-Feb-20	04-Feb-20	04-Feb-20	04-Feb-20	04-Feb-20	04-Feb-20	05-Feb-20			
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW			
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
TPH CWG (w)										
Ali >C5-C6 (w) _A [#]	<1	<1	<1	<1	<1	<1	<1	µg/l	1	A-T-022w
Ali >C6-C8 (w) _A [#]	<1	<1	<1	2	2	<1	<1	µg/l	1	A-T-022w
Ali >C8-C10 (w) _A [#]	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Ali >C10-C12 (w) _A [#]	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Ali >C12-C16 (w) _A [#]	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Ali >C16-C21 (w) _A [#]	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Ali >C21-C35 (w) _A [#]	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Total Aliphatics (w) _A [#]	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Aro >C5-C7 (w) _A [#]	<1	<1	<1	<1	<1	<1	<1	µg/l	1	A-T-022w
Aro >C7-C8 (w) _A [#]	<1	<1	<1	<1	<1	<1	<1	µg/l	1	A-T-022w
Aro >C8-C10 (w) _A	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Aro >C10-C12 (w) _A [#]	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Aro >C12-C16 (w) _A [#]	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Aro >C16-C21 (w) _A [#]	<5	<5	<5	<5	<5	<5	<5	µg/l	5	A-T-055w
Aro >C21-C35 (w) _A [#]	<10	<10	<10	<10	<10	<10	<10	µg/l	10	A-T-055w
Total Aromatics (w) _A	<10	<10	<10	<10	<10	<10	<10	µg/l	10	A-T-055w
TPH (Ali & Aro >C5-C35) (w) _A	<10	<10	<10	<10	<10	<10	<10	µg/l	10	A-T-055w
BTEX - Benzene (w) _A [#]	<1	<1	<1	<1	<1	<1	<1	µg/l	1	A-T-022w
BTEX - Toluene (w) _A [#]	<1	<1	<1	<1	<1	<1	<1	µg/l	1	A-T-022w
BTEX - Ethyl Benzene (w) _A [#]	<1	<1	<1	<1	<1	<1	<1	µg/l	1	A-T-022w
BTEX - m & p Xylene (w) _A [#]	<1	<1	<1	<1	<1	<1	<1	µg/l	1	A-T-022w
BTEX - o Xylene (w) _A [#]	<1	<1	<1	<1	<1	<1	<1	µg/l	1	A-T-022w
MTBE (w) _A [#]	<1	<1	<1	<1	<1	<1	<1	µg/l	1	A-T-022w

Envirolab Job Number: 20/01254

Client Project Name: Ringland

Client Project Ref: B066799

Lab Sample ID	20/01254/8	20/01254/9	20/01254/10	20/01254/11				Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS16	WS15	BH06	BH02						
Depth to Top	2.38	0.66	2.18	2.42						
Depth To Bottom										
Date Sampled	05-Feb-20	05-Feb-20	05-Feb-20	05-Feb-20						
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW						
Sample Matrix Code	N/A	N/A	N/A	N/A						
pH (w) _A [#]	7.83	7.49	7.52	7.53				pH	0.01	A-T-031w
Hardness Total _A [#]	323	388	418	395				mg/l Ca CO ₃	2	A-T-049w
Sulphate (w) _A [#]	69	8	29	3				mg/l	1	A-T-026w
Cyanide (total) (w) _A [#]	<0.005	<0.005	<0.005	<0.005				mg/l	0.005	A-T-042wTCN
Phenols - Total by HPLC (w) _A	<0.01	0.03	<0.01	<0.01				mg/l	0.01	A-T-050w
Sulphide (w) _A	<0.1	0.1	<0.1	<0.1				mg/l	0.1	A-T-S2-w
DOC (w) _A [#]	3.2	5.6	1.7	2.5				mg/l	0.2	A-T-032w
Arsenic (dissolved) _A [#]	<1	3	1	2				µg/l	1	A-T-025w
Boron (dissolved) _A [#]	39	19	28	28				µg/l	10	A-T-025w
Cadmium (dissolved) _A [#]	<0.2	<0.2	<0.2	<0.2				µg/l	0.2	A-T-025w
Calcium (dissolved) _A [#]	78	113	80	90				mg/l	1	A-T-049w
Copper (dissolved) _A [#]	2	2	1	2				µg/l	1	A-T-025w
Chromium (dissolved) _A [#]	24	11	13	12				µg/l	1	A-T-025w
Lead (dissolved) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-025w
Mercury (dissolved) _A [#]	<0.1	<0.1	<0.1	<0.1				µg/l	0.1	A-T-025w
Nickel (dissolved) _A [#]	3	3	<1	<1				µg/l	1	A-T-025w
Selenium (dissolved) _A [#]	2	<1	<1	<1				µg/l	1	A-T-025w
Zinc (dissolved) _A [#]	3	3	<1	3				µg/l	1	A-T-025w

Envirolab Job Number: 20/01254

Client Project Name: Ringland

Client Project Ref: B066799

Lab Sample ID	20/01254/8	20/01254/9	20/01254/10	20/01254/11				Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS16	WS15	BH06	BH02						
Depth to Top	2.38	0.66	2.18	2.42						
Depth To Bottom										
Date Sampled	05-Feb-20	05-Feb-20	05-Feb-20	05-Feb-20						
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW						
Sample Matrix Code	N/A	N/A	N/A	N/A						
PAH 16MS (w)										
Acenaphthene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Acenaphthylene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Anthracene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Benzo(a)anthracene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Benzo(a)pyrene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Benzo(ghi)perylene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Chrysene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Fluoranthene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Fluorene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Naphthalene (w) _A [#]	<0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Phenanthrene (w) _A [#]	0.01	<0.01	<0.01	<0.01				µg/l	0.01	A-T-019w
Pyrene (w) _A [#]	<0.01	<0.01	0.02	<0.01				µg/l	0.01	A-T-019w
Total PAH 16MS (w) _A [#]	0.01	<0.01	0.02	<0.01				µg/l	0.01	A-T-019w

Envirolab Job Number: 20/01254

Client Project Name: Ringland

Client Project Ref: B066799

Lab Sample ID	20/01254/8	20/01254/9	20/01254/10	20/01254/11				Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS16	WS15	BH06	BH02						
Depth to Top	2.38	0.66	2.18	2.42						
Depth To Bottom										
Date Sampled	05-Feb-20	05-Feb-20	05-Feb-20	05-Feb-20						
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW						
Sample Matrix Code	N/A	N/A	N/A	N/A						
TPH CWG (w)										
Ali >C5-C6 (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w
Ali >C6-C8 (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w
Ali >C8-C10 (w) _A [#]	<5	<5	<5	<5				µg/l	5	A-T-055w
Ali >C10-C12 (w) _A [#]	<5	<5	<5	<5				µg/l	5	A-T-055w
Ali >C12-C16 (w) _A [#]	<5	<5	<5	<5				µg/l	5	A-T-055w
Ali >C16-C21 (w) _A [#]	<5	<5	<5	<5				µg/l	5	A-T-055w
Ali >C21-C35 (w) _A [#]	<5	<5	<5	<5				µg/l	5	A-T-055w
Total Aliphatics (w) _A [#]	<5	<5	<5	<5				µg/l	5	A-T-055w
Aro >C5-C7 (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w
Aro >C7-C8 (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w
Aro >C8-C10 (w) _A	<5	<5	<5	<5				µg/l	5	A-T-055w
Aro >C10-C12 (w) _A [#]	<5	<5	<5	<5				µg/l	5	A-T-055w
Aro >C12-C16 (w) _A [#]	<5	<5	<5	<5				µg/l	5	A-T-055w
Aro >C16-C21 (w) _A [#]	<5	<5	<5	<5				µg/l	5	A-T-055w
Aro >C21-C35 (w) _A [#]	<10	<10	<10	<10				µg/l	10	A-T-055w
Total Aromatics (w) _A	<10	<10	<10	<10				µg/l	10	A-T-055w
TPH (Ali & Aro >C5-C35) (w) _A	<10	<10	<10	<10				µg/l	10	A-T-055w
BTEX - Benzene (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w
BTEX - Toluene (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w
BTEX - Ethyl Benzene (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w
BTEX - m & p Xylene (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w
BTEX - o Xylene (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w
MTBE (w) _A [#]	<1	<1	<1	<1				µg/l	1	A-T-022w

REPORT NOTES

General

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

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

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

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

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

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

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

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

Soil chemical analysis:

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

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

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

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

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

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

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

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

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

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

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

Predominant Matrix Codes:

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

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

Secondary Matrix Codes:

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

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

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

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

Please contact us if you need any further information.

Envirolab Deviating Samples Report

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

Client:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	20/01254
Project:	Ringland	Date Received:	07/02/2020 (am)
Clients Project No:	B066799	Cool Box Temperatures (°C):	4.6 - 4.9

NO DEVIATIONS IDENTIFIED

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

Appendix D – Geotechnical Laboratory Testing

TESTING VERIFICATION CERTIFICATE



1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **12/12/2019 15:49:52**.

Testing reported after this date is not covered by this Verification Certificate.

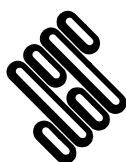
Approved Signatory
Tim Fay (Deputy Site Testing Manager)

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
Bedminster
Bristol
BS3 4AG

Castleford Laboratory
The Potteries, Pottery Street
Castleford
West Yorkshire
WF10 1NJ

Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU



**STRUCTURAL
SOILS LTD**

Contract:

Ringlands, Newport

Job No:

749239



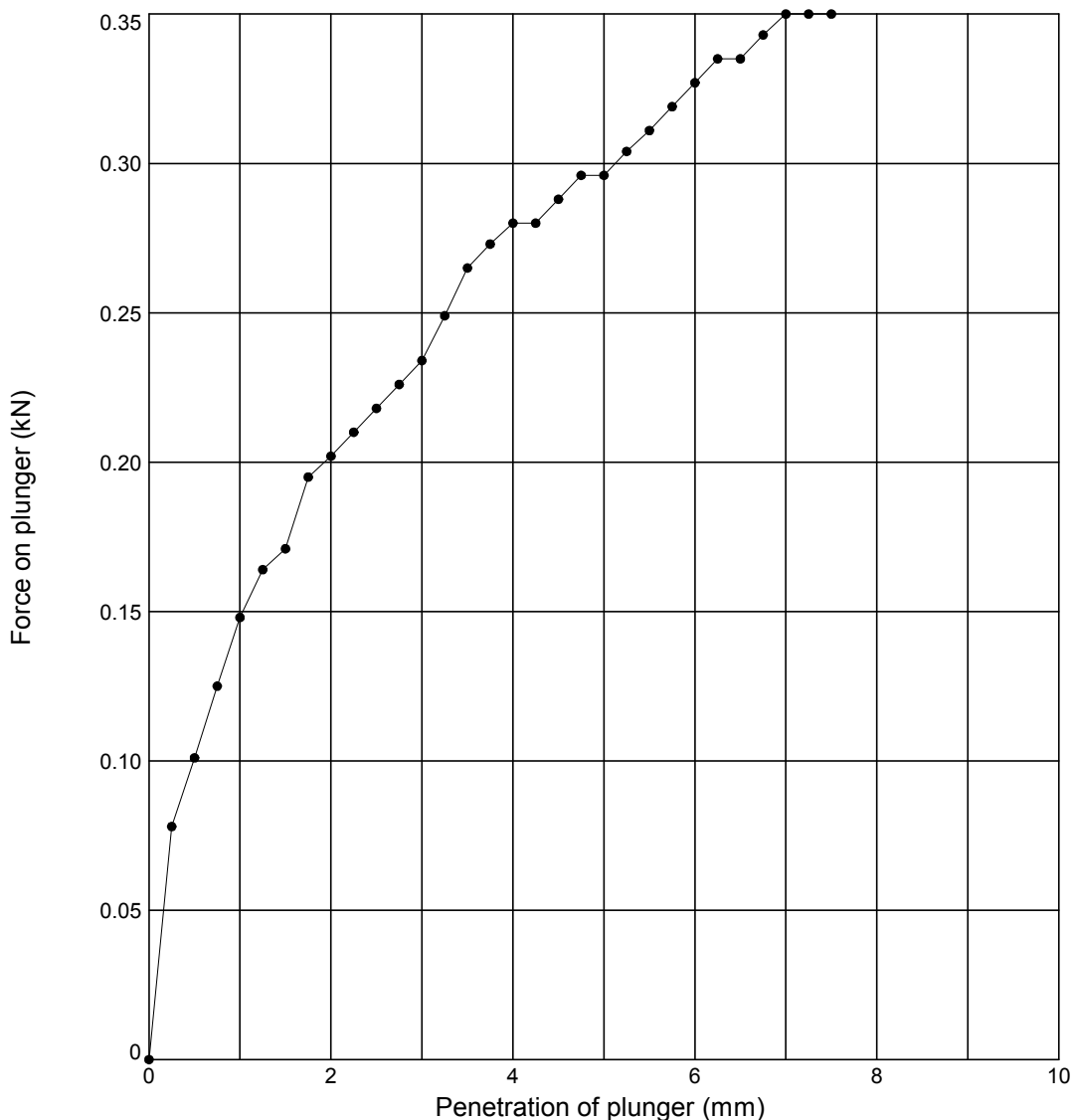
IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

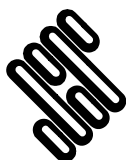
Position Ref: **CBR1**

Depth (m): **0.50**

Date: **10/12/19**



Test Details	Test Conditions	Test Results
Kentledge : Toyota Hilux Surcharge (kg) : 4.52 Surcharge Pressure (kPa) : 1	Weather : Rain Temperature (°C) : 10	CBR Value (%) : 1.7 Moisture Content (%) : 27
Sample Description	Test Notes	
Reddish brown gravelly silty CLAY	Estimated particles >20 mm (%) : 30 Size and position of particles >20mm in relation to the plunger : Unknown	



STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By

K. Limacher

KATIE LIMACHER

Date

12/12/19

Contract

Ringlands, Newport

Contract Ref:

749239



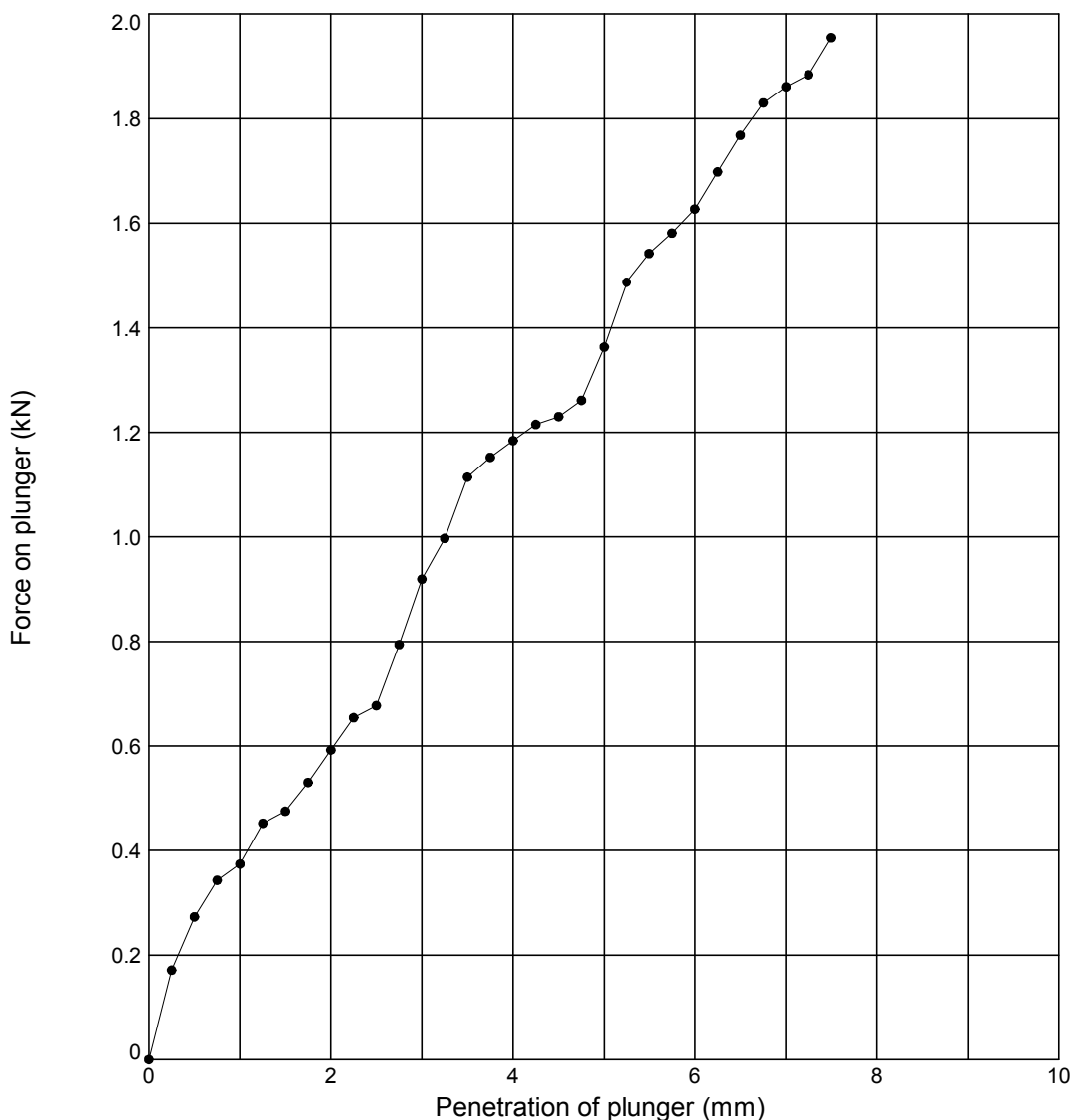
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In accordance with BS1377:Part 9:1990

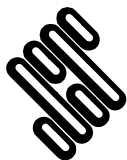
Position Ref: **CBR2**

Depth (m): **0.60**

Date: **10/12/19**



Test Details	Test Conditions	Test Results
Kentledge : Toyota Hilux Surcharge (kg) : 4.52 Surcharge Pressure (kPa) : 1	Weather : Rain Temperature (°C) : 11	CBR Value (%) : 6.8 Moisture Content (%) : 5.8
Sample Description	Test Notes	
Brown GRAVEL	Estimated particles >20 mm (%) : 90 Size and position of particles >20mm in relation to the plunger : Unknown	



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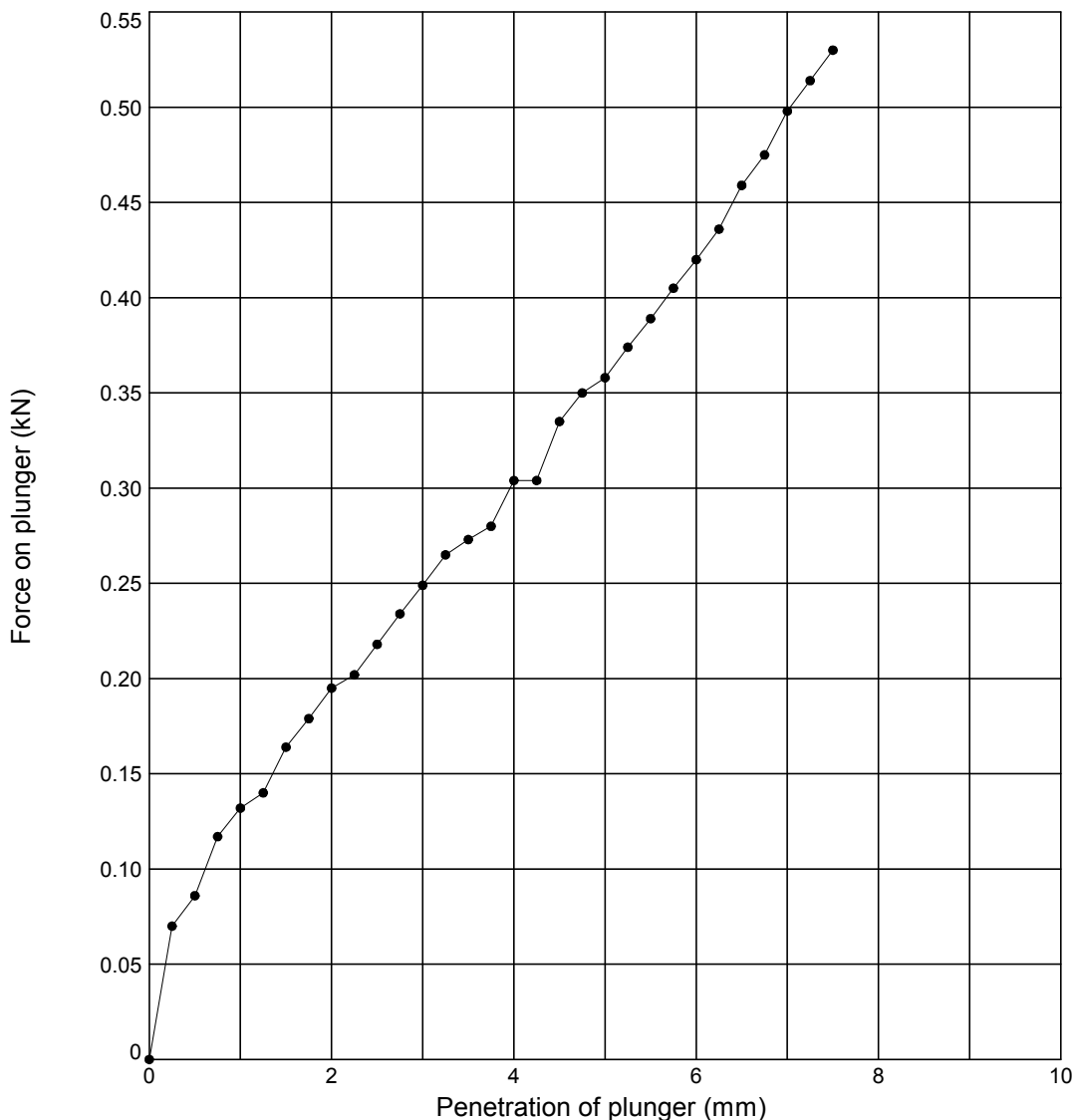
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In accordance with BS1377:Part 9:1990

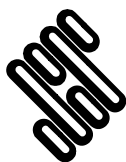
Position Ref: **CBR3**

Depth (m): **0.40**

Date: **10/12/19**



Test Details	Test Conditions	Test Results
Kentledge : Toyota Hilux Surcharge (kg) : 4.52 Surcharge Pressure (kPa) : 1	Weather : Rain Temperature (°C) : 12	CBR Value (%) : 1.8 Moisture Content (%) : 18
Sample Description	Test Notes	
Reddish brown gravelly silty CLAY	Estimated particles >20 mm (%) : 30 Size and position of particles >20mm in relation to the plunger : Unknown	



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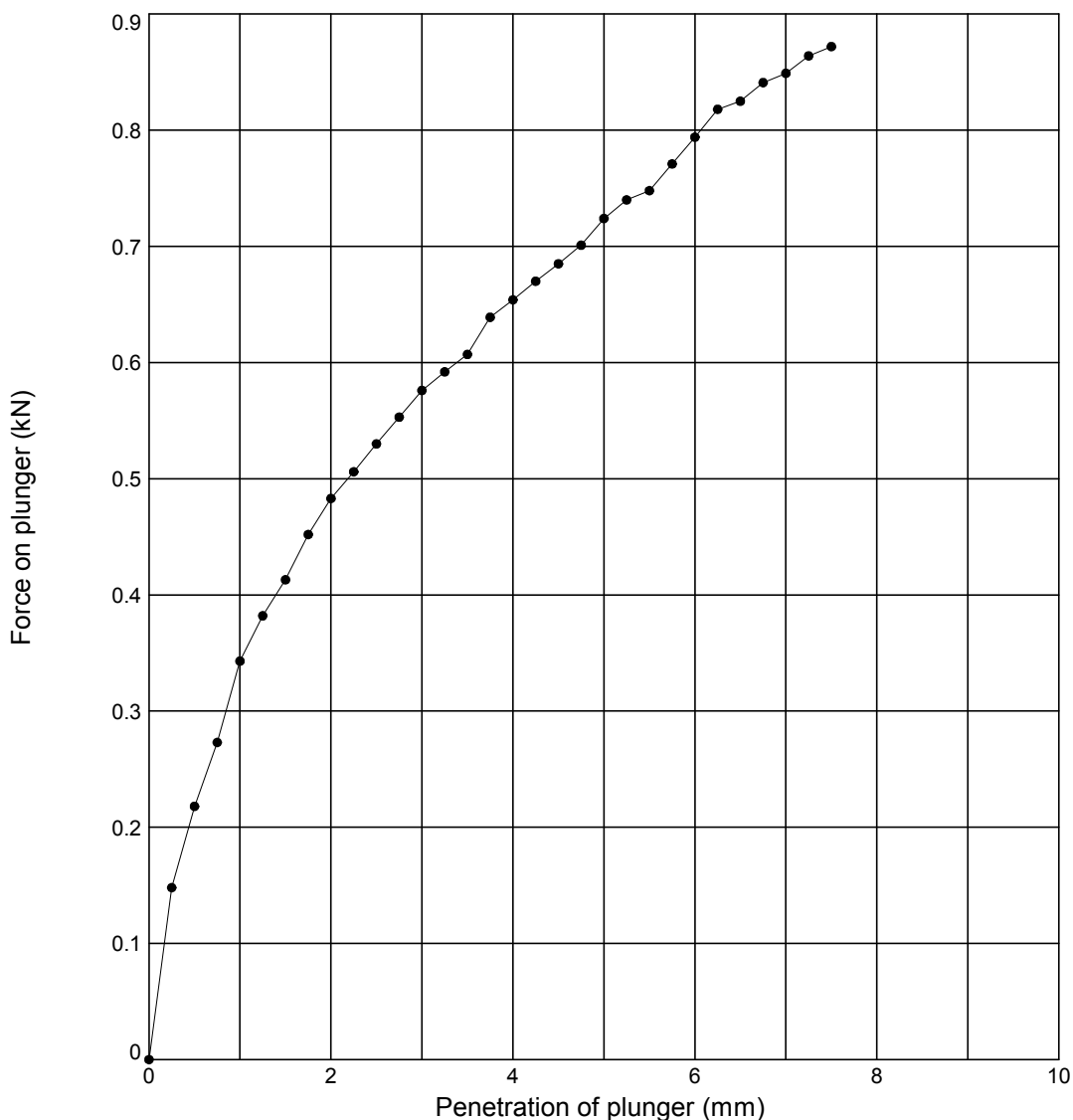
IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

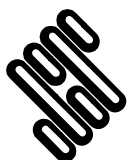
Position Ref: **CBR4**

Depth (m): **0.40**

Date: **10/12/19**



Test Details	Test Conditions	Test Results
Kentledge : Toyota Hilux Surcharge (kg) : 4.52 Surcharge Pressure (kPa) : 1	Weather : Rain Temperature (°C) : 10	CBR Value (%) : 4.0 Moisture Content (%) : 21
Sample Description	Test Notes	
Reddish brown gravelly SILT	Estimated particles >20 mm (%) : 20 Size and position of particles >20mm in relation to the plunger : Unknown	



