Roxhill Developments Limited

M1 Junction 15 West - Roade Bypass

Interpretative Ground Investigation Report

313583-02 (00)

NOVEMBER 2017

RSK

RSK GENERAL NOTES

Project No.: 313583-02 (00)

Title: Preliminary ground investigation interpretative report: M1 Junction 15 West: Roade Bypass

Client: Roxhill Developments Ltd (Roxhill), Lumonics House, Valley Drive, Swift Valley, Rugby, Warwickshire, CV21 1TQ

Date: 15th November 2017

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Status: Final

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1 INTRODUCTION

RSK Environment Limited (RSK) has been commissioned by Roxhill Developments Limited to carry out a Geotechnical and Geoenvironmental Assessment of the site for the proposed alignment of the bypass around the village of Roade, Northamptonshire.

The proposed highway stretches over approximately 2.5km in length and has various land owners and land uses which predominately comprise agricultural fields intersected from north to south by an active railway line (4 line track) in deep cutting, Blisworth Road, a shallow drainage ditch, a rough track and finally an east west trending dismantled railway line close to the most south westerly extent.

This report is specific to the investigation undertaken on the proposed highway scheme only.

The interpretative ground investigation report is presented herein. This report is subject to the RSK service constraints given in Appendix A.

1.1 Terms of reference

This report comprises a factual report in general accordance with the requirements of:

- BS5930:2015 'Code of practice for ground investigations';
- BS10175:2011 Investigation of potentially contaminated sites – Code of Practice;
- Environment Agency CLR 11 2004a 'Model Procedures for the Management of Land Contamination' (Contaminated Land Risk Assessment); and
- BS EN 1997-2:2007. Eurocode 7 - Geotechnical design - Part 2: Ground investigation and testing.

1.2 Proposed development

It is understood that the site is being considered for a bypass around the western edge of the village of Roade to relieve present and predicted future traffic volumes.

The redline boundary for the proposed road is shown upon Roxhill Developments Ltd and BWB Master plan ref: NGW-BWB-GEN-XX-SK-D-SK01, dated April 2016. Proposals are understood to comprise of a single 7.30m wide carriageway plus 1m hard strips and footway/cycleway provision along the route. The proposed road will start south of the village of Roade and will extend in a northwards direction around the western side of the village before branching east and crossing the railway line and reconnecting with the A508 (Northampton Road) north of the village of Roade.

1.3 Objectives

The purpose of the investigation works undertaken were to confirm the underlying ground conditions present beneath the bypass alignment. The bypass alignment has previously been subject to a Preliminary Sources Study Report 313418-02 (00), dated December 2016. In addition, the information collated will be used to assist in the master planning design and to support the Environmental Statement being developed for the proposed scheme.

The main objectives of the investigation are to:

- Confirm the stratigraphy of the soil across the site;
- Confirm the groundwater and soil gas regime;
- Confirm the contamination status of the site using a programme of in-situ screening and laboratory analysis; and
- To provide sufficient geotechnical information characterising the strata encountered beneath the alignment.

In line with Eurocode 7, BS5930, BS10175 and CLR 11 further phases of targeted investigation may be required to provide specific data and information for detailed design of individual elements of the scheme, as the design evolves.

1.4 Scope

The project has been carried out to an agreed brief as set out in RSK's proposal ref. M1 Junction 15 West: Roade Bypass dated June 2017 in order to provide information to enable to site to be redeveloped as a new bypass including provision of a new bridge constructed across the existing railway cutting and line.

The project has been carried out to an agreed brief as set out in RSKs proposal (ref. 313583-00 (01) Specification, dated 15th June 2017.

The ground investigation fieldwork carried out at the site was undertaken in accordance with a specification developed by RSK in view of the Client's proposed development proposals.

The scope of works for the assessment include:

Inclusive within the Factual Report;

- an intrusive investigation, with associated laboratory analysis and programme of subsequent monitoring events.

Inclusive within the Interpretive Report;

- development of a refined conceptual site model followed by generic quantitative risk assessment (GQRA) to assess complete pollutant linkages that may require the implementation of migration measures to facilitate development;
- interpretation of ground conditions and ground model for the site;
- classification of the strata encountered and identification of soil properties;

- an interpretative report to assess both geotechnical and geoenvironmental risks and identify implications that will affect the detailed design of the project; and
- an assessment of the potential waste classification implications of soil arisings.

1.5 Background information

The following scheme design master plan drawing has been provided to RSK by the client:

- NGW-BWB-GEN-XX-SK-D-SK01, dated June 2016.

A preliminary risk assessment (desk study) has been undertaken for the proposed development:

- M1 Junction 15 West – Roade Bypass: Preliminary sources study report (ref:313418-02), RSK, dated 7th December 2016.

1.6 Limitations

Access to numerous parcels (plots 100, 105 and 120) of land were not granted. Therefore several trial pits TP06, 08, 09, 10, 11, 19, 21, 24 and 25 were not undertaken as planned within the central portion of the route alignment. This is shown on Figure 2.

The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows may vary from those reported due to seasonal, or other, effects.

Whilst asbestos containing materials were not identified during the fieldworks or supporting laboratory analysis, asbestos is often present in discrete areas. Thus, although not encountered during the site investigation, may be found during more extensive ground works or within areas not investigated.

2 SITE DETAILS

2.1 Site location

The proposed Roade bypass, referred to hereafter as “the site” is located west of the village of Roade, Northampton and is designed to bypass the village of Roade in an attempt to relieve the village of high traffic congestion. The site currently comprises of a series of agricultural fields, a dismantled railway line alignment, Blisworth Road and an existing 4 track live railway line within deep cutting. The proposed development stretches approximately 2.5 km to the west of Roade, starting south of Roade (off the A508) and extends north for approximately 1.5 km before turning eastwards for approximately 1km for the remainder of the route and reconnecting with the A508, north of Roade.

A location plan for the site is presented as Figure 1, and the boundary of the current assessment and exploratory hole locations are defined on Figure 2 and upon Figure 3 showing the currently proposed alignment.

2.2 Local topography, geography and geomorphology

The site sits within a formerly glaciated area. The land is gently undulating with a general rise from the southern extent to the north eastern corner.

The site sits within a formerly glaciated area. The land is gently undulating with a general fall to the south of the site. At its highest, the site elevation is approximately 122m AOD located where the proposed bypass branches off from the A508 Northampton Road, north of the town of Roade. The proposed bypass crosses over a railway line north-west of the town of Roade, which is located within a deep cutting. The route dips to less than 115m AOD just after it crosses Blisworth Road and the drainage ditch, before rising back to 120m AOD at its most westerly extent. At the time of the walkover the drainage ditch did not contain any water. The route then drops again towards the A508 Stratford Road, rejoining at an elevation of approximately 100m AOD, although the topography is undulating at this end of the site.

The proposed bypass is to meet a modified section of the A508 Stratford Road, at the point at which it crosses an historic, now dismantled, overgrown railway line.

The geological sequence of the majority of the site is understood to comprise Oadby Member Glacial Till (Superficial) overlying solid deposits anticipated to be the Blisworth Limestone Formation, which is principally limestone’s with thin bands of fossiliferrous mudstone and marls, underlain by the succession of marine and non-marine mudstones, sandstones and limestone’s of the Blisworth Clay, Rutland Formation, Stamford Member, Northampton Sand Formation with the Whitby Mudstones at depth. Locally other deposits including Cornbrash limestone’s might be encountered at depth at the northern extent.

The geological sequence of the area is understood to be one of fossiliferrous mudstone and siltstone, laminated and bituminous in part, with thin siltstone or silty mudstone beds and rare fine-grained calcareous sandstone beds deposited within sea conditions and eroded by periods of glaciations and later deposition of Oadby Member and Glaciofluvial Deposits.

2.3 Site description

A site walkover was undertaken on the 22nd July 2016 and 24th August 2016. The proposed alignment of the proposed bypass predominately comprises fields, intersected by, from north to south, a 4 track live railway in deep cutting, Blisworth Road, a drainage ditch, a rough track/road and finally a dismantled former railway line.

From its northern extent, the proposed route leaves the A508 Northampton Road heading roughly west and crosses a ditch and hedge before crossing an arable field. Beyond the field the route crosses an existing 4 track live railway line (Roade Cutting SSSI) located within a steep, densely vegetated cutting. Immediately beyond the railway is an additional arable field with hedgerow boundaries. The first field is accessible from the A508 Northampton Road. This field can be accessed via a bridge over the railway line from the first field.

The route then turns south-west and passes through two livestock (sheep/cattle) fields bounded by hedgerows, between which is Blisworth Road. The field to the north of Blisworth Road is accessible via an adjacent field, while the field to the south is not accessible from the Road, and appears to be accessible via Hyde Farm.

From there the route heads south and crosses a drainage ditch between the southern livestock field and into a final livestock field, bounded again by hedgerows and semi mature trees and a shallow ditch, accessible via Hyde Farm. The route then turns south-east and crosses two arable fields separated by a farm track which provides access to the fields, and originates at Dovecote Farm off of Blisworth Road.

The route then terminates at the A508 Stratford Road, at the site of a dismantled railway. The dismantled railway is heavily overgrown by dense shrubs, brambles and semi-mature and mature trees. The end of the former railway immediately adjacent to the A508 is fully overgrown. An area of low growth and grassed verge is present adjacent to the A508, while the point at which the proposed bypass and the modified A508 will meet is accessed via the arable field to its north, mentioned above. The dismantled railway can also be accessed via a gated entrance of an adjacent field, further south along the A508.

3 SUMMARY OF AVAILABLE INFORMATION

3.1 Published geology and expected ground conditions

Table 1 provides further details of the anticipated geological succession.

Table 1: Geology at the site

Geological unit	Description	Thickness (m)
Surfacing and Buried Structures: (source: Envirocheck History Maps, Site Observation, Service records, Site clearance)	Hard standing was identified along tracks and roads that cross the route; however the vast majority of the site is open fields anticipated to be underlain by topsoil's from surface to nominal thicknesses. A known gas main was identified on the services drawing records as crossing a small portion of the northern most point where the proposed route joins the A508.	No thickness recorded
Made Ground / Topsoil: (source: BGS Maps, Available Borehole Logs, Envirocheck Geology & History Maps, memoirs)	The entire site is anticipated to be underlain by a cultivated plough layer or topsoil and turf resulting in subsoil or growing medium. Given its extensive use for arable crops and livestock grazing, it is anticipated that this layer could extend between 0.2m and 0.6m depth and is anticipated to be derived from the underlying Glacial Till, and would be anticipated to be sandy gravelly clay in nature. There is the potential for made ground to be present below and adjacent to any roads or railways that cross the route of the proposed bypass. The thickness of highway constructions is anticipated to be no greater than 0.45m in depth and likely to comprise bound macadam surfacing over granular sub base and perhaps granular hardcore capping.	No thickness recorded
Superficial geology		
Oadby Member (Glacial Till/ Diamicton Till) (source: BGS Maps, Available Borehole Logs, Envirocheck Geology & History Maps, memoirs)	The majority of the site appears to be underlain by a mantle of Oadby Member (Diamicton Till/Glacial Till) which is anticipated to be primarily over consolidated sandy gravelly clay. It may also contain sandy gravel strings, lenses and pockets which may contain perched or confined groundwater. Limited deposits of Glaciofluvial Deposits are anticipated to be present at the southern end of the route and are likely to take the form of sands and gravels.	No thickness recorded
Solid geology		

Geological unit	Description	Thickness (m)
Blisworth Limestone Member/ Rutland Formation	The entirety of the site is indicated to be underlain by the Blisworth Limestone Formation, likely to be weathered beneath superficial deposits to firm to stiff grey and brown clays tending to off-white or yellowish limestone with thin marl and mudstone bands. Calcareous shell and fossil fragments are common throughout these deposits. Beneath which the Blisworth Clay Formation is likely to be encountered. In the extreme south of the site, the Rutland Formation is present, and is likely to be weathered to grey clays and silts. Below this strata, it is likely that the Stamford Member which is anticipated to comprise sandstone and interbedded siltstone will be present overlying the Northampton Sand Formation, all above the Whitby Mudstone Formation.	>1,350m
Mining (source: Coal Authority web viewer, BGS Maps, Available Borehole Logs, Envirocheck records, Geology & History Maps)	None identified	N/A
Faults (source: BGS Maps, Available Borehole Logs, Envirocheck Geology Maps, memoirs)	None identified	N/A
Opencast Quarrying (source: Coal Authority web viewer, BGS Maps, Envirocheck History Maps)	Some sand and gravel quarries noted within 200m of the site, although none expected on site.	N/A
Mineral Protection (source: Local Authority Plan)	None identified	N/A
Soil Chemistry (source: Envirocheck / BGS)	Available soil chemistry data suggests that the natural soils anticipated to be present at shallow depths across the site are unlikely to contain any significantly elevated concentrations of contaminants that would be considered to represent a risk to Human Health for a commercial development.	N/A
Source: British Geological Survey: http://mapapps.bgs.ac.uk/geologyofbritain/home.html (accessed on 11th October 2017).		

4 GROUND INVESTIGATION

Intrusive investigation fieldworks were undertaken between 5th September and 20th September 2017 and were followed by a series of four, weekly ground gas and groundwater monitoring and sampling events.

The investigation undertaken at the site comprised the following:

- Setting out and service Clearance (RSK SafeGround);
- Sinking of 5 combined windowless and rotary follow on cored boreholes to depths between 15.00m and 30.00m bgl;
- Sinking of 12 window sample boreholes to depths between 3.00m and 5.45m;
- Excavation of 18 trial pits to depths between 0.50m and 4.50m;
- Sinking of 13 DCP tests to a depth of 1m;
- Installation of 17no combined groundwater/gas monitoring wells to varying depths within superficial deposits and bedrock including provision of lockable vandal proof covers;
- Four return visits to monitor groundwater levels & ground gas concentrations;
- One visit (first visit) to purge the groundwater from all boreholes;
- One visit (second visit) to undertake water sampling from boreholes;
- Surveying in of as built exploratory hole positions using GPS surveying equipment;
- Associated sampling and in-situ testing including SPTs;
- Soil and rock sample geotechnical laboratory testing; and
- Soil and groundwater sample chemical laboratory testing.

Full records and details covering the methodology of the investigation, the location rationale for exploratory holes, exploratory hole logs, completed laboratory testing results and exploratory hole location drawings are presented separately within the Factual Ground Investigation Report (313583 – 01 (00).

The ground investigation was developed to supplement the findings of the desk study research and to confirm or otherwise the conceptual side model presented within the Preliminary Sources Study Report. Additionally the investigation was required to obtain geotechnical and chemical properties to allow design assessments to be refined.

Specific issues targeted by the ground investigation are identified in Table 2 below;

Table 2: Issues targeted within the ground investigation

	Area	Issue	Exploratory Holes	Testing	Comments
Geo-environmental	General site coverage to obtain base line parameters for underlying geochemical characteristics of soil and groundwater	General chemical characteristics of the Topsoil, near surface sub soils and groundwater as the site is Greenfield	All exploratory positions	Chemical analysis	To confirm contamination risk potential as well as to confirm potential for aggressive ground for concrete mix designs
Geotechnical	General site coverage to obtain base line parameters for underlying geotechnical characteristics of superficial geology	General geotechnical characteristics	All window sample positions and all trial pit positions	Hand shear vane, SPT's	To confirm distribution, classification, uniformity in plan and depth
	General site coverage to obtain base line parameters for underlying geotechnical characteristics of bedrock geology	General geotechnical characteristics	BH01 – BH05	SPTs	To confirm strata succession and strength characteristics
	Cuttings and earthworks properties	Strata depths, properties and groundwater levels	All exploratory positions	SPT, PI, QUTxl, Hand Shear Vane, Consols, Compaction, MCV/MCC, Recompacted CBR	To confirm strata strength characteristics and uniformity. To confirm distribution, classification and reusability in earthworks filling operations
	Embankment Foundations	Strata depths and properties and groundwater levels	All exploratory positions	Classification and Compaction testing	To confirm strata strength characteristics and uniformity
	Preliminary bridge foundation design	Strata depths and properties and groundwater levels	BH01 and BH02	PI, QUTxl, Consols	To confirm bearing capacity and settlement characteristics and uniformity of strata
	Hard standing and highways	Strata depths and properties	All exploratory positions	DCP's Classification,	To confirm distribution,

	Area	Issue	Exploratory Holes	Testing	Comments
	and earthworks	and groundwater levels		Compaction testing and recompacted CBR.	classification, uniformity in plan and depth
	Flood Attenuation Ponds	Soil Infiltration	TP22, TP23 and TP26	Soakaways	To obtain infiltration characteristics and effectiveness of soakaways or need for lining of ponds

5 GROUND CONDITIONS IDENTIFIED

The results of the intrusive investigation and subsequent laboratory analysis undertaken are detailed below. The descriptions of the strata encountered, notes regarding visual or olfactory evidence of contamination, list of samples taken, field observations of soil and groundwater, in-situ testing and details of monitoring well installations are included on the exploratory hole records presented separately in the Factual Ground Investigation Report (313583-01 (00)).

5.1 Ground conditions

The exploratory holes revealed that the site is underlain by variable but nominal thicknesses of agricultural topsoil over drift deposits predominately identified to be the Oadby member (glacial till) however locally Glaciofluvial deposits were also encountered (within the central area of the proposed route).

Underlying these superficial deposits, the predominant geological member in the north of the route is the Blisworth Limestone Formation; however, as the route extends southwards, the Rutland Formation was encountered. This appears to confirm the stratigraphical succession described within the conceptual site model.

For the purpose of discussion, the ground conditions are summarised in Table 3 and the strata discussed in subsequent subsections.

Table 3: Geology encountered at the site

Strata	Exploratory holes encountered	Depth to Top of stratum m bgl	Depth to Bottom of stratum m bgl
Agricultural Topsoil	All exploratory positions except BH01, BH02, TP3, TP4, WS11 and WS12	GL	Ranged from 0.20m to 0.40m
Possible Made Ground	BH01, BH02, WS11, WS12, TP03, TP04, TP22 and TP23	GL	Ranged from 2.30m – 5.30m *base not proven within TP22, TP23, and WS12
Made Ground	TP16A and WS05	GL	0.40m to 0.50m
Oadby Member (Glacial Till)	All exploratory positions except WS3, TP3, TP12, TP15,TP16, TP17, TP22, TP23	0.20	Ranged from 0.5m to 9.00m *base not proven within WS01, WS02, WS03, WS10, WS11, WS12
Glaciofluvial Deposits (locally absent)	WS03 and TP12	0.30	1.20m to 3.30m

Strata	Exploratory holes encountered	Depth to Top of stratum m bgl	Depth to Bottom of stratum m bgl
Blisworth Limestone Formation	BH01 to BH05, TP02, TP13, TP14, TP15, TP16, TP17 and TP18	0.30m to 9.00m	Ranged from 6.50m to 18.65m *base not proven within any trial pits
Note: Thickness' are proven thickness in exploratory holes and not full thickness of strata. Strata are likely to be thicker.			

5.1.1 Agricultural topsoil

The topsoil (ploughed surface materials) across the site was typically uniform, comprising dark brown or orange brown sandy, gravelly occasionally silty CLAY. The gravel content was variable, but comprised variations of angular to sub-rounded fine to coarse flint, quartzite and chalk with frequent roots and rootlets. The Agricultural Topsoil ranged in thickness between 0.20m to 0.40m thick across most of the site.

The recorded laboratory test results are detailed within the Factual Ground Investigation Report presented separately.

11 soil samples of these deposits were sent for contamination screening testing.

No obvious visual or olfactory evidence of contamination was identified within any of these deposits encountered during the ground investigation.

5.1.2 Possible made ground

Possible made ground was encountered only within the exploratory holes near the Roade Cutting (BH01, BH02, TP22, TP23, WS11 and WS12). This was typically uniform, comprising brown mottled orange, sometimes multicoloured slightly sandy, slightly gravelly clay with occasional to frequent cobbles and boulders of limestone. The gravel content was variable but comprised variations of angular to sub-rounded, fine to coarse, flint, quartzite, chalk and limestone. These deposits were very hard to distinguish from the underlying natural Glacial Till as no foreign bodies were identified, however consideration of the strata colouration variation, consistency and strengths and visual review of the topography leads us to postulate that the Glacial deposits in the upper half of the deep cutting had been removed during the cutting construction and placed as haunches at the top of the cutting slopes where the cutting slope gradients are reduced in angle for stability and where the ground appears to rise from the surrounding ground levels fairly noticeably.

Two soil samples of these deposits were sent for contamination screening testing.

No obvious visual or olfactory evidence of contamination was identified within any of these deposits encountered during the ground investigation.

5.1.3 Made Ground

Definitive made ground was encountered within WS05 and TP16A which was located in the vicinity of the disused railway track in the southern most field of the proposed road.

This comprised of limestone cobbles and boulders which were typically used for railway ballast. This was proven to be 0.40m thick. No other Made Ground was encountered and these were found to directly overlie natural strata.

Two soil samples of these deposits were sent for contamination screening testing.

No obvious visual or olfactory evidence of contamination was identified within any of these deposits encountered during the ground investigation.

5.1.4 Oadby Member (Glacial Till)

The Oadby Member was typically encountered beneath the topsoil across the entirety of the site. On occasion, this stratum was located at depth beneath (possible made ground deposits within BH01 and BH02 close to the railway cutting crest.

The soils encountered typically comprised soft to firm orange brown slightly gravelly sandy CLAY; with a gravel content consisting of angular to sub-rounded fine to coarse flint, quartzite, chalk fragments. With depth this stratum becomes firm to stiff dark brown or bluish grey, occasionally mottled orange, slightly silty CLAY.

Exploratory holes indicate that these stratums can vary in thickness between 0.40m to 5.10m with the majority of holes where full thickness was defined suggesting an approximate thickness of 1 to 3m. However, the base of the stratum was typically not proven within the shallower trial pits and window sampler boreholes.

Three soil samples of these deposits were sent for contamination screening testing.

These deposits were recorded to be generally stable during excavation as trial pits did not collapse when left open to undertake soakaway testing.

A summary of the in-situ and laboratory test results in this stratum is presented in Table 4 below and are included within the Appendix E and P.

The recorded in-situ test results and laboratory test results are detailed within the Factual Ground Investigation Report presented separately.

Table 4: Summary of insitu and exsitu soil testing for glacial till

Soil parameters	Range	No Tests
Moisture content (%)	14 - 27	4
Liquid limit (%)	42 - 65	3
Plasticity limit (%)	16 – 30	
Plasticity index (%)	26 - 35	
Plasticity term	Intermediate to high	n/a
Shrinkage Potential	Medium	
Clay (%)	24 - 35	3
Silt (%)	25 - 38	
Sand (%)	23 - 34	
Gravel (%)	4 - 17	
Earthworks Class	Class 2	
Maximum Dry Density – 4.5kg Rammer (Mg/m^3)	1.80	1

Soil parameters	Range	No Tests
Optimum Moisture Content - 4.5kg Rammer (%)	17	
Natural Moisture Contents of samples tested (%)	13	
SPT 'N' values	6 – 50	23
Undrained shear strength inferred from SPT 'N' values (kN/m^2)	25 - 210	
Stiffness term	Soft to very stiff	
Undrained shear strength measured by onsite hand vane testing (kN/m^2)	38 – 126	21
Stiffness term	Soft to stiff	

Given the topography, individual borehole plan positions and inherent heterogeneity of the strata in terms of its thickness and material structure there is considerable variation with depth and level. However, as expected in most instances the data indicates a progressive increase in SPT and corresponding strength of the strata with depth with most materials initially being soft to firm closer to surface becoming stiff with depth.

5.1.5 Glaciofluvial deposits

The Glaciofluvial deposits were encountered within two exploratory holes (TP12 and WS03) approximately half way along the proposed route. The thickness of the stratum was proven to range from 1.00m to 3.00m.

The soils encountered comprised orange slightly silty slightly clayey slightly gravelly sand or orangish brown sandy gravel, with gravel fraction typically fine to coarse quartzite, flint, chalk and rare limestone.

A summary of the in-situ and laboratory test results in this stratum is presented in Table 5 below and are included within the Appendix E and O.

Table 5: Summary of insitu and exsitu soil testing for Glaciofluvial deposits

Soil parameters	Range	No Tests
Moisture content (%)	10 - 16	2
Clay (%)	10 - 14	2
Silt (%)	12 - 15	
Sand (%)	56 – 67	
Gravel (%)	8 - 18	
Earthworks Class	2	
Maximum Dry Density – 4.5kg Rammer (Mg/m^3)	1.82	1
Optimum Moisture Content - 4.5kg Rammer (%)	13	
Natural Moisture Contents of samples tested (%)	16	

5.1.6 Blisworth limestone formation

The Blisworth limestone formation stratum was encountered in two forms a weathered form and a solid form.

5.1.6.1 Weathered Blisworth limestone formation

The Blisworth limestone formation was regularly encountered in its weathered form. This was typically observed below the Oadby Member and above the solid deposits. However, this was occasionally observed directly below the topsoil.

The deposits encountered typically comprised a firm to stiff grey slightly gravelly clay with fine to coarse sub-angular to sub-rounded limestone gravels.

Table 6: Summary of insitu and exsitu soil testing for weathered Blisworth Limestone Formation

Soil parameters	Range	No tests
Moisture content (%)	17	1
Liquid limit (%)	33	
Plasticity limit (%)	18	
Plasticity index (%)	25	
Plasticity term	Low	
Volume change potential	Medium	
SPT 'N' values (depth plots presented separately)	14 – 50	17
Undrained shear strength inferred from SPT 'N' values (kN/m^2)	58 - 210	
Stiffness term	Firm to very stiff	
Undrained shear strength measured by onsite hand vane testing (kN/m^2)	42 – 110	9
Stiffness term	Firm to stiff	

One soil sample of these deposits was sent for contamination screening testing.

5.1.6.2 Solid Blisworth limestone formation

Solid geology associated with the Blisworth limestone formation was encountered directly beneath the weathered zones within BH02, BH03, BH04, BH05, TP14 and TP15. This stratum was encountered directly beneath the Oadby Member within TP01, TP02, TP05, TP13 and TP18. The thickness of the solid deposit was proven within all rotary boreholes (BH01 to BH05) and was thickest within the northern part of the proposed highway alignment. The thickness typically ranged from 8.55m (BH02) to 2.50m (BH05).

The bedrock geology associated with the Blisworth limestone formation was encountered as a medium strong to extremely strong grey (sometimes yellow orange brown) limestone.

A summary of the in-situ and laboratory tests in the Blisworth limestone formation is presented in Table 7 below and are included within Appendix E and Appendix P.

The recorded in-situ test results and laboratory test results are detailed within the Factual Ground Investigation Report presented separately.

Table 7: Summary of insitu and exsitu soil testing for Blisworth Limestone Formation

Soil parameters	Range	No tests
Moisture content (%)	2.00 – 27	9
SPT 'N' values (depth plots presented separately)	>50	24
Bulk Density (Mg/m^3)	2.48 – 2.49	2
Dry Density (Mg/m^3)	2.37 – 2.37	2
Moisture Content (%)	4.7 - 5	2
Unconfined Compressive Strength (MPa)	6 – 27	2
Point Load (I_{50}) (MN/m^2)	0.17 – 3.82	5
Equivalent estimated UCS of Point Load (MPa) *(using factor of 20)*	3.4 – 76.4	5
Natural Moisture Content at test	2 – 9.5	5

As expected in most instances the strata graduates from residual weathered soils to rock. Initially the weathered strata are noted to be more granular and fractured tending to more intact sections with depth.

No obvious visual or olfactory evidence of contamination was identified within any of these deposits encountered during the ground investigation.

5.1.7 Rutland formation

The Rutland formation was encountered in two forms a weathered form and a solid form. This formation was more typically encountered more towards the southern part of the proposed road development.

5.1.7.1 Weathered Rutland Formation

The Rutland formation was often encountered in its weathered state directly below the Oadby member in the southern areas of the site and are indicated to be present from a minimum top depth of between 0.70m to 2.00m (WS04, WS05, WS06, WS07, WS08 and WS09). However, typically, the depth to the top of the weathered Rutland formation is approximately 1.30 – 1.60m bgl.

The deposits encountered typically comprised a firm to stiff green grey silty clay or green grey slightly sandy gravelly silt, or an extremely weak yellow laminated siltstone. A summary of the in-situ in the weathered Rutland Formation is presented in Table 8 below and are included within Appendix E.

Table 8: Summary of insitu soil testing for weathered Rutland Formation

Soil parameters	Range	No tests
SPT 'N' values	8 – 50	23
Stiffness term	Soft to very stiff	

One soil sample of these deposits was sent for contamination screening testing.

5.1.7.2 *Solid Rutland formation*

Solid geology associated with the Rutland formation was encountered directly beneath the Blisworth limestone formation within trial pits 16 and 17, however it's thickness was not proven within these exploratory holes. The formation was also encountered below the solid Blisworth limestone formation within all rotary boreholes (BH01 – BH05).

The solid geology associated with the Rutland formation was encountered as medium strong to strong grey brown silty mudstone or an extremely strong grey limestone.

A summary of the in-situ and laboratory test results in the Rutland Formation is presented in Table 9 below and are included within the Appendix P.

The recorded in-situ test results and laboratory test results are detailed within the Factual Ground Investigation Report presented separately.

Table 9: Summary of in-situ and laboratory test results for Solid Rutland Formation

Soil parameters	Range	No tests
Moisture content (%)	8.3	1
SPT 'N' values (depth plots presented separately)	42 – 50	19
Point Load (I_{50}) (MN/m^2)	0.09* – 3.63^ * mudstone ^ Limestone	4
Equivalent estimated UCS of Point Load (MPa) *(using factor of 20)*	1.8 – 72.6	
Natural Moisture Content at test	1.7 - 13	

As expected in most instances this indicates a progressive increase in SPT and corresponding strength of the strata with depth as the strata graduates from weathered to rock.

5.1.8 Results of soakage testing

Three soakaway tests were attempted close to locations where it is thought that storm water attenuation ponds or drainage swales might be located to check to see if any infiltration may occur and to confirm whether the ground conditions are suitable for the adoption of soakaway sustainable urban drainage systems.

The results of the soakage testing are summarised in the table below.

Table 10: summary of soakage testing

Trial pit	Geological unit	Test result (m/s)
TP22	Oadby Member (cohesive)	Insufficient drop in water level. Unable to calculate infiltration rate by extrapolation due to lack of soakage.
TP23	Oadby Member (cohesive)	*2.13×10^{-6}
TP26	Oadby Member (cohesive)	Insufficient drop in water level. Unable to calculate infiltration rate by extrapolation due to lack of soakage.
Notes: * The infiltration rate was extrapolated to obtain the infiltration rate. Test was not completed sufficiently as insufficient soakage achieved.		

5.2 Groundwater

Groundwater was encountered during the investigation as detailed in the table below.