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Contract Ref:

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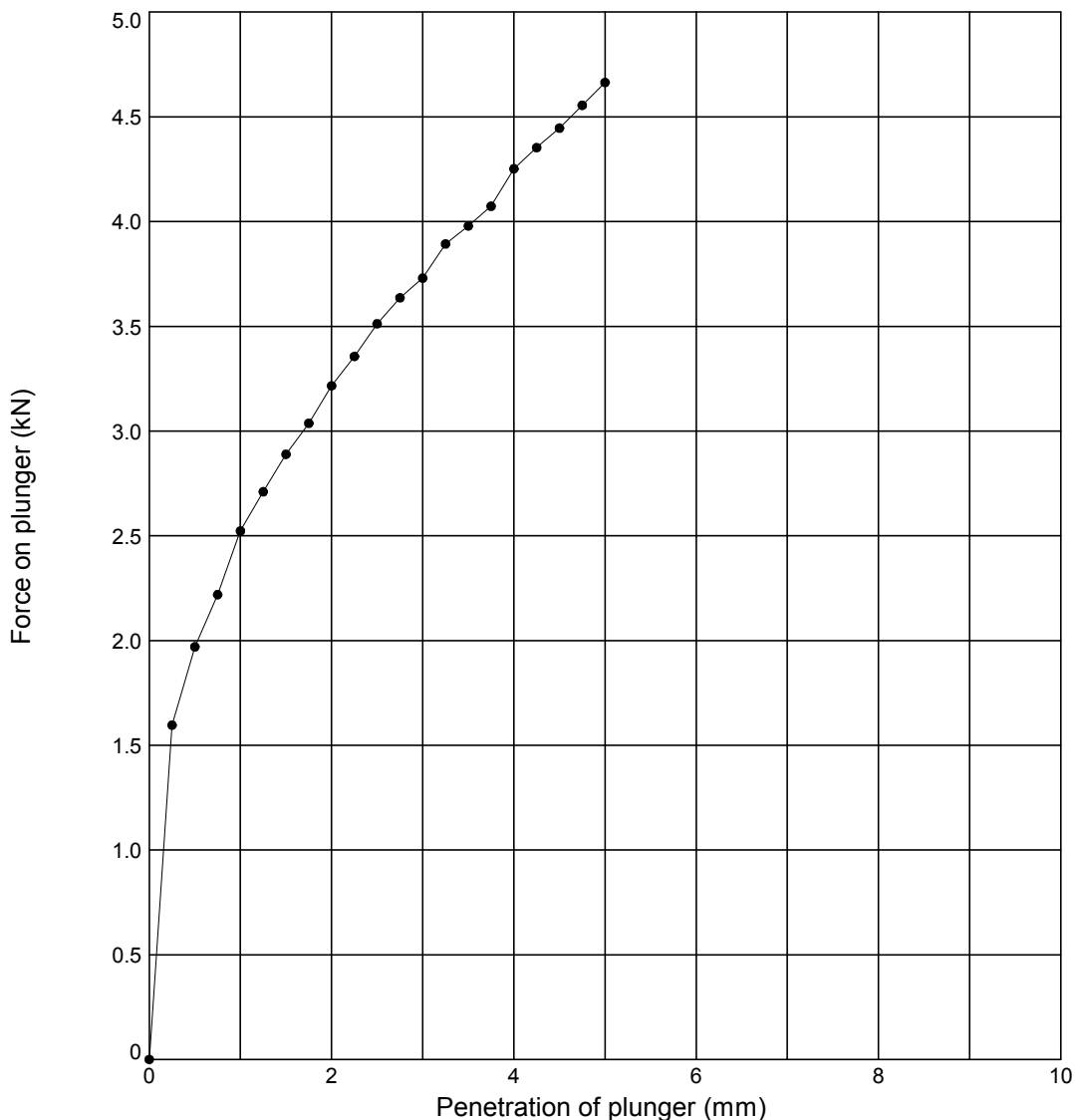
IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

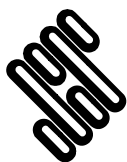
Position Ref: **CBR5**

Depth (m): **0.40**

Date: **10/12/19**



Test Details	Test Conditions	Test Results
Kentledge : Toyota Hilux Surcharge (kg) : 4.52 Surcharge Pressure (kPa) : 1	Weather : Rain Temperature (°C) : 12	CBR Value (%) : 27 Moisture Content (%) : 12
Sample Description	Test Notes	
Reddish brown gravelly SILT	Estimated particles >20 mm (%) : 20 Size and position of particles >20mm in relation to the plunger : Unknown	



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Bristol
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KATIE LIMACHER

Date

12/12/19

Contract

Ringlands, Newport

Contract Ref:

749239



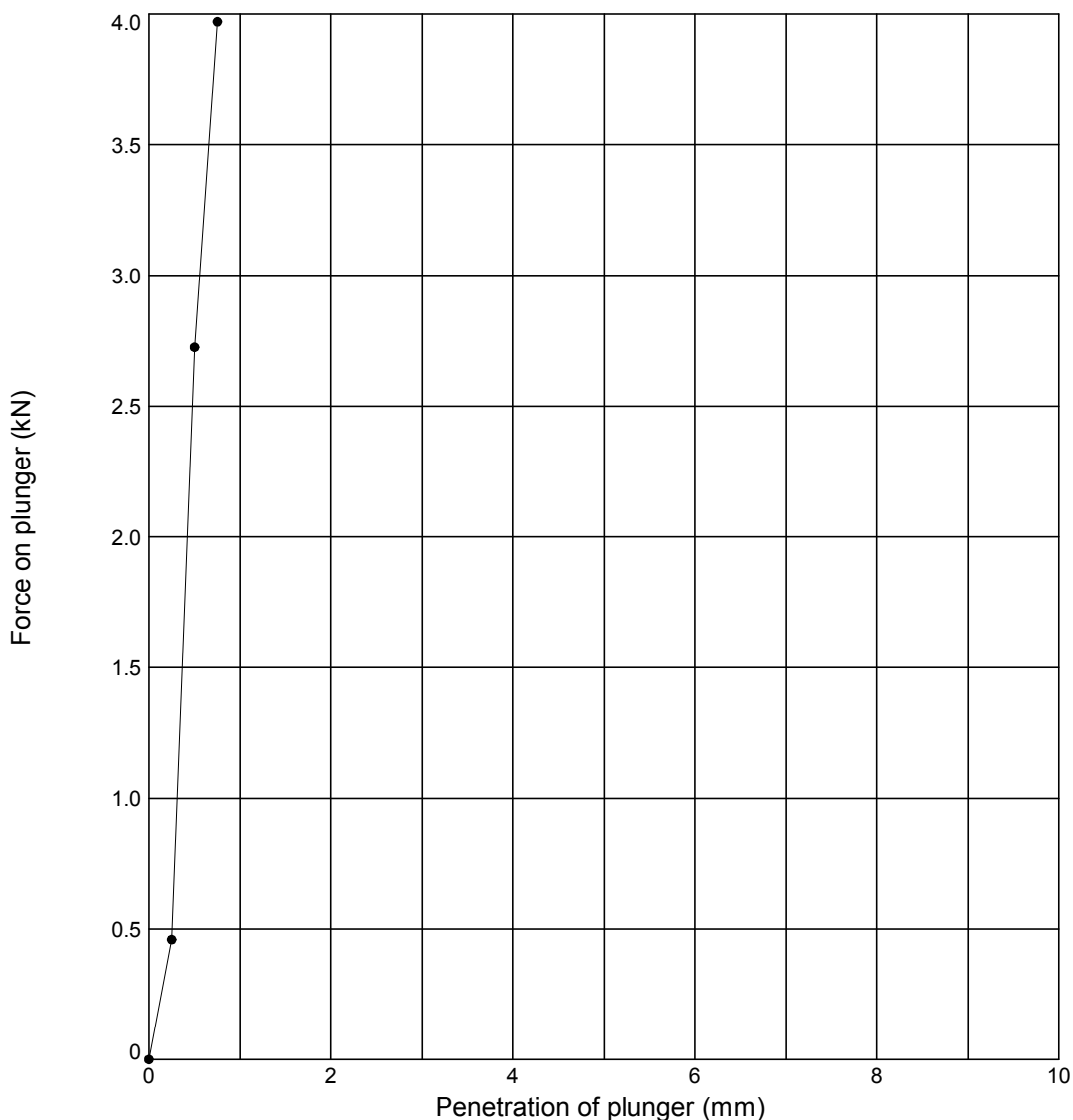
IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

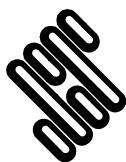
Position Ref: **CBR6**

Depth (m): **0.30**

Date: **10/12/19**



Test Details	Test Conditions	Test Results
Kentledge : Toyota Hilux Surcharge (kg) : 4.52 Surcharge Pressure (kPa) : 1	Weather : Rain Temperature (°C) : 12	CBR Value (%) : 35 Moisture Content (%) : 12
Sample Description	Test Notes	
Reddish brown MUDSTONE	Estimated particles >20 mm (%) : 20 Size and position of particles >20mm in relation to the plunger : Unknown Remarks : Test stopped prematurely due to limits of equipment being reached.	



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1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By

Date

K. Limacher

KATIE LIMACHER

12/12/19

Contract

Ringlands, Newport

Contract Ref:

749239



Laboratory Test Certificate

Site Ringlands, Newport
Client Ian Farmer Associates



F.A.O. Bill Sell
Address Unit 4
Faraday Close
Pattinson Industrial Estate
Washington
NE38 8QJ

Order Number 2260193
Job Number 2070991
Lab Number L14314

Number of samples submitted for testing: 21 sample (s)

Natural Water Content	.....	7	test(s)
Atterberg Limits	.....	7	test(s)
Coarse Particle Size Distribution	.....	4	test(s)
Point Load Determination *	.....	12	test(s)
UCS *	.....	1	test(s)
Total Sulphate	.....	1	test(s)
Aqueous Sulphate	.....	3	test(s)
pH	.....	3	test(s)
Total Sulphur	.....	1	test(s)

* Non UKAS Accredited Test

Date (s) sample (s) received at laboratory:	.....	2	Jan-20
Date of receipt of testing instructions	.....	17	Jan-20
Date testing started:	.....	5	Feb-20
Date of issue:	.....	28	Feb-20

Please note that we will keep the sample (s) for one month after submission of our report and will then dispose of them without notice unless you ask us to store them. We will then make a separate charge for this.

Approved by :
Lorna Logan



1429

All tests performed in accordance with BS1377:1990 unless specified otherwise						
Water Content Performed in accordance with BS EN ISO 17892-1 : 2014						
Key			Date Printed	Approved By	Table	
Density test	Liquid Limit	Particle density	28/02/2020	L Logan	1	
Linear measurement unless :	4pt cone unless :	sp - small pyknometer			sheet	
wd - water displacement	cas - Casagrande method	gj - gas jar			1	
wi - immersion in water	1pt - single point test					

PARTICLE SIZE DISTRIBUTION

Job Ref

2070991

Borehole/Pit No.

BH1

Site Name

Ringlands Newport

Sample No.

Soil Description

Brown MUDSTONE GRAVEL

Depth, m

1.30

Specimen Reference

Specimen Depth

m

Sample Type

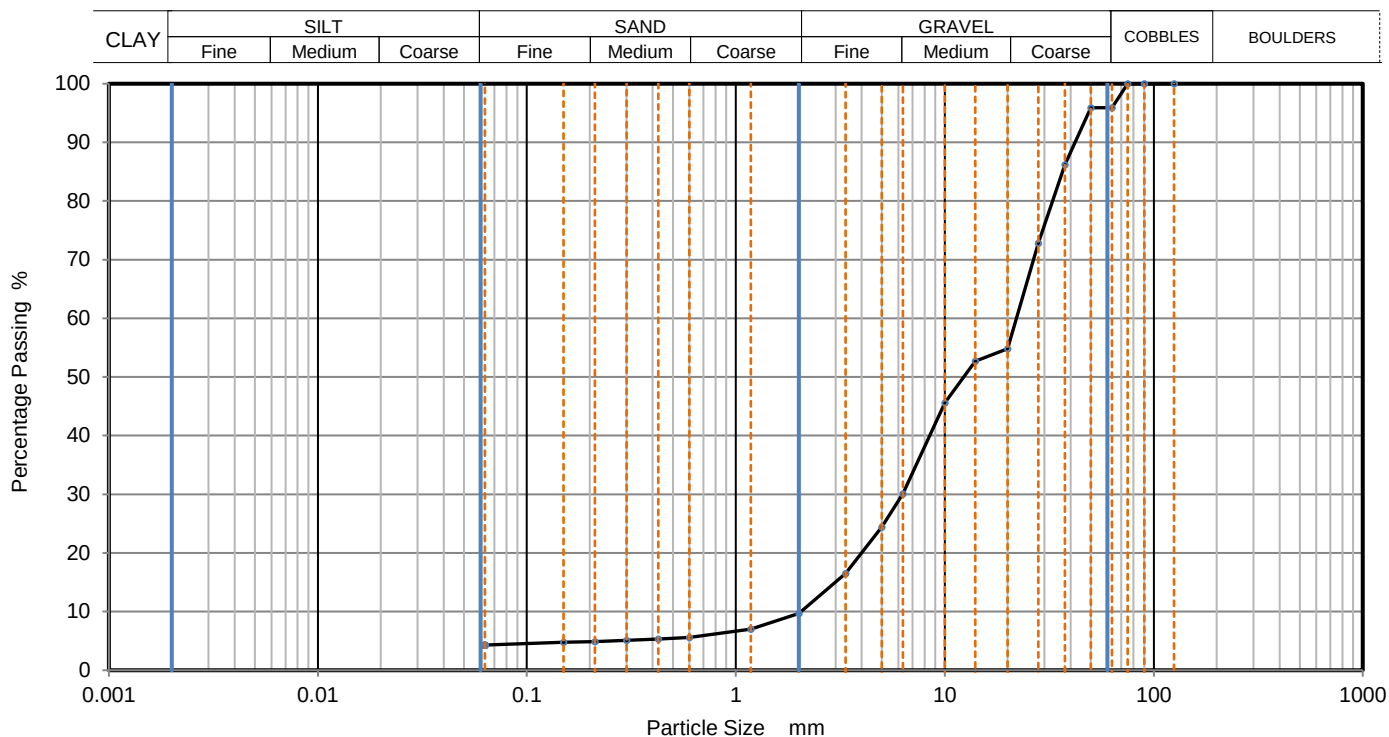
C

Test Method

BS1377:Part 2:1990, clause 9.2

KeyLAB ID

CJA_202002180



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	96		
50	96		
37.5	86		
28	73		
20	55		
14	53		
10	46		
6.3	30		
5	24		
3.35	17		
2	10		
1.18	7		
0.6	6		
0.425	5		
0.3	5		
0.212	5		
0.15	5		
0.063	4		

Dry Mass of sample, g

6362

Sample Proportions	% dry mass
Very coarse	4
Gravel	86
Sand	5
Fines <0.063mm	4

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	11
Curvature Coefficient	0.87

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator

Checked

Approved

Sheet printed

Fig 1

28/02/2020 15:20

Sheet

L Logan

PARTICLE SIZE DISTRIBUTION

Job Ref

2070991

Borehole/Pit No.

BH1

Site Name

Ringlands Newport

Sample No.

Soil Description

Brown mottled grey MUDSTONE GRAVEL

Depth, m

7.20

Specimen Reference

Specimen Depth

m

Sample Type

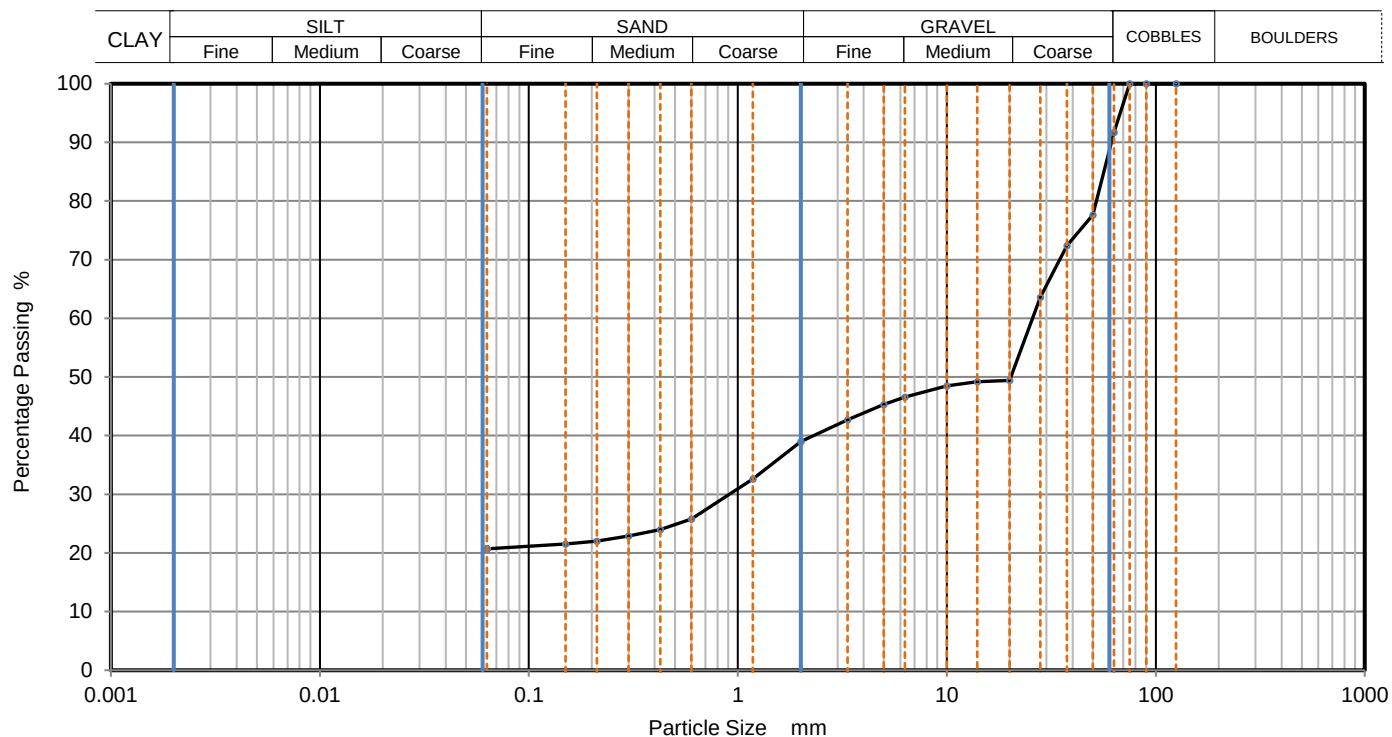
C

Test Method

BS1377:Part 2:1990, clause 9.2

KeyLAB ID

CJA_202002184



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	92		
50	78		
37.5	72		
28	64		
20	49		
14	49		
10	49		
6.3	47		
5	45		
3.35	43		
2	39		
1.18	33		
0.6	26		
0.425	24		
0.3	23		
0.212	22		
0.15	22		
0.063	21		

Dry Mass of sample, g

6136

Sample Proportions	% dry mass
Very coarse	8
Gravel	53
Sand	18
Fines <0.063mm	21

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator

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Approved

Sheet printed

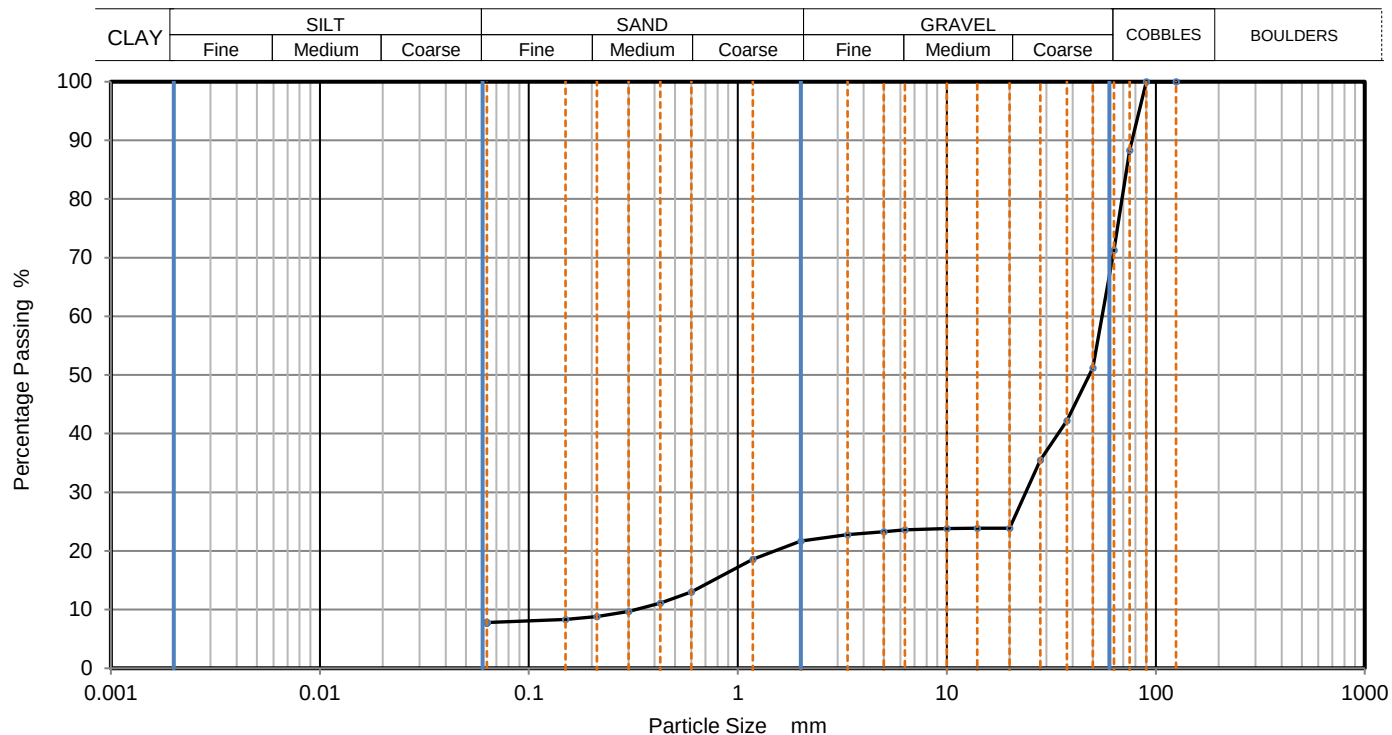
Fig 1

28/02/2020 15:20

Sheet

L Logan

cjassociates	PARTICLE SIZE DISTRIBUTION			Job Ref	2070991
				Borehole/Pit No.	BH2
Site Name	Ringlands Newport			Sample No.	
Soil Description	Brown MUDSTONE GRAVEL			Depth, m	11.70
Specimen Reference		Specimen Depth	m	Sample Type	C
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	CJA_202002188



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	88		
63	71		
50	51		
37.5	42		
28	36		
20	24		
14	24		
10	24		
6.3	24		
5	23		
3.35	23		
2	22		
1.18	19		
0.6	13		
0.425	11		
0.3	10		
0.212	9		
0.15	8		
0.063	8		

Dry Mass of sample, g

8701

Sample Proportions	% dry mass
Very coarse	29
Gravel	50
Sand	14
Fines <0.063mm	8

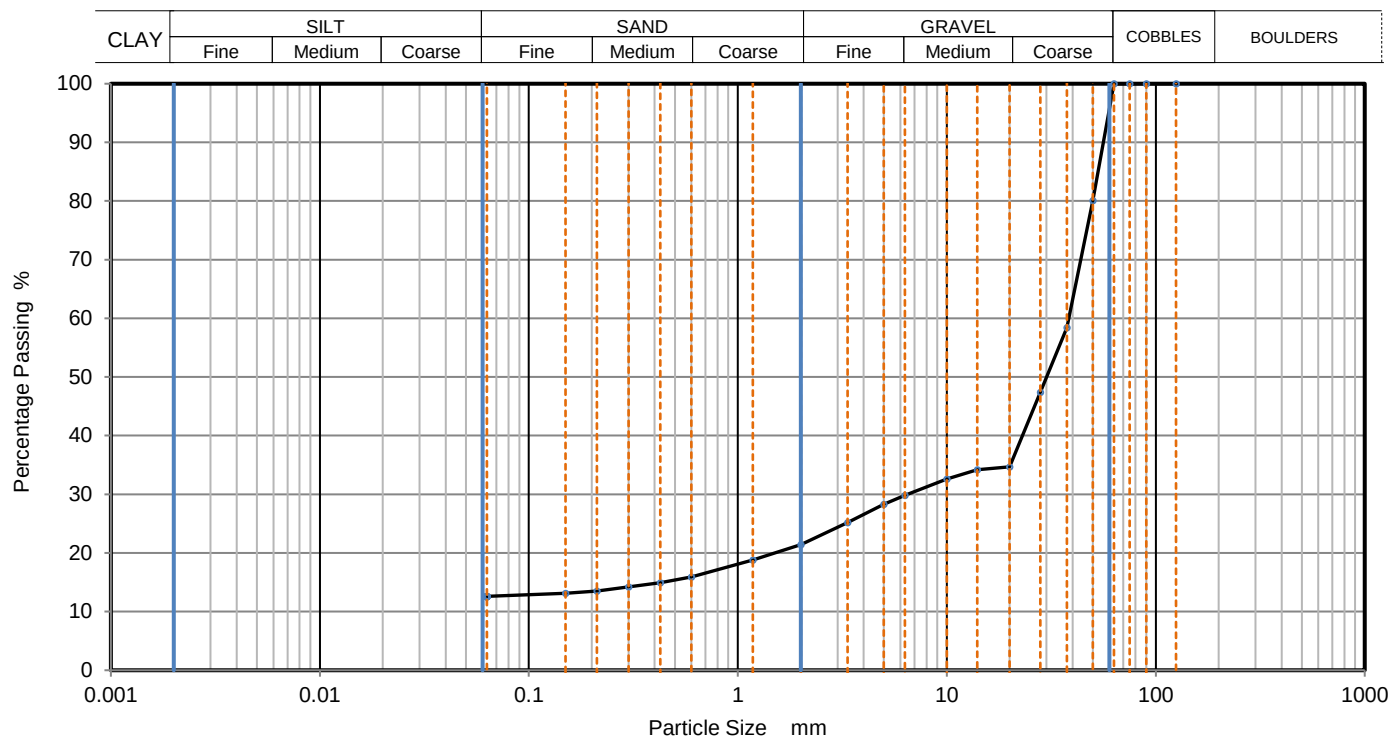
Grading Analysis		
D100	mm	
D60	mm	55.3
D30	mm	23.9
D10	mm	0.326
Uniformity Coefficient		170
Curvature Coefficient		32