Table 11: summary of groundwater strike and rise during ground investigation

BH/TP	Stratum	Strike (m bgl)	Level (mAOD)	Rise (m)	Level (mAOD)
BH02	PRF	25.20	96.25	1.60	97.85
BH03	BLF	8.00	111.60	0.30	111.90
BH05	RF	9.00	92.76	1.00	93.76
WS06	WRF	3.50	93.65	-	-
Notes: **GT = Glacial Till, WRF = Weathered Rutland Formation, PRF = Possible Rutland Formation, RF = Rutland Formation and BWL = Blisworth Limestone Formation**					

Where not listed, exploratory holes did not encounter groundwater strikes during drilling. It should be noted that the speed of drilling and casing of holes can often mask minor seepages and water strikes. The addition of air mist flush during rotary coring to advance the hole may obscure minor water strikes, however major water strikes would be evident.

It should be noted that groundwater levels might fluctuate for a number of reasons including in the short term the prevailing weather conditions immediately before and during investigation and monitoring works and longer term seasonal variations should be expected.

The results of the subsequent groundwater monitoring and well surveying exercise are summarised in Table 12.

Table 12: Summary of groundwater monitoring

Monitoring well	Response Zone (m bgl)	Strata	Ground Level elevation (m AOD)	Monitored Groundwater Depth Range (mb GL)	Monitored Groundwater Elevation (m AOD)
BH01	10.00 – 20.00	BWL	119.70	16.53 to 17.45	103.17 to 102.25
BH02	20.00 – 30.00	PRF	121.45	20.12 to 20.21	101.24 to 101.33
BH03	8.00 – 15.00	BWL/RF	119.60	12.33 to 12.56	107.27 to 107.04
BH04	7.00 – 11.00	RF	115.71	10.12 to 9.40	105.59 to 106.31
BH05	8.00 – 12.00	RF	101.76	6.85 to 7.10	94.91 to 94.66
WS01	1.00 – 2.50	GT	120.71	Dry	-
WS02	3.00 – 5.00	GT	119.35	1.18 to 3.05	118.17 to 116.30
WS03	1.00 – 3.00	GT	115.32	3.00 (Damp Base)*	112.32
WS04	1.00 – 2.00	GT/WRF	104.35	dry to 1.87	102.45 to 102.48
WS05	2.00 – 4.00	WRF	102.94	3.95 to dry	98.99 to 98.95
WS06	2.00 – 4.00	WRF	97.15	2.36 to 2.62	94.75 to 94.53
WS07	1.00 – 2.50	WRF	102.01	1.91 to 2.07	100.10 to 99.94
WS08	1.00 – 3.00	WRF	101.76	2.65 to 2.70	99.11 to 99.06
WS09	1.00 – 3.00	GT/WRF	113.77	dry to 3.08	110.69 to 110.68
WS10	2.00 – 4.00	GT	117.97	2.75 to 3.23	115.22 to 114.74
WS11	3.00 – 4.53	GT	121.33	Dry	116.80
WS12	3.00 – 5.00	GT	119.74	3.58 to 4.80	116.16 to 114.94

* Was noted to be dry three out of four visits

Notes: **GT = Glacial Till, WRF = Weathered Rutland Formation, PRF = Possible Rutland Formation, RF = Rutland Formation and BWL = Blisworth Limestone Formation**

The findings appear to confirm the site has localised perched water within discrete pockets of granular material within the Oadby Member and weathered zones of the Rutland Formation. Additionally, localised seepages from the cohesive Oadby Member may have also accumulated within the base of standpipes instrumented within these cohesive deposits. The variable nature of the granular and cohesive strata present throughout the Oadby Member deposits results in pockets of water bearing granular strata and pore water release, which are not thought to be linked or consistent across the site.

Deeper installed instruments placed within rotary boreholes within the Blisworth limestone and Rutland Formation (BH01 and BH02, near the Roade railway cutting) suggest a continuous and deeper water table is present within these strata at depths of approximately 101.24mAOD to 103.17mAOD. Deeper instruments within BH03, BH04 and BH05, (installed within the Rutland Formation) towards the central and southern half of the development suggest that the deeper water table is in hydraulic connectivity with these.

It should also be appreciated that some of the instrumentation installed cover large response zones including some more permeable strata trapped between less permeable strata. If the more permeable strata yield water these standpipes fill up to the draining layer trapped in the less permeable mudstone surrounding them below and therefore maintain what appears to be a water table, which may not reflect reality and possibly only represent perched water confined by cohesive strata above and below.

Following purging of three well volumes, six water samples were obtained from monitoring instrumentation for contamination screening testing. No obvious visual or olfactory contamination was identified when taking these samples.

5.3 Ground gas regime

The results of the ground gas monitoring and testing carried out are given in Appendix F. The maximum results are recorded in Table 13.

Table 13: Summary of gas monitoring results

Borehole	Response zone (m)	Probable source(s) of ground gas	Number of monitoring visits	Methane (%) (max)	Carbon dioxide (%) (max)	Oxygen (%) (min)	Flow rate (l/hr) (max)	Monitored Water level (m bgl)
BH01	10.00 - 20.00	None identified	4	0.0	0.2	20.8	0.1	16.53 to 17.45
BH02	20.00 – 30.00	None identified	4	0.0	0.4	16.8	0.1	20.21 to 20.12
BH03	8.00 – 15.00	None identified	4	0.0	0.6	19	0.1	12.33 to 12.56
BH04	7.00 – 11.00	None identified	4	0.0	0.9	20.0	0.1	10.12 to 9.40
BH05	8.00 – 12.00	None identified	4	0.0	0.5	19.1	0.2	6.85 to 7.10
WS01	1.00 – 2.50	None identified	4	0.0	1.7	2.8	0.2	Dry
WS02	3.00 – 5.00	None identified	4	0.0	2.2	15.8	0.3	1.18 to 3.05
WS03	1.00 – 3.00	None identified	4	0.0	2.4	18.2	0	3.00
WS04	1.00 – 2.00	None identified	4	0.0	1.3	19.4	0.1	1.90 to 1.87

Borehole	Response zone (m)	Probable source(s) of ground gas	Number of monitoring visits	Methane (%) (max)	Carbon dioxide (%) (max)	Oxygen (%) (min)	Flow rate (l/hr) (max)	Monitored Water level (m bgl)
WS05	2.00 – 4.00	None identified	4	0.0	1.8	17.1	0	3.95 to 3.99
WS06	2.00 – 4.00	None identified	4	0.0	1.4	17.8	0.2	2.40 to 2.62
WS07	1.00 – 2.50	None identified	4	0.0	1.9	12.5	0.3	1.91 to 2.07
WS08	1.00 – 3.00	None identified	4	0.0	2.5	14.8	0.1	2.65 to 2.70
WS09	1.00 – 3.00	None identified	4	0.0	1.0	18.5	0.1	3.08 to 3.09
WS10	2.00 – 4.00	None identified	4	0.0	2.7	14.0	0.2	2.75 to 3.23
WS11	3.00 – 5.00	None identified	4	0.0	4.0	13.6	0.2	4.53
WS12	3.00 – 5.00	None identified	4	0.0	9.1	11.2	0	3.58 to 4.80

No obvious sources of gas were identified during the investigation and the results detailed above are believed to represent the natural soil gas conditions. Gas monitoring visits were undertaken during periods of rising, constant and falling pressures of between 1007 and 1018mbar.

5.4 Visual/olfactory evidence of soil and groundwater contamination

No visual or olfactory evidence of soil or groundwater contamination was encountered or identified during the investigations.

5.5 Ground model

In summary, the ground conditions underlying the proposed bypass route appear to comprise relatively thin agricultural topsoil which is underlain by variable thicknesses of cohesive low permeability Oadby Member (Glacial Till) which extends across the entirety of the proposed development. Minor localised pockets of Glaciofluvial deposits, are restricted to a localised area approximately half way along the highway alignment.

Possible made ground and definitive made ground have been identified in two areas of the proposed route. Firstly, possible made ground, which is assumed to be reworked natural glacial deposits from the existing railways cutting appears to have been placed upon the natural deposits of Glacial Till at the crest of the cutting in the vicinity of positions TP3, BH01, WS11, TP4, BH02 and WS12. Secondly, made ground was also identified within the disused railway line in the southern part of the site, in the vicinity of

TP16 and TP16A. This was identified as limestone cobbles and boulders which were used for railway ballast laid directly upon to natural strata.

Weathered zones of bedrock geology were typically encountered underlying the Oadby Member, however in several positions TP15, TP16 and TP17, the weathered Blisworth limestone formation was encountered directly beneath the topsoil.

Available information from the exploratory hole logs identifies that the BLF was encountered at greater depths (typically 4.00m to 4.50m within BH03, BH04 and BH05) in the southern region of the route. However, in the northern half of the route the BLF was encountered at depths slightly greater (typically 6.7m to 9.00m in BH01 and BH02, respectively).

This in turn is underlain by the Rutland Formation which was encountered at depths of 17.5m and 18.65m within BH01 and BH02, respectively. Within BH03, BH04, BH05, the Rutland Formation was encountered at shallower depths (13.3m, 10m and 6.50m), respectively.

The exploratory positions appear to confirm that the site has localised perched water in granular pockets within the glacial till and other shallower deposits. Available information within deeper boreholes suggests that there is a possible continuous water table at depth within the Blisworth Limestone Formation and Rutland Formation underlying the site.

However it is considered unlikely that the encountered groundwater beneath the site is linked to surface water receptors in the vicinity of the site. The only surface water receptor within the vicinity of the site is a drain that runs northwest to southeast through the middle section of the bypass. During the walkover of the site the drain was noted to be dry and as such is likely to only flow during periods of heavy rainfall and is not considered to be connected to groundwater beneath the site.

6 QUANTITATIVE RISK ASSESSMENT

In line with CLR11 (EA, 2004a), there are two stages of quantitative risk assessment, generic and detailed. The GQRA comprises the comparison of soil, groundwater, soil gas and ground gas results with generic assessment criteria (GAC) that are appropriate to the linkage being assessed. This comparison can be undertaken directly against the laboratory results or following statistical analysis depending upon the sampling procedure that was adopted.

6.1 Linkages for assessment

Section 5.5 outlines the refined conceptual model/ ground model which identified the linkages that required assessment after the findings of the site investigation had been considered. These linkages together with the method of assessment are presented in Table 14.

Table 14: Identified potentially relevant pollutant linkages

Potentially relevant pollutant linkage	Assessment method
1. Inhalation of vapour	Human health GAC outlined in Appendix J for soil and groundwater based on indoor inhalation exposure to vapour-phase volatile organic compounds (VOC).
2. Inhalation of fugitive dust	Direct comparison of laboratory results of soil samples compared to human health GAC in Appendix J for a proposed **commercial and industrial end use.**
3. Ingestion and absorption by direct contact; including hand to mouth contact and absorption through the skin	Direct comparison of laboratory results of soil samples compared to human health GAC in Appendix J for a proposed **commercial and industrial end use.**
4. Uptake of contaminants by vegetation potentially impacting plant growth	Comparison of soil data to GAC in Appendix K.
5. Migration by surface run-off; including in suspension or solution into nearby surface water receptors	Has been considered qualitatively using soil results. Consideration of soil results presented within Appendix H.
6. Migration into groundwater (principal aquifer); including leaching in the unsaturated zone and diffusion in the saturated zone.	Has been considered qualitatively using soil and groundwater results. Comparison of groundwater data to GAC in Table 1 of Appendix L.
7. Transportation via the land drains in to the sewerage	Has been considered qualitatively using soil results.

Potentially relevant pollutant linkage	Assessment method
system or to outlets into the environment (drainage ditches and streams).	Consideration of soil results presented within Appendix H.

As no structures are to be developed on the site risks from ground gases are not considered to exist but may pose a potential risk to construction workers during development.

6.2 Methodology and results

The methodology and results of the GQRA are presented for each relevant pollutant linkage in turn.

6.2.1 Inhalation of vapour

Contaminated made ground was not encountered during the site investigation and this was further proven in the chemical testing as all VOC results were noted to be below the laboratory's limit of detection. Additionally, no visual or olfactory evidence of impacted soil was observed during the site investigation and photo ionisation detection results all returned 0.00 parts per million (ppm) as such this pathway will not be considered further.

6.2.2 Inhalation of fugitive dust

Chemical testing of soil samples obtained from the site were below the relevant generic assessment criteria and therefore, it is considered any dust generated from the site would not be detrimental to human health and as such, this pathway will not be considered further.

6.2.3 Ingestion and absorption by direct contact; including hand to mouth contact and absorption through the skin

End users are defined as those who are exposed to sources of contamination on a regular and predictable basis. In the case of developments for commercial end use, the critical receptor is defined within SR3 as a 16 to 65 year old female.

The chemical test results have been compared directly to the appropriate GAC for each contamination, based on a Soil Organic Matter (SOM) of 1%. The direct comparison table, which presents the chemical laboratory data set compared against the relevant GAC, is included within Appendix J.

All samples are below the GAC and the results of the assessment indicate the strata as encountered are suitable for use.

Based on the above assessment, no potentially significant risks associated with the soil contamination have been identified and it is considered that the site may be regarded as suitable for the proposed end use. It should however be noted that investigations should be undertaken in the areas that were inaccessible, however given the history of the site defined within the desk based studies it is not considered likely that any significant contamination sources or contaminants would be encountered within these areas, indeed it is understood that part of the area is noted to be occupied by an unusually undisturbed habitat (see separate ecological assessments for more information).

6.2.4 Uptake of contaminants by vegetation potentially impacting plant growth

The results have been compared with the GAC presented in Appendix K for this linkage. The results indicate that a relevant pollutant linkage is unlikely to exist associated with phytotoxic effects. No exceedances were recorded and therefore it is considered that this pollutant linkage does not exist, therefore this will not be considered further.

6.2.5 Migration by surface run-off

The potential for leaching has been considered qualitatively using soil results. No relevant sources of contamination were identified at the site that would be considered as creating a risk via surface runoff.

Analysis of TPHCWG, PAHS, pesticides and herbicides were typically at the Limit of Detection (LOD) within the soil samples tested with occasional minor detections of PAHs (maximum total PAH of 2.07mg/kg).

Analysis of metals indicated that the metals concentrations detected in soils were typically less than expected background concentrations within the area as shown in Table 15.

Table 15: Comparison of soil concentrations against background concentrations

Analyte	Maximum Soil Concentration detected (mg/kg)	Background soil concentration (mg/kg)	Source
Arsenic	11	15-25	Envirocheck
Cadmium	1.3	<1.8	Envirocheck
Chromium	39	60-90	Envirocheck
Lead	96	<100	Envirocheck
Nickel	33	30-45	Envirocheck
Copper	33	21-35	BGS website – background map
Selenium	<1	0.29	UK soil observatory

It is therefore considered that the sample results do not indicate that a risk to drains via surface runoff exists.

6.2.6 Migration into groundwater (Principal Aquifer)

No relevant sources of contamination were identified at the site. Soil concentrations at the site are generally typical of those recorded in natural strata and topsoil are at concentrations less than expected background concentrations as indicated in the previous section. The results of the comparison of the groundwater results to the UK Drinking water standards indicate there are several exceedances of the standards as noted in the table below.

Table 16: Summary of groundwater contaminant exceedances

Analyte	U.K./EC DWS	No. samples screened	No. exceedances of EQS	Location of highest concentration (value)
Sulphate	250 (mg/l)	6	4	WS10 (1520mg/l)
Boron	1000 (µg/l)	6	2	BH01 (2220µg/l)
Nickel	20 (µg/l)	6	2	WS02 (29 µg/l)
Selenium	24 (µg/l)	6	1	WS02 (24 µg/l)

The Blisworth Limestone Formation is a member of the Blue Lias Group which is known to be a pyritic strata with naturally occurring sulphates which are known to precipitate out within these deposits. In addition when pyrite is oxidised this leads to the formation of sulphuric acid, which reduces the pH of groundwater, as observed within the laboratory data presented in Appendix L. Therefore the presence of naturally occurring pyrite and sulphates would explain the slightly elevated levels of sulphate in groundwater.

The mobility of heavy metals typically increases with a reduction of PH so it is possible that the slightly elevated metals present within some of the groundwater samples is a result of reduced pH concentrations leaching metals from naturally occurring soils.

Slightly elevated concentrations of boron were only noted within BH01 and BH02 which are located on both sides of the Roade railway cutting. It is plausible that the elevated concentrations within the groundwater at this location may be associated with the railway line, where track levels are some 15m below surrounding ground levels at the highway over bridge crossing point and only some 1-3m above the monitored groundwater levels in the two deep holes located either side of the cutting from which these samples were taken. Boron based compounds are typically used as a non-toxic woodworm and dry root treatment and are likely to have been used on the railway for the treatment of railway sleepers.

The identified nickel and selenium exceedances are considered to be marginal and as such are unlikely to represent a risk to the aquifer given the low permeability of the superficial deposits present across the site. Table 15 has also indicated that the detected soil concentrations are typically lower than expected background concentrations.

Therefore it is considered that the site investigation has not indicated there to be significantly elevated concentrations present in groundwater beneath the site that has been caused by anthropogenic sources of contamination along the length of the road bypass. Risks to the Principal Aquifer are considered to be low.

6.2.7 Transportation via the land drains in to the sewerage system or to outlets into the environment (drainage and streams)

The potential for leaching has been considered qualitatively using the soil results presented in Appendix H.

As can be seen in section 6.2.5 and Table 15 the soil tests undertaken indicate that concentrations of contaminants are typically below expected background concentrations and are therefore are also considered unlikely to represent a risk via this potential pollutant linkage.

6.3 Summary of quantitative risk assessment

The site is currently predominately used for arable farm land with the exception of the area of the Roade railway cutting (not part of the site but straddled by a proposed bridge) and the former railway line towards the southern end of the proposed route.

Intrusive investigations carried out across the site have confirmed that the site is directly underlain by natural soils and no contaminated strata were identified during the field works.

Furthermore, comparison of laboratory testing results of soils obtained from the ground investigation indicate that pollutant linkages are unlikely to exist for risk to human health, phytotoxic effects, or the underlying aquifer. Exceedances of metals and sulphates were identified within groundwater, however, due to the generally minor nature of exceedance, general lack of onsite sources, they are not considered to pose a risk. Elevated boron concentrations detected in groundwater in BH01 and BH02 were considered to have potentially been caused by the railway line that runs between them.

7 ASSESSMENT OF POTENTIAL LAND CONTAMINATION

7.1 Potential sources of contamination

Likely ground contamination resulting from the current and former land uses has been determined from the desk study research and the relevant Department of the Environment Industry Profiles.

The Assessment of Potential Land Contamination based upon site walkover and available data collated is included within the Preliminary Sources Study Report for the site ref: 313418 – 02 (00) presented separately within the Contaminated Land Risk Register. This register has been updated to reflect the findings in these recent investigations and an updated version is included in Appendix R.

This report updates the initial assessment by taking account of:

- the Quantitative Risk Assessment of the chemical analysis of soil and groundwater samples taken from the recent supplementary ground investigations and assessment of gas monitoring results also undertaken as part of the recent supplementary ground investigations.

In summary, the ground investigation has not identified any significant areas of Made Ground or potential contamination confirming as expected that the vast majority of the site is undisturbed Greenfield land underlain by clean natural geological strata and as such negligible risk has been determined to exist to end users or controlled waters.

The information detailed above has been used to update the Contaminated Land Risk Assessment (Conceptual Site Model) Matrix included in Appendix R.

The main identified risks are discussed below in more detail however reference should be made to the risk matrix to understand all of the risks assessed

7.2 Preliminary contaminated land risk assessment

7.2.1 Risks to human health during construction

The human health assessment presented in Section 6.2.3 has not indicated there to be any risks to construction workers as no contamination has been identified, the strata present are for the most part natural and scheme will be built using clean site won materials or / and suitable clean imported material. Therefore the risk to human health during construction is considered to be negligible.

7.2.2 Risk to human health post construction

The human health assessment presented in Section 6.2.3 has not indicated there to be any risks to end users.

Given the nature of the proposed scheme is for a highway, human exposure to soils and groundwater will be extremely low with soils covered by hard standing minimising any potential contact pathways.

7.2.3 Risks to local ecology and landscape planting

The phytotoxicity assessment presented in Section 6.2.4 indicated that potential risks to plant growth are unlikely to exist. Given that the crops and flora are thriving upon the site and that no significant Made Ground or contamination has been observed that the scheme will be built using clean site won materials or / and suitable clean imported material the risk to the local ecology from contamination is considered to be Negligible.

7.2.4 Risks to surface water

No risks to surface water receptors were identified to the site in its current conditions as indicated in sections 6.2.5 and 6.2.7.

The greatest risks to surface waters are from potential uncontrolled release of silt, created during construction activities and subsequent effects on aquatic flora and fauna. This will be controlled by a suitable site specific construction environmental management plan and code of practice.

7.2.5 Risks to groundwater

No risks to groundwater are currently considered to exist at the site. Careful consideration will need to be given to suitability of imported materials if required. Also controls will be required during the construction programme to ensure that any potentially contaminative substances, particularly fuels, are contained sufficiently to prevent any uncontrolled release to the aquifer.

7.2.6 Risks due to ground gas

The anticipated geology is not indicative of widespread presence of strata likely to naturally degrade and produce harmful soil gases. The environmental database report has identified a landfill to the south east of the site. Monitoring of ground gas on the site has yielded no concentrations of methane gas, very low concentrations of carbon dioxide (normal conditions) and no to very low flow conditions and as such indicates that there are no on site sources of soil gas and that the landfill south west of the site is unlikely to pose a risk to the site or construction workers involved on the project. Indeed the presence of low permeability cohesive soils would inhibit movement of ground gas from any off site sources.

As the proposed scheme design for the site is a highway, the exposure to ground gases posing a risk to human health post-construction is considered to be negligible.

In regards to ground gases posing a risk to workers during the construction it is considered that there is a very low risk to personnel from asphyxiation where they have to enter below ground excavations or in ground inspection chambers, provided suitable atmosphere testing is carried out and confined spaces protocols are observed.

7.2.7 Risk to buried structures and services

The soils beneath the site are known to include naturally occurring sulphates and as such in ground concrete will need to be designed to accommodate the risks represented by contact with such sulphates.

As such careful consideration should be given to the design chemical and sulphate class of concrete used within the development particularly when in contact with the ground.

In addition consideration will need to be given to the potential for sulphate induced heave especially where the materials noted above are used within a cut and fill program where soils would be significantly disturbed allowing a greater oxidation potential.

This assessment of the potential for chemical attack on buried concrete is based on current BRE guidance. The desk study and site walkover indicate that, for the purposes of this assessment of the aggressive chemical environment, the site should be considered as a Greenfield that has not been subject to previous industrial development.

A suite of chemical analyses appropriate to this site classification was carried out on samples within BH01, BH02 and BH03, targeted at the location of the bridge.

The results of chemical tests carried out indicate 2:1 water soil extract sulphate contents of up to 652mg/l with pH values in the range of 6.63 to 9.04. In addition groundwater analysis indicates sulphate concentrations up to 1520mg/l.

Based on the characteristic values above for soil and groundwater, the initial Aggressive Chemical Environment for Concrete (ACEC) Classification is AC-3, with a Design Sulphate Class of DS-3. This assumes nominally mobile groundwater conditions.

Due to the potential for the pyrite bearing materials within the natural geology across the site, characteristic values of Total Potential Sulphate (TPS) and Oxidisable Sulphides (OS) have also been determined for the site.

The results of the laboratory testing indicate maximum values of 4.32% (TPS) and 3.91% (OS). As the oxidisable sulphides is greater than 0.30% within all the samples, with the exception of one within BH02 at 12.27m bgl, pyrite s probably present. On this basis the Aggressive Chemical Environment for Concrete Classification is AC-4 with a Design Sulphate Classification of DS4.

<u>It is recommended that further testing is undertaking at detailed design stage to confirm this over a broader selection of sample depths.</u>

8 GEOTECHNICAL SITE ASSESSMENT

8.1 Preliminary geohazard and geotechnical assessment

Using the available information and taking into account the ground model for the site, the Preliminary Geotechnical Risk Register presented within the Preliminary Resources Study Report (313418-02) has been revised and updated and is presented within Appendix Q and highlights several potential risks associated with the site. The main identified risks are discussed below in more detail however reference should be made to the risk matrix to understand all of the risks assessed.

8.1.1 Mining and natural cavities

The site is not within an area affected by coal mining or brine extraction. The geology is not conducive to the formation of large natural cavities. This has been confirmed by the ground investigation which has confirmed the ground model.

8.1.2 Man made voids or obstructions

No voids have been identified during the ground investigation.

8.1.3 Earthworks

Cut to fill earthworks are anticipated to be required to be undertaken to achieve the proposed redevelopment vertical and horizontal alignments.

In order to reduce the risk of excessive cost for offsite disposal and on site importation it is assumed that;

- site won materials will be utilised
- and that a cut to fill volume balance will be achieved.

The ground investigation has revealed that the site is underlain by the Oadby Member (Glacial Till) which is cohesive in nature and therefore moisture content sensitive. Many UK cohesive soils tend to be wet of the optimum for compaction and therefore there is considered to be a moderate risk that these soils may need soil modification or stabilisation to render them suitable for reuse within structural fill beneath buildings and hard standing. Further classification and earthworks investigations and trials are required to fully inform detailed design and specification, however the materials identified would be classed as a Class 2 cohesive general fill material.

When considering lime modification or stabilisation account must be taken of the risks of creating heave through the chemical reaction with naturally occurring sulphates within the clays soils present, therefore prior testing will be required to confirm if this risk is present so that it may be mitigated in the mix design.

8.1.4 Existing cut slopes

A deep railway cutting is located near the northern end of the proposed route and is considered to be stable, as no signs of instability were identified during the walkover or intrusive investigation. However, it should be noted that limited access was available when viewing the cutting from the public right of way footbridge.

8.1.5 Gradient on site

Cut and fill earthworks may be required to develop the site into a suitable highway vertical alignment, as such, slopes may be created as part of the design. No earthworks plan has been provided to RSK, as such, no detailed slope assessment has been made. Ground conditions identified to date do not suggest that the existing ground represents significant or unusual risks.

8.1.6 As-dug cut material suitability

The site is underlain by natural soils which are considered to be suitable for reuse. These are predominately cohesive in nature and are these sensitive to moisture content change. Further earthwork investigation is required to appropriately classify materials to be reused for the proposed scheme.

8.1.7 Embankment stability

Preliminary road layouts have been provided and it is considered that minor cut and fill works are required to complete the proposed road. No detailed design of proposed embankments has been provided to RSK and as such, no detailed stability assessment can be made.

If embankments are to be constructed it is assumed that clean site won materials will be suitable for reuse within the embankment construction to avoid excessive costs for importation of materials to form the embankment. The design of the embankment will need to take account of the classification of the materials being utilised for its construction as well as the founding stratum. Options for increasing side slopes and reducing footprint and volume may be explored and these may include reinforced embankments (geogrids) or soil stabilisation (lime and cement) or even retaining walls if required.

The risk of failure of embankments is increased where fine grained soils are used to construct them particularly if insufficient compaction and drainage is designed and the works proceed too quickly. Therefore it is recommended that staged construction is undertaken and that granular basal layers is installed and linked to the wider drainage network to avoid the build-up of pore water pressures in fine soils as works progress. This will aid and speed up consolidation and increase stability. Alternatively or additionally the use of soil stabilisation or reinforced earth might be considered.

Embankment slopes must be designed appropriately with regard to the stability of the soils being used to construct the embankment and take account of the strength of the underlying foundation soils. However it is understood that they will have been designed with a conservative slope angle of no steeper than 1:3 which is normally acceptable in the long term for formation of embankments using most British soils upon reasonable founding stratum.

Drainage will need to be carefully designed to cope with surface water and to avoid runneling and softening of the slope faces and softening in the foundation soils, in particular at the toe of the slopes.

8.1.8 Bridge foundations

At this stage given the depth of the cutting, its steep sides, the importance of the infrastructure and taking into account the strata identified to be present on each side it is recommended that a piled foundation solution is adopted. This should extend foundations down into the solid strata at depth and ensure that the bridge loads are taken down below the base of the cutting avoiding loading the cutting side slopes.

Preliminary recommendations for the design and construction of pile foundations in relation to the ground conditions identified beneath the site are set out in Table 17. The preliminary recommendations given below are based on the field results obtained on site today and will subject to confirmation in the final report.

Table 17: Preliminary advice for the design and construction of piled foundations

Design/construction considerations	Design/construction recommendations
Pile type	The construction of both driven and bored (CFA or rotary) piles is considered technically feasible at this site.
Possible constraints on choice of pile type	Given that the site is located adjacent to the railway lines/embankment, it is likely that vibration/noise associated with pile driving may not be acceptable particularly as the bridge will span a deep cutting. CFA borings may struggle to penetrate the limestone to sufficient depths to avoid loading the cutting face. There it is considered that rotary bored piles may be required to ensure sufficient depth into rock head if high loads are required to be supported.
Temporary casing	Given a likely presence of groundwater strikes within overlying made ground strata, bored piles will require temporary casing throughout this depth.
Limitations afforded by ground	For the purpose of assessing preliminary pile capacities the probable made ground has been presumed not to contribute to the load-carrying capacity for the piles. At this time, no negative skin friction has been considered due to presence of significant depths of probable made ground. It should be considered or included in the final design by others.
For the purpose of assessing preliminary pile capacities the	The presence of any buried sub-structures or other obstructions within made ground may lead to some difficulty during piling. Where buried obstructions are encountered, it will be necessary to either relocate the pile(s) or make allowance for removing the obstruction.
Hard strata	An allowance should be made for chiselling or slow boring within ‘rock’ bands within the clay formation and the thicker beds of Limestone and Mudstone.

Design/construction considerations	Design/construction recommendations	
Pile design parameters for Clay	Pile design parameter	CFA
	Undrained shear strength c_u (kN/m^2)	4.5*SPT N Values (for Clay) and triaxial results
	Adhesion factor α	0.50
	End bearing factor (N_c)	9
Pile design parameters assumed for Limestone and Mudstone	Shaft friction factor (ks.tan δ)	0.80
	Limiting end bearing (kN/m^2)	12500
General parameters	Limiting concrete stress (kN/m^2)	$7.5N/mm^2$
	Limiting shaft friction (kN/m^2)	110
	Global margin of safety	2 (with load testing) and 2.5 (without)
Special precautions relating to bored pile shafts and bases	Bored pile concrete should be cast as soon after completion of boring as possible and in any event the same day as boring. Prior to casting the base of the pile bore should be clean, otherwise a reduced safe working load will be required. Similarly, if the pile bore is left open the shaft walls may relax/soften, leading to a reduced safe working load.	

The design procedure for piles varies considerably, depending on the proposed type of pile. However, for illustrative purposes gives likely working pile loads for traditional bored, cast-in-situ concrete piles of various diameters and lengths, based on the design parameters given in Table 18. For this purpose, the soil profile in boreholes (BH01 & BH02) has been considered. It has been assumed that little or no positive skin friction will be obtained from ground level to about 5.0m depth due to possible thick made ground. The preliminary pile loads below are based on forming rock sockets a minimum 2 x up to 5 x pile diameter into the bedrock.

Table 18: Illustration of typical pile working loads for CFA piles

Depth of pile (m)	Diameter of pile (m)	End bearing Qb (kN)	Shaft Friction Fs (kN)	Ultimate Pile Capacity (kN)	Allowable Pile Capacity (kN) FoS = 2.0	Allowable Pile Capacity (kN) FoS = 2.5
11	0.30	884	362	1246	623	498
	0.35	1203	423	1625	813	650
	0.40	1571	483	2054	1027	822
	0.45	1988	544	2532	1266	1013
	0.50	2454	604	3058	1529	1223
	0.60	3534	725	4259	2130	1704
12	0.30	884	438	1321	661	529

Depth of pile (m)	Diameter of pile (m)	End bearing Qb (kN)	Shaft Friction Fs (kN)	Ultimate Pile Capacity (kN)	Allowable Pile Capacity (kN) FoS = 2.0	Allowable Pile Capacity (kN) FoS = 2.5
	0.35	1203	511	1713	857	685
	0.40	1571	584	2155	1077	862
	0.45	1988	657	2645	1322	1058
	0.50	2454	730	3184	1592	1274
	0.60	3534	876	4410	2205	1764
13	0.30	884	521	1404	702	562
	0.35	1203	608	1810	905	724
	0.40	1571	694	2265	1133	906
	0.45	1988	781	2769	1385	1108
	0.50	2454	868	3322	1661	1329
	0.60	3534	1041	4576	2288	1830
14	0.30	884	611	1495	747	598
	0.35	1203	713	1916	958	766
	0.40	1571	815	2386	1193	954
	0.45	1988	917	2905	1452	1162
	0.50	2454	1019	3473	1737	1389
	0.60	3534	1222	4757	2378	1903
15	0.30	884	709	1593	796	637
	0.35	1203	827	2030	1015	812
	0.40	1571	946	2516	1258	1007
	0.45	1988	1064	3052	1526	1221
	0.50	2454	1182	3636	1818	1455
	0.60	3534	1418	4953	2476	1981

It should be stressed that the above capacities do not take into consideration pile group effects which is more pronounced for a large number of closely spaced piles.

Notwithstanding the above, it is recommended that a specialist piling contractor should be contacted at an early stage for their advice on the most suitable pile type and capacity for the strata encountered at this site. In particular the piling specialist will need to confirm the ability of their equipment to form of rock sockets within the bedrock and depth of penetration practically achievable based on their previous experience in the local area.

8.1.9 Cutting stability

The preliminary highway alignment appears to suggest that little or only minor cut and fill works are required. No detailed geometry of proposed cuttings has been provided to

RSK and as such, no detailed stability assessment has been made. However it is understood that they will have been designed with a conservative slope angle of no steeper than 1:3 which is normally acceptable in the long term for most British soils.

8.1.10 Earthworks – Materials reuse

In this case it is expected that embankments will be constructed from site-won arisings from the cutting works.

It is anticipated that the majority of soils excavated from the site will be cohesive soil associated with the Glacial Till and would be considered to be a Class 2 material. It is expected that granular fractions of the Glaciofluvial Deposits potentially present within localised areas could be suitable for reuse within embankment fill as a Class 1 general fill if encountered in any significant quantity.

There is considered to be a low to moderate risk that the underlying mudstone and perhaps the overlying cohesive till (derived in part from the underlying strata) will include high sulphates. As such careful consideration should be given to the design and specification of earthworks given to the potential for sulphate induced heave especially where the materials noted above are used within a cut and fill program where soils would be significantly disturbed allowing a greater oxidation potential. Soil stabilisation techniques will also require careful consideration for the same reasons. Such materials would however be suitable for reuse within landscape features where the potential for heave does not present a risk.

According to the CL:AIRE guidance “The Definition of Waste: Development Industry Code of Practice” (version 2, March 2011), any material that may be otherwise considered by the Environment Agency as waste (such as made ground), if dealt with in accordance with the Code of Practice under a Materials Management Plan (MMP) will not be considered as waste if used for the purposes of land development. Any Clean and Naturally occurring material may be reused on the site of origin without the need to be included within an MMP.

8.1.11 Aggressive soil chemistry

The soils underlying the site were anticipated to include naturally elevated levels of sulphates (gypsum) and ground concrete mix will be designed to accommodate these risks. The assessment is presented with Section 7.6 has indicated a classification of DS4 and AC4.

In addition consideration will need to be given to the potential for sulphate induced heave especially where the materials noted above are used within a cut and fill program where soils would be significantly disturbed allowing a greater oxidation potential, this can be a particular problem where lime stabilisation is utilised to improve soil strengths.

8.1.12 Highway construction

As the site requires cut to fill earthworks to achieve the required development levels, it is anticipated that engineering earthworks design specification will be provided to cover these elements and is likely to include a performance specification for the formation levels beneath the highways in both cut and filled embankment areas.

Embankment earthworks designs will need to be checked for foundation bearing, settlement and slope stability to ensure that the embankments will not suffer detrimental settlement or failure once constructed. Similarly any new cuttings and existing cuttings (Roade Cutting) will also need to be assessed for long term stability.

In the 1m of current existing ground level the exploratory holes have revealed a soil profile comprising topsoil, over glacial till. The potentially poorest sub-grade material within this profile is the topsoil, however this is assumed to be stripped prior to construction.

In pavement design terms, the groundwater conditions are anticipated to comprise a low water table, i.e. at least 1m below the pavement formation level.

The estimated minimum, equilibrium soil-suction, California bearing ratio (CBR) value for the soils and groundwater conditions described above under a completed pavement is 3 %, based upon Table C1 in TRRL (1984) Report LR1132.

The results of in-situ DCP testing indicate that the near surface soils (assuming a cut of 450m) have a CBR value that ranges from between 3.5% to 30%, with most results falling in around 3.5-7% the results are summarised in Table 19.

Table 19: Summary of CBR values derived from in-situ DCP tests

Test location	Material type	Minimum CBR value determined at or just below anticipated formation level
TP01	2	6%
TP02	2	10%
TP03	2	7%
TP04	2	16%
TP04 (test 2)	2	20%
TP05	2	5%
TP07	2	5%
TP12	2	5%
TP13	2	3.5%
TP14	2	4%
TP15	2	30%
TP17	2	30%
TP20	2	9%
TP26	2	7%

The recommended sub-grade soil CBR value for road pavement design is therefore 3%. This value assumes that during construction the formation level will be carefully compacted and any soft spots removed and replaced with well-compacted granular fill.

It is normal practice to assume the sub-grade will be frost-susceptible as a minimum requirement for adoption and as such the thickness of sub-base must be sufficient to give a total thickness of non-frost-susceptible pavement construction over the soil of not less than 450 mm.

8.1.13 Groundwater levels

The Oadby Member is an unproductive strata, and monitoring events have shown that localised perched water is generally only present where discrete localised granular pockets are present within these deposits. However, these do not seem to be connected to form a shallow water table.

Monitoring events have indicated a deeper confined groundwater table is present within the Blisworth Limestone Formation/Rutland Formation with groundwater levels in range of between 101.30mAOD to 102.50mAOD within the area of Roade Cutting (BH01 and BH02, respectively). As the proposed highway alignment route progresses southwards, the groundwater table appears to rise with water levels ranging from between 108.8mAOD to 116.58mAOD.

Assuming that a high perched groundwater table is present, cutting slopes could require drainage systems to be designed and installed to intersect water bearing confined strata intersected by the cutting slopes and to filter it away longitudinally and horizontally to avoid softening and degradation of more susceptible softer strata beneath. Alternative face or cut off drains behind the cut face might also be considered as alternatives depending upon the detailed value engineering design goals.

The scheme design should also attempt to avoid cutting below major water tables to avoid dewatering and drainage problems. In this case it is unlikely that the main groundwater table will be breached.

8.1.14 Drainage

Soakaway tests within shallow strata (Oadby Member) displayed poor infiltration characteristics as such; alternative drainage solutions may be required.

9 REUSE OF MATERIALS

9.1 Reuse of suitable materials

It is understood that no soil wastes are anticipated to be generated from the site with a complete cut to fill balance being achieved in modelling.

As the site has not been previously developed all excavation works are expected to generate only clean and naturally occurring soils.

Under the Waste Framework Directive naturally occurring soils are not considered waste if re-used on the site of origin. Therefore it should not be necessary to either obtain a licence or prepare a Materials Management Plan in accordance with the CL; AIRE Code of Practice.

9.2 Waste for landfill disposal

Whilst it is not anticipated that any soils will be removed to landfill an initial assessment of waste classification has been undertaken using the soil contamination data. This is presented within Appendix S. The results suggest that the soils tested would be classified as Non Hazardous for disposal. Given that arisings are anticipated to be natural strata it is possible that they could be classified as inert waste, however full Waste Acceptance Criteria analysis would be required to confirm this.

9.3 Landfill tax

Waste producers disposing of material to landfill are required to pay landfill tax by HM Revenue and Customs.

The tax is chargeable by weight (tonnage) and two rates apply, either standard or lower rate. The lower rate only applies to those less polluting wastes as set out in the Landfill Tax (Qualifying Material) Order 2011, which include naturally occurring rock and soil, concrete, some minerals, some furnace slags and ash, and some low-activity organic compounds. Evidence confirming that the waste qualifies for the lower rate will be required, and standard rate tax will apply for the whole waste load for any loads of mixed waste.

Currently (since 1 April 2017), standard rate landfill tax is £86.10 per tonne.

The lower rate of landfill tax applicable to less polluting wastes (i.e. ‘inert’ wastes) remains at £2.70 per tonne.

Material disposed of at a soil treatment centre will not be subject to landfill tax.

10 CONCLUSIONS

The geology of the site comprises of predominately glacial till across the entirety of the site, with some Glaciofluvial deposits within the centre. This is underlain by the Blisworth limestone formation, which is all underlain by the Rutland Formation.

The site is primarily considered to be Greenfield and there is little evidence to suggest that there are any significant potential sources of contamination likely to be present that would detrimentally impact upon the proposed scheme design, end users, controlled water or neighbours within areas of the site that were investigated.

Minor exceedances of the groundwater GACs for some metals and sulphates were identified, however due to the general lack of on-site sources, low permeability nature of the near surface strata and potential for pyritic bearing strata within Blue Lias Formation (Blisworth Limestone), this is not considered to be a risk. Ground concrete must be designed accordingly.

No specific geo-hazards or risks were identified that would affect the proposed scheme design, construction and alignment.

All geotechnical risks are normal to a project of this type and would be anticipated to be resolved using normal civil engineering techniques.

Piled foundations are likely to be required to support the bridge across the deep railway cutting (Roade Cutting) to ensure loads are transferred down to strata beneath the slope face to avoid slope instability risks and to provide sufficient bearing for the bridge structure.

A cut and fill earthworks balance is anticipated to be achievable as all materials should be suitable for use as general fill for the construction of the highway. The 1:3 side slopes currently proposed for all cuttings and embankments are anticipated to be suitable, however, slope stability assessments will be required at detailed design stage as the design evolves to ensure that all slopes are stable.

Groundwater levels and soil gas concentrations do not appear to present any unacceptable risk to the proposed scheme.

The soils underlying the site were anticipated to include naturally elevated levels of sulphates (gypsum) and ground concrete mix will be designed to accommodate these risks. The assessment is presented with Section 7.6 has indicated a classification of DS4 and AC4

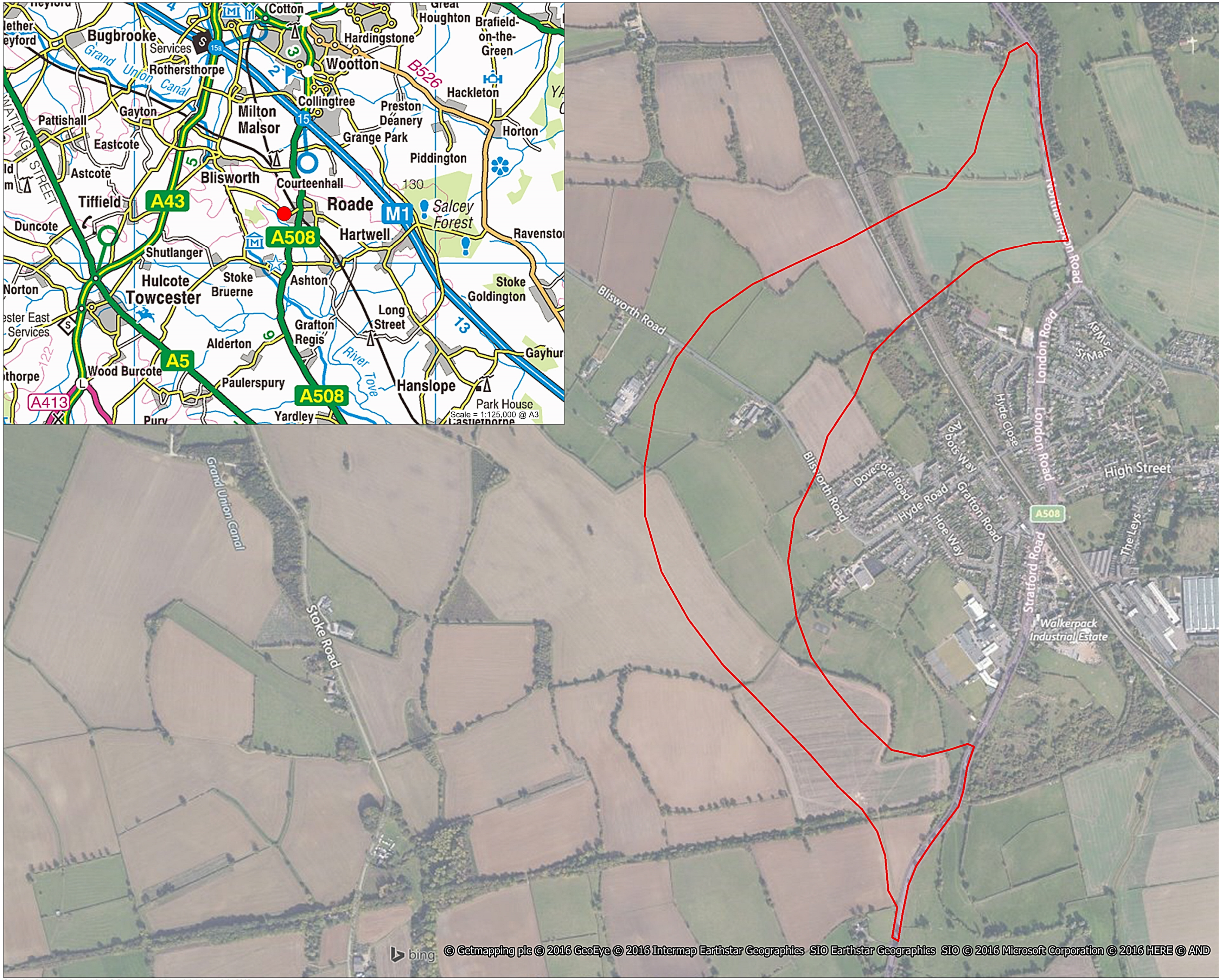
11 RECOMMENDATIONS

11.1 General recommendations

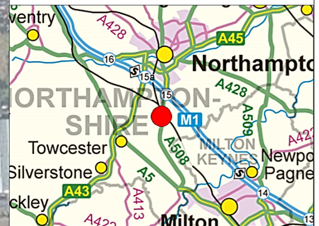
Some of the key recommendations are summarised below. Many of the technical or advice recommendations have not been included below. The whole of the report should be read to identify all recommendations and advice.

- It is recommended that the findings of the Contaminated Land Risk Assessment are confirmed and agreed with the regulatory authorities.
- It is recommended that at detailed design stage (Post DCO) a site wide Earthworks Specification is prepared which should include testing frequency requirements and performance criteria for the various elements of the scheme design and may well require on site compaction trials to be undertaken to inform the specification.
- At detailed design stage it is recommended that cutting slope stability assessments are carried out to refine the design.
- At detailed design stage it is recommended that embankment design geometries should be checked for slope stability and settlement. However it should be understood that the stability of an embankment will be a function of its geometry, the materials with which it is built, the degree of compaction applied, speed of construction and the foundation strata and underlying groundwater table on to which it is formed. This information will be required to feed into the earthworks specification.
- Drainage will need to be designed with care due to the poor drainage infiltration of the underlying shallow soils.
- In ground concrete should be designed to resist elevated sulphates with a minimum mix design of **DS-4 AC-4** to allow for the potential for naturally occurring sulphates within the underlying strata.

FIGURES



Site Location



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M1 Junction 15

Figure 1

Site Loction Plan

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Metres

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M1 Junction 15 West - Roade Bypass

RSK

Figure 2

As Built Exploratory Hole Location Plan

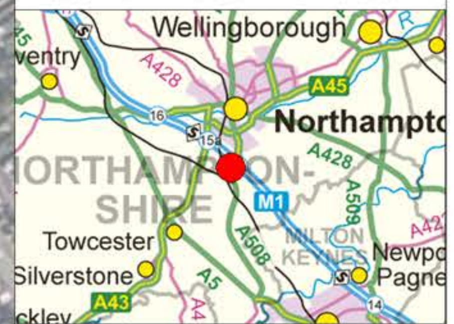
Map 1 of 3

REV 00

File Name : U:\Geo\313583 - Roade Bypass\GIS

- Site boundary (Feb 2017)
- Borehole (BH)
- Dynamic Cone Penetrometer (DCP)
- Trial Pit (TP) with Soakaway (S)
- Window Sample (WS)
- No access

Trial pits 6, 8, 9, 10, 11, 19, 21, 24 and 25 were not excavated as access permissions were not in place at the time of works



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M1 Junction 15 West - Roade Bypass

RSK

Figure 2

As Built Exploratory Hole Location Plan

Map 2 of 3

0 100
metres
Scale = 1:3,500 @ A3

REV 00

File Name : U:\Geo\313583 - Roade Bypass\GIS

Site boundary (Feb 2017)
Borehole (BH)
Dynamic Cone Penetrometer (DCP)
Trial Pit (TP) with Soakaway (S)
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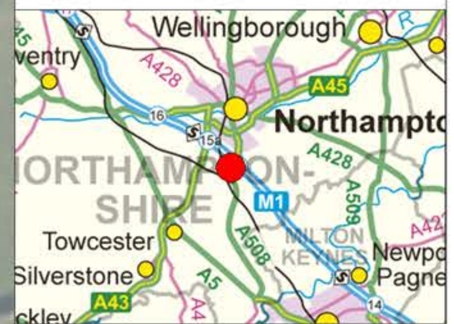

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M1 Junction 15 West - Roade Bypass

Figure 2

As Built Exploratory Hole Location Plan

Map 3 of 3

0 100
metres
Scale = 1:3,500 @ A3

N W E S

REV 00

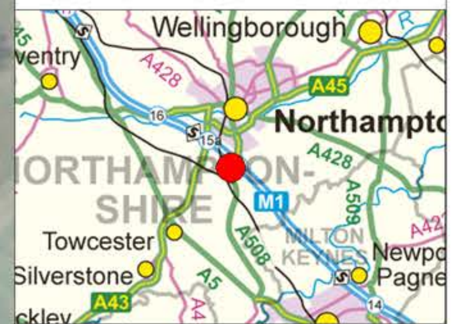
File Name : U:\Geo\313583 - Roade Bypass\GIS

Site boundary (Feb 2017)

Borehole (BH)

Trial Pit (TP) with Soakaway (S)

Window Sample (WS)



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M1 Junction 15 West - Roade Bypass

Figure 3

As Dug Exploratory Hole Location Plan

Map 1 of 3

0 100 metres

Scale = 1:3,500 @ A3

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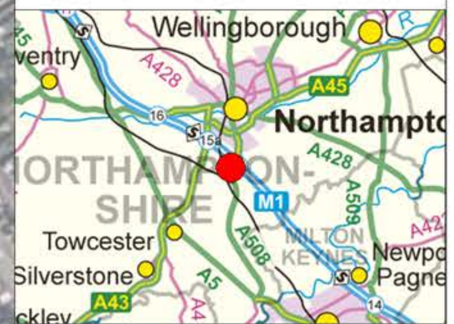
File Name : U:\Geo\313583 - Roade Bypass\GIS

Base mapping provided by client, Drawing; NGW-BWB-HGN-R-M3-D-101-S1-P1_Roade Bypass Main Alignment.dwg

Site boundary (Feb 2017)
Borehole (BH)
Trial Pit (TP) with Soakaway (S)
Window Sample (WS)



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M1 Junction 15 West - Roade Bypass

RSK

Figure 3

As Dug Exploratory Hole Location Plan

Map 2 of 3

0 100
metres
Scale = 1:3,500 @ A3

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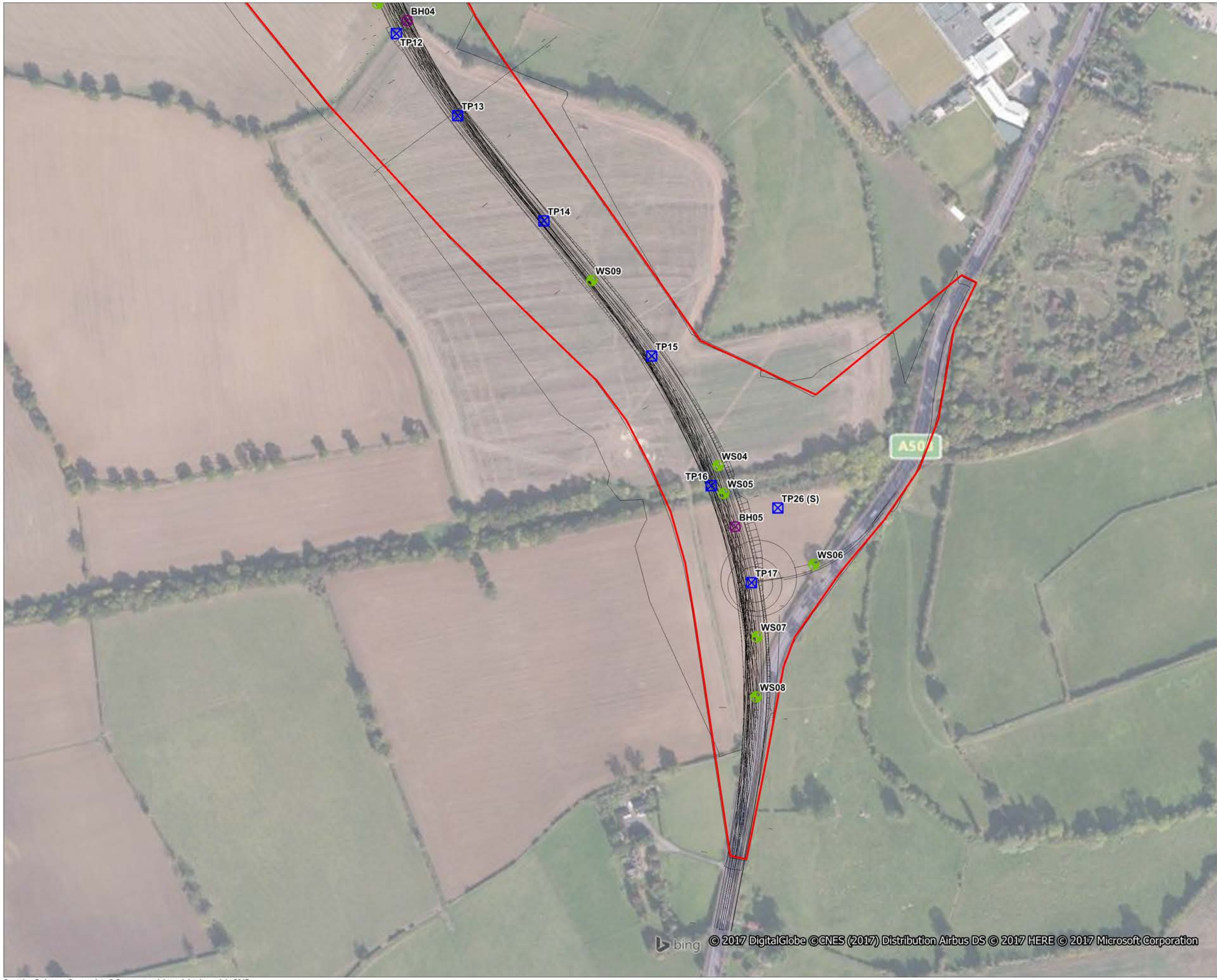
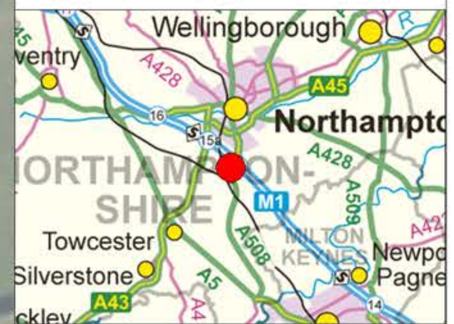
Base mapping provided by client, Drawing; NGW-BWB-HGN-R-M3-D-101-S1-P1_Roade Bypass Main Alignment.dwg



Site boundary (Feb 2017)
Borehole (BH)
Trial Pit (TP) with Soakaway (S)
Window Sample (WS)



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Rev	Date	Description	Drn	Chk	App

M1 Junction 15 West - Roade Bypass

RSK

Figure 3

As Dug Exploratory Hole Location Plan

Map 3 of 3

0 100
metres
Scale = 1:3,500 @ A3

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File Name : U:\Geo\313583 - Roade Bypass\GIS

Base mapping provided by client, Drawing; NGW-BWB-HGN-R-M3-D-101-S1-P1_Roade Bypass Main Alignment.dwg

APPENDIX A
SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Roxhill Developments Limited in accordance with the terms of a contract between RSK and the "client", dated 8th November 2016. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be** well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.
8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

APPENDIX B
SUMMARY OF LEGISLATION AND POLICY RELATING TO CONTAMINATED LAND

Part IIA of the Environmental Protection Act 1990 (EPA) and its associated Contaminated Land Regulations 2000 (SI 2000/227), which came into force in England on 1 April 2000, formed the basis for the current regulatory framework and the statutory regime for the identification and remediation of contaminated land. Part IIA of the EPA 1990 defines contaminated land as ‘any land which appears to the Local Authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that significant harm is being caused, or that there is significant possibility of significant harm being caused, or that pollution of controlled waters is being or is likely to be caused’. Controlled waters are considered to include all groundwater, inland waters and estuaries.

In August 2006, the Contaminated Land (England) Regulations 2006 (SI 2006/1380) were implemented, which extended the statutory regime to include Part IIA of the EPA as originally introduced on 1 April 2000, together with changes intended chiefly to address land that is contaminated by virtue of radioactivity. These have been replaced subsequently by the Contaminated Land (England) (Amendment) Regulations 2012, which now exclude land that is contaminated by virtue of radioactivity.

The intention of Part IIA of the EPA is to deal with contaminated land issues that are considered to cause significant harm on land that is not undergoing development (see Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance, April 2012). This document replaces Annex III of Defra Circular 01/2006, published in September 2006 (the remainder of this document is now obsolete).

Water Framework Directive (WFD)

The Water Framework Directive 2000/60/EC is designed to:

- enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands that depend on the aquatic ecosystems
- promote the sustainable use of water
- reduce pollution of water, especially by ‘priority’ and ‘priority hazardous’ substances
- ensure progressive reduction of groundwater pollution.

The WFD requires a management plan for each river basin be developed every six years.

Groundwater Directive (GWD)

The 1980 Groundwater Directive 80/68/EEC and the 2006 Groundwater Daughter Directive 2006/118/EC of the WFD are the main European legislation in place to protect groundwater. The 1980 Directive is due to be repealed in December 2013. The European legislation has been transposed into national legislation by regulations and directions to the Environment Agency.

Environmental Permitting Regulations (EPR)

The Environmental Permitting (England and Wales) Regulations 2010 provide a single regulatory framework that streamlines and integrates waste management licensing, pollution prevention and control, water discharge consenting, groundwater authorisations, and radioactive substances regulation. Schedule 22, paragraph 6 of EPR 2010 states: 'the regulator must, in exercising its relevant functions, take all necessary measures - (a) to prevent the input of any hazardous substance to groundwater; and (b) to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.'

Water Resources Act (WRA)

The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 updated the Water Resources Act 1991, which introduced the offence of causing or knowingly permitting pollution of controlled waters. The Act provides the Environment Agency with powers to implement remediation necessary to protect controlled waters and recover all reasonable costs of doing so.

Priority Substances Directive (PSD)

The Priority Substances Directive 2008/105/EC is a 'Daughter' Directive of the WFD, which sets out a priority list of substances posing a threat to or via the aquatic environment. The PSD establishes environmental quality standards for priority substances, which have been set at concentrations that are safe for the aquatic environment and for human health. In addition, there is a further aim of reducing (or eliminating) pollution of surface water (rivers, lakes, estuaries and coastal waters) by pollutants on the list. The WFD requires that countries establish a list of dangerous substances that are being discharged and EQS for them. In England and Wales, this list is provided in the River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010. In order to achieve the objectives of the WFD, classification schemes are used to describe where the water environment is of good quality and where it may require improvement.

Planning Policy

Contaminated land is often dealt with through planning because of land redevelopment. This approach was documented in Planning Policy Statement: Planning and Pollution Control PPS23, which states that it remains the responsibility of the landowner and developer to identify land affected by contamination and carry out sufficient remediation to render the land suitable for use. PPS23 was withdrawn early in 2012 and has been replaced by much reduced guidance within the National Planning Policy Framework (NPPF).

The new framework has only limited guidance on contaminated land, as follows:

- *"planning policies and decisions should also ensure that:*
    - *the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;*

- *after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
- *adequate site investigation information, prepared by a competent person, is presented".*

APPENDIX C
SITE PHOTOGRAPHS

APPENDIX C
EXPLORATORY HOLE PHOTOGRAPHS

Photo no. **1**

Date: 11/09/2017

Exploratory hole number:

Trial pit 1

Description:

Trial Pit 1 excavated to a maximum depth of 3.80m.

Photo No. **2**

Date: 11/09/2017

Exploratory hole number:

Trial pit 1

Description:

Trial pit 1 stockpiled material

Photo No. 3	Date: 11/09/2017	
Exploratory hole number: Trial pit 2		
Description:		

Photo No. 4	Date: 11/09/2017	
Exploratory hole number: Trial pit 2		
Description: Trial pit 2 stockpiled material		

Photo no. 5	Date: 11/09/2017	
Exploratory hole number: Trial pit 3		
Description: Trial pit 3 excavated to a maximum depth of 4.00m.		

Photo No. 6	Date: 11/09/2017	
Exploratory hole number: Trial pit 3		
Description: Trial pit 3 stockpiled material		

Photo No.	Date:
7	11/09/2017

Exploratory hole number:

Trial pit 4

Description:

Trial pit 4 excavated to a maximum depth of 3.80m.

Photo No.	Date:
8	11/09/2017

Exploratory hole number:

Trial pit 4

Description:

Trial pit 3 stockpiled material

<table>
<tr><td>Photo no.
9</td><td>Date:
11/09/2017</td><td rowspan="3"></td></tr>
<tr><td colspan="2">Exploratory hole number:
Trial pit 5</td></tr>
<tr><td colspan="2">Description:
Trial pit 4 excavated to a maximum depth of 3.20m.</td></tr>
</table>

<table>
<tr><td>Photo No.
10</td><td>Date:
11/09/2017</td><td rowspan="3"></td></tr>
<tr><td colspan="2">Exploratory hole number:
Trial pit 5</td></tr>
<tr><td colspan="2">Description:
Trial pit 5 stockpiled material</td></tr>
</table>

Photo No. 11	Date: 08/09/2017	
Exploratory hole number: Trial pit 7		
Description: Trial pit 7 excavated to a maximum depth of 3.80m.		