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig 1
		L Logan	28/02/2020 15:20	
				Sheet

cjassociates	PARTICLE SIZE DISTRIBUTION			Job Ref	2070991
				Borehole/Pit No.	BH6
Site Name	Ringlands Newport			Sample No.	
Soil Description	Brown MUDSTONE GRAVEL			Depth, m	11.05
Specimen Reference		Specimen Depth	m	Sample Type	C
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	CJA_2020021811



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	80		
37.5	58		
28	47		
20	35		
14	34		
10	33		
6.3	30		
5	28		
3.35	25		
2	21		
1.18	19		
0.6	16		
0.425	15		
0.3	14		
0.212	14		
0.15	13		
0.063	13		

Dry Mass of sample, g

6150

Sample Proportions	% dry mass
Very coarse	0
Gravel	79
Sand	9
Fines <0.063mm	13

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

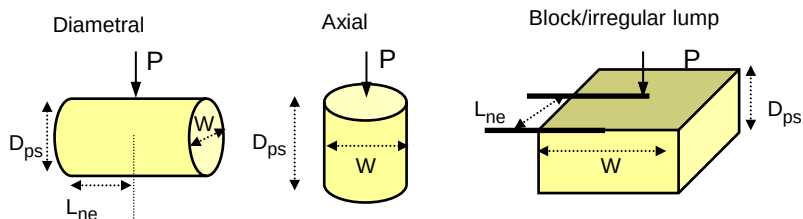
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig 1
		L Logan	28/02/2020 15:20	
				Sheet

Project No.				Project Name														
2070991				Ringlands Newport														
Borehole No.	Sample			Specimen		Rock Type and Test condition	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P kN	Equivalent diameter, De mm	Point Load Strength Index		Remarks (including water content if measured)
	Depth m	Ref.	Type	Ref.	Depth m		Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm			Is MPa	Is(50) MPa	
BH1	2.60		C		2.90	MUDSTONE	A		YES		89.5	108.0	95.0	2.6	104.0	0.237	0.329	w = 7.6%
BH1	4.20		C		4.50	MUDSTONE	D		YES		89.5	95.0	90.0	0.8	89.7	0.097	0.126	w = 7.9%
BH1	6.00		C		6.00	MUDSTONE	D		YES		87.8	91.0	84.0	0.1	85.9	0.016	0.020	w = 19.7%
BH1	12.10		C		12.40	MUDSTONE	A		YES		89.8	95.0	90.0	0.5	101.4	0.048	0.065	w = 17.9%
BH2	1.60		C		1.60	MUDSTONE	D		YES		90.3	96.0	90.0	0.1	90.1	0.016	0.020	w = 9.5%
BH2	4.20		C		4.20	MUDSTONE	A		YES		89.6	73.0	63.0	1.1	84.8	0.150	0.190	w = 8.1%
BH2	8.80		C		8.90	MUDSTONE	D		YES		90.3	95.0	91.0	0.6	90.6	0.075	0.098	w = 12.5%
BH6	5.00		C		5.00	MUDSTONE	A		YES		89.6	95.0	91.0	0.6	101.9	0.059	0.081	w = 7.2%
BH6	5.50		C		5.50	MUDSTONE	D		YES		89.4	94.0	90.0	2.8	89.7	0.343	0.446	w = 6.5%
BH6	12.50		C		12.80	MUDSTONE	A		YES		89.6	90.0	76.0	1.4	93.1	0.162	0.214	w = 12.1%
BH6	13.50		C		13.80	MUDSTONE	D		YES		89.2	95.0	90.0	1.1	89.6	0.142	0.185	w = 14.2%
BH6	15.00		C		14.45	MUDSTONE	D		YES		89.6	95.0	91.0	0.4	90.3	0.052	0.067	w = 15.7%

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 2007, unless noted otherwise
Detailed legend for test and dimensions, based on ISRM, is shown above.
Size factor, $F = (De/50)0.45$ for all tests.

Date Printed

28/02/2020

Approved By

L Logan

Table

sheet

1

1

SUMMARY OF RESULTS
UNIAXIAL COMPRESSIVE STRENGTH OF ROCK
ISRM 2007

[illegible]

Notes: Test Specification : International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

1 ISRM p87 test 1, water content at $105 \pm 3^{\circ}\text{C}$, specimen as received at the laboratory.

2 ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density

3 ISRM p153 part 1 determination of Uniaxial Compressive Strength (UCS) of Rock Materials

Mode of failure: S - Single Shear MS - Multiple Shear AC - Axial Cleavage F - Fragmented

QA Ref. ISRM Rev 1.0	 King Road Avenue, Bristol, BS11 9HF Tel 0117 9821473	Approver 	Date 21/02/2020	Fig. UCS 1
		R Anstee, Materials and Field Testing Director		

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/01711
Issue Number: 1

Date: 25 February, 2020

Client: CJ Associates
King Road
Bristol
BS11 9HF

Project Manager: Admin/Lorna Logan
Project Name: Ringlands Newport
Project Ref: 2070991-L14314-S7923
Order No: N/A
Date Samples Received: 20/02/20
Date Instructions Received: 20/02/20
Date Analysis Completed: 25/02/20

Prepared by:



Melanie Marshall
Laboratory Coordinator

Approved by:



Iain Haslock
Analytical Consultant

Envirolab Job Number: 20/01711

Client Project Name: Ringlands Newport

Client Project Ref: 2070991-L14314-S7923

Lab Sample ID	20/01711/1	20/01711/2	20/01711/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH1	BH2	BH6							
Depth to Top	2.00	11.70	2.60							
Depth To Bottom	2.10	12.70	2.90							
Date Sampled										
Sample Type	Solid	Solid	Solid							
Sample Matrix Code	7	7	7							
% Stones >10mm _A	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE _D ^{M#}	9.27	9.24	8.99					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	<10	<10	<10					mg/l	10	A-T-026s
Sulphate BRE (acid sol) _D ^{M#}	<0.02	-	-					% w/w	0.02	A-T-028s
Sulphur BRE (total) _D	<0.01	-	-					% w/w	0.01	A-T-024s

REPORT NOTES

General

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

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

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

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

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

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

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

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

Soil chemical analysis:

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

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

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

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

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

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

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

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

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

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

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

Predominant Matrix Codes:

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

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

Secondary Matrix Codes:

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

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

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

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

Please contact us if you need any further information.

Envirolab Deviating Samples Report

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

Client: CJ Associates, King Road , Bristol, BS11 9HF

Project No: 20/01711

Project: Ringlands Newport
Clients Project No: 2070991-L14314-S7923

Date Received: 20/02/2020 (am)

Cool Box Temperatures (°C): 9.4

Lab Sample ID	20/01711/1	20/01711/2	20/01711/3
Client Sample No			
Client Sample ID/Depth	BH1 2.00-2.10m	BH2 11.70-12.70m	BH6 2.60-2.90m
Date Sampled			
Deviation Code			
E (no date)	✓	✓	✓

Key
E (no date) No sampling date provided (all results affected if not provided)

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

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/01641
Issue Number: 1
Date: 25 February, 2020

Client: Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: Ringlands, Newport
Project Ref: 2260193
Order No: N/A
Date Samples Received: 19/01/20
Date Instructions Received: 05/02/20
Date Analysis Completed: 25/02/20

Prepared by:



Melanie Marshall
Laboratory Coordinator

Approved by:



Danielle Brierley
Client Manager

Envirolab Job Number: 20/01641

Client Project Name: Ringlands, Newport

Client Project Ref: 2260193

Lab Sample ID	20/01641/1	20/01641/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS6	WS9A								
Depth to Top	1.80	0.80								
Depth To Bottom										
Date Sampled										
Sample Type	Soil - D	Soil - D								
Sample Matrix Code	5A	5A								
% Stones >10mm _A	<0.1	4.0						% w/w	0.1	A-T-044
pH BRE _D ^{M#}	8.90	8.86						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	<10	<10						mg/l	10	A-T-026s

REPORT NOTES

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

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

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

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

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

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Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

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

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

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

Predominant Matrix Codes:

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

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

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Superscript "M" indicates method accredited to MCERTS.

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

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

Please contact us if you need any further information.

Envirolab Deviating Samples Report

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

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North
Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: Ringlands, Newport

Clients Project No: 2260193

Project No: 20/01641

Date Received: 19/02/2020 (am)

Cool Box Temperatures (°C): 5.2

Lab Sample ID	20/01641/1	20/01641/2
Client Sample No		
Client Sample ID/Depth	WS6 1.80m	WS9A 0.80m
Date Sampled		
Deviation Code		
E (no date)	✓	✓

Key

E (no date)

No sampling date provided (all results affected if not provided)

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

F.A.O.

Final Test Report - 2260193 / 1

Site: Ringlands, Newport

Job Number: 2260193

Originating Client:

Originating Reference: 2260193

Date Sampled: Not Given

Date Scheduled: 05/02/2020

Date Testing Started: 18/02/2020

Date Testing Finished: 21/02/2020

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:



Tim Robinson
Quality Technician

Report Issue Date: 21/02/2020

Site: Ringlands, Newport

Job Number: 2260193

Client:
Page: 2

**Determination of Water Content, Liquid Limit and Plastic Limit
and Derivation of Plasticity and Liquidity Index**

Borehole / Trial Pit	Depth (m)	Sample	Natural / Sieved	Natural Water Content %	Sample Passing 425 µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	Description / Remarks
					Percentage %	Water Content %						
BH6	1.00	D	Natural	23	100	23.0	42	31	11	-0.73	MI	Brown clayey SILT
BH6	2.00	D		17								Brown slightly silty CLAY
WS12	0.80	D	Natural	21	91	23.0	39	23	16	-0.03	CI	Brown/Grey slightly gravelly, silty CLAY
WS15	1.00	D		19								Brown silty CLAY
WS15	1.50	D	Natural	25	100	25.0	46	24	22	0.05	CI	Brown silty CLAY
WS5	1.70	D		20								Brown silty CLAY
WS5	2.00	D	Natural	23	100	23.0	47	23	24	0.00	CI	Brown silty CLAY
WS5	3.00	D		16								Brown/Grey silty CLAY
WS6	1.40	D	Natural	24	100	24.0	50	23	27	0.04	CI/CH	Brown CLAY
WS6	1.80	D		18								Brown slightly gravelly, silty CLAY
WS6	2.80	D	Natural	21	100	21.0	44	23	21	-0.10	CI	Brown silty CLAY
WS6	3.80	D		18								Brown silty CLAY
WS8	1.00	D		25								Brown slightly gravelly, silty CLAY
WS8	1.90	D		23								Brown slightly gravelly, silty CLAY
WS9A	0.80	D	Natural	13	79	15.0	35	21	14	-0.42	CL/CI	Grey gravelly, silty CLAY

Method of Preparation: BS 1377 : Part 1 : 1990 : Clause 7 Preparation of disturbed samples for testing
 BS 1377 : Part 1 : 2016 : Clause 8.4.3 Preparation of samples for plasticity tests
 BS 1377 : Part 2 : 1990 : Clause 4.2 Preparation of samples for plastic limit tests

Method of Test: BS 1377 : Part 2 : 1990 : Clause 3.2 Determination of moisture content
 BS 1377 : Part 2 : 1990 : Clause 4.3 or 4.4 Determination of the liquid limit
 BS 1377 : Part 2 : 1990 : Clause 5.3 Determination of the plastic limit and plasticity index



Final Test Report - 2260193 / 1

Site: Ringlands, Newport

Job Number: 2260193

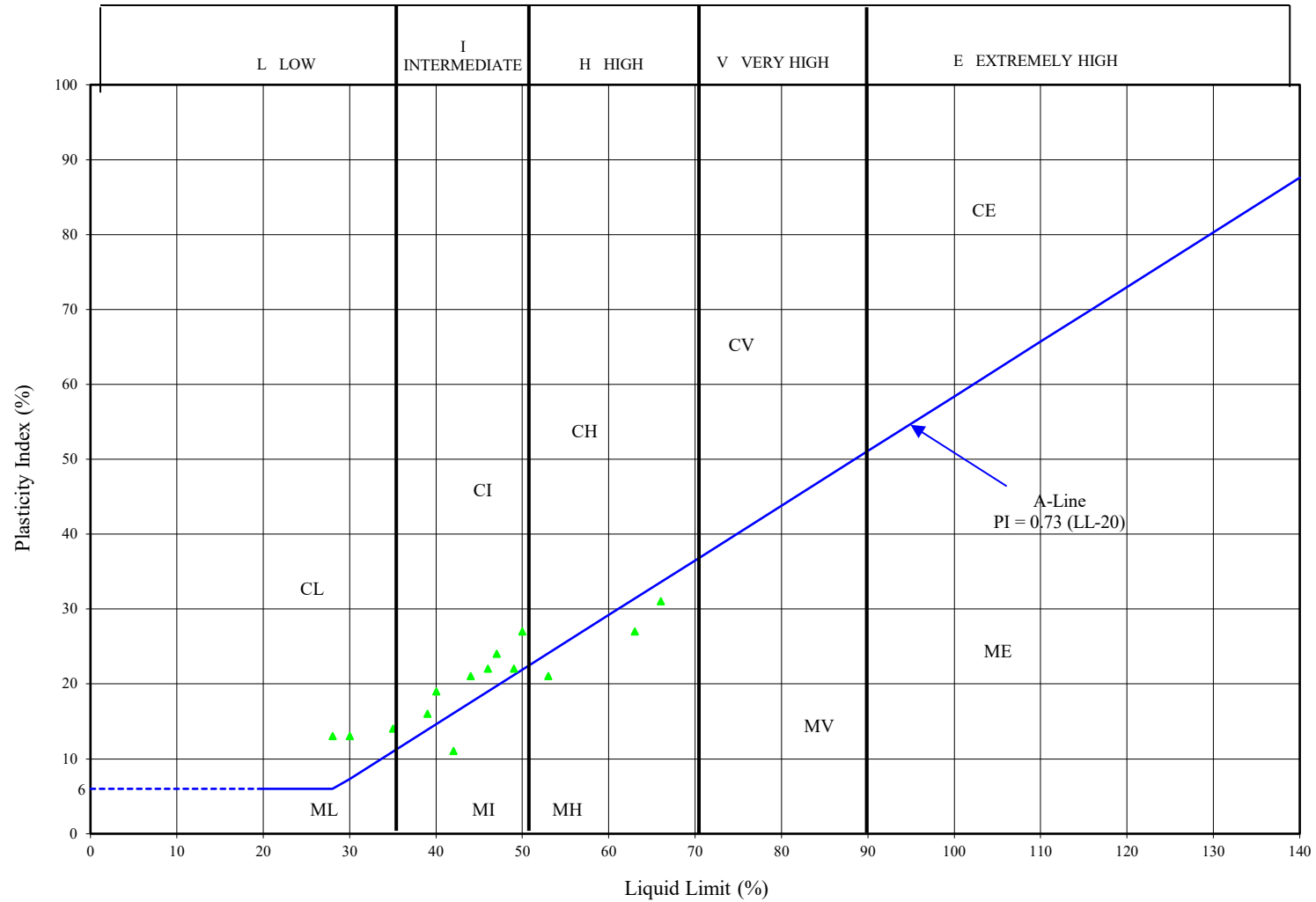
Originating Client:

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

This test report shall not be reproduced, except in full and only with the written permission of Ian Farmer Associates Ltd.

Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 21/02/2020



Appendix E – Generic Assessment Criteria

Adopted Soil Generic Assessment Criteria
Sandy loam with 6% SOM



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

Notes

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

Adopted Soil Generic Assessment Criteria
Sandy loam with 2.5% SOM



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

Notes

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

Adopted Soil Generic Assessment Criteria
Sandy loam with 1% SOM



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

Notes

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

Tier 1 Thresholds

Water Contaminants: Initial Assessment of Risk



Introduction

The Generic Assessment Criteria (GAC) employed as Tier 1 Controlled Water Screening criteria are given in Tables 1 and 2. The more conservative available Drinking Water Standards (DWS) and Environmental Quality Standards (EQS) (Freshwater and Saltwater), applicable in England and Wales have been included in the tables.

The list of determinands is non-industry specific and it should be recognised that additional site specific determinands may need to be taken into account. The applicability of these criteria, with regard to the developed Conceptual Site Model, is discussed within the relevant section of the preceding report. Further details on individual GAC can be obtained in the referenced source legislation.

Generic Assessment Criteria

Table 1 – Inorganic Contaminant Controlled Waters Generic Assessment Criteria

Contaminant	Units	Hardness Banding (mg/l CaCO ₃)	EQS (Freshwater)	EQS (Saltwater)	EU DWS	WHO
Arsenic	µg/l	-	50	25	10	10
Boron	µg/l	-	2000	7000	1000	0.3
Cadmium	µg/l	<40	0.08	0.2	5	3
		40- <50	0.08			
		50- <100	0.09			
		100- <200	0.15			
		>200	0.25			
Chromium III	µg/l	-	4.7	-	50	50
Chromium VI	µg/l	-	3.4	0.6		
Copper	µg/l	-	1 bioavailable ⁱ	3.76 Where DOC ⁱⁱ ≤ 1mg	2000	2000
				3.76 + (2.677 x ((DOC/2)- 0.5)) Where DOC ⁱⁱ >1mg/l		
Cyanide (Free)	µg/l	-	1	1		
Cyanide (Total)	µg/l	-	1	1	50	70
Iron	µg/l	-	1000	1000	200	300
Lead	µg/l		1.2	1.3	10	10
Mercury	µg/l	-	0.07 ⁱⁱⁱ	0.07 ⁱⁱⁱ	1	1
Nickel	µg/l	-	4 bioavailable ⁱ	8.6	20	70

Tier 1 Thresholds

Water Contaminants: Initial Assessment of Risk



Contaminant	Units	Hardness Banding (mg/l CaCO ₃)	EQS (Freshwater)	EQS (Saltwater)	EU DWS	WHO
Selenium	µg/l	-	-	-	10	10
Sulphate	mg/l	-	400	-	250	-
Sulphide	µg/l	-	0.25	-	-	-
Zinc	µg/l	-	10.9 bioavailable ⁱⁱ + ABC ^v	6.8 dissolved ^{iv} + ABC	5000	3000

i - fraction likely to have toxic effect as determined using the UKTAG Metal Bioavailability Assessment Tool

ii - concentration of dissolved organic carbon in mg/l of the receiving water (as identified in the Conceptual Site Model)

iii - in absence on Annual Average the Maximum Allowable Concentration Used

iv - total dissolved as reported

v - Average Background Concentration (ABC) as listed in Part 2 Table 2 in Ref. 1.

Table 2 – Organic Contaminant Controlled Waters Generic Assessment Criteria

Contaminant	Units	EQS (Freshwater)	EQS (Saltwater)	EU DWS	WHO
Organics					
Phenol (total)	µg/l	7.7	7.7	0.5	-
MTBE	µg/l	-	-	-	15
Total Petroleum Hydrocarbons (TPH)					
Aliphatic C5-C6	µg/l	-	-	-	15000
Aliphatic C6-C8	µg/l	-	-	-	15000
Aliphatic C8-C10	µg/l	-	-	-	300
Aliphatic C10-C12	µg/l	-	-	-	300
Aliphatic C12-C16	µg/l	-	-	-	300
Aliphatic C16-C21	µg/l	-	-	-	300
Aliphatic C21-C35	µg/l	-	-	-	300
Aromatic C6-C7 (benzene)	µg/l	10	8	1	10
Aromatic C7-C8 (toluene)	µg/l	74	74	-	700
Aromatic C8-C10 (ethylbenzene)	µg/l	20	20	-	300
Aromatic C10-C12	µg/l	-	-	-	100
Aromatic C12-C16	µg/l	-	-	-	100
Aromatic C16-C21	µg/l	-	-	-	90
Aromatic C21-C35	µg/l	-	-	-	90
Total Hydrocarbons (Dissolved / Emulsion)	µg/l	-	-	10 (revoked)	300

Tier 1 Thresholds

Water Contaminants: Initial Assessment of Risk

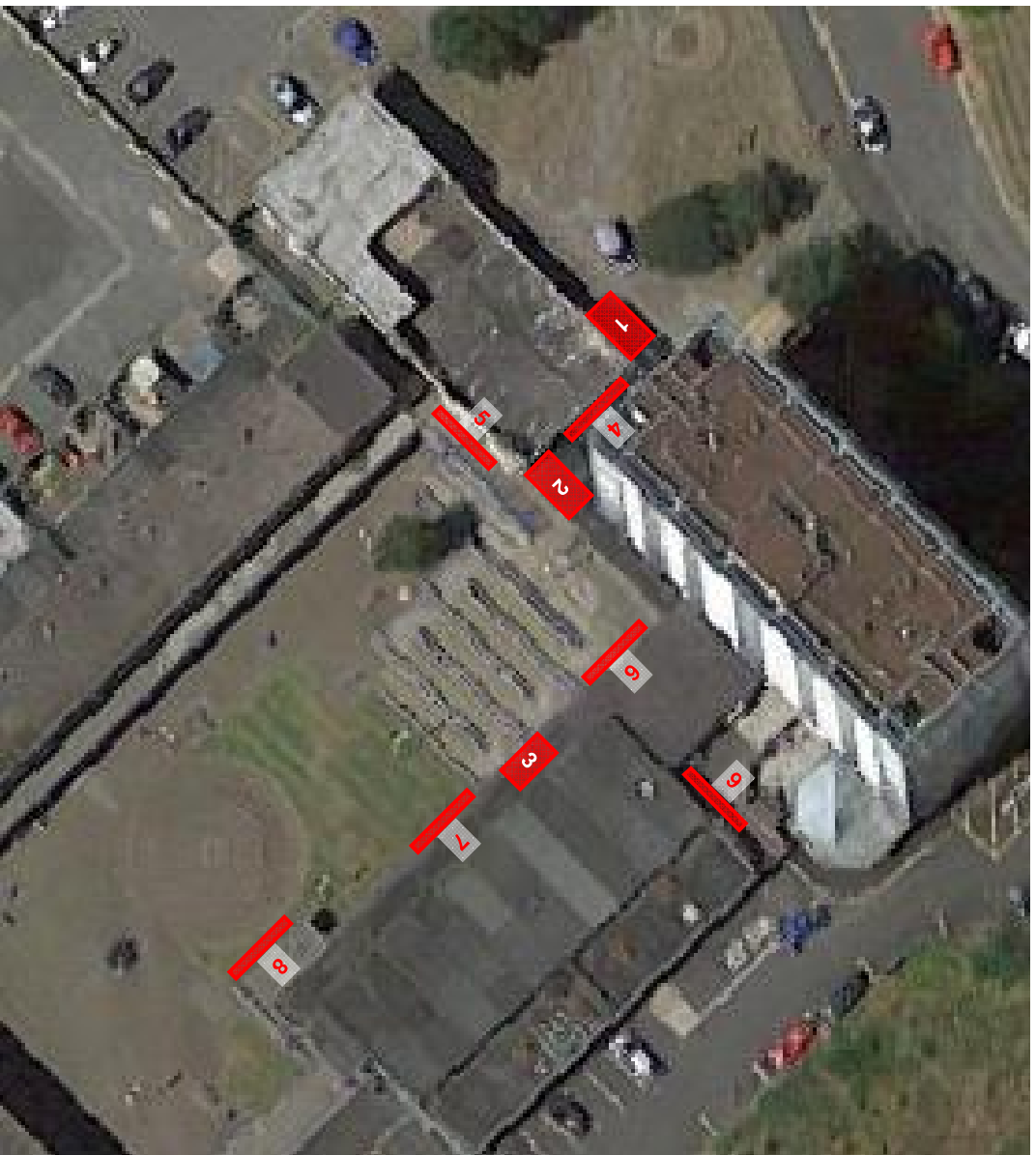


Contaminant	Units	EQS (Freshwater)	EQS (Saltwater)	EU DWS	WHO
BTEX Compounds					
Benzene	µg/l	10	8	1	10
Toluene	µg/l	74	74	-	700
Ethyl-benzene	µg/l	20	20	-	300
Xylene (o+p+m)	µg/l	30	30	-	-
Polycyclic Aromatic Hydrocarbons (PAH)					
Anthracene	µg/l	0.1	0.1	-	-
Benzo(a)pyrene	µg/l	0.00017	0.00017	0.01	0.01
Napthalene	µg/l	2	2	-	-
PAHs Sum of four-benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, indeno(1,2,3-c,d)pyrene	µg/l	-	-	0.1	-

References

- 1 The Water Framework Directive, (Standards and Classification) Directions (England and Wales) [2015]
- 2 Council Directive 76/464/EEC, Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) [1976]
- 3 Council Directive 98/83/EC on the quality of water intended for human consumption [1998]
- 4 World Health Organisation (WHO), Guidelines for Drinking Water Quality. Third edition [2004]

Appendix F - Opening Up and Structural Inspection Works



1. Remove paving slabs and undertake drilling to retained soil to probe at the base of the retaining wall to establish top of concrete level to retaining wall heel. Probing to continue at regular intervals away from building perimeter 0.75m, 1.5m, 2.25m, 3m etc. to establish lateral extent of retaining wall heel.
2. Lift paving slabs to walkway areas and undertake hand dug trial pit to establish detail to head of retaining wall and presence of concrete slab or otherwise to underside of paving.
3. Lift paving slabs to walkway areas and undertake hand dug trial pit to establish detail to head of retaining wall and presence of concrete slab or otherwise to underside of paving.
4. Lift paving slabs and undertake trial pits adjacent to manhole, Milton Court and pub to establish foundation extents to both structures as well as detail to head of retaining wall and presence of concrete slab or otherwise to underside of paving.
5. Remove bricks to verify wall construction and confirm presence or otherwise of basement to rear side of wall. Brickwork is assumed to act as cladding only to reinforced concrete retaining wall structure. Location of works to be confirmed within internal extent of pub basement to establish location of internal primary structure in relation to external wall structure.
6. Remove bricks to verify wall construction and confirm presence or otherwise of basement to rear side of wall. Brickwork is assumed to act as cladding only to reinforced concrete retaining wall structure.
7. Remove bricks to verify wall construction and confirm presence or otherwise of basement to rear side of wall. Brickwork is assumed to act as cladding only to reinforced concrete retaining wall structure.
8. Remove bricks to verify wall construction and confirm presence or otherwise of basement to rear side of wall. Brickwork is assumed to act as cladding only to reinforced concrete retaining wall structure.
9. Lift paving slabs and undertake trial pits adjacent to manhole, Milton Court and shops to establish foundation extents to both structures as well as detail to head of retaining wall and presence of concrete slab or otherwise to underside of paving.

All areas subject to CAT scan and establishment of services prior to commencement of any works.