Photo No. 12	Date: 08/09/2017	
Exploratory hole number: Trial pit 7		
Description: Trial pit 7 stockpiled material		

Photo no.	Date:
13	08/09/2017

Exploratory hole number:

Trial pit 12

Description:

Trial pit 7 excavated to a maximum depth of 3.60m.

Photo No.	Date:
14	08/09/2017

Exploratory hole number:

Trial pit 12

Description:

Trial pit 12 stockpiled material.

Photo No. 15	Date: 08/09/2017	
Exploratory hole number: Trial pit 13		
Description: Trial pit 7 excavated to a maximum depth of 3.60m.		

Photo No. 16	Date: 08/09/2017	
Exploratory hole number: Trial pit 13		
Description: Trial pit 13 stockpiled material		

Photo no. 17	Date: 07/09/2017
Exploratory hole number: Trial pit 14	
Description: Trial pit 14 excavated to a maximum depth of 3.60m.	

Photo No. 18	Date: 07/09/2017
Exploratory hole number: Trial pit 14	
Description: Trial pit 14 stockpiled material	

Photo No.	Date:	
19	07/09/2017	
Exploratory hole number: Trial pit 15		
Description: Trial pit 15 excavated to a maximum depth of 2.50m.		

Photo No.	Date:	
20	07/09/2012	
Exploratory hole number: Trial pit 15		
Description: Trial pit 15 stockpiled material		

Photo no. 21	Date: 07/09/2017	
Exploratory hole number: Trial pit 16		
Description: Trial pit 15 excavated to a maximum depth of 1.80m.		

Photo No. 22	Date: 07/09/2017	
Exploratory hole number: Trial pit 16		
Description: Trial pit 16 stockpiled material		

Photo No. 23	Date: 07/09/2017	
Exploratory hole number: Trial pit 16A		
Description: Trial pit 16 excavated to a maximum depth of 0.50m.		

Photo No. 24	Date: 07/09/2017	
Exploratory hole number: Trial pit 17		
Description: Trial pit 17 excavated to a maximum depth of 4.50m.		

Photo no. 25	Date: 07/09/2017
Exploratory hole number: Trial pit 17	
Description: Trial pit 17 stockpiled material.	

Photo No. 26	Date: 08/09/2017
Exploratory hole number: Trial pit 18	
Description: Trial pit 18 excavated to a maximum depth of 3.60m.	

Photo No.	Date:	
27	08/09/2017	
Exploratory hole number: Trial pit 18		
Description: Trial pit 18 stockpiled material.		

Photo No.	Date:	
28	08/09/2017	
Exploratory hole number: Trial pit 20		
Description: Trial pit 20 excavated to a maximum depth of 3.80m.		

Photo no. 29	Date: 08/09/2017
Exploratory hole number: Trial pit 20	
Description: Trial pit 20 stockpiled material.	

Photo No. 30	Date: 13/09/2017
Exploratory hole number: Trial pit 23	
Description: Trial pit 23 excavated to a maximum depth of 3.00m and soakaway test undertaken.	

Photo No.	Date:	
31	13/09/2017	
Exploratory hole number: Trial pit 23		
Description: Trial pit 23 stockpiled material.		

Photo No.	Date:	
32	13/09/2017	
Exploratory hole number: Trial pit 26		
Description: Trial pit 26 excavated to a maximum depth of 3.00m		

Photo no.	Date:
33	13/09/2017

Exploratory hole number:

Trial pit 26

Description:

Trial pit 26 stockpiled material

Photo No.	Date:
34	06/09/2017

Exploratory hole number:

Window Sample 01

Description:

Window sample 01 drilled to 2.50m.

Photo No. 35	Date: 06/09/2017	
Exploratory hole number: Window Sample 02		
Description: Window sample 02 drilled to 5.45m.		

Photo No. 36	Date: 06/09/2017	
Exploratory hole number: Window Sample 03		
Description: Window sample 03 drilled to 3.00m.		

Photo no. 37

Date: 05/09/2017

Exploratory hole number:

Window Sample 04

Description:

Window sample 04 drilled to 4.90m.

Photo No. 38

Date: 05/09/2017

Exploratory hole number:

Window Sample 05

Description:

Window sample 05 drilled to 4.45m.

Photo No. 39	Date: 05/09/2017	
Exploratory hole number: Window Sample 06		
Description: Window sample 06 drilled to 5.45m.		

Photo No. 40	Date: 05/09/2017	
Exploratory hole number: Window Sample 07		
Description: Window sample 07 drilled to 4.45m.		

Photo no.	Date:	
41	05/09/2017	
Exploratory hole number: Window Sample 08		
Description: Window sample 08 drilled to 5.45m.		

Photo No.	Date:	
42	05/09/2017	
Exploratory hole number: Window Sample 09		
Description: Window sample 09 drilled to 3.00m.		

Photo No.	Date:	
43	06/09/2017	
Exploratory hole number: Window Sample 10		
Description: Window sample 10 drilled to 4.45m		

Photo No.	Date:	
44	06/09/2017	
Exploratory hole number: Window Sample 11		
Description: Window sample 11 drilled to 4.80m.		

<table>
<tr><td>Photo no.
45</td><td>Date:
06/09/2017</td><td rowspan="3">
</td></tr>
<tr><td colspan="2">Exploratory hole number:
Window Sample 12</td></tr>
<tr><td colspan="2">Description:
Window sample 12 drilled to 5.00m.</td></tr>
</table>

<table>
<tr><td>Photo No.
46</td><td>Date:
19/09/2017</td><td rowspan="3">
</td></tr>
<tr><td colspan="2">Exploratory hole number:
Borehole 01</td></tr>
<tr><td colspan="2">Description:
Borehole 01 dynamic sampling run from 1.00m to 9.00m</td></tr>
</table>

Photo No.	Date:	
47	21/09/2017	
Exploratory hole number: Borehole 01		
Description: Borehole 01, box 1 of 7, 9.00m to 12.00m		

Photo No.	Date:	
48	21/09/2017	
Exploratory hole number: Borehole 01		
Description: Borehole 01, box 2 of 7, 12.00m to 15.00m		

Photo no.	Date:	
49	21/09/2017	
Exploratory hole number: Borehole 01		
Description: Borehole 01, box 3 of 7, 15.00m to 18.00m.		

Photo No.	Date:	
50	21/09/2017	
Exploratory hole number: Borehole 01		
Description: Borehole 01, box 4 of 7, 18.00m to 21.00m.		

Photo No.	Date:	
51	21/09/2017	
Exploratory hole number: Borehole 01		
Description: Borehole 01, box 5 of 7, 21.00m to 24.00m.		

Photo No.	Date:	
52	21/09/2017	
Exploratory hole number: Borehole 01		
Description: Borehole 01, box 6 of 7, 24.00m to 27.00m.		

Photo no.	Date:
53	21/09/2017

Exploratory hole number:

Borehole 01

Description:

Borehole 01, box 7 of 7, 27.00m to 30.00m

Photo No.	Date:
54	15/09/2017

Exploratory hole number:

Borehole 02

Description:

Borehole 02 dynamic sampling run from 1.00m to 8.50m.

Photo No. 55

Date: 15/09/2017

Exploratory hole number:

Borehole 02

Description:

Borehole 02, Box 1 of 8, 8.50m to 11.50m.

Photo No. 56

Date: 15/09/2017

Exploratory hole number:

Borehole 02

Description:

Borehole 02, Box 2 of 8, 11.50m to 14.50m.

Photo no. **57**	**Date:** 18/09/2017	
Exploratory hole number: Borehole 02		
Description: Borehole 02, Box 2 of 8, 14.50m to 17.50m.		

Photo No. **58**	**Date:** 18/09/2017	
Exploratory hole number: Borehole 02		
Description: Borehole 02, Box 4 of 8, 17.50m to 20.00m.		

Photo No.	Date:	
59	18/09/2017	

Exploratory hole number:

Borehole 02

Description:

Borehole 02, Box 5 of 8, 20.00m to 22.50m.

Photo No.	Date:	
60	18/09/2017	

Exploratory hole number:

Borehole 02

Description:

Borehole 02, Box 6 of 8, 22.50m to 24.00m.

Photo no.	**Date:**
61	19/09/2017

Exploratory hole number:

Borehole 02

Description:

Borehole 02, Box 7 of 8, 24.00m to 27.00m.

Photo No.	**Date:**
62	19/09/2017

Exploratory hole number:

Borehole 02

Description:

Borehole 02, Box 8 of 8, 27.00m to 30.00m.

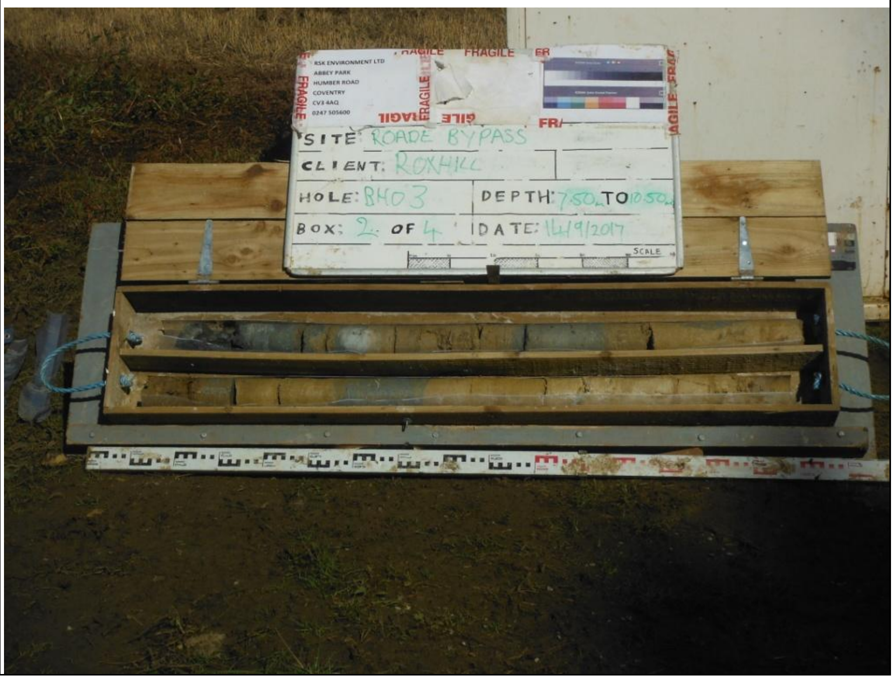
Photo No.	Date:	
63	14/09/20147	

Exploratory hole number:

Borehole 03

Description:

Borehole 03, Box 1 of 4, 4.50m to 7.50m.

Photo No.	Date:	
64	14/09/2017	

Exploratory hole number:

Borehole 03

Description:

Borehole 03, Box 2 of 4, 7.50m to 10.50m.

Photo no.	Date:
65	14/09/2017
Exploratory hole number: Borehole 03	
Description: Borehole 03, Box 3 of 4, 10.50m to 13.50m.	

Photo No.	Date:
66	14/09/2017
Exploratory hole number: Borehole 03	
Description: Borehole 03, Box 4 of 4, 13.50m to 15.00m.	

Photo No.	Date:
67	12/09/2017

Exploratory hole number:

Borehole 04

Description:

Borehole 04, Box 1 of 7, 4.00m to 6.50m.

Photo no.	Date:
68	12/09/2017

Exploratory hole number:

Borehole 04

Description:

Borehole 04, Box 2 of 7, 6.50m to 9.50m.

Photo No.	**Date:**
69	12/09/2017
Exploratory hole number:	
Borehole 04	
Description:	
Borehole 04, Box 3 of 7, 9.50m to 11.00m	

Photo No.	**Date:**
70	12/09/2017
Exploratory hole number:	
Borehole 04	
Description:	
Borehole 04, Box 4 of 7, 11.00m to 14.00m.	

Photo No.

71

Date:

12/09/2017

Exploratory hole number:

Borehole 04

Description:

Borehole 04, Box 5 of 7, 14.00m to 15.50m.

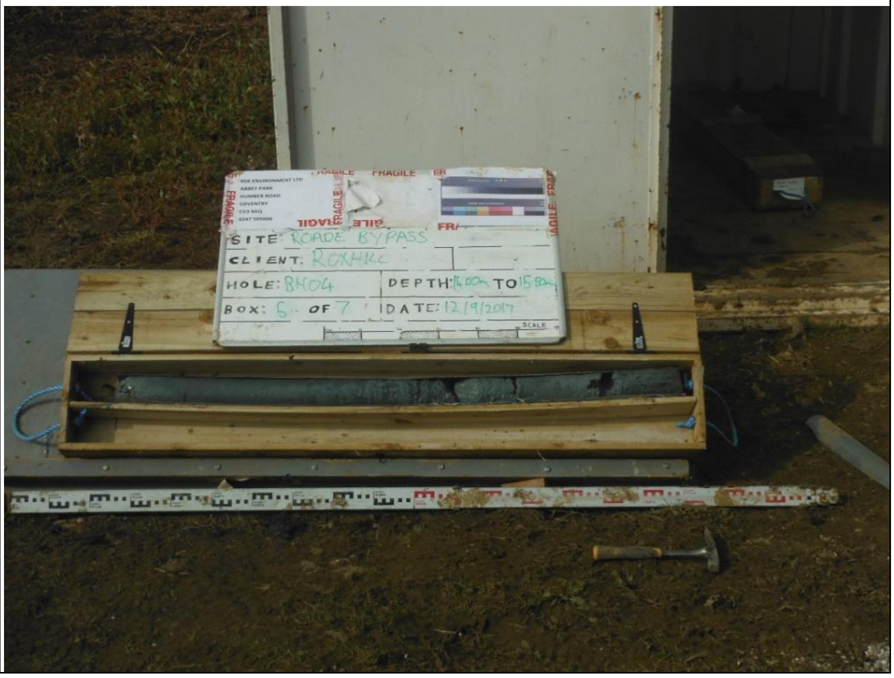


Photo no.

72

Date:

12/09/2017

Exploratory hole number:

Borehole 04

Description:

Borehole 04, Box 6 of 7, 18.50m to 20.00m.

Photo No.	Date:	
73	12/09/2017	
Exploratory hole number: Borehole 04		
Description: Borehole 04, Box 7 of 7, 18.50m to 20.00m.		

Photo No.	Date:	
74	12/09/2017	
Exploratory hole number: Borehole 05		
Description: Borehole 05, 1.20m to 4.00m.		

Photo No. **75**

Date: 12/09/2017

Exploratory hole number:

Borehole 04

Description:

Borehole 04, Box 5 of 7, 14.00m to 15.50m.

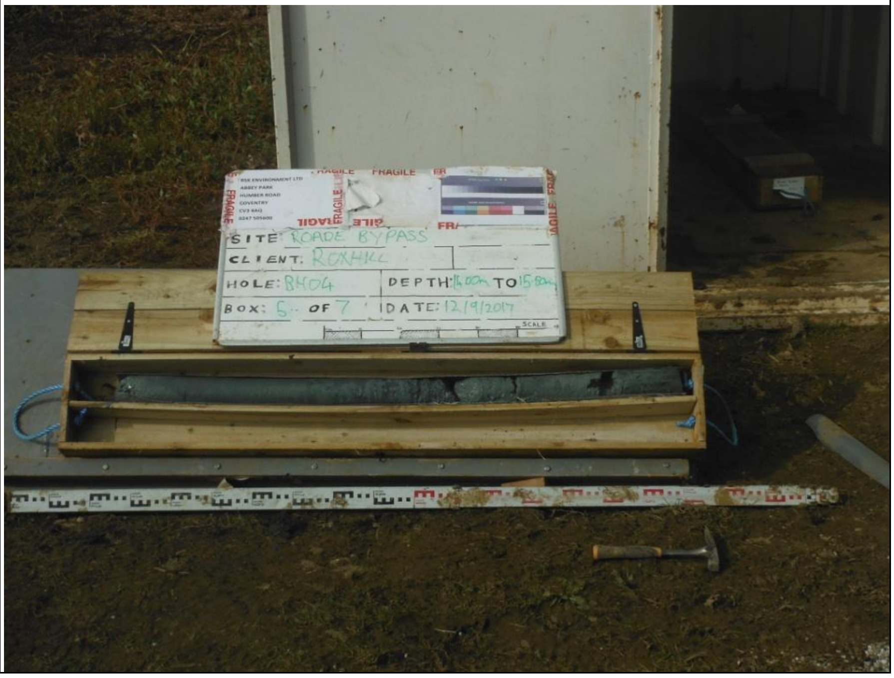


Photo no. **76**

Date: 12/09/2017

Exploratory hole number:

Borehole 04

Description:

Borehole 04, Box 6 of 7, 18.50m to 20.00m.

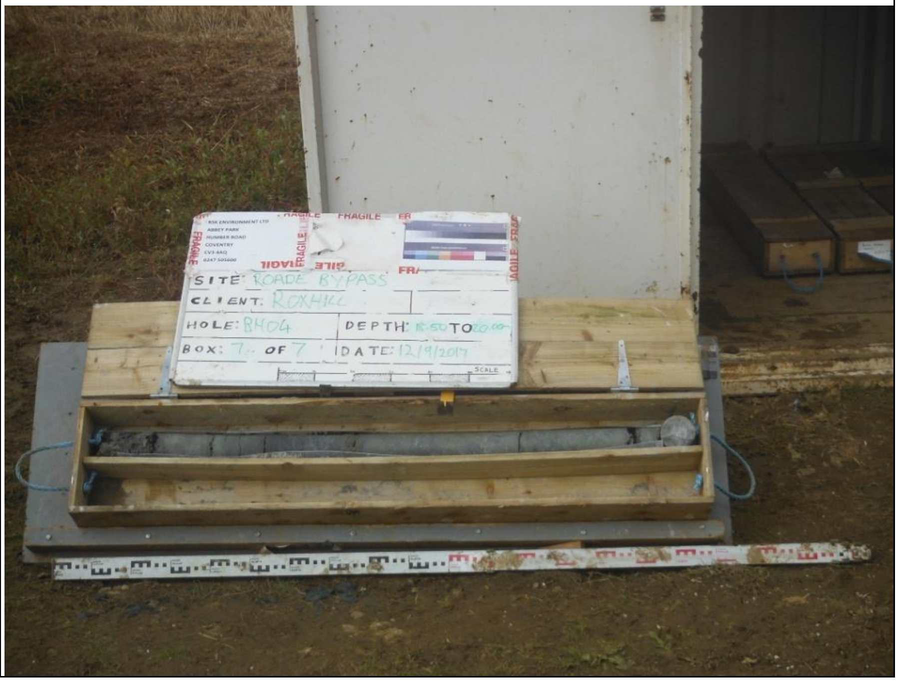
Photo No. 77	Date: 12/09/2017	
Exploratory hole number: Borehole 04		
Description: Borehole 04, Box 7 of 7, 18.50m to 20.00m.		

Photo No. 78	Date: 12/09/2017	
Exploratory hole number: Borehole 05		
Description: Borehole 05, 1.20m to 4.00m.		

Photo No.	Date:	
79	12/09/2017	
Exploratory hole number: Borehole 05		
Description: Borehole 05, Box 1 of 5, 4.00m to 7.00m.		

Photo no.	Date:	
80	12/09/2017	
Exploratory hole number: Borehole 05		
Description: Borehole 05, Box 2 of 5, 7.00m to 10.00m.		

Photo No.	Date:
81	12/09/2017

Exploratory hole number:

Borehole 05

Description:

Borehole 05, Box 3 of 5, 11.50m to 14.00m

Photo No.	Date:
82	12/09/2017

Exploratory hole number:

Borehole 05

Description:

Borehole 05, Box 4 of 5, 14.00m to 17.00m.

Photo No.	**Date:**	
83	12/09/2017	
Exploratory hole number:		
Borehole 05		
Description:		
Borehole 05, Box 5 of 5, 17.00m to 20.00m.		

APPENDIX D
RISK ASSESSMENT METHODOLOGY

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. Under CLR11, three stages of risk assessment exist: preliminary, generic quantitative and detailed quantitative. An outline conceptual model should be formed at the preliminary risk assessment stage that collates all the existing information pertaining to a site in text, tabular or diagrammatic form. The outline conceptual model identifies potentially complete (termed possible) pollutant linkages (contaminant–pathway–receptor) and is used as the basis for the design of the site investigation. The outline conceptual model is updated as further information becomes available, for example as a result of the site investigation.

Production of a conceptual model requires an assessment of risk to be made. Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk. RSK has adopted guidance provided in CIRIA C552 for use in the production of conceptual models.

The likelihood of an event can be classified on a four-point system using the following terms and definitions based on CIRIA C552:

- highly likely: the event 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: it is probable that an event will occur or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term
- low likelihood: circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term
- unlikely: circumstances are such that it is improbable the event would occur even in the long term.

The severity can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to severity are:

- 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 resources. Catastrophic damage to buildings or property. Short-term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in ‘Draft Circular on Contaminated Land’, DETR 2000)
- medium: chronic damage to human health (‘significant harm’ as defined in ‘Draft Circular on Contaminated Land’, DETR 2000), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem
- mild: pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services (‘significant harm’ as defined in ‘Draft Circular on Contaminated Land’, DETR 2000). Damage to sensitive buildings, structures or the environment

- minor: harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

Once the probability of an event occurring and its consequences have been classified, a risk category can be assigned according to the table below.

		Consequences			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**Highly likely**	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very low	Very low

Definitions of these risk categories are as follows together with an assessment of the further work that may be required:

- Very high: there is a high probability that severe harm could occur or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability; urgent investigation and remediation are likely to be required.
- High: harm is likely to occur. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required. Remedial works may be necessary in the short term and are likely over the long term.
- Moderate: it is possible that harm could arise, but it is unlikely that the harm would be severe and it is more likely that the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term.
- Low: it is possible that harm could occur, but it is likely that if realised this harm would at worst normally be mild.
- Very low: there is a low possibility that harm could occur and if realised the harm is unlikely to be severe.

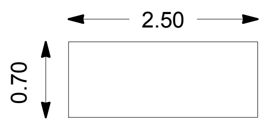
APPENDIX E
EXPLORATORY HOLE RECORDS

TRIAL PIT LOG

Contract: Roade Bypass	Client: Roxhill	Trial Pit: TP01
Contract Ref: 313583	Start: 11.09.17 End: 11.09.17	Ground Level: 121.28
National Grid Co-ordinate: E:475469.5 N:252463.3	Sheet: 1 of 1	

Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.20 0.20		ES PID	 0.0ppm			Crop over silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite, flint and limestone. (TOPSOIL)	120.98	(0.30) 0.30	
0.50 0.70 0.70 0.80 0.80		V D PID B PID	c_u=64/52/68 0.0ppm 0.0ppm			Firm orangish brown light grey silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse limestone, chalk, flint and quartzite. (GLACIAL TILL)	119.88	(1.10) 1.40	
1.70 1.70 1.80 1.80 2.80 2.80 3.40 3.40		D PID B PID D PID D PID	 0.0ppm 0.0ppm 0.0ppm 0.0ppm			Firm stiff light grey and brown silty slighty sandy CLAY with rare to occasional fine rounded limestone gravel. (GLACIAL TILL) . . . at 2.60m large limestone boulders. . . . at 3.00m pocket of gravelly sand. . . . at 3.20m becoming dark grey.	117.48	(2.40) 3.80	
						Dark grey medium strong to strong LIMESTONE. (BLISWORTH LIMESTONE FORMATION) Trial pit terminated at 3.8m depth due to rockbed.			

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hard digging from 2.50m bgl.
3. Trial pit remained stable during excavation.
4. Groundwater not encountered.
5. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

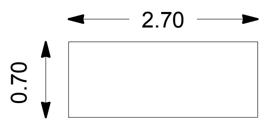
Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: JMB

TRIAL PIT LOG

Contract: Roade Bypass	Client: Roxhill	Trial Pit: TP02
Contract Ref: 313583	Start: 11.09.17 End: 11.09.17	Ground Level: 120.60
National Grid Co-ordinate: E:475303.7 N:252359.8	Sheet: 1 of 1	

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
0.20		ES				Crop over silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite, flint and limestone. (TOPSOIL)	120.30	(0.30) 0.30	
0.20		PID	0.0ppm						
0.50		D				Firm orangish brown light grey silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse limestone, flint and quartzite. (GLACIAL TILL)			
0.50		PID	0.0ppm						
0.70		V	c_u=48/62/66						
1.00		B				. . . at 1.00m occasional angular limestone cobbles.		(1.30)	
1.00		PID	0.0ppm						
1.50		D					119.00	1.60	
1.50		PID	0.0ppm			Firm to stiff light grey and brown silty slighty sandy CLAY with rare to occasional fine rounded limestone gravel. (GLACIAL TILL)			
2.00		B							
2.00		PID	0.0ppm						
2.50		D						(2.00)	
2.50		PID	0.0ppm						
3.00		D				. . . at 3.00m dark grey.			
3.00		PID	0.0ppm						
3.50		D					117.00	3.60	
3.50		PID	0.0ppm			Strong dark grey and grey LIMESTONE. (BLISWORTH LIMESTONE FORMATION)	116.90	3.70	
						Trial pit terminated at 3.70m depth on rockbed.			

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: TMB

AGS

TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Roade Bypass	**Roxhill**	**TP03**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	Start: **11.09.17** End: **11.09.17**	**119.66**	**E:475144.8 N:252257.5**	**1** of **1**

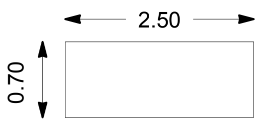
Samples and In-situ Tests

Depth	No	Type	Results
0.30		ES	
0.30		PID	0.0ppm
0.50		B	
0.50		PID	0.0ppm
0.60		V	c_u=98/110/102
0.70		D	
0.70		PID	0.0ppm
1.00		B	
1.00		PID	0.0ppm
1.70		D	
1.70		PID	0.0ppm
1.80		V	c_u=112/102/108
2.50		V	c_u=60/72/56
2.60		D	
2.60		PID	0.0ppm
3.50		D	
3.50		PID	0.0ppm
4.00		D	
4.00		PID	0.0ppm

Description of Strata

Description of Strata	Reduced Level	Depth (Thickness)
Turf over silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, flint and limestone. (POSSIBLE MADE GROUND)	119.46	0.20
Firm to stiff light grey and dark greyish brown silty slightly sandy slightly gravelly CLAY with rare limestone boulders and cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, flint and limestone. Boulders are >250mm and are rounded. Cobbles are approximately 150mm and are subangular to subrounded. (GLACIAL TILL/POSSIBLE MADE GROUND)	117.46	(2.00) 2.20
Firm brown, light grey and orangish brown silty slightly sandy slightly gravelly CLAY. Sand is dine to coarse. Gravel is subangular to subrounded fine to coarse limestone, quartzite and flint with occasional limestone cobbles and boulders. Cobbles are 150mm to 250mm and are subrounded to subangular. Boulders are >300mm and are rounded. (GLACIAL TILL/POSSIBLE MADE GROUND)	115.66	(1.80) 4.00
Trial pit terminated at 4.00m depth.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**RSalama**	TMB

AGS

TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Roade Bypass	Roxhill	TP04

Contract Ref:	Start: 11.09.17 / End: 11.09.17	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	Start: 11.09.17 End: 11.09.17	121.42	E:475070.3 N:252224.4	1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)
0.50		ES				Firm light grey and dark greyish brown silty slightly sandy slightly gravelly CLAY with rare limestone boulders and cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, flint and limestone. (GLACIAL TILL/POSSIBLE MADE GROUND)		
0.50		PID	0.0ppm					
0.70		D						
0.70		PID	0.0ppm					
1.00		B						(2.00)
1.00		PID	0.0ppm					
1.70		D						
1.70		PID	0.0ppm				119.42	2.00
2.00		B				Soft brown, light grey and orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone, quartzite and flint with occasional limestone cobbles and boulders. (GLACIAL TILL)		
2.00		PID	0.0ppm					
2.50		D						(1.10)
2.50		PID	0.0ppm				118.32	3.10
						Firm dark brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse quartzite and limestone. (GLACIAL TILL)		(0.90)
							117.42	4.00
						Trial pit terminated at 4.00m depth.		

Plan (Not to Scale)

2.50

0.70

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	JCB-3CX	RSalama	JMB

AGS

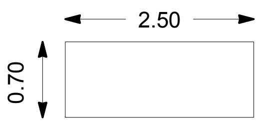
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Roade Bypass	Roxhill	TP05

Contract Ref:	Start: 11.09.17	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	End: 11.09.17	120.61	E:474984.3 N:252133.6	1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
0.20 0.20		ES PID	0.0ppm			Crop over silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite, flint and limestone. (TOPSOIL)	120.31	(0.30) 0.30	
0.50 0.50 0.50		D V PID	c_u=38/46/50 0.0ppm			Firm orangish brown light grey silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse limestone, flint and quartzite. (GLACIAL TILL)	117.41	(2.90) 3.20	
1.00 1.00		B PID	0.0ppm						
1.50 1.50		D PID	0.0ppm						
2.00 2.00		B PID	0.0ppm						
2.50 2.50		D PID	0.0ppm						
3.00 3.00		D PID	0.0ppm						
						Very strong grey LIMESTONE. (BLISWORTH LIMESTONE FORMATION) Trial pit terminated at 3.20m depth.			

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
5. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	JCB-3CX	RSalama	TMB

TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Roade Bypass	**Roxhill**	**TP07**

Contract Ref:	Start:	End:	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	**08.09.17**	**08.09.17**	**119.86**	**E:474875.3 N:251916.9**	**1** of **1**

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.10		ES				Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite and flint.	119.66	0.20	
0.10		PID	0.0ppm						
0.50		D				Firm brown and light grey mottled orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone. (GLACIAL TILL)			
0.50		PID	0.0ppm						
0.80		V	c_u=48/56/52						
						. . . at 1.40m large limestone boulder.			
1.50		D							
1.50		PID	0.0ppm						
						. . . at 1.80m grey in colour.		(3.60)	
						. . . at 2.30m dark grey.			
2.50		D							
2.50		PID	0.0ppm						
3.50		D							
3.50		PID	0.0ppm				116.06	3.80	
						Trial pit terminated at 3.80m depth due to machine lifting.			

Plan (Not to Scale)

2.50

0.70

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hard digging from 3.40m bgl.
3. Trial pit remained stable during excavation.
4. Groundwater not encountered.
5. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	**Machine dug**	Plant Used:	**JCB-3CX**	Logged By:	**RSalama**	Checked By:	TMB

AGS

TRIAL PIT LOG

Contract: Roade Bypass	Client: Roxhill	Trial Pit: TP12
Contract Ref: 313583	Start: 08.09.17 / End: 08.09.17	Sheet: 1 of 1
Ground Level: 115.32	National Grid Co-ordinate: E:474783.5 N:251216.1	

Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.20 0.20		ES PID	 0.0ppm			Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse flint, quartzite and chalk. (TOPSOIL)	115.02	(0.30) 0.30	
0.90 0.90 1.00 1.00 1.10 1.10		D PID B PID D PID	 0.0ppm 0.0ppm 0.0ppm			Firm to stiff orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, limestone and chalk. (GLACIOFLUVIAL DEPOSITS)	114.32	(0.70) 1.00	
						Orangish brown slightly silty slightly clayey slightly gravelly SAND. SAnd is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite and flint. (GLACIOFLUVIAL DEPOSITS)	114.02	(0.30) 1.30	
2.00 2.00 3.00 3.00		D PID B PID	 0.0ppm 0.0ppm			Orangish brown sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of quartzite and flint. (GLACIOFLUVIAL DEPOSITS) . . . at 3.20m large limestone boulders, > 300mm.	112.02	(2.00) 3.30	
						Trial pit terminated at 3.30m depth on assumed rockhead.			

Plan (Not to Scale)

2.50 × 0.70

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: TMB

TRIAL PIT LOG

Contract: Roade Bypass	Client: Roxhill	Trial Pit: TP13
Contract Ref: 313583	Start: 08.09.17 End: 08.09.17	Ground Level: 115.93
National Grid Co-ordinate: E:474841.1 N:251141.4	Sheet: 1 of 1	

Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
						Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse flint and quartzite. (TOPSOIL)	115.73	0.20	
0.70		D				Firm to stiff orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, limestone and chalk. (GLACIAL TILL)			
0.70		PID	0.0ppm						
0.80		B							
0.80		PID	0.0ppm					(1.60)	
						. . . between 1.40m and 1.70m gravelly clay.	114.13	1.80	
1.90		B				Very soft orangish brown silty CLAY. (GLACIAL TILL)			
1.90		PID	0.0ppm					(0.70)	
							113.43	2.50	
2.80		B				Firm brown silty slightly sandy slightly gravelly CLAY with occasional limestone boulders. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse ironstone and limestone. Boulders are of 20x15x20cm limestone. (GLACIAL TILL)			
2.80		PID	0.0ppm					(0.90)	
2.90		D							
2.90		PID	0.0ppm				112.53	3.40	
3.40		D				Extremely weak light greyish brown silty LIMESTONE. (BLISWORTH LIMESTONE FORMATION)			
3.40		PID	0.0ppm					(0.60)	
							111.93	4.00	
						Trial pit terminated at 4.00m depth.			

Plan (Not to Scale)

2.70

0.70

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hard digging from 3.40m bgl.
3. Trial pit remained stable during excavation.
4. Groundwater not encountered.
5. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: TMB

AGS

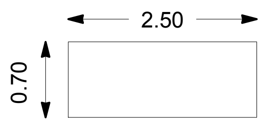
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Roade Bypass	**Roxhill**	**TP14**

Contract Ref:	Start: / End:	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	Start: **07.09.17** End: **07.09.17**	**114.78**	**E:474922.9 N:251044.6**	**1** of **1**

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.20 0.20		ES PID	 0.0ppm			Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite and flint with occasional quartzite and limestone cobbles. Cobbles are 6x4x6cm. (TOPSOIL)	114.48	(0.30) 0.30	
0.50 0.50 0.60 0.60 1.50 1.50 1.60 1.60 2.50 2.50 2.60 2.60		B PID D PID B PID D PID B PID D PID	 0.0ppm 0.0ppm 0.0ppm 0.0ppm 0.0ppm 0.0ppm			Frim orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite with occasional limestone cobbles. (GLACIAL TILL) . . . at 0.30m frequent limestone boulders. Boulders are 30x20x20cm.	112.08	(2.40) 2.70	
						Very stiff dark greyish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of limestone and mudstone lithorelicts. (WEATHERED BLISWORTH LIMESTONE FORMATION)	111.78	(0.30) 3.00	
3.50 3.50 3.60 3.60		B PID D PID	 0.0ppm 0.0ppm			Medium strong to strong dark greyish brown LIMESTONE recovered as cobbles and gravel. (BLISWORTH LIMESTONE FORMATION)	111.18	(0.60) 3.60	
						Trial pit terminated at 3.60m depth.			

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**RSalama**	TMB

TRIAL PIT LOG

Contract: Roade Bypass	Client: Roxhill	Trial Pit: TP15
Contract Ref: 313583	Start: 07.09.17 End: 07.09.17	Ground Level: 110.97
National Grid Co-ordinate: E:475025.6 N:250920.1	Sheet: 1 of 1	

Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.20 0.20	1	ES PID	 0.0ppm			Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite and flint with occasional quartzite, flint and limestone cobbles. Cobbles are 6x4x6cm. (TOPSOIL)	110.67	(0.30) 0.30	
0.50		V	c_u=42/50/58			Firm orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite with occasional limestone cobbles. (WEATHERED BLISWORTH LIMESTONE FORMATION)	109.77	(0.90) 1.20	
0.70 0.70	4	D PID	 0.0ppm						
1.00 1.00	3	B PID	 0.0ppm						
1.50 1.50 1.50	5 7	D ES PID	 0.0ppm			Firm to stiff yellowish brown and grey silty slightly sandy slightly gravelly CLAY with frequent limestone cobbles. (WEATHERED BLISWORTH LIMESTONE FORMATION)	108.67	(1.10) 2.30	
2.00 2.00	6	B PID	 0.0ppm						
2.40 2.40 2.50		D PID B	 0.0ppm			Extremely weak yellowish brown slightly clayey slightly sandy LIMESTONE. (BLISWORTH LIMESTONE FORMATION)	106.97	(1.70) 4.00	
						Trial pit terminated at 4.00m depth.			

Plan (Not to Scale)

2.50

0.70

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hard digging from 1.50m bgl.
3. Trial pit remained stable during excavation.
4. Groundwater not encountered.
5. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: TMB

AGS

TRIAL PIT LOG

Contract: Roade Bypass		Client: Roxhill		Trial Pit: TP16
Contract Ref: 313583	Start: 07.09.17 End: 07.09.17	Ground Level: 104.51	National Grid Co-ordinate: E:475082.9 N:250808.0	Sheet: 1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.10 0.10		ES PID	 0.0ppm			Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite, flint, chalk and limestone. (TOPSOIL)	104.21	(0.30) 0.30	
0.60 0.60		B PID	 0.0ppm			Light brown creamy silty slightly sandy gravelly CLAY with frequent limestone cobbles. Cobbles are 7x6x6cm and are limestone. Gravel is subangular to subrounded fine to coarse of limestone. (WEATHERED BLISWORTH LIMESTONE FORMATION)	103.81	(0.40) 0.70	
1.60 1.60 1.70 1.70		B PID D PID	 0.0ppm 0.0ppm			Very stiff dark grey mottled orangish brown silty slightly sandy desicated CLAY. (RUTLAND FORMATION) . . . from 1.80m becoming light bluish grey. Trial pit terminated at 1.80m depth.	102.71	(1.10) 1.80	

Plan (Not to Scale)

2.50 × 0.70

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hard digging from 0.70m bgl.
3. Trial pit remained stable during excavation.
4. Groundwater not encountered.
5. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: TMB

AGS

TRIAL PIT LOG

Contract: Roade Bypass	Client: Roxhill	Trial Pit: TP16A
Contract Ref: 313583	Start: 08.09.17 End: 08.09.17	Ground Level: 104.51
National Grid Co-ordinate: E:475082.9 N:250808.0	Sheet: 1 of 1	

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
0.20		ES				MADE GROUND: Grass over LIMESTONE COBBLES. (MADE GROUND/RAILWAY BALLAST)		(0.40)	
0.20		PID	0.0ppm				104.11	0.40	
0.50		ES				Orangish brown silty slightly sandy slightly gravelly CLAY. (GLACIAL TILL)	104.01	0.50	
0.50		PID	0.0ppm			Trial pit terminated at 0.50m depth.			

Plan (Not to Scale)	General Remarks
2.50 × 0.70	1. Location scanned with GPR prior to breaking ground. No services encountered. 2. Trial pit remained stable during excavation. 3. Groundwater not encountered. 4. Trial pit backfilled with arisings upon completion.
	All dimensions in metres — Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: TMB

AGS

TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Roade Bypass	Roxhill	TP17

Contract Ref:	Start / End	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	Start: 07.09.17 End: 07.09.17	102.16	E:475121.9 N:250710.3	1 of 1

Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)
0.20		ES				Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite, flint, chalk and limestone. (TOPSOIL)	101.86	0.30
0.20		PID	0.0ppm					
0.50		B				Light brown creamy silty slightly sandy gravelly CLAY with frequent limestone cobbles. Cobbles are 7x6x6cm and are limestone. Gravel is subangular to subrounded fine to coarse of limestone. (WEATHERED BLISWORTH LIMESTONE FORMATION)		(0.70)
0.50		PID	0.0ppm					
0.60		D						
0.60		PID	0.0ppm					
0.70		V	c_u=48/54/56				101.16	1.00
1.30		V	c_u=98/110/86			Very stiff grey mottled orangish brown slightly sandy CLAY. Sand is fine to coarse. (WEATHERED BLISWORTH LIMESTONE FORMATION)		
1.50		B						
1.50		PID	0.0ppm					
1.60		D				. . . at 1.70m white subangular to angular fine to coarse limestone gravels.		
1.60		PID	0.0ppm					
2.50		B						(3.20)
2.50		PID	0.0ppm					
2.60		D						
2.60		PID	0.0ppm			. . . at 2.90m becoming light grey.		
3.50		B						
3.50		PID	0.0ppm					
3.60		D				. . . at 3.70m becoming grey in colour.		
3.60		PID	0.0ppm				97.96	4.20
4.40		D				Soft dark bluish grey mottled orangish brown silty slightly sandy CLAY with frequent subangular to angular fine to coarse mudstone lithorelicts. (RUTLAND FORMATION)	97.66	4.50
4.40		PID	0.0ppm					
4.50		B				Trial pit terminated at 4.50m depth.		

Plan (Not to Scale)

2.60

0.70

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hard digging from 2.00m bgl.
3. Trial pit remained stable during excavation.
4. Groundwater not encountered.
5. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:35

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	JCB-3CX	RSalama	TMB

TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Roade Bypass	Roxhill	TP18

Contract Ref:	Start: 08.09.17	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	End: 08.09.17	117.37	E:474880.5 N:251786.9	1 of 1

Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)
						Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite and flint. (TOPSOIL)	117.17	0.20
0.20		ES						
0.20		PID	0.0ppm			Firm brown and light grey mottled orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone. (GLACIAL TILL)		
0.60		V	c_u=56/68/62					
0.70		B						
0.70		PID	0.0ppm					
0.80		D						
0.80		PID	0.0ppm					(1.80)
						. . . between 1.30m and 1.70m boulders and cobbles of limestone. Cobbles are 100mm to 250mm and are subangular to subrounded. Boulders are >300mm and are rounded to subrounded.		
1.70		D						
1.70		PID	0.0ppm				115.37	2.00
2.00		V	c_u=74/68/83			Firm grey silty CLAY. (GLACIAL TILL)		
2.10		D						
2.10		PID	0.0ppm					
						. . . at 2.50m stiff.		(1.10)
2.70		V	c_u=114/126/120				114.27	3.10
3.20		D				Very stiff grey mottled orangish brown silty slightly sandy CLAY. (GLACIAL TILL)		(0.40)
3.20		PID	0.0ppm			. . . at 3.30m greyish green.	113.87	3.50
						Strong greyish green LIMESTONE. (BLISWORTH LIMESTONE FORMATION) Trial pit terminated at 3.50m depth.		

Plan (Not to Scale)

2.50

0.70

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	JCB-3CX	RSalama	TMB

AGS

TRIAL PIT LOG

Contract: Roade Bypass		Client: Roxhill		Trial Pit: TP20
Contract Ref: 313583	Start: 08.09.17 End: 08.09.17	Ground Level: 119.11	National Grid Co-ordinate: E:474839.3 N:251894.4	Sheet: 1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
						Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite and flint.	118.91	0.20	
						Firm brown and light grey mottled orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone. (GLACIAL TILL)			
0.50 0.50		D PID	 0.0ppm						
1.50 1.50		D PID	 0.0ppm						
						. . . at 2.00m becoming dark grey.		(3.60)	
2.50 2.50		D PID	 0.0ppm						
3.50 3.50		D PID	 0.0ppm						
							115.31	3.80	
						Trial pit terminated at 3.80m depth.			

Plan (Not to Scale)

2.50

0.70

General Remarks

1. Area scanned with GPr prior to breaking ground. No services detected.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: TMB	AGS

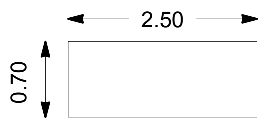
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Roade Bypass	**Roxhill**	**TP22**

Contract Ref:	Start:	End:	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	**13.09.17**	**13.09.17**	**117.11**	**E:475190.4 N:252244.0**	**1** of **1**

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
						Grass over brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chalk, quartzite, flint and limestone. (TOPSOIL)	116.81	(0.30) 0.30	
						Firm to stiff light grey brown silty slightly sandy slightly gravelly CLAY with frequent angular limestone cobbles. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse limestone, flint and quartzite. (GLACIAL TILL/POSSIBLE MADE GROUND)	114.11	(2.70) 3.00	
1.00	1	B							
1.00		PID	0.0ppm						
2.00	2	B							
2.00		PID	0.0ppm						
3.00	3	B							
3.00		PID	0.0ppm						

Plan (Not to Scale)



General Remarks

1. Area scanned with GPR prior to breaking ground. No services detected.
2. Hard digging from 1.50m bgl.
3. Trial pit remained stable during excavation.
4. Groundwater not encountered.
5. Trial pit backfilled with arisings.
6. Trial pit used for soakaway test.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**RSalama**	TMB

AGS

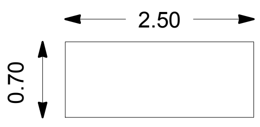
TRIAL PIT LOG

Contract: Roade Bypass	Client: Roxhill	Trial Pit: TP23

Contract Ref: 313583	Start: 13.09.17 End: 13.09.17	Ground Level: 121.20	National Grid Co-ordinate: E:475053.4 N:252237.1	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
						Grass over brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chalk, quartzite, flint and limestone.	120.90	(0.30) 0.30	
						Firm brown light grey mottled dark grey silty slightly sandy slightly gravelly CLAY with rare limestone cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone quartzite and flint. (GLACIAL TILL/POSSIBLE MADE GROUND)			
1.00	1	B							
1.00		PID	0.0ppm						
								(2.70)	
2.00	2	B				. . . Brown in colour from 2.00m.			
2.00		PID	0.0ppm						
							118.20	3.00	
3.00	3	B							
3.00		PID	0.0ppm						

Plan (Not to Scale)



General Remarks

1. Area scanned with GPR prior to breaking ground. No services detected.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled arisings upon completion.
5. Trial pit used for soakaway test.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: TMB

TRIAL PIT LOG

Contract: Roade Bypass	Client: Roxhill	Trial Pit: TP26
Contract Ref: 313583	Start: 13.09.17 End: 13.09.17	Ground Level: 99.88
National Grid Co-ordinate: E:475145.4 N:250780.4	Sheet: 1 of 1	

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
						Grass over brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, flint and limestone.	99.58	(0.30) 0.30	
1.00 1.00	1	B PID	0.0ppm			Firm brown orange silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite flint and limestone. (GLACIAL TILL)			
						. . . light grey in colour from 1.50m		(2.70)	
2.00 2.00	2	B PID	0.0ppm						
						. . . with angular limestone cobbles from 2.50m			
						. . . Soil becoming damp from 2.80m	96.88	3.00	
3.00 3.00	2	B PID	0.0ppm						

Plan (Not to Scale)

2.50

0.70

General Remarks

1. Area scanned with GPR prior to breaking ground. No services detected.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.
5. Trial pit used for soakaway test.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: RSalama	Checked By: JMB

AGS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Roade Bypass	**Roxhill**	**WS01**

Contract Ref:	Start: / End:	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	Start: **06.09.17** End: **06.09.17**	**120.71**	**E:475488.6 N:252412.5**	**1** of **1**

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	0.20	1	ES				Crop over dark brown slightly sandy slightly gravelly CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse of quartzite. (TOPSOIL)	120.41	(0.30) 0.30	
	0.20		PID	0.0ppm						
	0.40	2	B				Firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk, quartzite and flint. (GLACIAL TILL)			
	0.90	3	D							
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=27			. . . Becoming stiff from 1.20m bgl.		(2.20)	
	1.20	4	D							
2.00 - 2.50 (75mm dia) 100% rec	2.00-2.45	2	SPT(c)	N=50			. . . becoming very stiff from 2.00m.	118.21	2.50	
	2.50-2.89	3	SPT(c)	N:50 for 285mm			Window sample hole terminated at 2.50m depth on refusal.			

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 2.50m bgl.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**DSUK LTD**	**MSouthworth**	TMB

AGS

WINDOW SAMPLE LOG

Contract: Roade Bypass		Client: Roxhill		Window Sample: WS02
Contract Ref: 313583	Start: 06.09.17 End: 06.09.17	Ground Level: 119.35	National Grid Co-ordinate: E:474865.0 N:251894.1	Sheet: 1 of 2

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Water	Backfill & Instrumentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	0.20	1	ES				Crop over brown sandy slightly gravelly CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse of chalk and quartzite. (TOPSOIL)	118.95	(0.40) 0.40	
	0.20		PID	0.0ppm						
	0.50	2	D				Firm becoming stiff orangish brown sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk and quartzite. (GLACIAL TILL)	117.55	(1.40) 1.80	
	0.70	4	B							
	1.00	3	D							
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=17						
	1.40	5	D							
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	2	SPT(c)	N=22			Stiff greyish brown mottled orangish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk, quartzite and flint. (GLACIAL TILL) . . . at 1.90m cobbles of sandstone. . . . at 2.90m becoming very stiff.	116.25	(1.30) 3.10	
	2.40	6	D							
3.00 - 4.00 (65mm dia) 100% rec	3.00-3.45	3	SPT(c)	N=46			Stiff dark grey silty slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk and sandstone. (GLACIAL TILL)		(2.35)	
	3.40	7	D							
4.00 - 5.00 (65mm dia) 100% rec	4.00-4.45	4	SPT(c)	N=40						
	4.40	8	D							

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 5.00m bgl.

All dimensions in metres | Scale: 1:25

Method Used: Tracked window sampling	Plant Used: Premier 110	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: JMB

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Roade Bypass	Roxhill	WS02

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	06.09.17 / End: 06.09.17	119.35	E:474865.0 N:251894.1	2 of 2

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
4.00 - 5.00 (65mm dia) 100% rec							Stiff dark grey silty slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of chalk and sandstone. (GLACIAL TILL) *(stratum copied from 3.10m from previous sheet)*	113.90	5.45	
	5.00-5.45	5	SPT(c)	N=43						
							Window sample hole terminated at 5.45m depth.			

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: 1:25

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	Premier 110	DSUK LTD	MSouthworth	TMB

AGS

WINDOW SAMPLE LOG

Contract: Roade Bypass		Client: Roxhill		Window Sample: WS03
Contract Ref: 313583	Start: 06.09.17 End: 06.09.17	Ground Level: 115.32	National Grid Co-ordinate: E:474764.6 N:251244.6	Sheet: 1 of 1

Window Run	Depth	No	Type	Results	Water	Description of Strata	Reduced Level	Depth (Thickness)
	0.10	1	ES			Grass over brown silty slightly clayey slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of quartzite and flint. (TOPSOIL)	115.12	0.20
	0.10		PID	0.0ppm				
	0.20-1.00	2	B					
	0.50	3	D			Orangish brown slightly silty slightly clayey slightly gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of quartzite, flint and chalk. (PROBABLE GLACIOFLUVIAL DEPOSITS)	114.12	(1.00) 1.20
	1.20-1.65	1	SPT	N=14		Firm orangish brown silty slightly sandy gravelly CLAY. Sand is fine to coarse . Gravel is subangular to subrounded fine to coarse of quartzite, chalk and flint. (GLACIAL TILL)	112.62	(1.50) 2.70
	1.50	4	D					
	2.00-2.45	2	SPT	N=14				
	2.50	5	D			Orangish brown SAND. (GLACIAL TILL)	112.32	(0.30) 3.00
	3.00-3.37	3	SPT	N:50 for 215mm		Window sample hole terminated at 3.00m depth due to refusal.		

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 3.00m bgl.

All dimensions in metres | Scale: 1:25

Method Used: Tracked window sampling	Plant Used: Premier 110	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB

WINDOW SAMPLE LOG

Contract: Roade Bypass		Client: Roxhill		Window Sample: WS04
Contract Ref: 313583	Start: 05.09.17 End: 05.09.17	Ground Level: 104.35	National Grid Co-ordinate: E:475088.9 N:250819.0	Sheet: 1 of 2

Progress Window Run	Samples / Tests Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
							Grass over orangish brown very sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of quartzite. (TOPSOIL)		(0.40)	
	0.30	1	ES							
	0.30		PID	0.0ppm				103.95	0.40	
	0.50	2	D				Light yellowish brown clayey slightly sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of siltstone lithorelicts. (GLACIAL TILL)		(1.00)	
	0.70	3	B							
	1.10	4	D							
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=20				102.95	1.40	
							Firm greenish grey silty CLAY. (WEATHERED RUTLAND FORMATION)			
	1.80		D				. . . from 1.80m to 2.60m light grey.			
2.00 - 3.00 (75mm dia) 95% rec	2.00-2.45	2	SPT(c)	N=34						
							. . . from 2.60m to 2.95m greenish grey mottled orangish brown slightly sandy.			
	2.80		D							
3.00 - 4.00 (65mm dia) 95% rec	3.00-3.45	3	SPT(c)	N=38			. . . at 3.00m light grey.		(3.88)	
	3.80		D							
4.00 - 5.00 (65mm dia) 70% rec	4.00-4.45	4	SPT(c)	N=8						

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 2.00m bgl.

All dimensions in metres | Scale: 1:25

Method Used: Tracked window sampling	Plant Used: Premier 110	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB	AGS

WINDOW SAMPLE LOG

Contract: Roade Bypass		Client: Roxhill		Window Sample: WS04
Contract Ref: 313583	Start: 05.09.17 End: 05.09.17	Ground Level: 104.35	National Grid Co-ordinate: E:475088.9 N:250819.0	Sheet: 2 of 2

Progress	Samples / Tests				Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results						
4.00 - 5.00 (65mm dia) 70% rec	4.80		D				Firm greenish grey silty CLAY. (WEATHERED RUTLAND FORMATION) *(stratum copied from 1.40m from previous sheet)*			
	4.90-5.28	5	SPT(c)	N:50 for 229mm				99.07	5.28	
							Window sample hole terminated at 5.28m depth.			

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: 1:25

Method Used: Tracked window sampling	Plant Used: Premier 110	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Roade Bypass	**Roxhill**	**WS05**

Contract Ref:	Start / End	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	Start: **05.09.17** End: **05.09.17**	**102.94**	**E:475094.7 N:250779.9**	**1** of **1**

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thick ness)	Material Graphic Legend
	0.20	1	ES				MADE GROUND: Grass over dark brown slightly silty slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of quartzite, brick and coal. (MADE GROUND)	102.54	(0.40) 0.40	
	0.20		PID	0.0ppm						
	0.30	2	D							
	0.50	3	D				Firm grey occasionally mottled orangish brown silty slightly sandy slightly gravelly CLAY/ Gravel is angular to subrounded fine to coarse of quartzite, flint and chalk fragments. (GLACIAL TILL)	101.64	(0.90) 1.30	
	0.80	6	B							
	0.90	4	D							
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=37			Stiff greenish grey very clayey slightly sandy slightly gravelly SILT. Gravel is angular to subrounded fine to coarse of chalk fragments. (WEATHERED RUTLAND FORMATION)	98.49	(3.15) 4.45	
	1.20	5	D				. . . from 1.35m to 1.40m pocket of silt.			
	1.70	7	D				. . . from 1.50m to 1.55m band of extremely weak siltstone.			
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	2	SPT(c)	N=21						
	2.00	9	D							
	2.70	8	D				. . . at 2.80m increase in siltstone gravel.			
3.00 - 4.00 (65mm dia) 100% rec	3.00-3.45	3	SPT(c)	N=31						
	3.70	10	D							
	4.00-4.30	4	SPT(c)	N:50 for 154mm						
							Window sample hole terminated at 4.45m depth.			

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 4.00m bgl.

All dimensions in metres | Scale: **1:35**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**DSUK LTD**	**MSouthworth**	TMB

AGS

WINDOW SAMPLE LOG

Contract: Roade Bypass	Client: Roxhill	Window Sample: WS06

Contract Ref: 313583	Start: 05.09.17 End: 05.09.17	Ground Level: 97.15	National Grid Co-ordinate: E:475179.7 N:250728.3	Sheet: 1 of 2

Progress Window Run	Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	0.10 0.10	1	ES PID	0.0ppm			Grass over dark brown sandy slightly gravelly CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse of quartzite. (TOPSOIL)	96.85	(0.30) 0.30	
	0.50 0.70	2 3	B D				Firm orangish brown sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of quartzite and flint. (GLACIAL TILL)	96.35	(0.50) 0.80	
	1.00 1.20-1.65	4 1	D SPT(c)	 N=18			Light yellowish brown clayey slightly sandy slightly gravelly SILT. Gravel is angular to subrounded fine to coarse of siltstone. (WEATHERED RUTLAND FORMATION)	95.75	(0.60) 1.40	
1.20 - 2.00 (85mm dia) 100% rec	1.40-1.90 1.50 1.50	7 10 5	B ES D				Firm dark blackish brown to black silty organic rich CLAY with frequent roots and rootlets. (WEATHERED RUTLAND FORMATION)	95.25	(0.50) 1.90	
2.00 - 3.00 (75mm dia) 64% rec	2.00-2.45 2.00 3.00-3.45	2 6 3	SPT(c) D SPT(c)	N=10 N=9			Firm clayey slightly sandy slightly gravelly SILT. Gravel is angular to subrounded fine to coarse of siltstone. (WEATHERED RUTLAND FORMATION)	94.05	(1.20) 3.10	
3.00 - 4.00 (65mm dia) 100% rec	3.20	7	D				Light grey very silty SAND. (WEATHERED RUTLAND FORMATION)	93.50	(0.55) 3.65	
4.00 - 5.00 (55mm dia) 100% rec	4.00-4.45 4.00	4 8	SPT(c) D	N=10			Firm light grey occasionally mottled orangish brown silty CLAY. (WEATHERED RUTLAND FORMATION)			

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater encontered at 3.50m bgl.
4. Gas and groundwater monitoring well installed to 4.00m bgl.

All dimensions in metres | Scale: 1:25

Method Used: Tracked window sampling	Plant Used: Premier 110	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB

AGS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Roade Bypass	**Roxhill**	**WS06**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	**05.09.17** End: **05.09.17**	**97.15**	**E:475179.7 N:250728.3**	**2** of **2**

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
4.00 - 5.00 (55mm dia) 100% rec	4.50	9	D				Firm light grey occasionally mottled orangish brown silty CLAY. (WEATHERED RUTLAND FORMATION) *(stratum copied from 3.65m from previous sheet)*		(1.80)	
	5.00-5.45	5	SPT(c)	N=32				91.70	5.45	
							Window sample hole terminated at 5.45m depth.			

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**DSUK LTD**	**MSouthworth**	TMB

AGS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Roade Bypass	**Roxhill**	**WS07**

Contract Ref:	Start: **05.09.17** / End: **05.09.17**	Ground Level:	National Grid Co-ordinate:	Sheet:
313583		**102.01**	**E:475127.9 N:250660.3**	**1** of **1**

Progress: Window Run	Samples / Tests: Depth	No	Type	Results
	0.20	1	ES	
	0.20		PID	0.0ppm
	0.50	2	D	
	1.00	3	D	
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=30
	1.20	4	D	
	1.90	5	D	
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	2	SPT(c)	N=31
	2.90	6	D	
3.00 - 4.00 (65mm dia) 100% rec	3.00-3.45	3	SPT(c)	N=33
	3.90	7	D	
	4.00-4.45	4	SPT(c)	N:50 for 295mm

Description of Strata	Reduced Level	Depth (Thickness)
Grass over dark brown sand slightly gravelly CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse of chalk and quartzite. (TOPSOIL)	101.71	0.30
Firm orangish brown very sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of quartzite. (GLACIAL TILL)	101.31	(0.40) 0.70
Stiff light yellowish brown clayey slightly sandy slightly gravelly SILT. Gravel is angular to subrounded fine to coarse of siltstone. (WEATHERED RUTLAND FORMATION)	100.21	(1.10) 1.80
Extremely weak light yellowish brown slightly laminated SILTSTONE. (WEATHERED RUTLAND FORMATION)	99.91	2.10
Firm to stiff light yellowish brown clayey slightly sandy slightly gravelly SILT. Gravel is angular to subrounded fine to coarse of siltstone. (WEATHERED RUTLAND FORMATION)	99.71	2.30
Stiff to very stiff greenish grey silty slightly sandy CLAY. (WEATHERED RUTLAND FORMATION) . . . at 2.80m occasional iron staining. . . . at 3.10m mudstone lithorelicts.	97.56	(2.15) 4.45
Window sample hole terminated at 4.45m depth.		

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 2.50m bgl.

All dimensions in metres | Scale: **1:35**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**DSUK LTD**	**MSouthworth**	TMB

AGS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Roade Bypass	**Roxhill**	**WS08**

Contract Ref:	Start: **05.09.17**	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	End: **05.09.17**	**101.76**	**E:475122.6 N:250604.3**	**1** of **2**

Progress: Window Run	Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
							Grass over sandy slightly gravelly CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse of quartzite. (TOPSOIL)	101.46	(0.30) 0.30	
	0.40 0.40	1	ES PID	0.0ppm			Firm orangish brown sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of flint and quartzite. (GLACIAL TILL)	100.96	(0.50) 0.80	
	0.60	2	D							
	0.70	5	B							
	0.90	3	D				Stiff to very stiff light yellowish brown clayey slightly sandy slightly gravelly SILT. Gravel is angular to subangular fine to coarse of siltstone and rare limestone. (WEATHERED RUTLAND FORMATION)			
	1.10	4	D							
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=37						
	1.80	7	D				. . . from 1.80m to 1.90m thin band of extremely weak siltstone.		(2.10)	
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45 2.00	2 8	SPT(c) D	N=46				98.86	2.90	
3.00 - 4.00 (65mm dia) 87% rec	3.00-3.45	3	SPT(c)	N=36			Stiff to very stiff grey silty CLAY with occasional mudstone lithorelicts. (WEATHERED RUTLAND FORMATION)			
	3.40	9	D							
4.00 - 5.00 (65mm dia) 81% rec	4.00-4.45	4	SPT(c)	N=35					(2.55)	
	4.40	10	D							

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 3.00m bgl.

All dimensions in metres | Scale: **1:25**

Method Used: **Tracked window sampling** | Plant Used: **Premier 110** | Drilled By: **DSUK LTD** | Logged By: **MSouthworth** | Checked By: TMB

AGS

WINDOW SAMPLE LOG

Contract: Roade Bypass		Client: Roxhill		Window Sample: WS08
Contract Ref: 313583	Start: 05.09.17 End: 05.09.17	Ground Level: 101.76	National Grid Co-ordinate: E:475122.6 N:250604.3	Sheet: 2 of 2

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
4.00 - 5.00 (65mm dia) 81% rec	4.90-5.35	5	SPT(c)	N=49			Stiff to very stiff grey silty CLAY with occasional mudstone lithorelicts. (WEATHERED RUTLAND FORMATION) *(stratum copied from 2.90m from previous sheet)*	96.31	5.45	
							Window sample hole terminated at 5.45m depth.			