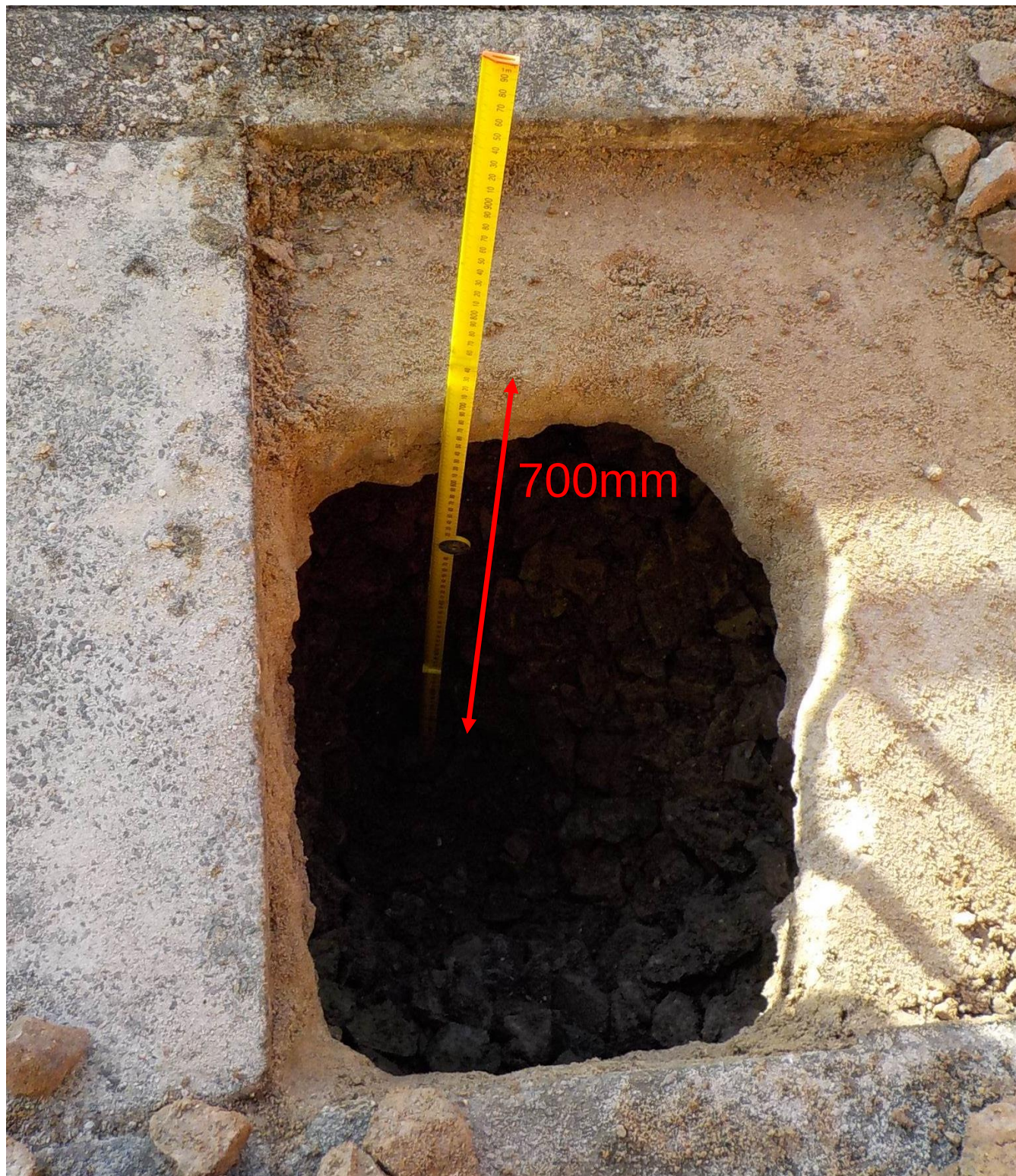
063454 Newport East - Site Plan

Intrusive Works Scope

Rev- 15/03/2019



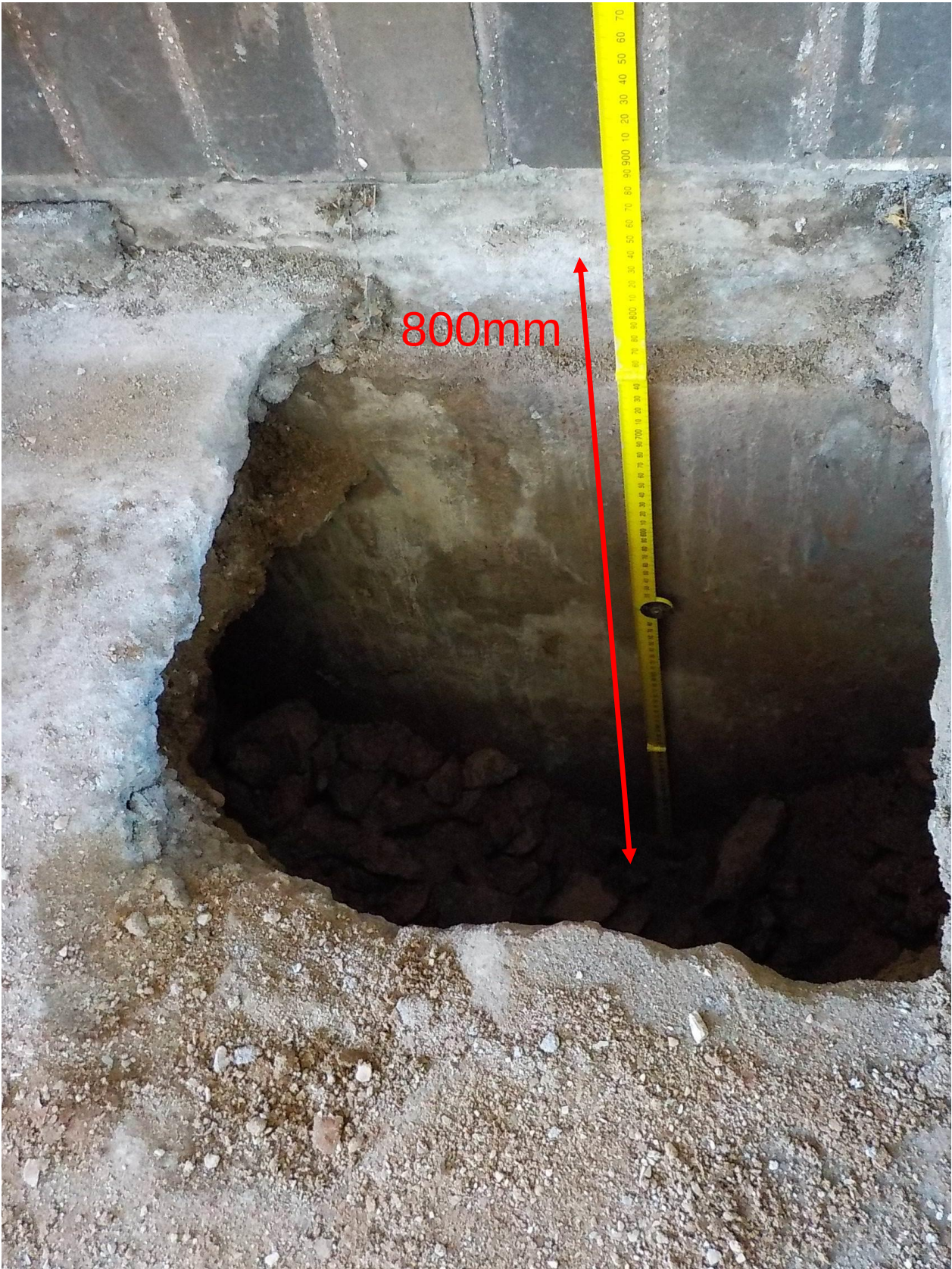
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		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.62	



Date Drawn: 23-02-2020	Scale: NTS	Title: Opening Up Works Location 3	
 IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.63	

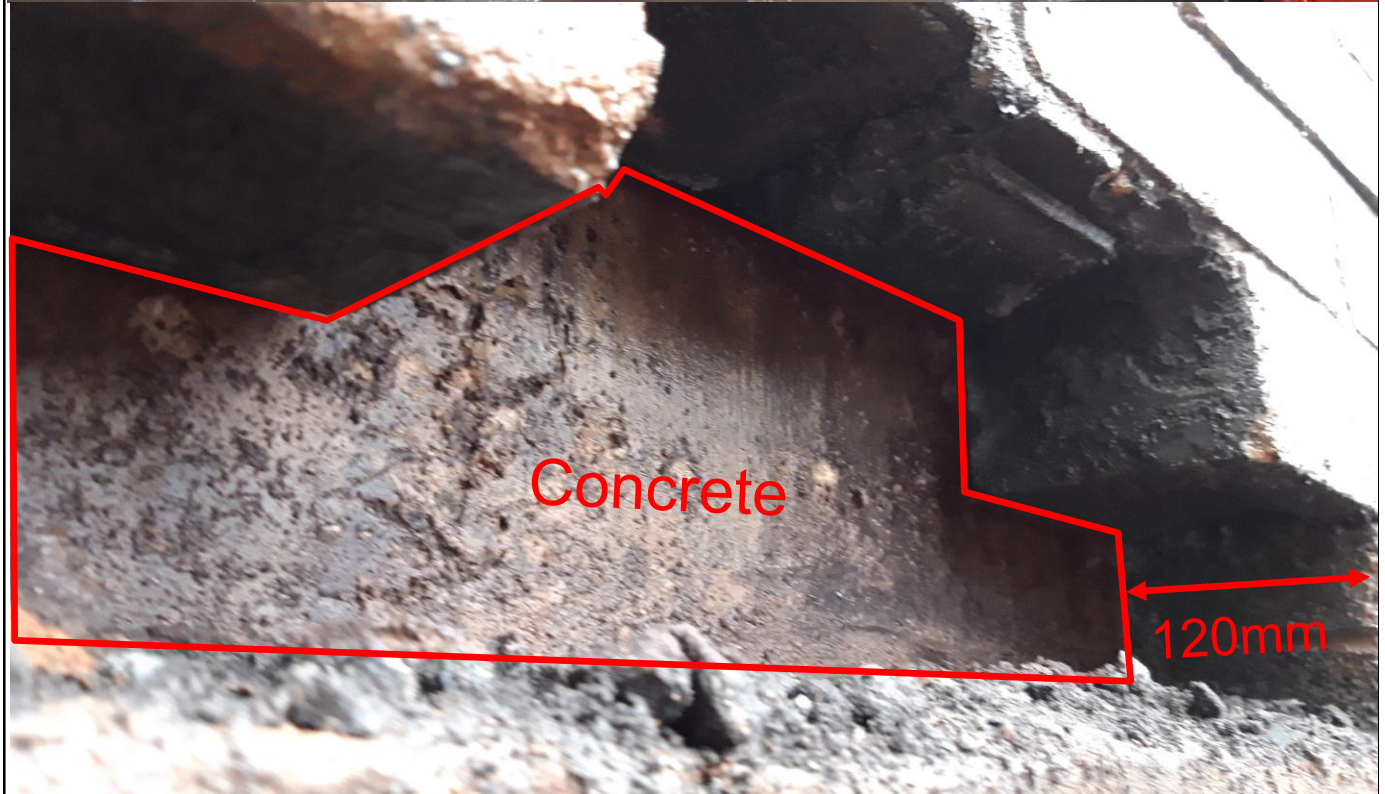


Date Drawn: 23-02-2020	Scale: NTS	Title: Opening Up Works Location 3	
		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.64	



Date Drawn: 23-02-2020	Scale: NTS	Title: Opening Up Works Location 4	
		Client: Curtins	
		Project: Ringlands Centre, Newport	Job No.: C2260193
		Fig A2.65	

Block Work 100mm, Cavity 20mm



Date Drawn:
23-02-2020

Scale: NTS

Title: Opening Up Works Location 5

Client: Curtins

Project: Ringlands Centre, Newport

Job No.: C2260193

**IAN FARMER
ASSOCIATES**
Geotechnical & Environmental Specialists

Fig A2.66

Block Work 100mm, Cavity 30mm



Date Drawn:
23-02-2020

Scale: NTS

Title: Opening Up Works Location 6

Client: Curtins

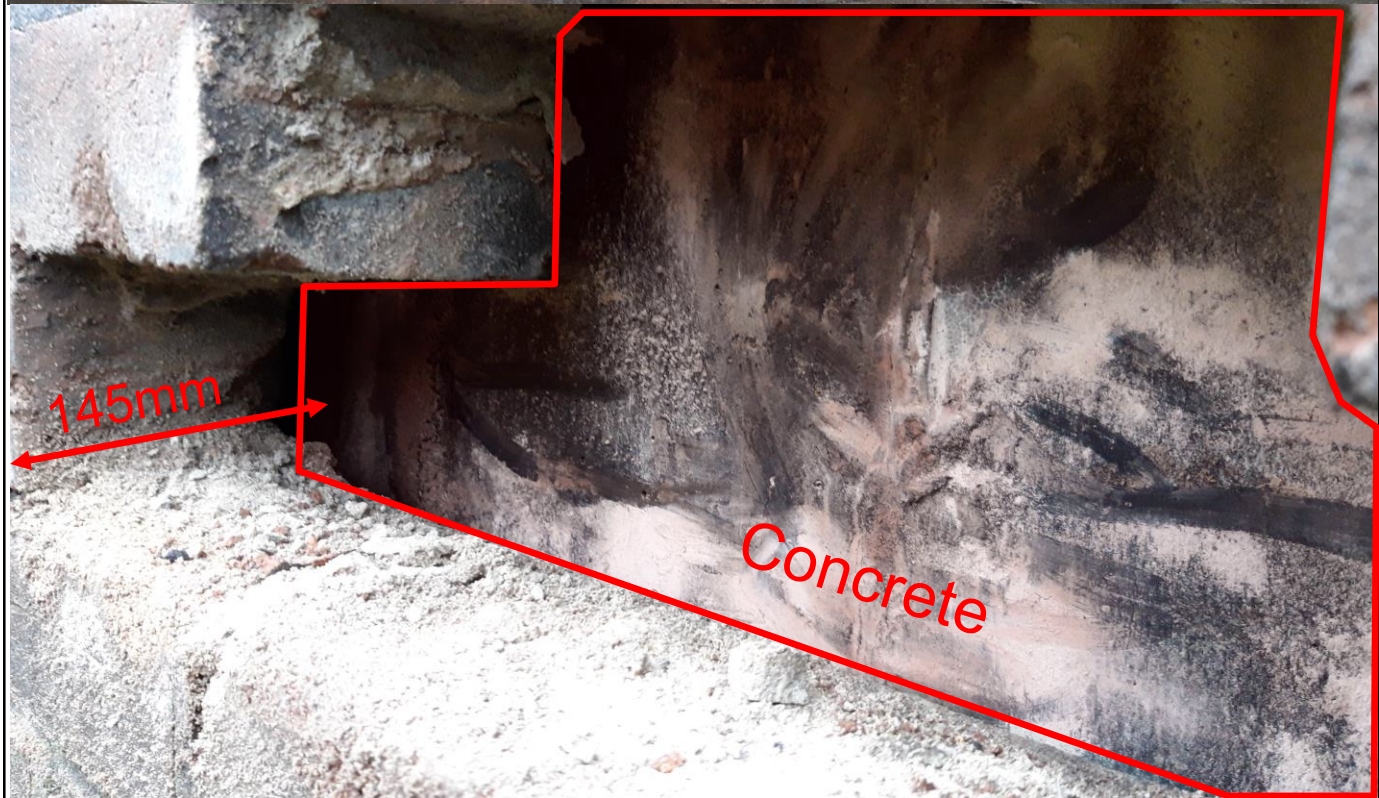
Project: Ringlands Centre, Newport

Job No.: C2260193

**IAN FARMER
ASSOCIATES**
Geotechnical & Environmental Specialists

Fig A2.67

Block Work 100mm, Cavity 45mm



Date Drawn:
23-02-2020

Scale: NTS

Title: Opening Up Works Location 7

Client: Curtins

Project: Ringlands Centre, Newport

Job No.: C2260193

Block Work 100mm, Cavity 20mm



Date Drawn:
23-02-2020

Scale: NTS

Title: Opening Up Works Location 8

Client: Curtins

Project: Ringlands Centre, Newport

Job No.: C2260193

**IAN FARMER
ASSOCIATES**
Geotechnical & Environmental Specialists

Fig A2.69

Probe Log

Borehole No.

DCP01

Sheet 1 of 2

Project Name: Ringlands Centre

Project No.
C62260193

Co-ords: -

Hole Type
DCP

Location: Newport

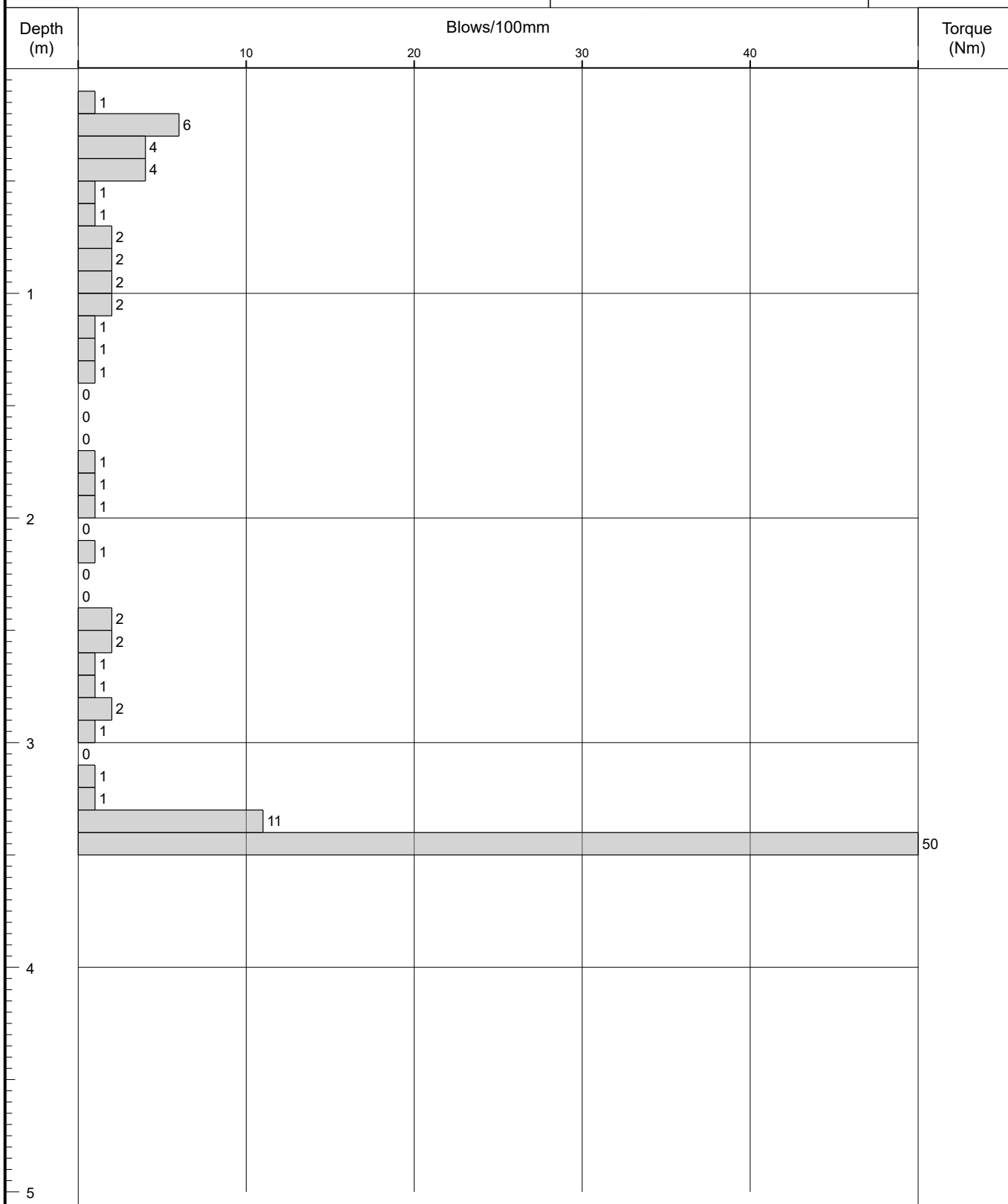
Level:

Scale
1:25

Client: Curtins

Dates: 18/12/19

Logged By



Remarks

Located 0.75m off the wall

Fall Height 750

Hammer Wt 64

Probe Type DPSH-B

Cone Base Diameter

Final Depth 3.50

Log Scale 1:25

Probe Log

Borehole No.

DCP02

Sheet 2 of 2

Project Name: Ringland Centre

Project No.
C2260193

Co-ords: -

Hole Type
DCP

Location: Newport

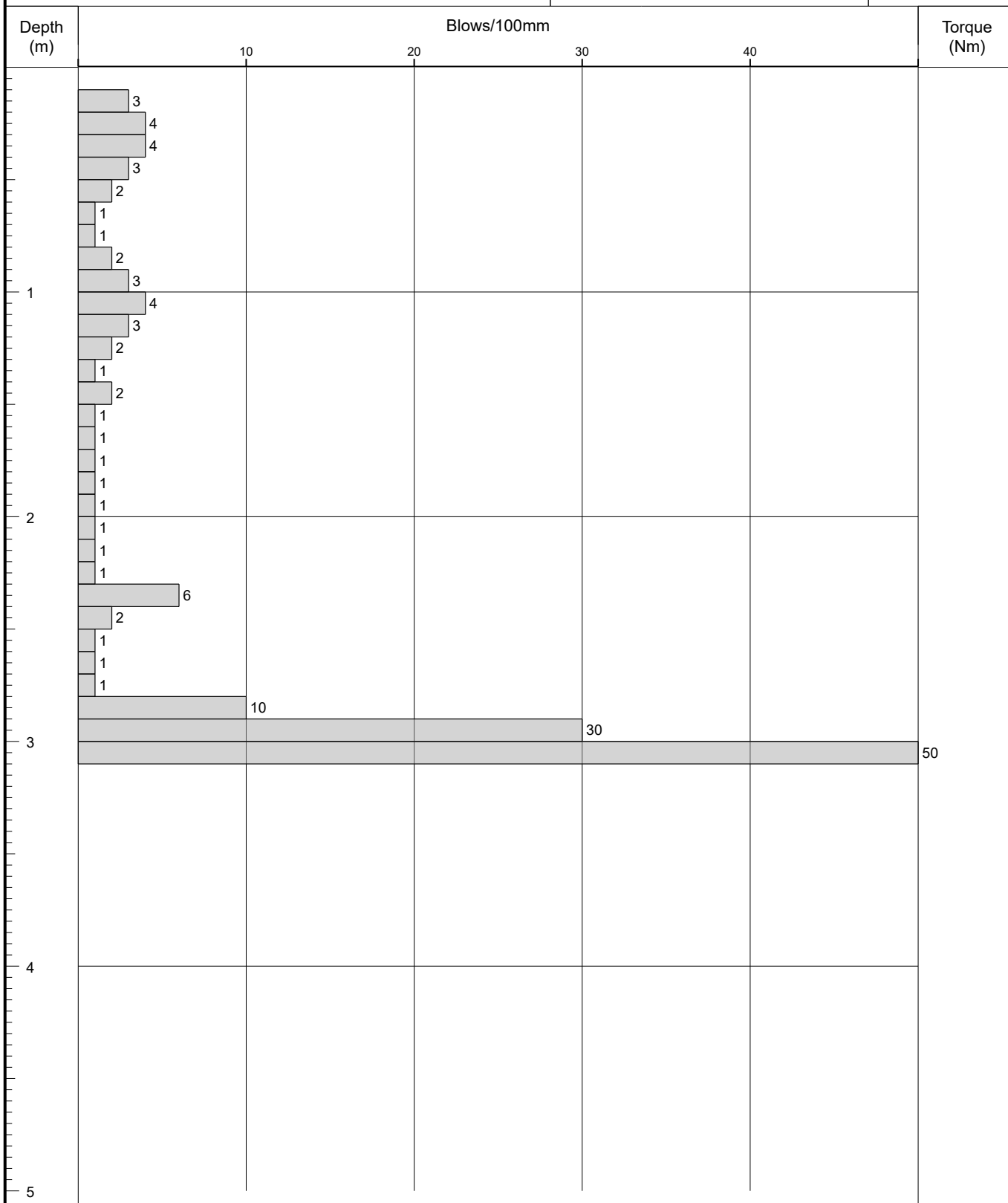
Level:

Scale
1:25

Client: Curtins

Dates: 18/12/2019

Logged By



Remarks

Located 1.50m off the wall

Fall Height 750

Hammer Wt 64

Probe Type DPSH-B

Cone Base Diameter

Final Depth 3.10

Log Scale 1:25

Appendix G – Risk Assessment Methodology

The site-specific risk assessment, presented in this report, follows the principle of establishing whether there is a viable linkage between a contaminant source to a potential receptor, via an exposure pathway.

The risk assessment corresponds with the total site area and incorporates both descriptive (qualitative) and, where available, numerical (quantitative) lines of evidence.

Risk assessment is the process of collating known information on a hazard or set of hazards to estimate actual or potential risk to receptors. The receptor may be humans, a water resource, a sensitive local ecosystem or future construction materials. Receptors can be connected to the source by one or several exposure pathways such as direct contact for example. Risks are generally managed by isolating the receptor or intercepting the exposure pathway or by isolating or removing the hazard.

Without the three essential components of a source, pathway and receptor there can be no risk. Therefore, the presence of contaminant source on a site does not necessarily mean there is a risk.

The risk assessment considers the likelihood of an event taking place (accounting for the presence of the source and receptor and the viability of the exposure pathway) in conjunction with the severity of the potential consequence (accounting for the potential severity of the hazard and the sensitivity of the receptor).

In the risk assessment, the consequence of the hazard has been classified as severe or medium or mild or minor and the probability (likelihood) of the circumstances occurring classified as high likelihood or likely or low likelihood or unlikely.

The consequences and probabilities are subsequently cross-correlated to give a qualitative estimation of the risk using Department of the Environment risk classifications as detailed in the table below and as referenced in CIRIA C552.

		Consequence			
		Severe	Medium	Mild	Minor
Probability (Likelihood)	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

In accordance with DoE guidance, the following categorisation of **consequence** has been developed.

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to an ecosystem or organisation forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in an ecosystem or organism forming part of such ecosystem.	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary A aquifer. Death of a species within a designated nature reserve. Lesser toxic and asphyxiate effects
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater (inc. Secondary B aquifers). Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

In accordance with DoE guidance, the following categorisation of **probability** has been developed.

Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

In accordance with DoE guidance, the following categorisation of **risk** has been developed.

Classification	Definition
Very High Risk	There is a <i>high probability</i> that <i>severe harm</i> could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	<i>Harm is likely to arise</i> to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	<i>It is possible</i> that without appropriate further action <i>harm could arise</i> to a designated receptor. It is relatively <i>unlikely</i> that any such harm would be <i>severe</i> , and if any harm were to occur it is <i>more likely</i> that such harm would be <i>relatively mild</i> .
Low Risk	<i>It is possible</i> that <i>harm could arise</i> to a designated receptor from an identified hazard. It is <i>likely</i> that, at worst, if any harm was realised any effects would be <i>mild</i> .
Very Low Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The term 'risk' in this instance refers to the risk that the source, pathway, receptor linkage for a given source of contamination is complete. It does not refer to immediate risk to individuals or features present on the site from potential contaminants and is intended to be used as a tool to assess the necessity of further investigation.

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