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: 1:25

Method Used: Tracked window sampling	Plant Used: Premier 110	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB

AGS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Roade Bypass	**Roxhill**	**WS09**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	**05.09.17** / End: **05.09.17**	**113.77**	**E:474968.6 N:250989.9**	**1** of **1**

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Water	Backfill & Instrumentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	0.20		ES				Grass over orangish brown very sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of quartzite, flint and chalk. (TOPSOIL)	113.37	(0.40) 0.40	
	0.20		PID	0.0ppm						
	0.60		D				Orangish brown silty sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of quartzite, chalk and flint. (GLACIAL TILL)			
	1.00		B							
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=40			. . . from 1.20m very stiff and mottled light grey. Gravel includes subangular to angular fine to coarse siltstone lithorelicts.	111.77	(1.60) 2.00	
	1.60		D							
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	2	SPT(c)	N=17			Firm stiff dark grey silty slightly sandy slightly gravelly CLAY. Gravel is subangular to angular of siltstone lithorelicts. (WEATHERED RUTLAND FORMATION)	110.77	(1.00) 3.00	
	2.60		D							
	3.00-3.24	3	SPT(c)	N:50 for 154mm			Window sample hole terminated at 3.00m depth due to refusal.			

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 3.00m bgl.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**DSUK LTD**	**MSouthworth**	DMB

AGS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Roade Bypass	**Roxhill**	**WS10**

Contract Ref:	Start: **06.09.17**	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	End: **06.09.17**	**117.97**	**E:474832.9 N:251829.0**	**1** of **1**

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Description of Strata	Reduced Level	Depth (Thickness)
					Crop over dark brown slightly gravelly sandy CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse of quartzite. (TOPSOIL)	117.67	0.30
	0.40	1	ES				
	0.40		PID	0.0ppm			
	0.50	3	B				
	0.60	2	D		Firm orangish brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subrounded fine to coarse of chal, quartzite, flint and ironstone. (GLACIAL TILL)		(1.30)
	1.10	6	D				
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=30	. . . becoming stiff from 1.20m.	116.37	1.60
	1.80		D		Firm to stiff light grey mottled orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of chalk and quartzite. (GLACIAL TILL)		
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	2	SPT(c)	N=22			(1.60)
	2.80		D			114.77	3.20
3.00 - 4.00 (65mm dia) 100% rec	3.00-3.45	3	SPT(c)	N=18	Stiff dark grey mottled orangish brown silty CLAY. (GLACIAL TILL)		(1.25)
	3.80		D				
	4.00-4.44	4	SPT(c)	N:50 for 290mm		113.52	4.45
					Window sample hole terminated at 4.45m depth due to refusal.		

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 4.00m bgl.

All dimensions in metres | Scale: **1:35**

Method Used: **Tracked window sampling** | Plant Used: **Premier 110** | Drilled By: **DSUK LTD** | Logged By: **MSouthworth** | Checked By: DMB

AGS

WINDOW SAMPLE LOG

Contract: Roade Bypass	Client: Roxhill	Window Sample: WS11
Contract Ref: 313583	Start: 06.09.17 End: 06.09.17 / Ground Level: 121.33 / National Grid Co-ordinate: E:475066.5 N:252232.3	Sheet: 1 of 2

Progress Window Run	Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	0.20 0.20		ES PID	 0.0ppm			Grass over dark brown slightly sandy slightly gravelly CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse of quartzite. (GLACIAL TILL/POSSIBLE MADE GROUND)	121.03	(0.30) 0.30	
	0.60		D				Firm to stiff brown grey mottled orange silty slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse chalk, flint and quartzite. (GLACIAL TILL/POSSIBLE MADE GROUND) (POSSIBLE MADE GROUND)			
	1.00		B							
1.20 - 2.00 (87mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=22			. . . becoming stiff from 1.20m. . . . becoming light orangish brown from 1.30m		(2.30)	
	1.50		D							
2.00 - 3.00 (77mm dia) 100% rec	2.00-2.45	2	SPT(c)	N=23						
	2.50		D					118.73	2.60	
							Firm to stiff orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse subangular to subrounded fine to coarse of quartzite, flint and quartzite. (GLACIAL TILL)			
3.00 - 4.00 (67mm dia) 80% rec	3.00-3.45	3	SPT(c)	N=15						
	3.50		D						(2.64)	
4.00 - 5.00 (57mm dia) 100% rec	4.00-4.45	4	SPT(c)	N=26			. . . becoming stiff from 4.00m			

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 5.00m bgl.

All dimensions in metres | Scale: 1:25

Method Used: Tracked window sampling	Plant Used: Premier 110	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB

AGS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Roade Bypass	Roxhill	WS11

Contract Ref:	Start: 06.09.17	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	End: 06.09.17	121.33	E:475066.5 N:252232.3	2 of 2

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
4.00 - 5.00 (57mm dia) 100% rec	4.50		D				Firm to stiff orangish brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse subangular to subrounded fine to coarse of quartzite, flint and quartzite. (GLACIAL TILL) *(stratum copied from 2.60m from previous sheet)*	116.10	5.24	
	4.80-5.24	5	SPT(c)	N:50 for 285mm						
							Window sample hole terminated at 5.24m depth due to refusal.			

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: 1:25

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	Premier 110	DSUK LTD	MSouthworth	JMB

AGS

WINDOW SAMPLE LOG

Contract: Roade Bypass	Client: Roxhill	Window Sample: WS12
Contract Ref: 313583	Start: 06.09.17 End: 06.09.17	Ground Level: 119.74
National Grid Co-ordinate: E:475138.6 N:252273.3	Sheet: 1 of 2	

Progress: Window Run	Samples / Tests: Depth	No	Type	Results	Water	Description of Strata	Reduced Level	Depth (Thickness)
						Grass over dark brown slightly sandy slightly gravelly CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse of quartzite. (POSSIBLE MADE GROUND)	119.34	(0.40) 0.40
	0.30	1	ES					
	0.30		PID	0.0ppm				
						Firm greyish brown mottled orangish brown slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse of chalk, flint and quartzite. (POSSIBLE MADE GROUND)	117.84	(1.50) 1.90
	0.80	2	D					
	0.90	4	B					
	1.10	3	D					
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT(c)	N=9				
	1.60	5	D					
						Firm dark grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse of chalk. (GLACIAL TILL/POSSIBLE MADE GROUND) (POSSIBLE MADE GROUND)	117.44	(0.40) 2.30
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	2	SPT(c)	N=11				
	2.00	6	D					
						Firm orangish brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine to coarse of chalk and quartzite. (GLACIAL TILL/POSSIBLE MADE GROUND) (POSSIBLE MADE GROUND)		(3.15)
	2.60	7	D					
3.00 - 4.00 (65mm dia) 100% rec	3.00-3.45	3	SPT(c)	N=15		. . . becoming firm to stiff from 3.00m bgl		
	3.50	8	D			. . . from 3.40m to 3.60m pockets of dark grey clay.		
4.00 - 5.00 (65mm dia) 100% rec	4.00-4.45	4	SPT(c)	N=20		. . . becoming stiff from 4.00m.		

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR prior to breaking ground. No Services encountered.
2. Hand dug inspection pit to 1.20m bgl,
3. Groundwater not encontered.
4. Gas and groundwater monitoring well installed to 5.00m bgl.

All dimensions in metres | Scale: 1:25

Method Used: Tracked window sampling	Plant Used: Premier 110	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB

AGS

WINDOW SAMPLE LOG

Contract: Roade Bypass		Client: Roxhill		Window Sample: WS12
Contract Ref: 313583	Start: 06.09.17 End: 06.09.17	Ground Level: 119.74	National Grid Co-ordinate: E:475138.6 N:252273.3	Sheet: 2 of 2

Progress Window Run	Samples / Tests Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
4.00 - 5.00 (65mm dia) 100% rec	5.00-5.45	5	SPT(c)	N=31			Firm orangish brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine to coarse of chalk and quartzite. (GLACIAL TILL/POSSIBLE MADE GROUND) (POSSIBLE MADE GROUND) *(stratum copied from 2.30m from previous sheet)*	114.29	5.45	
							Window sample hole terminated at 5.45m depth.			

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: 1:25

Method Used: Tracked window sampling	Plant Used: Premier 110	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB

AGS

BOREHOLE LOG

Contract: Roade Bypass	Client: Roxhill	Borehole: BH01
Contract Ref: 313583	Start: 18.09.17 End: 20.09.17	Ground Level: 119.70
National Grid Co-ordinate: E:475141.6 N:252265.6	Sheet: 1 of 4	

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
0.50	1	ES								Grass over firm to stiff grey brown mottled orange silty slightly sandy slighty gravelly CLAY with occasional limestone cobbles and boulders. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, flint, chalk and limestone. (GLACIAL TILL/POSSIBLE MADE GROUND)			
0.50		PID	0.0ppm										
0.60	2	D											
0.60		PID	0.0ppm										
1.00-1.45	1	SPT	N=11										
1.60	3	D											
1.60		PID	0.0ppm										
2.00-2.45	2	SPT	N=16										
2.60	4	D										(5.30)	
2.60		PID	0.0ppm										
3.00-3.45	3	SPT	N=24							. . . stiff from 3.00m bgl.			
										. . . becoming brown orange in colour from 3.50m			
4.00-4.45	4	SPT	N=14										
5.00-5.45	5	SPT	N=18							. . . stiff from 5.00m bgl.	114.40	5.30	
										Stiff dark grey light grey mottled brown silty slightly sandy gravelly CLAY with occasional cobbles of limestone. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse limestone. Cobbles are subangular 100mm to 250mm bgl. (GLACIAL TILL)			
5.60	5	D											
5.60		PID	0.0ppm										
6.00-6.45	6	SPT	N=19										
6.60	6	D											
6.60		PID	0.0ppm										
7.00-7.45	7	SPT	N=24									(3.70)	
7.60	7	D											
7.60		PID	0.0ppm										
8.00-8.45	8	SPT	N=24										
8.60	8	D											
8.60		PID	0.0ppm							. . . brown orange at 8.70m bgl.	110.70	9.00	

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
19/09/17		1.00	None	300	
19/09/17		19.50	9.00	123	Dry
19/09/17		19.50	9.00	123	Dry
19/09/17		30.00	9.00	123	Dry

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hand dug inspection pit tp 1.20m bgl.
3. Groundwater not encountered.
4. Gas and groundwater monitoring well installed to 20.00m bgl upon completion.

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: TMB

BOREHOLE LOG

Contract:	Client:	Borehole:
Roade Bypass	**Roxhill**	**BH01**

Contract Ref:	Start: **18.09.17** End: **20.09.17**	Ground Level:	National Grid Co-ordinate:	Sheet:
313583		**119.70**	**E:475141.6 N:252265.6**	**2** of **4**

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
9.00-10.00				35	19	0				Medium strong dark grey silty MUDSTONE with horizontal medium spaced planar stepped clean fracture. (BLISWORTH LIMESTONE FORMATION)		(1.00)	
9.00-9.45	9	SPT	N=48							. . . mottled light grey from 9.60m bgl.			
9.00-9.19	9	C								. . . band of firm clay from 9.60m to 9.70m bgl.	109.70	10.00	
10.00-11.50				100	92	80				Very to extremely strong light grey LIMESTONE with horizontal to vertical closely spaced planar smooth clean fractures. (BLISWORTH LIMESTONE FORMATION)			
10.15	10	D								. . . mottled brown beige from 10.65m bgl.			
10.15		PID	0.0ppm							. . . band of soft grey clay from 11.10m to 11.15m bgl.			
11.50-13.00				97	79	75							
11.83-12.00	11	C											
12.00-12.06	10	SPT	N:30 for 10mm							. . . band of very soft dark grey clay from 12.00, to 12.05m bgl.		(5.20)	
13.00-14.50				93	78	68							
13.20-13.50	12	C											
13.40	13	D								. . . light grey in colour from 13.50m bgl.			
13.40		PID	0.0ppm										
14.50-16.00				82	81	68							
14.80-15.00	14	C											
15.00-15.06	11	SPT	N:50 for 20mm								104.50	15.20	
										Medium strong to strong dark grey silty MUDSTONE with horizontal to vertical closely spaced planar smooth tight clean fractures. (BLISWORTH LIMESTONE FORMATION)	104.20	15.50	
15.60	15	D								Very to extremely strong grey LIMESTONE with horizontal close to medium space planar smooth partly open clean fractures. (BLISWORTH LIMESTONE FORMATION)		(1.95)	
15.60		PID	0.0ppm										
16.00-17.50				91	80	79							
16.70-16.95	16	C									102.25	17.45	
17.50-19.00				93	85	81				*Description on next sheet*			

Description on next sheet

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: **1:50**

Method Used: **Rotary Cored**	Plant Used: **Comacchio GEO 205**	Drilled By: **DSUK LTD**	Logged By: **RSalama**	Checked By: DMB

AGS

BOREHOLE LOG

Contract: Roade Bypass	Client: Roxhill	Borehole: BH01
Contract Ref: 313583	Start: 18.09.17 End: 20.09.17 · Ground Level: 119.70 · National Grid Co-ordinate: E:475141.6 N:252265.6	Sheet: 3 of 4

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
18.00-18.03	12	SPT	N:50 for 20mm	93	85	81				Medium strong to strong grey silty MUDSTONE with horizontal closely spaced planar smooth and rough tight to partly open fractures. (POSSIBLE RUTLAND FORMATION) *(stratum copied from 17.45m from* previous sheet) . . . light blue grey from 18.00m to 19.30m bgl. . . . dark grey from 19.30m to 19.70m bgl.			
19.00-20.00				55	20	20							
19.30-19.40	17	C											
19.50	18	D											
19.50		PID	0.0ppm										
20.00-21.00				49	26	16						(5.75)	
20.60-20.80	19	C											
21.00-22.50				59	56	56				. . . dark grey from 21.00m bgl.			
21.00-21.07	13	SPT	N:50 for 40mm										
22.50-24.00				85	82	41					96.50	23.20	
23.20	20	D								Extremely strong grey LIMESTONE with horizontal close to medium spaced planar smooth partly open clean fractures. (POSSIBLE RUTLAND FORMATION)			
23.20		PID	0.0ppm										
23.80-24.00	21	C										(1.60)	
24.00-25.50				100	95	88				. . . band of medium strong to strong silty mudstone from 24.30m to 24.45m bgl.			
24.00-24.03	14	SPT	N:50 for 20mm										
24.70	22	D									94.90	24.80	
24.70		PID	0.0ppm							Strong grey silty MUDSTONE with vertical to sub-horizontal closely to medium spaced planar smooth and rough tight to partly open fractures with shell fragments. (POSSIBLE RUTLAND FORMATION)			
25.50-27.00				100	97	93				. . . dark grey from 26.00m bgl.			

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: DMB

AGS

BOREHOLE LOG

Contract: Roade Bypass		Client: Roxhill		Borehole: BH01
Contract Ref: 313583	Start: 18.09.17 End: 20.09.17	Ground Level: 119.70	National Grid Co-ordinate: E:475141.6 N:252265.6	Sheet: 4 of 4

Depth (m)	Samples & Testing No	Type	Results	Mechanical Log TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
27.00-28.50				63	61	61				Strong grey silty MUDSTONE with vertical to sub-horizontal closely to medium spaced planar smooth and rough tight to partly open fractures with shell fragments. (POSSIBLE RUTLAND FORMATION) *(stratum copied from 24.80m from* previous sheet)		(5.30)	
27.00-27.32	15	SPT	N:50 for 170mm										
28.15-28.50	23	C											
28.50-30.00				70	59	55					89.60	30.10	
30.00-30.10	16	SPT	N:50 for 85mm							Borehole terminated at 30.10m bgl.			

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: DMB

BOREHOLE LOG

Contract:	Client:	Borehole:
Roade Bypass	Roxhill	BH02

Contract Ref:	Start: / End:	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	Start: 15.09.17 End: 18.09.17	121.45	E:475077.5 N:252210.1	1 of 4

Samples & Testing / Mechanical Log

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)
0.70	1	D					
0.70		PID	0.0ppm				
1.00-1.45	1	SPT	N=7				
1.20	2	ES					
1.20		PID	0.0ppm				
1.70	3	D					
1.70		PID	0.0ppm				
2.00-2.45	2	SPT	N=16				
2.70	4	D					
2.70		PID	0.0ppm				
3.00-3.45	26	UT	100% recovery				
3.70	5	D					
3.70		PID	0.0ppm				
4.70-5.15	3	SPT	N=16				
4.70	6	D					
4.70		PID	0.0ppm				
5.70-6.10	4	SPT	N=29				
5.70	7	D					
5.70		PID	0.0ppm				
6.70-6.82	5	SPT	N:50 for 70mm				
6.70	8	D					
6.70		PID	0.0ppm				
7.00	9	D					
7.00		PID	0.0ppm				
8.50-10.00				23	13	0	
8.50-8.95	6	SPT	N=44				

Description of Strata

Description of Strata	Reduced Level	Depth (Thickness)
Firm to stiff grey mottled brown red orange silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, flint and limestone with occasional limestone cobbles and boulders. (GLACIAL TILL/POSSIBLE MADE GROUND)	119.65	(1.80) 1.80
Firm to stiff brown orange silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, flint and limestone with frequent limestone cobbles. (GLACIAL TILL/POSSIBLE MADE GROUND)	118.25	(1.40) 3.20
Firm to stiff grey mottled brown red orange silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular gular to subrounded fine to coarse quartzite, flint and limestone. (GLACIAL TILL/POSSIBLE MADE GROUND)	117.55	(0.70) 3.90
. . . dark grey mottled brown from 3.70m to 4.80m bgl.	116.65	(0.90) 4.80
Firm to stiff brown orange silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, flint and limestone with frequent limestone cobbles. (GLACIAL TILL/POSSIBLE MADE GROUND)		
Firm light grey mottled brown orange silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse quartzite, flint and limestone with frequent limestone cobbles. (GLACIAL TILL)	114.75	(1.90) 6.70
. . . light grey mottled brown between 4.80m to 5.10m bgl.		
Stiff grey CLAY with thin bands of limestone. (WEATHERED BLISWORTH LIMESTONE FORMATION)	112.95	(1.80) 8.50
Description on next sheet		

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
14/09/17		11.50	10.00	300	11.30
15/09/17		24.00	10.00	123	21.40
18/09/17		30.00	10.00	123	21.30

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hand dug inspection pit tp 1.20m bgl.
3. Groundwater encountered at 25.20m bgl and rose to 23.60m after 20 minutes.
4. Gas and groundwater monitoring well installed to 30.00m bgl upon completion.

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: DMB

AGS

BOREHOLE LOG

Contract: Roade Bypass	Client: Roxhill	Borehole: BH02
Contract Ref: 313583	Start: 15.09.17 End: 18.09.17 · Ground Level: 121.45 · National Grid Co-ordinate: E:475077.5 N:252210.1	Sheet: 2 of 4

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Description of Strata	Reduced Level	Depth (Thickness)
				23	13	0		Stiff silty CLAY with limestone cobbles. (WEATHERED BLISWORTH LIMESTONE FORMATION) *(stratum copied from 8.50m from previous sheet)*		(1.60)
10.00-11.50									111.35	10.10
10.00-10.45	7	SPT	N=44					Extremely weak grey silty MUDSTONE. (BLISWORTH LIMESTONE FORMATION)	111.05	10.40
10.60	10	D						Strong to very strong silty LIMESTONE. (BLISWORTH LIMESTONE FORMATION)		
10.60		PID	0.0ppm	100	92	80				(1.10)
11.15-11.50	11	C						. . . band of firm grey silty clay from 11.10m to 11.16m bgl.	109.95	11.50
11.50-13.00								Soft grey silty gravelly CLAY. Gravel is subangular fine to coarse limestone with horizontal to vertical close to medium spaced planar smooth clean fractures. (BLISWORTH LIMESTONE FORMATION)	109.75	11.70
11.50-11.58	8	SPT	N:50 for 45mm							
12.00		PID	0.0ppm							
12.27-12.54	12	C		97	79	75		Strong to very strong grey LIMESTONE with horizontal to subhorizontal with close to medium spaced planar smooth clean fractures. (BLISWORTH LIMESTONE FORMATION)		
13.00-14.50								. . . mottled brown from 12.10m to 12.60m bgl.		
13.50-13.55	13	D						. . . mottled brown from 13.00m to 13.60m bgl.		
13.50		PID	0.0ppm	93	78	68				(4.50)
13.57-13.77	14	C								
14.50-16.00										
14.50-14.56	9	SPT	N:50 for 30mm							
				82	81	68				
15.70	15	D						. . . band of very stiff clay from 15.60m to 15.65m bgl.		
15.70		PID	0.0ppm						105.25	16.20
16.00-17.50								Weak dark grey silty MUDSTONE with closely spaced vertical partly open clean fracture. (BLISWORTH LIMESTONE FORMATION)		
16.00-16.20	16	C							104.85	16.60
				91	80	79		Very strong to Extremely strong grey silty LIMESTONE with medium space horizontal tight fractures. (BLISWORTH LIMESTONE FORMATION)		(2.05)
17.50-19.00										
17.50-17.60	10	SPT	N:50 for 50mm	93	85	81				

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored | Plant Used: Comacchio GEO 205 | Drilled By: DSUK LTD | Logged By: RSalama | Checked By: DMB

BOREHOLE LOG

Contract: Roade Bypass	Client: Roxhill	Borehole: BH02
Contract Ref: 313583	Start: 15.09.17 End: 18.09.17	Ground Level: 121.45	National Grid Co-ordinate: E:475077.5 N:252210.1	Sheet: 3 of 4

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										. . . band of very stiff clay from 17.45m to 17.50m bgl.			
18.50-18.60	17	C		93	85	81					102.80	18.65	
19.00-20.00										Extremely to very weak dark grey silty MUDSTONE with closely spaced horizontal - subhorizontal tight to party open clean and clay infilled fractures. (POSSIBLE RUTLAND FORMATION)			
19.00	18	D								. . . mottled blue from 19.00m bgl.			
19.00		PID	0.0ppm	55	20	20							
20.00-21.00													
20.00-20.23	11	SPT	N:50 for 95mm	49	26	16							
21.00-22.50												(5.35)	
				59	56	56							
22.17-22.40	19	C											
22.50-24.00										. . . band of stiff clay from 22.50, to 22.60m bgl.			
22.50-22.53	12	SPT	N:50 for 20mm										
23.00	20	D											
23.00		PID	0.0ppm	85	82	41			1				
										. . . band of very stiff clay from 23.60m to 23.80m bgl.	97.45	24.00	
24.00-25.50										Extremely strong grey silty LIMESTONE with horizontal to subhorizontal close to medium spaced planar smooth clean fractures. (POSSIBLE RUTLAND FORMATION)		(1.40)	
				100	95	88			1				
25.05-25.70	21	C									96.05	25.40	
25.50-27.00										Weak to strong grey MUDSTONE with medium spaced horizontal planar smooth partly open to open clean fractures. (POSSIBLE RUTLAND FORMATION)			
25.50-25.54	13	SPT	N:50 for 20mm							. . . band of soft silty clay from 25.50m to 25.60m bgl.			
25.50	22	D											
25.50		PID	0.0ppm	100	97	93							
26.77-27.00	23	C											

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: DMB

AGS

BOREHOLE LOG

Contract:	Client:	Borehole:
Roade Bypass	Roxhill	BH02

Contract Ref:	Start: 15.09.17	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	End: 18.09.17	121.45	E:475077.5 N:252210.1	4 of 4

Depth (m)	Samples & Testing No	Type	Results	Mechanical Log TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
27.00-28.50				63	61	61				Weak to strong grey MUDSTONE with medium spaced horizontal planar smooth partly open to open clean fractures. (POSSIBLE RUTLAND FORMATION) *(stratum copied from 25.40m from* previous sheet) . . . dark grey from 27.00m to 28.20m bgl.		(4.60)	
28.30	24	D											
28.30		PID	0.0ppm										
28.50-30.00				70	59	55				. . . mottled blue from 29.20m to 29.80m bgl.			
28.50-28.75	14	SPT	N:50 for 160mm										
29.10-29.40	25	C									91.45	30.00	
										Borehole terminated at 30.00m bgl.			

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: DMB

AGS

BOREHOLE LOG

Contract:	Client:	Borehole:
Roade Bypass	Roxhill	BH03

Contract Ref:	Start: 12.09.17	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	End: 13.09.17	119.60	E:474853.9 N:251919.4	1 of 2

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										Grass over dark brown slightly gravelly sandy CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse quartzite. (TOPSOIL)	119.30	0.30	
1.00-1.45	1	SPT	N=43							Firm orange brown slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse chalk fragments, quartzite and flint. (GLACIAL TILL)			
1.00	1	D											
1.00		PID	0.0ppm										
1.50	2	D										(2.70)	
2.00	3	D											
2.00		PID	0.0ppm								116.60	3.00	
3.00-3.32	2	SPT	N:50 for 170mm							Firm dark brown grey slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse quartzite, flint and chalk. (GLACIAL TILL)			
3.00	4	D											
3.00		PID	0.0ppm									(1.50)	
4.00	5	D											
4.00		PID	0.0ppm								115.10	4.50	
4.50-6.00				37	8	7				Firm to stiff grey silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded medium coarse LIMESTONE. (WEATHERED BLISWORTH LIMESTONE FORMATION)			
4.50-4.95	3	SPT	N=43									(2.60)	
5.90	6	D											
5.90		PID	0.0ppm										
6.00-7.50				45	33	33							
6.00-6.45	4	SPT	N=45								112.50	7.10	
7.50-9.00				89	69	48			1	Strong dark grey fine grained silty LIMESTONE with close to medium spaced horizontal to vertical stepped and planar, rough and smooth clean fractures. (BLISWORTH LIMESTONE FORMATION) . . . with shell inclusions from 7.60m bgl. . . . beige brown from 7.90m to 8.20m bgl. . . . beige brown from 8.40m to 9.10m bgl.			
7.50-7.54	5	SPT	N:50 for 30mm										
8.20	7	D											
8.20		PID	0.0ppm										
8.35-8.60	8	C											

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
12/09/17		3.00	4.50	123	Dry
13/09/17		3.00	4.50	123	2.60
13/09/17		15.00	9.00	123	13.60

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hand dug inspection pit tp 1.20m bgl.
3. Groundwater encountered at 8.00m bgl.
4. Gas and groundwater monitoring well installed to 15.00m bgl upon completion.

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: TMB

AGS

BOREHOLE LOG

Contract: Roade Bypass	Client: Roxhill	Borehole: BH03
Contract Ref: 313583	Start: 12.09.17 End: 13.09.17 / Ground Level: 119.60 / National Grid Co-ordinate: E:474853.9 N:251919.4	Sheet: 2 of 2

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
9.00-10.50 9.00-9.03	6	SPT	N:50 for 20mm	89	56	45				Strong dark grey fine grained silty LIMESTONE with close to medium spaced horizontal to vertical stepped and planar, rough and smooth clean fractures. (BLISWORTH LIMESTONE FORMATION) *(stratum copied from 7.10m from previous sheet)* . . . stiff clay with sandstone gravels from 9.00m to 9.10m bgl. . . . beige brown from 9.20m to 9.40m bgl. . . . beige brown from 9.60m to 10.00m bgl. . . . beige brown from 11.20m to 13.00m bgl.		(6.20)	
10.50-12.00 10.50-10.71	7	SPT	N:50 for 125mm	91	59	52							
11.15-11.25 11.15	9	D PID	0.0ppm										
12.00-13.50 12.00-12.11 12.13-12.35	8 10	SPT C	N:50 for 70mm	87	67	53					106.30	13.30	
13.50-15.00 13.50-13.54 13.50 14.02-14.18	9 11	SPT PID C	N:50 for 30mm 0.0ppm	93	72	65				Extremely strong dark grey silty MUDSTONE. (RUTLAND FORMATION) . . . band of stiff clay from 13.50m to 13.60m bgl. . . . band of stiff clay with horizontal closely spaced planar smooth clean and clay infilled fractures from 14.600m to 14.65m bgl.		(1.75)	
14.90 15.00-15.05 15.00	12 10	D SPT PID	N:50 for 36mm 0.0ppm							Borehole termianted at 15.05m bgl.	104.55	15.05	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: TMB

BOREHOLE LOG

Contract: Roade Bypass	Client: Roxhill	Borehole: BH04
Contract Ref: 313583	Start: 11.09.17 End: 13.09.17	Ground Level: 115.71
National Grid Co-ordinate: E:474793.0 N:251226.6	Sheet: 1 of 3	

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										Grass over dark brown slightly gravelly sandy CLAY with frequent roots and rootlets. Gravel is angular to subrounded fine to coarse quartzite (TOPSOIL)	115.41	0.30	
1.00-1.45 1.00 1.00	1 1	SPT D PID	N=6 0.0ppm							Firm orange brown slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse chalk, quartzite and flint. (GLACIAL TILL)			
2.00-2.45 2.00 2.00	2 2	SPT D PID	N=11 0.0ppm									(3.70)	
3.00-3.45 3.00 3.00	3 3	SPT D PID	N=24 0.0ppm								111.71	4.00	
4.00-5.00 4.00-4.31 4.00 4.00 4.50	 4 4 5	 SPT D PID D	N:50 for 160mm 0.0ppm	90	17	12				Firm orange brown slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse chalk, quartzite and flint. (GLACIAL TILL)	111.61	4.10	
5.00-6.50 5.00-5.41 5.00	 5	 SPT PID	N:50 for 255mm 0.0ppm	87	40	35				Medium strong to strong yellow orange brown fine grained LIMESTONE with an occasional clayey matrix. Fractures are Extremely widely spaced dipping 25 - 45 degrees planar occasionally stepped smooth and clean. No staining noted on fractures. (WEATHERED BLISWORTH LIMESTONE FORMATION) . . . weak from 5.50m to 5.90m bgl.		(4.20)	
6.50-8.00 6.50-6.59	 6	 SPT	N:50 for 60mm	85	64	53				. . . shell inclusions from 7.80m bgl.	107.41	8.30	
8.00-9.50 8.00-8.30 8.00-8.03 8.00	 6 7	 C SPT PID	 N:50 for 20mm 0.0ppm	91	79	79				Medium strong to strong dark grey fine grained LIMESTONE with shell inclusions. (WEATHERED BLUE LIAS	107.01	8.70	

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
11/09/17		15.50	11.00	123	14.90
12/09/17		15.50	11.00	123	14.10
12/09/17		20.00	11.00	123	19.30

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hand dug inspection pit tp 1.20m bgl.
3. Groundwater not encountered.
4. Borehole backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB

AGS

BOREHOLE LOG

Contract:	Client:	Borehole:
Roade Bypass	Roxhill	BH04

Contract Ref:	Start: 11.09.17	Ground Level:	National Grid Co-ordinate:	Sheet:
313583	End: 13.09.17	115.71	E:474793.0 N:251226.6	2 of 3

Samples & Testing

Depth (m)	No	Type	Results
9.50-11.00			
9.50	7	D	
9.50-9.55	8	SPT	N:50 for 30mm
9.50		PID	0.0ppm
11.00-12.50			
11.00-11.05	9	SPT	N:50 for 40mm
12.00-12.35	8	C	
12.50-14.00			
12.50-12.95	10	SPT	N=44
14.00-15.50			
14.00	9	D	
14.00-14.39	11	SPT	N:50 for 241mm
14.00		PID	0.0ppm
15.50-17.00			
15.50-15.95	12	SPT	N=47
16.10-16.20	10	C	
17.00-18.50			
17.00-17.05	13	SPT	N:50 for 40mm

Mechanical Log

Core run (m)	TCR (%)	SCR (%)	RQD (%)	If (mm)
to 9.50	91	79	79	
9.50-11.00	85	73	68	
11.00-12.50	68	53	53	
12.50-14.00	47	36	36	
14.00-15.50	68	61	55	
15.50-17.00	93	77	77	
17.00-18.50	95	72	53	

Description of Strata

Description of Strata	Reduced Level	Depth (Thickness)
FORMATION) (BLISWORTH LIMESTONE FORMATION)		(0.80)
Medium strong to strong yellow orange brown fine grained LIMESTONE with an occasional clayey matrix. Fractures are 35 to 45 degrees stepped smooth clean with occasional fractures infilled with clay. No staining identified upon fractures. (BLISWORTH LIMESTONE FORMATION) *(stratum copied from 8.70m from previous sheet)* . . . shell inclusions from 9.40m bgl.	106.21	9.50
Stiff to very stiff dark grey silty CLAY with occasional pockets of orange brown silt. (RUTLAND FORMATION)	105.71	(0.50) 10.00
Strong light grey fine grained MUDSTONE. Fractures are 25 to 35 degrees planar and stepped smooth occasionally rough very wide and clean. (RUTLAND FORMATION) . . . pocket of dark grey silty clay from 10.90m to 10.95m bgl. . . . no recovery from 12.50m to 13.10m bgl.	102.41	(3.30) 13.30
Very stiff dark blue grey silty structured CLAY with frequent mudstone lithorelicts. Fractures are 35 to 45 planar smooth occasionally rough wide to Extremely wide and clean. (RUTLAND FORMATION)	99.71	(2.70) 16.00
Strong light grey fine grained MUDSTONE. Fractures are 25 to 35 planar smooth wide to Extremely wide and clean. (RUTLAND FORMATION)		(2.10)

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Rotary Cored	Comacchio GEO 205	DSUK LTD	MSouthworth	JMB

AGS

RSK

BOREHOLE LOG

Contract: Roade Bypass	Client: Roxhill	Borehole: BH04
Contract Ref: 313583	Start: 11.09.17 End: 13.09.17	Ground Level: 115.71
National Grid Co-ordinate: E:474793.0 N:251226.6	Sheet: 3 of 3	

Depth (m)	Samples & Testing No	Type	Results	Mechanical Log TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
				95	72	53				Medium strong to strong dark grey fine grained MUDSTONE. Fractures are 25 to 35 planar smooth wide to Extremely wide and open. (RUTLAND FORMATION)	97.61	18.10	
18.50-20.00													
18.50	11	D											
18.50-18.77	14	SPT	N:50 for 160mm										
18.50		PID	0.0ppm									(2.35)	
				100	80	80							
19.50-19.90	12	C								. . . becoming light grey from 19.50m bgl.			
20.00-20.10	15	SPT	N:50 for 60mm										
											95.26	20.45	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: MSouthworth	Checked By: TMB

AGS

BOREHOLE LOG

Contract: Roade Bypass		Client: Roxhill		Borehole: BH05
Contract Ref: 313583	Start: 07.09.17 End: 08.09.17	Ground Level: 101.76	National Grid Co-ordinate: E:475105.8 N:250762.3	Sheet: 1 of 3

Depth (m)	Samples & Testing No	Type	Results	Mechanical Log TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
										Brown silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse flint, quartzite and limestone. (TOPSOIL)	101.46	0.30	
1.00-1.45	1	SPT	N=30							Soft to firm light grey mottled brown orange silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse quartzite, flint and limestone. (GLACIAL TILL) . . . stiff from 1.20m bgl.		(2.70)	
1.00		PID	0.0ppm										
1.30	1	ES											
1.30		PID	0.0ppm										
1.70	2	D											
2.00-2.45	2	SPT	N=22										
2.70	3	D											
2.70		PID	0.0ppm								98.76	3.00	
3.00-3.45	3	SPT	N=27							Very stiff grey mottled orange red silty slightly sandy CLAY. Sand is fine to coarse. (GLACIAL TILL)		(1.00)	
3.70	4	D											
3.70		PID	0.0ppm								97.76	4.00	
4.00-5.50				97	63	33				Stiff brown red silty slightly sandy CLAY. (WEATHERED BLISWORTH LIMESTONE FORMATION)	97.66	4.10	
4.00-4.36	4	SPT	N:50 for 210mm							Strong orange LIMESTONE with close to medium spaced horizontal to vertical planar smooth tight partly open gravel filled clean fractures. (BLISWORTH LIMESTONE FORMATION) . . . mottled light grey from 4.30m bgl.		(2.40)	
4.50-4.60	6	D											
4.50		PID	0.0ppm										
5.20-5.50	5	C											
5.50-7.00				64	59	13							
5.50-5.54	6	SPT	N:50 for 30mm								95.26	6.50	
										Firm grey silty CLAY with gravel sized mudstone lithorelicts. (RUTLAND FORMATION)		(1.10)	
7.00-8.50				85	76	64					94.16	7.60	
7.00-7.45	7	SPT	N=37						1	Extremely weak dark grey black MUDSTONE. (RUTLAND FORMATION)		(0.90)	
											93.26	8.50	
8.50-10.00				27	24	22				No recovery from 8.50m to 9.50m bgl.			ZCL
8.50-8.95	8	SPT	N=42						1				
8.80-9.00	7	C											

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
07/09/17		14.00	11.50	N/R	Dry
07/09/17		20.00	11.50	N/R	14.30

General Remarks

1. Location scanned with GPR prior to breaking ground. No services encountered.
2. Hand dug inspection pit tp 1.20m bgl.
3. Groundwater encountered at 9.00m bgl.
4. Gas and groundwater monitoring well installed to 12.00m bgl upon completion.

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: TMB

AGS

BOREHOLE LOG

Contract: Roade Bypass		Client: Roxhill		Borehole: BH05
Contract Ref: 313583	Start: 07.09.17 End: 08.09.17	Ground Level: 101.76	National Grid Co-ordinate: E:475105.8 N:250762.3	Sheet: 2 of 3

Depth (m)	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Description of Strata	Reduced Level	Depth (Thickness)
								No recovery from 8.50m to 9.50m bgl. *(stratum copied from 8.50m from previous sheet)*		(1.10)
9.40-9.50 9.40	8	D PID	0.0ppm	27	24	22			92.16	9.60
								Extremely weak dark grey black MUDSTONE. (RUTLAND FORMATION)	91.76	10.00
10.00-10.45	9	SPT	N=28					Grey silty slightly clayey SAND. (RUTLAND FORMATION) (STAMFORD MEMBER)		(1.50)
									90.26	11.50
11.50-12.50 11.50-11.95	10	SPT	N=42					Weak grey silty MUDSTONE. (RUTLAND FORMATION)	90.21	11.55 (0.55)
				70	55	10		Very stiff dark grey silty CLAY. (RUTLAND FORMATION)	89.66	12.10
12.30-12.40	9	C						Very stiff weak grey silty MUDSTONE with horizontal to subhorizontal close to medium spaced planar and stepped smooth and rough tight to open clean and clay infilled fractures. (RUTLAND FORMATION)		
12.50-14.00 12.50-12.95	11	SPT	N=43							
				76	52	39				
13.70-16.50 13.70	10	D PID	0.0ppm							
14.00-15.50 14.00-14.45	12	SPT	N=42					. . . band of frim grey silty clay from 13.95m to 14.03m bgl.		(4.90)
				87	67	58				
								. . . band of soft to firm grey silty clay from 15.00m to 15.20m bgl.		
15.50-17.00 15.50-15.95	13	SPT	N=46							
				100	87	62		. . . band of soft to firm grey silty clay from 16.10m to 16.30m bgl.		
									84.76	17.00
17.00-18.50 17.00-17.39	14	SPT	N:50 for 235mm					Very stiff grey silty CLAY with gravel sized MUDSTONE lithorelicts. (RUTLAND FORMATION)	84.46	17.30
				100	68	54		*Description on next sheet*		

ZCL

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: TMB

AGS

BOREHOLE LOG

Contract: Roade Bypass	Client: Roxhill	Borehole: BH05

Contract Ref: 313583	Start: 07.09.17 End: 08.09.17	Ground Level: 101.76	National Grid Co-ordinate: E:475105.8 N:250762.3	Sheet: 3 of 3

Depth (m)	Samples & Testing No	Type	Results	Mechanical Log TCR (%)	SCR (%)	RQD (%)	If (mm)	Backfill & Instru-mentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
				100	68	54				Weak grey silty MUDSTONE with closely spaced, subhorizontal, planar smooth closed fractures. (RUTLAND FORMATION) *(stratum copied from 17.30m from previous sheet)*	82.76	(1.70) 19.00	
18.50-20.00													
18.50-18.94	15	SPT	N:50 for 285mm										
				60	20	9				Soft grey silty CLAY. (RUTLAND FORMATION)	82.06	(0.70) 19.70	
20.00-20.45	16	SPT	N=47							Extremely weak grey silty MUDSTONE with closely to medium spaced planar smooth partly open to open clean fractures horizontal to subhorizontal. (RUTLAND FORMATION)	81.31	(0.75) 20.45	
										Borehole terminated at 20.45m bgl.			

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

General Remarks

All dimensions in metres | Scale: 1:50

Method Used: Rotary Cored	Plant Used: Comacchio GEO 205	Drilled By: DSUK LTD	Logged By: RSalama	Checked By: DMB

APPENDIX F
GROUND GAS MONITORING DATA

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks
Round 1	-	Fluctuating	1004	1003	Weather: Cloudy + Ground: Wet + Wind: Light + Air Temp: 15DegC
Round 2	-	Fluctuating	1001	1003	GA5000 + Dipmeter + Weather: Cloudy + Ground: Damp + Wind: Medium + Air Temp: 12DegC
Round 3	-	Rising	1007	1009	Weather: Clear + Ground: Dry + Wind: Light + Air Temp: 15DegC
Round 4	-	Fluctuating	1002	993	

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH01	1	50	1	20.00	---	10.00 to 20.00	28/09/2017 09:05:00	1001	1001	-0.1$_{(I)}$	-	-	-	-	-	-	-
BH01	1	50	1		---	10.00 to 20.00	30 secs	-	-	-0.1$_{(SS)}$	-	-	-	-	-	-	-
BH01	1	50	1 (2)	20.00	---	10.00 to 20.00	28/09/2017 09:06:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH01	1	50	1 (2)		---	10.00 to 20.00	15 secs	-	-	-	-	0.1	0.0	21.0	0.0	1	0
BH01	1	50	1 (2)		---	10.00 to 20.00	30 secs	-	-	-	-	0.1	0.0	21.0	0.0	1	0
BH01	1	50	1 (2)		---	10.00 to 20.00	60 secs	-	-	-	-	0.1	0.0	21.0	0.0	1	0
BH01	1	50	1 (2)		---	10.00 to 20.00	90 secs	-	-	-	-	0.1	0.0	20.9	0.0	1	0
BH01	1	50	1 (2)		---	10.00 to 20.00	120 secs	-	-	-	-	0.1	0.0	21.0	0.0	1	0
BH01	1	50	1 (2)		---	10.00 to 20.00	180 secs	-	-	-	-	0.1	0.0	21.0	0.0	1	0
BH01	1	50	1 (2)		---	10.00 to 20.00	240 secs	-	-	-	-	0.1	0.0	21.0	0.0	1	0
BH01	1	50	1 (2)		---	10.00 to 20.00	300 secs	-	-	-	-	0.1	0.0	20.9	0.0	1	0
BH01	1	50	1 (3)	20.00	19.62	10.00 to 20.00	28/09/2017 09:12:00	-	-	-	16.53	-	-	-	-	-	-
BH01	1	50	2	20.00	---	10.00 to 20.00	05/10/2017 09:52:00	1001	999	0.0$_{(I)}$	-	-	-	-	-	-	-
BH01	1	50	2		---	10.00 to 20.00	30 secs	-	-	0.0$_{(SS)}$	-	-	-	-	-	-	-
BH01	1	50	2 (2)	20.00	---	10.00 to 20.00	05/10/2017 09:53:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH01	1	50	2 (2)		---	10.00 to 20.00	15 secs	-	-	-	-	0.1	0.0	20.9	0.0	0	0
BH01	1	50	2 (2)		---	10.00 to 20.00	30 secs	-	-	-	-	0.1	0.0	20.9	0.0	0	0
BH01	1	50	2 (2)		---	10.00 to 20.00	60 secs	-	-	-	-	0.1	0.0	20.9	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH01	1	50	2 (2)		---	10.00 to 20.00	90 secs	-	-	-	-	0.1	0.0	20.9	0.0	0	0
BH01	1	50	2 (2)		---	10.00 to 20.00	120 secs	-	-	-	-	0.1	0.0	20.9	0.0	0	0
BH01	1	50	2 (2)		---	10.00 to 20.00	180 secs	-	-	-	-	0.1	0.0	21.0	0.0	0	0
BH01	1	50	2 (2)		---	10.00 to 20.00	240 secs	-	-	-	-	0.1	0.0	21.0	0.0	0	0
BH01	1	50	2 (2)		---	10.00 to 20.00	300 secs	-	-	-	-	0.1	0.0	21.0	0.0	0	0
BH01	1	50	2 (3)	20.00	19.50	10.00 to 20.00	05/10/2017 09:59:00	-	-	-	17.17	-	-	-	-	-	-
BH01	1	50	3	20.00	---	10.00 to 20.00	13/10/2017 09:55:00	-	-	$0.0_{(I)}$	-	-	-	-	-	-	-
BH01	1	50	3		---	10.00 to 20.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH01	1	50	3 (2)	20.00	---	10.00 to 20.00	13/10/2017 09:56:00	-	-	-	-	0.1	0.0	20.9	-	0	0
BH01	1	50	3 (2)		---	10.00 to 20.00	60 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH01	1	50	3 (2)		---	10.00 to 20.00	90 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH01	1	50	3 (2)		---	10.00 to 20.00	120 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH01	1	50	3 (2)		---	10.00 to 20.00	150 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH01	1	50	3 (2)		---	10.00 to 20.00	240 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH01	1	50	3 (2)		---	10.00 to 20.00	255 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH01	1	50	3 (2)		---	10.00 to 20.00	270 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH01	1	50	3 (3)	20.00	19.50	10.00 to 20.00	13/10/2017 10:00:45	-	-	-	17.37	-	-	-	-	-	-
BH01	1	50	4	20.00	---	10.00 to 20.00	19/10/2017 10:21:00	-	-	$0.2_{(I)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH01	1	50	4		---	10.00 to 20.00	15 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
BH01	1	50	4 (2)	20.00	---	10.00 to 20.00	19/10/2017 10:21:30	-	-	-	-	0.1	0.0	20.9	-	0	0
BH01	1	50	4 (2)		---	10.00 to 20.00	30 secs	-	-	-	-	0.2	0.0	20.7	-	0	0
BH01	1	50	4 (2)		---	10.00 to 20.00	90 secs	-	-	-	-	0.1	0.0	20.7	-	0	0
BH01	1	50	4 (2)		---	10.00 to 20.00	120 secs	-	-	-	-	0.1	0.0	20.8	-	0	0
BH01	1	50	4 (2)		---	10.00 to 20.00	150 secs	-	-	-	-	0.1	0.0	20.8	-	0	0
BH01	1	50	4 (2)		---	10.00 to 20.00	180 secs	-	-	-	-	0.1	0.0	20.8	-	0	0
BH01	1	50	4 (2)		---	10.00 to 20.00	210 secs	-	-	-	-	0.1	0.0	20.8	-	0	0
BH01	1	50	4 (2)		---	10.00 to 20.00	270 secs	-	-	-	-	0.1	0.0	20.8	-	0	0
BH01	1	50	4 (2)		---	10.00 to 20.00	330 secs	-	-	-	-	0.1	0.0	20.8	-	0	0
BH01	1	50	4 (3)	20.00	19.50	10.00 to 20.00	19/10/2017 10:32:00	-	-	-	17.45	-	-	-	-	-	-
BH02	1	50	1	30.00	---	20.00 to 30.00	28/09/2017	1003	1003	$0.0_{(I)}$	-	-	-	-	-	-	-
BH02	1	50	1		---	20.00 to 30.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH02	1	50	1 (2)	30.00	---	20.00 to 30.00	28/09/2017 00:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH02	1	50	1 (2)		---	20.00 to 30.00	15 secs	-	-	-	-	0.2	0.0	20.6	0.0	1	0
BH02	1	50	1 (2)		---	20.00 to 30.00	30 secs	-	-	-	-	0.1	0.0	20.4	0.0	1	0
BH02	1	50	1 (2)		---	20.00 to 30.00	60 secs	-	-	-	-	0.1	0.0	20.4	0.0	2	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH02	1	50	1 (2)		---	20.00 to 30.00	90 secs	-	-	-	-	0.1	0.0	20.3	0.0	2	0
BH02	1	50	1 (2)		---	20.00 to 30.00	120 secs	-	-	-	-	0.1	0.0	20.3	0.0	2	0
BH02	1	50	1 (2)		---	20.00 to 30.00	180 secs	-	-	-	-	0.1	0.0	20.2	0.0	2	0
BH02	1	50	1 (2)		---	20.00 to 30.00	240 secs	-	-	-	-	0.1	0.0	20.2	0.0	2	0
BH02	1	50	1 (2)		---	20.00 to 30.00	300 secs	-	-	-	-	0.1	0.0	20.1	0.0	2	0
BH02	1	50	1 (3)	30.00	29.10	20.00 to 30.00	28/09/2017 00:07:00	-	-	-	20.21	-	-	-	-	-	-
BH02	1	50	2	30.00	---	20.00 to 30.00	05/10/2017 09:00:00	1003	1003	$0.0_{(I)}$	-	-	-	-	-	-	-
BH02	1	50	2		---	20.00 to 30.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH02	1	50	2 (2)	30.00	---	20.00 to 30.00	05/10/2017 09:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH02	1	50	2 (2)		---	20.00 to 30.00	15 secs	-	-	-	-	0.1	0.0	20.6	0.0	1	0
BH02	1	50	2 (2)		---	20.00 to 30.00	30 secs	-	-	-	-	0.1	0.0	20.4	0.0	1	0
BH02	1	50	2 (2)		---	20.00 to 30.00	60 secs	-	-	-	-	0.1	0.0	20.4	0.0	1	0
BH02	1	50	2 (2)		---	20.00 to 30.00	90 secs	-	-	-	-	0.1	0.0	20.4	0.0	1	0
BH02	1	50	2 (2)		---	20.00 to 30.00	120 secs	-	-	-	-	0.1	0.0	20.4	0.0	1	0
BH02	1	50	2 (2)		---	20.00 to 30.00	180 secs	-	-	-	-	0.1	0.0	20.3	0.0	1	0
BH02	1	50	2 (2)		---	20.00 to 30.00	240 secs	-	-	-	-	0.1	0.0	20.2	0.0	1	0
BH02	1	50	2 (2)		---	20.00 to 30.00	300 secs	-	-	-	-	0.1	0.0	20.2	0.0	1	0
BH02	1	50	2 (3)	30.00	29.02	20.00 to 30.00	05/10/2017 09:07:00	-	-	-	20.15	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH02	1	50	3	30.00	---	20.00 to 30.00	13/10/2017 09:45:00	1007	1007	$0.1_{(I)}$	-	-	-	-	-	-	-
BH02	1	50	3		---	20.00 to 30.00	30 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
BH02	1	50	3 (2)	30.00	---	20.00 to 30.00	13/10/2017 09:46:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH02	1	50	3 (2)		---	20.00 to 30.00	15 secs	-	-	-	-	0.4	0.0	19.5	0.0	1	0
BH02	1	50	3 (2)		---	20.00 to 30.00	30 secs	-	-	-	-	0.4	0.0	18.2	0.0	1	0
BH02	1	50	3 (2)		---	20.00 to 30.00	60 secs	-	-	-	-	0.4	0.0	18.4	0.0	1	0
BH02	1	50	3 (2)		---	20.00 to 30.00	93 secs	-	-	-	-	0.4	0.0	18.7	0.0	1	0
BH02	1	50	3 (2)		---	20.00 to 30.00	120 secs	-	-	-	-	0.4	0.0	18.8	0.0	1	0
BH02	1	50	3 (2)		---	20.00 to 30.00	180 secs	-	-	-	-	0.3	0.0	19.4	0.0	1	0
BH02	1	50	3 (2)		---	20.00 to 30.00	240 secs	-	-	-	-	0.2	0.0	19.7	0.0	1	0
BH02	1	50	3 (2)		---	20.00 to 30.00	300 secs	-	-	-	-	0.2	0.0	20.0	0.0	1	0
BH02	1	50	3 (3)	30.00	28.90	20.00 to 30.00	13/10/2017 09:52:00	-	-	-	20.15	-	-	-	-	-	-
BH02	1	50	4	30.00	---	20.00 to 30.00	19/10/2017 09:58:00	993	993	$0.0_{(I)}$	-	-	-	-	-	-	-
BH02	1	50	4		---	20.00 to 30.00	15 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH02	1	50	4 (2)	30.00	---	20.00 to 30.00	19/10/2017 09:58:30	-	-	-	-	0.1	0.0	20.1	-	0	0
BH02	1	50	4 (2)		---	20.00 to 30.00	30 secs	-	-	-	-	0.3	0.0	19.7	-	0	0
BH02	1	50	4 (2)		---	20.00 to 30.00	60 secs	-	-	-	-	0.4	0.0	16.9	-	0	0
BH02	1	50	4 (2)		---	20.00 to 30.00	90 secs	-	-	-	-	0.3	0.0	16.8	-	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd, Abbey Park, Humber Road, Coventry, CV3 4AQ	Compiled By	Date	Checked By	Date	Contract Ref:
	MDStreager	26/10/17			**313583**
	Contract: **Roade Bypass**				Page: **5** of **48**

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH02	1	50	4 (2)		---	20.00 to 30.00	120 secs	-	-	-	-	0.3	0.0	17.8	-	0	0
BH02	1	50	4 (2)		---	20.00 to 30.00	150 secs	-	-	-	-	0.3	0.0	18.0	-	0	0
BH02	1	50	4 (2)		---	20.00 to 30.00	210 secs	-	-	-	-	0.3	0.0	18.2	-	0	0
BH02	1	50	4 (2)		---	20.00 to 30.00	270 secs	-	-	-	-	0.3	0.0	18.5	-	0	0
BH02	1	50	4 (2)		---	20.00 to 30.00	330 secs	-	-	-	-	0.2	0.0	18.7	-	0	0
BH02	1	50	4 (3)	30.00	28.85	20.00 to 30.00	19/10/2017 10:07:00	-	-	-	20.12	-	-	-	-	-	-
BH03	1	50	1	15.00	---	8.00 to 15.00	28/09/2017 10:11:00	1004	1004	$0.0_{(I)}$	-	-	-	-	-	-	-
BH03	1	50	1		---	8.00 to 15.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH03	1	50	1 (2)	15.00	---	8.00 to 15.00	28/09/2017 10:12:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH03	1	50	1 (2)		---	8.00 to 15.00	15 secs	-	-	-	-	0.2	0.0	20.2	0.0	10	0
BH03	1	50	1 (2)		---	8.00 to 15.00	30 secs	-	-	-	-	0.3	0.0	19.1	0.0	10	0
BH03	1	50	1 (2)		---	8.00 to 15.00	60 secs	-	-	-	-	0.3	0.0	19.0	0.0	10	0
BH03	1	50	1 (2)		---	8.00 to 15.00	90 secs	-	-	-	-	0.3	0.0	19.0	0.0	9	0
BH03	1	50	1 (2)		---	8.00 to 15.00	120 secs	-	-	-	-	0.3	0.0	19.0	0.0	9	0
BH03	1	50	1 (2)		---	8.00 to 15.00	180 secs	-	-	-	-	0.3	0.0	19.0	0.0	9	0
BH03	1	50	1 (2)		---	8.00 to 15.00	240 secs	-	-	-	-	0.3	0.0	19.0	0.0	9	0
BH03	1	50	1 (2)		---	8.00 to 15.00	300 secs	-	-	-	-	0.3	0.0	19.0	0.0	9	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH03	1	50	1 (3)	15.00	14.34	8.00 to 15.00	28/09/2017 10:18:00	-	-	-	12.33	-	-	-	-	-	-
BH03	1	50	2	15.00	---	8.00 to 15.00	06/10/2017 10:41:00	1001	1001	$0.0_{(I)}$	-	-	-	-	-	-	-
BH03	1	50	2		---	8.00 to 15.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH03	1	50	2 (2)	15.00	---	8.00 to 15.00	06/10/2017 10:42:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH03	1	50	2 (2)		---	8.00 to 15.00	15 secs	-	-	-	-	0.6	0.0	20.5	0.0	2	0
BH03	1	50	2 (2)		---	8.00 to 15.00	30 secs	-	-	-	-	0.6	0.0	20.2	0.0	2	0
BH03	1	50	2 (2)		---	8.00 to 15.00	60 secs	-	-	-	-	0.6	0.0	20.1	0.0	2	0
BH03	1	50	2 (2)		---	8.00 to 15.00	90 secs	-	-	-	-	0.6	0.0	20.1	0.0	2	0
BH03	1	50	2 (2)		---	8.00 to 15.00	120 secs	-	-	-	-	0.6	0.0	20.1	0.0	1	0
BH03	1	50	2 (2)		---	8.00 to 15.00	180 secs	-	-	-	-	0.6	0.0	20.0	0.0	1	0
BH03	1	50	2 (2)		---	8.00 to 15.00	240 secs	-	-	-	-	0.6	0.0	20.0	0.0	1	0
BH03	1	50	2 (2)		---	8.00 to 15.00	300 secs	-	-	-	-	0.6	0.0	20.0	0.0	1	0
BH03	1	50	2 (3)	15.00	14.25	8.00 to 15.00	06/10/2017 10:48:00	-	-	-	12.38	-	-	-	-	-	-
BH03	1	50	3	15.00	---	8.00 to 15.00	13/10/2017 10:25:00	-	-	$0.0_{(I)}$	-	-	-	-	-	-	-
BH03	1	50	3		---	8.00 to 15.00	30 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
BH03	1	50	3		---	8.00 to 15.00	60 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH03	1	50	3		---	8.00 to 15.00	180 secs	-	-	-	-	0.2	0.0	20.8	-	0	0
BH03	1	50	3		---	8.00 to 15.00	210 secs	-	-	-	-	0.2	0.0	20.7	-	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH03	1	50	3		---	8.00 to 15.00	225 secs	-	-	-	-	0.2	0.0	20.7	-	0	0
BH03	1	50	3		---	8.00 to 15.00	240 secs	-	-	-	-	0.2	0.0	20.6	-	0	0
BH03	1	50	3		---	8.00 to 15.00	270 secs	-	-	-	-	0.2	0.0	20.6	-	0	0
BH03	1	50	3		---	8.00 to 15.00	300 secs	-	-	-	-	0.2	0.0	20.6	-	0	0
BH03	1	50	3		---	8.00 to 15.00	360 secs	-	-	-	-	0.3	0.0	20.5	-	0	0
BH03	1	50	3		---	8.00 to 15.00	420 secs	-	-	-	-	0.3	0.0	20.4	-	0	0
BH03	1	50	3		---	8.00 to 15.00	480 secs	-	-	-	-	0.1	0.0	20.6	-	0	0
BH03	1	50	3		14.30	8.00 to 15.00	540 secs	-	-	-	12.55	-	-	-	-	-	-
BH03	1	50	4	15.00	---	8.00 to 15.00	18/10/2017 10:29:00	1002	1002	$0.0_{(I)}$	-	-	-	-	-	-	-
BH03	1	50	4		---	8.00 to 15.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH03	1	50	4 (2)	15.00	---	8.00 to 15.00	18/10/2017 10:30:00	-	-	-	-	0.1	0.0	20.9	-	0	0
BH03	1	50	4 (2)		---	8.00 to 15.00	60 secs	-	-	-	-	0.3	0.0	20.9	-	0	0
BH03	1	50	4 (2)		---	8.00 to 15.00	90 secs	-	-	-	-	0.3	0.0	20.8	-	0	0
BH03	1	50	4 (2)		---	8.00 to 15.00	105 secs	-	-	-	-	0.3	0.0	20.8	-	0	0
BH03	1	50	4 (2)		---	8.00 to 15.00	120 secs	-	-	-	-	0.3	0.0	20.8	-	0	0
BH03	1	50	4 (2)		---	8.00 to 15.00	150 secs	-	-	-	-	0.3	0.0	20.8	-	0	0
BH03	1	50	4 (2)		---	8.00 to 15.00	180 secs	-	-	-	-	0.3	0.0	20.8	-	0	0
BH03	1	50	4 (2)		---	8.00 to 15.00	240 secs	-	-	-	-	0.3	0.0	20.8	-	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH03	1	50	4 (2)		---	8.00 to 15.00	300 secs	-	-	-	-	0.3	0.0	20.8	-	0	0
BH03	1	50	4 (3)	15.00	14.25	8.00 to 15.00	18/10/2017 10:40:00	-	-	-	12.56	-	-	-	-	-	-
BH04	1	50	1	11.00	---	7.00 to 11.00	28/09/2017 12:48:00	1004	1004	$0.0_{(I)}$	-	-	-	-	-	-	-
BH04	1	50	1		---	7.00 to 11.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH04	1	50	1 (2)	11.00	---	7.00 to 11.00	28/09/2017 12:49:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH04	1	50	1 (2)		---	7.00 to 11.00	15 secs	-	-	-	-	0.1	0.0	20.7	0.0	0	0
BH04	1	50	1 (2)		---	7.00 to 11.00	30 secs	-	-	-	-	0.1	0.0	20.7	0.0	0	0
BH04	1	50	1 (2)		---	7.00 to 11.00	60 secs	-	-	-	-	0.1	0.0	20.7	0.0	0	0
BH04	1	50	1 (2)		---	7.00 to 11.00	90 secs	-	-	-	-	0.1	0.0	20.6	0.0	0	0
BH04	1	50	1 (2)		---	7.00 to 11.00	120 secs	-	-	-	-	0.1	0.0	20.6	0.0	0	0
BH04	1	50	1 (2)		---	7.00 to 11.00	180 secs	-	-	-	-	0.1	0.0	20.6	0.0	0	0
BH04	1	50	1 (2)		---	7.00 to 11.00	240 secs	-	-	-	-	0.1	0.0	20.5	0.0	0	0
BH04	1	50	1 (2)		---	7.00 to 11.00	300 secs	-	-	-	-	0.1	0.0	20.5	0.0	0	0
BH04	1	50	1 (3)	11.00	11.00	7.00 to 11.00	28/09/2017 12:55:00	-	-	-	10.12	-	-	-	-	-	-
BH04	1	50	2	11.00	---	7.00 to 11.00	06/10/2017 13:05:00	1003	1003	$-0.1_{(I)}$	-	-	-	-	-	-	-
BH04	1	50	2		---	7.00 to 11.00	30 secs	-	-	$-0.1_{(SS)}$	-	-	-	-	-	-	-
BH04	1	50	2 (2)	11.00	---	7.00 to 11.00	06/10/2017 13:06:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH04	1	50	2 (2)		---	7.00 to 11.00	15 secs	-	-	-	-	0.8	0.0	20.2	0.0	0	0
BH04	1	50	2 (2)		---	7.00 to 11.00	30 secs	-	-	-	-	0.8	0.0	20.1	0.0	0	0
BH04	1	50	2 (2)		---	7.00 to 11.00	60 secs	-	-	-	-	0.9	0.0	20.0	0.0	0	0
BH04	1	50	2 (2)		---	7.00 to 11.00	90 secs	-	-	-	-	0.9	0.0	20.0	0.0	0	0
BH04	1	50	2 (2)		---	7.00 to 11.00	120 secs	-	-	-	-	0.9	0.0	20.0	0.0	0	0
BH04	1	50	2 (2)		---	7.00 to 11.00	180 secs	-	-	-	-	0.9	0.0	20.0	0.0	0	0
BH04	1	50	2 (2)		---	7.00 to 11.00	240 secs	-	-	-	-	0.9	0.0	20.0	0.0	0	0
BH04	1	50	2 (2)		---	7.00 to 11.00	300 secs	-	-	-	-	0.9	0.0	20.0	0.0	0	0
BH04	1	50	2 (3)	11.00	10.87	7.00 to 11.00	06/10/2017 13:12:00	-	-	-	9.92	-	-	-	-	-	-
BH04	1	50	3	11.00	---	7.00 to 11.00	13/10/2017 12:37:00	1010	1010	$0.0_{(I)}$	-	-	-	-	-	-	-
BH04	1	50	3		---	7.00 to 11.00	15 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH04	1	50	3 (2)	11.00	---	7.00 to 11.00	13/10/2017 12:37:30	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	30 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	60 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	90 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	120 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	150 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	210 secs	-	-	-	-	0.1	0.0	20.9	-	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH04	1	50	3 (2)		---	7.00 to 11.00	270 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	330 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	345 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	360 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	390 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	450 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (2)		---	7.00 to 11.00	480 secs	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	3 (3)	11.00	9.44	7.00 to 11.00	13/10/2017 12:47:00	-	-	-	9.44	-	-	-	-	-	-
BH04	1	50	4	11.00	---	7.00 to 11.00	19/10/2017 12:27:00	993	993	$0.0_{(I)}$	-	-	-	-	-	-	-
BH04	1	50	4		---	7.00 to 11.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH04	1	50	4 (2)	11.00	---	7.00 to 11.00	19/10/2017 12:28:00	-	-	-	-	0.1	0.0	20.9	-	0	0
BH04	1	50	4 (2)		---	7.00 to 11.00	60 secs	-	-	-	-	0.3	0.0	20.8	-	0	0
BH04	1	50	4 (2)		---	7.00 to 11.00	90 secs	-	-	-	-	0.3	0.0	20.6	-	0	0
BH04	1	50	4 (2)		---	7.00 to 11.00	105 secs	-	-	-	-	0.3	0.0	20.6	-	0	0
BH04	1	50	4 (2)		---	7.00 to 11.00	120 secs	-	-	-	-	0.3	0.0	20.6	-	0	0
BH04	1	50	4 (2)		---	7.00 to 11.00	150 secs	-	-	-	-	0.3	0.0	20.6	-	0	0
BH04	1	50	4 (2)		---	7.00 to 11.00	180 secs	-	-	-	-	0.3	0.0	20.6	-	0	0
BH04	1	50	4 (2)		---	7.00 to 11.00	240 secs	-	-	-	-	0.3	0.0	20.6	-	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH04	1	50	4 (2)		---	7.00 to 11.00	300 secs	-	-	-	-	0.3	0.0	20.6	-	0	0
BH04	1	50	4 (3)	11.00	9.40	7.00 to 11.00	19/10/2017 12:36:00	-	-	-	9.40	-	-	-	-	-	-
BH05	1	50	1	12.00	---	8.00 to 12.00	28/09/2017	1008	1008	$-0.1_{(I)}$	-	-	-	-	-	-	-
BH05	1	50	1		---	8.00 to 12.00	30 secs	-	-	$-0.1_{(SS)}$	-	-	-	-	-	-	-
BH05	1	50	1 (2)	12.00	---	8.00 to 12.00	28/09/2017 00:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH05	1	50	1 (2)		---	8.00 to 12.00	15 secs	-	-	-	-	0.4	0.0	19.2	0.0	45	0
BH05	1	50	1 (2)		---	8.00 to 12.00	30 secs	-	-	-	-	0.4	0.0	18.3	0.0	61	0
BH05	1	50	1 (2)		---	8.00 to 12.00	60 secs	-	-	-	-	0.5	0.0	18.3	0.0	63	0
BH05	1	50	1 (2)		---	8.00 to 12.00	90 secs	-	-	-	-	0.5	0.0	18.3	0.0	63	0
BH05	1	50	1 (2)		---	8.00 to 12.00	120 secs	-	-	-	-	0.5	0.0	18.3	0.0	63	0
BH05	1	50	1 (2)		---	8.00 to 12.00	180 secs	-	-	-	-	0.5	0.0	18.3	0.0	63	0
BH05	1	50	1 (2)		---	8.00 to 12.00	240 secs	-	-	-	-	0.5	0.0	18.3	0.0	63	0
BH05	1	50	1 (2)		---	8.00 to 12.00	300 secs	-	-	-	-	0.5	0.0	18.3	0.0	63	0
BH05	1	50	1 (3)	12.00	9.78	8.00 to 12.00	28/09/2017 00:07:00	-	-	-	6.85	-	-	-	-	-	-
BH05	1	50	2	12.00	---	8.00 to 12.00	05/10/2017 12:55:00	1007	1008	$-0.2_{(I)}$	-	-	-	-	-	-	-
BH05	1	50	2		---	8.00 to 12.00	30 secs	-	-	$-0.2_{(SS)}$	-	-	-	-	-	-	-
BH05	1	50	2 (2)	12.00	---	8.00 to 12.00	05/10/2017 12:56:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH05	1	50	2 (2)		---	8.00 to 12.00	15 secs	-	-	-	-	0.3	0.0	20.1	0.0	14	0
BH05	1	50	2 (2)		---	8.00 to 12.00	30 secs	-	-	-	-	0.4	0.0	19.3	0.0	18	0
BH05	1	50	2 (2)		---	8.00 to 12.00	60 secs	-	-	-	-	0.4	0.0	19.2	0.0	19	0
BH05	1	50	2 (2)		---	8.00 to 12.00	90 secs	-	-	-	-	0.4	0.0	19.2	0.0	19	0
BH05	1	50	2 (2)		---	8.00 to 12.00	120 secs	-	-	-	-	0.4	0.0	19.1	0.0	19	0
BH05	1	50	2 (2)		---	8.00 to 12.00	180 secs	-	-	-	-	0.4	0.0	19.1	0.0	19	0
BH05	1	50	2 (2)		---	8.00 to 12.00	240 secs	-	-	-	-	0.4	0.0	19.1	0.0	20	0
BH05	1	50	2 (2)		---	8.00 to 12.00	300 secs	-	-	-	-	0.4	0.0	19.1	0.0	20	0
BH05	1	50	2 (3)	12.00	9.78	8.00 to 12.00	05/10/2017 13:02:00	-	-	-	6.92	-	-	-	-	-	-
BH05	1	50	3	12.00	---	8.00 to 12.00	13/10/2017 11:05:00	1006	1007	$-2.7_{(I)}$	-	-	-	-	-	-	-
BH05	1	50	3		---	8.00 to 12.00	240 secs	-	-	-0.2	-	-	-	-	-	-	-
BH05	1	50	3 (2)	12.00	---	8.00 to 12.00	13/10/2017 11:10:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
BH05	1	50	3 (2)		---	8.00 to 12.00	15 secs	-	-	-	-	0.3	0.0	20.5	0.0	4	0
BH05	1	50	3 (2)		---	8.00 to 12.00	30 secs	-	-	-	-	0.4	0.0	20.2	0.0	6	0
BH05	1	50	3 (2)		---	8.00 to 12.00	60 secs	-	-	-	-	0.5	0.0	20.0	0.0	7	0
BH05	1	50	3 (2)		---	8.00 to 12.00	90 secs	-	-	-	-	0.5	0.0	20.0	0.0	7	0
BH05	1	50	3 (2)		---	8.00 to 12.00	120 secs	-	-	-	-	0.5	0.0	20.0	0.0	7	0
BH05	1	50	3 (2)		---	8.00 to 12.00	180 secs	-	-	-	-	0.5	0.0	20.0	0.0	7	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
BH05	1	50	3 (2)		---	8.00 to 12.00	240 secs	-	-	-	-	0.5	0.0	20.0	0.0	7	0
BH05	1	50	3 (2)		---	8.00 to 12.00	300 secs	-	-	-	-	0.5	0.0	20.0	0.0	7	0
BH05	1	50	3 (3)	12.00	9.84	8.00 to 12.00	13/10/2017 11:16:00	-	-	-	7.06	-	-	-	-	-	-
BH05	1	50	4	12.00	---	8.00 to 12.00	19/10/2017 11:46:00	1000	996	$0.0_{(I)}$	-	-	-	-	-	-	-
BH05	1	50	4		---	8.00 to 12.00	15 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
BH05	1	50	4 (2)	12.00	---	8.00 to 12.00	19/10/2017 11:46:30	-	-	-	-	0.1	0.0	20.9	-	0	0
BH05	1	50	4 (2)		---	8.00 to 12.00	15 secs	-	-	-	-	0.5	0.0	20.5	-	4	0
BH05	1	50	4 (2)		---	8.00 to 12.00	30 secs	-	-	-	-	0.5	0.0	19.9	-	5	0
BH05	1	50	4 (2)		---	8.00 to 12.00	60 secs	-	-	-	-	0.5	0.0	19.9	-	6	0
BH05	1	50	4 (2)		---	8.00 to 12.00	90 secs	-	-	-	-	0.5	0.0	19.9	-	6	0
BH05	1	50	4 (2)		---	8.00 to 12.00	120 secs	-	-	-	-	0.5	0.0	19.9	-	6	0
BH05	1	50	4 (2)		---	8.00 to 12.00	150 secs	-	-	-	-	0.5	0.0	19.9	-	6	0
BH05	1	50	4 (2)		---	8.00 to 12.00	210 secs	-	-	-	-	0.5	0.0	19.9	-	6	0
BH05	1	50	4 (3)	12.00	9.80	8.00 to 12.00	19/10/2017 11:52:00	-	-	-	7.10	-	-	-	-	-	-
WS01	1	50	1	2.50	---	1.50 to 2.50	28/09/2017 09:24:00	1001	1001	$0.0_{(I)}$	-	-	-	-	-	-	-
WS01	1	50	1		---	1.50 to 2.50	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS01	1	50	1 (2)	2.50	---	1.50 to 2.50	28/09/2017 09:25:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS01	1	50	1 (2)		---	1.50 to 2.50	15 secs	-	-	-	-	1.1	0.0	12.2	0.0	2	0
WS01	1	50	1 (2)		---	1.50 to 2.50	30 secs	-	-	-	-	1.0	0.0	10.6	0.0	2	0
WS01	1	50	1 (2)		---	1.50 to 2.50	60 secs	-	-	-	-	1.0	0.0	10.3	0.0	2	0
WS01	1	50	1 (2)		---	1.50 to 2.50	90 secs	-	-	-	-	1.0	0.0	10.2	0.0	2	0
WS01	1	50	1 (2)		---	1.50 to 2.50	120 secs	-	-	-	-	1.1	0.0	10.1	0.0	1	0
WS01	1	50	1 (2)		---	1.50 to 2.50	180 secs	-	-	-	-	1.1	0.0	10.1	0.0	1	0
WS01	1	50	1 (2)		---	1.50 to 2.50	240 secs	-	-	-	-	1.0	0.0	10.1	0.0	1	0
WS01	1	50	1 (2)		---	1.50 to 2.50	300 secs	-	-	-	-	1.0	0.0	10.1	0.0	1	0
WS01	1	50	1 (3)	2.50	2.48	1.50 to 2.50	28/09/2017 09:31:00	-	-	-	DRY	-	-	-	-	-	-
WS01	1	50	2	2.50	---	1.50 to 2.50	05/10/2017 07:30:00	1001	1001	$0.0_{(I)}$	-	-	-	-	-	-	-
WS01	1	50	2		---	1.50 to 2.50	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS01	1	50	2 (2)	2.50	---	1.50 to 2.50	05/10/2017 07:31:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS01	1	50	2 (2)		---	1.50 to 2.50	15 secs	-	-	-	-	1.7	0.0	12.9	0.0	1	0
WS01	1	50	2 (2)		---	1.50 to 2.50	30 secs	-	-	-	-	1.7	0.0	5.1	0.0	1	0
WS01	1	50	2 (2)		---	1.50 to 2.50	60 secs	-	-	-	-	1.7	0.0	4.4	0.0	1	0
WS01	1	50	2 (2)		---	1.50 to 2.50	90 secs	-	-	-	-	1.7	0.0	4.3	0.0	0	0
WS01	1	50	2 (2)		---	1.50 to 2.50	120 secs	-	-	-	-	1.7	0.0	4.3	0.0	0	0
WS01	1	50	2 (2)		---	1.50 to 2.50	180 secs	-	-	-	-	1.7	0.0	4.3	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd, Abbey Park, Humber Road, Coventry, CV3 4AQ	Compiled By	Date	Checked By	Date	Contract Ref: 313583
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IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS01	1	50	2 (2)		---	1.50 to 2.50	240 secs	-	-	-	-	1.7	0.0	4.2	0.0	0	0
WS01	1	50	2 (2)		---	1.50 to 2.50	300 secs	-	-	-	-	1.7	0.0	4.2	0.0	0	0
WS01	1	50	2 (3)	2.50	2.48	1.50 to 2.50	05/10/2017 07:37:00	-	-	-	DRY	-	-	-	-	-	-
WS01	1	50	3	2.50	---	1.50 to 2.50	13/10/2017 10:00:00	1007	1007	$0.2_{(I)}$	-	-	-	-	-	-	-
WS01	1	50	3		---	1.50 to 2.50	30 secs	-	-	$0.2_{(SS)}$	-	-	-	-	-	-	-
WS01	1	50	3 (2)	2.50	---	1.50 to 2.50	13/10/2017 10:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS01	1	50	3 (2)		---	1.50 to 2.50	15 secs	-	-	-	-	1.7	0.0	13.1	0.0	0	0
WS01	1	50	3 (2)		---	1.50 to 2.50	30 secs	-	-	-	-	1.7	0.0	3.6	0.0	0	0
WS01	1	50	3 (2)		---	1.50 to 2.50	60 secs	-	-	-	-	1.7	0.0	3.0	0.0	0	0
WS01	1	50	3 (2)		---	1.50 to 2.50	90 secs	-	-	-	-	1.7	0.0	2.9	0.0	0	0
WS01	1	50	3 (2)		---	1.50 to 2.50	120 secs	-	-	-	-	1.7	0.0	2.9	0.0	0	0
WS01	1	50	3 (2)		---	1.50 to 2.50	180 secs	-	-	-	-	1.7	0.0	2.9	0.0	0	0
WS01	1	50	3 (2)		---	1.50 to 2.50	240 secs	-	-	-	-	1.7	0.0	2.8	0.0	0	0
WS01	1	50	3 (2)		---	1.50 to 2.50	300 secs	-	-	-	-	1.7	0.0	2.8	0.0	0	0
WS01	1	50	3 (3)	2.50	2.48	1.50 to 2.50	13/10/2017 10:07:00	-	-	-	DRY	-	-	-	-	-	-
WS01	1	50	4	2.50	---	1.50 to 2.50	19/10/2017 10:38:00	-	-	$0.1_{(I)}$	-	-	-	-	-	-	-
WS01	1	50	4		---	1.50 to 2.50	30 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
WS01	1	50	4 (2)	2.50	---	1.50 to 2.50	19/10/2017 10:38:45	-	-	-	-	0.1	0.0	20.9	-	0	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
MDStreeuge	26/10/17			313583

Contract: **Roade Bypass**

AGS

GINT_LIBRARY_V8_06.GLB : E - GAS MON - STANDARD - 6B - A4L : 313583 - ROADE BYPASS.GPJ : 26/10/17 09:43 : MS4 :

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS01	1	50	4 (2)		---	1.50 to 2.50	15 secs	-	-	-	-	1.8	0.0	17.0	-	0	0
WS01	1	50	4 (2)		---	1.50 to 2.50	45 secs	-	-	-	-	1.7	0.0	5.8	-	0	0
WS01	1	50	4 (2)		---	1.50 to 2.50	75 secs	-	-	-	-	1.7	0.0	4.8	-	0	0
WS01	1	50	4 (2)		---	1.50 to 2.50	105 secs	-	-	-	-	1.7	0.0	4.5	-	0	0
WS01	1	50	4 (2)		---	1.50 to 2.50	135 secs	-	-	-	-	1.7	0.0	4.4	-	0	0
WS01	1	50	4 (2)		---	1.50 to 2.50	195 secs	-	-	-	-	1.7	0.0	4.1	-	0	0
WS01	1	50	4 (2)		---	1.50 to 2.50	255 secs	-	-	-	-	1.7	0.0	4.0	-	0	0
WS01	1	50	4 (2)		---	1.50 to 2.50	315 secs	-	-	-	-	1.7	0.0	3.9	-	0	0
WS01	1	50	4 (2)		---	1.50 to 2.50	375 secs	-	-	-	-	1.7	0.0	3.9	-	0	0
WS01	1	50	4 (3)	2.50	2.48	1.50 to 2.50	19/10/2017 10:48:00	-	-	-	DRY	-	-	-	-	-	-
WS02	1	50	1	5.00	---	3.00 to 5.00	02/09/2017 10:02:00	1004	1004	$0.1_{(I)}$	-	-	-	-	-	-	-
WS02	1	50	1		---	3.00 to 5.00	30 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
WS02	1	50	1 (2)	5.00	---	3.00 to 5.00	02/09/2017 10:03:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS02	1	50	1 (2)		---	3.00 to 5.00	15 secs	-	-	-	-	1.7	0.0	17.6	0.0	2	0
WS02	1	50	1 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	1.6	0.0	15.8	0.0	2	0
WS02	1	50	1 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	1.6	0.0	15.8	0.0	2	0
WS02	1	50	1 (2)		---	3.00 to 5.00	93 secs	-	-	-	-	1.6	0.0	15.8	0.0	2	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS02	1	50	1 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	1.6	0.0	15.8	0.0	2	0
WS02	1	50	1 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	1.6	0.0	15.8	0.0	2	0
WS02	1	50	1 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	1.6	0.0	15.8	0.0	2	0
WS02	1	50	1 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	1.6	0.0	15.8	0.0	2	0
WS02	1	50	1 (3)	5.00	4.98	3.00 to 5.00	02/09/2017 10:09:00	-	-	-	1.18	-	-	-	-	-	-
WS02	1	50	2	5.00	---	3.00 to 5.00	05/10/2017 10:25:00	1018	1005	$15.4_{(I)}$	-	-	-	-	-	-	-
WS02	1	50	2		---	3.00 to 5.00	420 secs	-	-	$0.2_{(SS)}$	-	-	-	-	-	-	-
WS02	1	50	2 (2)	5.00	---	3.00 to 5.00	05/10/2017 10:33:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS02	1	50	2 (2)		---	3.00 to 5.00	15 secs	-	-	-	-	2.1	0.0	18.6	0.0	0	0
WS02	1	50	2 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	2.1	0.0	17.7	0.0	0	0
WS02	1	50	2 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	2.1	0.0	17.6	0.0	0	0
WS02	1	50	2 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	2.1	0.0	17.6	0.0	0	0
WS02	1	50	2 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	2.1	0.0	17.6	0.0	0	0
WS02	1	50	2 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	2.1	0.0	17.6	0.0	0	0
WS02	1	50	2 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	2.1	0.0	17.6	0.0	0	0
WS02	1	50	2 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	2.1	0.0	17.6	0.0	0	0
WS02	1	50	2 (3)	5.00	5.00	3.00 to 5.00	05/10/2017 10:39:00	-	-	-	2.77	-	-	-	-	-	-
WS02	1	50	3	5.00	---	3.00 to 5.00	13/10/2017 10:18:00	1051	1009	$18.2_{(I)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS02	1	50	3		---	3.00 to 5.00	30 secs	-	-	$0.3_{(SS)}$	-	-	-	-	-	-	-
WS02	1	50	3 (2)	5.00	---	3.00 to 5.00	13/10/2017 10:19:00	-	-	-	-	0.1	0.0	20.9	-	0	0
WS02	1	50	3 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	1.9	0.0	20.1	-	1	0
WS02	1	50	3 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	2.2	0.0	19.4	-	1	0
WS02	1	50	3 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	2.2	0.0	17.5	-	1	0
WS02	1	50	3 (2)		---	3.00 to 5.00	105 secs	-	-	-	-	2.2	0.0	17.3	-	1	0
WS02	1	50	3 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	2.2	0.0	17.3	-	1	0
WS02	1	50	3 (2)		---	3.00 to 5.00	150 secs	-	-	-	-	2.2	0.0	17.3	-	1	0
WS02	1	50	3 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	2.1	0.0	17.4	-	1	0
WS02	1	50	3 (3)	5.00	4.98	3.00 to 5.00	13/10/2017 10:24:00	-	-	-	3.05	-	-	-	-	-	-
WS02	1	50	4	5.00	---	3.00 to 5.00	18/10/2017 10:12:00	1002	1002	$17.8_{(I)}$	-	-	-	-	-	-	-
WS02	1	50	4		---	3.00 to 5.00	30 secs	-	-	$0.2_{(SS)}$	-	-	-	-	-	-	-
WS02	1	50	4 (2)	5.00	---	3.00 to 5.00	18/10/2017 10:16:00	-	-	-	-	0.1	0.0	20.9	-	0	0
WS02	1	50	4 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	2.2	0.0	20.1	-	0	0
WS02	1	50	4 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	2.1	0.0	17.7	-	0	0
WS02	1	50	4 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	2.1	0.0	17.3	-	0	0
WS02	1	50	4 (2)		---	3.00 to 5.00	150 secs	-	-	-	-	2.1	0.0	17.3	-	0	0
WS02	1	50	4 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	2.1	0.0	17.3	-	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS02	1	50	4 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	2.1	0.0	17.3	-	0	0
WS02	1	50	4 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	2.1	0.0	17.3	-	0	0
WS02	1	50	4 (2)		---	3.00 to 5.00	360 secs	-	-	-	-	2.1	0.0	17.3	-	0	0
WS02	1	50	4 (3)	5.00	---	3.00 to 5.00	18/10/2017 10:23:00	-	-	-	-	-	-	-	-	-	-
WS03	1	50	1	3.00	---	1.00 to 3.00	28/09/2017 12:37:00	1005	1005	$0.0_{(I)}$	-	-	-	-	-	-	-
WS03	1	50	1		---	1.00 to 3.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS03	1	50	1 (2)	3.00	---	1.00 to 3.00	28/09/2017 12:38:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS03	1	50	1 (2)		---	1.00 to 3.00	15 secs	-	-	-	-	2.2	0.0	18.6	0.0	0	1
WS03	1	50	1 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	2.1	0.0	18.2	0.0	0	1
WS03	1	50	1 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	2.1	0.0	18.2	0.0	0	1
WS03	1	50	1 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	2.1	0.0	18.2	0.0	0	1
WS03	1	50	1 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	2.1	0.0	18.2	0.0	0	1
WS03	1	50	1 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	2.1	0.0	18.2	0.0	0	1
WS03	1	50	1 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	2.1	0.0	18.2	0.0	0	1
WS03	1	50	1 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	2.1	0.0	18.2	0.0	0	1
WS03	1	50	1 (3)	3.00	3.00	1.00 to 3.00	28/09/2017 12:44:00	-	-	-	DRY	-	-	-	-	-	-
WS03	1	50	2	3.00	---	1.00 to 3.00	06/10/2017 12:30:00	1003	1003	$0.3_{(I)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS03	1	50	2		---	1.00 to 3.00	30 secs	-	-	$0.3_{(SS)}$	-	-	-	-	-	-	-
WS03	1	50	2 (2)	3.00	---	1.00 to 3.00	06/10/2017 12:31:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS03	1	50	2 (2)		---	1.00 to 3.00	15 secs	-	-	-	-	2.4	0.0	19.3	0.0	0	0
WS03	1	50	2 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	2.3	0.0	18.8	0.0	0	0
WS03	1	50	2 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	2.2	0.0	18.7	0.0	0	0
WS03	1	50	2 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	2.2	0.0	18.7	0.0	0	0
WS03	1	50	2 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	2.2	0.0	18.7	0.0	0	0
WS03	1	50	2 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	2.2	0.0	18.7	0.0	0	0
WS03	1	50	2 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	2.2	0.0	18.6	0.0	0	0
WS03	1	50	2 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	2.2	0.0	18.6	0.0	0	0
WS03	1	50	2 (3)	3.00	2.99	1.00 to 3.00	06/10/2017 12:37:00	-	-	-	DRY	-	-	-	-	-	-
WS03	1	50	3	3.00	---	1.00 to 3.00	13/10/2017 11:50:00	1009	1009	$0.0_{(I)}$	-	-	-	-	-	-	-
WS03	1	50	3		---	1.00 to 3.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS03	1	50	3 (2)	3.00	---	1.00 to 3.00	13/10/2017 11:51:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS03	1	50	3 (2)		---	1.00 to 3.00	15 secs	-	-	-	-	2.1	0.0	20.0	0.0	0	0
WS03	1	50	3 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	2.1	0.0	19.3	0.0	0	0
WS03	1	50	3 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	2.1	0.0	19.2	0.0	0	0
WS03	1	50	3 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	2.1	0.0	19.2	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd, Abbey Park, Humber Road, Coventry, CV3 4AQ	Compiled By	Date	Checked By	Date	Contract Ref:
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IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS03	1	50	3 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	2.1	0.0	19.3	0.0	0	0
WS03	1	50	3 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	2.1	0.0	19.3	0.0	0	0
WS03	1	50	3 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	2.1	0.0	19.3	0.0	0	0
WS03	1	50	3 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	2.1	0.0	19.3	0.0	0	0
WS03	1	50	3 (3)	3.00	3.02	1.00 to 3.00	13/10/2017 11:57:00	-	-	-	DRY	-	-	-	-	-	-
WS03	1	50	4	3.00	---	1.00 to 3.00	19/10/2017 12:39:00	993	993	$0.0_{(I)}$	-	-	-	-	-	-	-
WS03	1	50	4		---	1.00 to 3.00	30 secs	993	993	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS03	1	50	4 (2)	3.00	---	1.00 to 3.00	19/10/2017 12:40:00	-	-	-	-	0.1	0.0	20.9	-	0	0
WS03	1	50	4 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	1.9	0.0	20.5	-	0	0
WS03	1	50	4 (2)		---	1.00 to 3.00	45 secs	-	-	-	-	1.8	0.0	19.7	-	0	0
WS03	1	50	4 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	1.8	0.0	19.6	-	0	0
WS03	1	50	4 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	1.8	0.0	19.6	-	0	0
WS03	1	50	4 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	1.8	0.0	19.6	-	0	0
WS03	1	50	4 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	1.8	0.0	19.6	-	0	0
WS03	1	50	4 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	1.8	0.0	19.6	-	0	0
WS03	1	50	4 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	1.8	0.0	19.6	-	0	0
WS03	1	50	4 (2)		---	1.00 to 3.00	360 secs	-	-	-	-	1.8	0.0	19.6	-	0	0
WS03	1	50	4 (3)	3.00	3.00	1.00 to 3.00	19/10/2017 12:50:00	-	-	-	3.00	-	-	-	-	-	-

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IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS04	1	50	1	2.00	---	1.00 to 2.00	28/09/2017 13:25:00	-	-	$0.1_{(I)}$	-	-	-	-	-	-	-
WS04	1	50	1		---	1.00 to 2.00	30 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
WS04	1	50	1 (2)	2.00	---	1.00 to 2.00	28/09/2017 13:26:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS04	1	50	1 (2)		---	1.00 to 2.00	15 secs	-	-	-	-	1.2	0.0	19.4	0.0	0	0
WS04	1	50	1 (2)		---	1.00 to 2.00	30 secs	-	-	-	-	1.2	0.0	19.5	0.0	0	0
WS04	1	50	1 (2)		---	1.00 to 2.00	60 secs	-	-	-	-	1.1	0.0	19.4	0.0	0	0
WS04	1	50	1 (2)		---	1.00 to 2.00	90 secs	-	-	-	-	1.1	0.0	19.4	0.0	0	0
WS04	1	50	1 (2)		---	1.00 to 2.00	120 secs	-	-	-	-	1.1	0.0	19.4	0.0	0	0
WS04	1	50	1 (2)		---	1.00 to 2.00	180 secs	-	-	-	-	1.1	0.0	19.4	0.0	0	0
WS04	1	50	1 (2)		---	1.00 to 2.00	240 secs	-	-	-	-	1.1	0.0	19.4	0.0	0	0
WS04	1	50	1 (2)		---	1.00 to 2.00	300 secs	-	-	-	-	1.1	0.0	19.4	0.0	0	0
WS04	1	50	1 (3)	2.00	2.10	1.00 to 2.00	28/09/2017 13:32:00	-	-	-	DRY	-	-	-	-	-	-
WS04	1	50	2	2.00	---	1.00 to 2.00	06/10/2017 14:20:00	1008	1008	$0.0_{(I)}$	-	-	-	-	-	-	-
WS04	1	50	2		---	1.00 to 2.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS04	1	50	2 (2)	2.00	---	1.00 to 2.00	06/10/2017 14:21:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS04	1	50	2 (2)		---	1.00 to 2.00	15 secs	-	-	-	-	0.1	0.0	20.7	0.0	1	0
WS04	1	50	2 (2)		---	1.00 to 2.00	30 secs	-	-	-	-	0.2	0.0	20.6	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS04	1	50	2 (2)		---	1.00 to 2.00	60 secs	-	-	-	-	0.2	0.0	20.5	0.0	0	0
WS04	1	50	2 (2)		---	1.00 to 2.00	90 secs	-	-	-	-	0.2	0.0	20.5	0.0	0	0
WS04	1	50	2 (2)		---	1.00 to 2.00	120 secs	-	-	-	-	0.3	0.0	20.4	0.0	0	0
WS04	1	50	2 (2)		---	1.00 to 2.00	180 secs	-	-	-	-	0.5	0.0	20.2	0.0	0	0
WS04	1	50	2 (2)		---	1.00 to 2.00	240 secs	-	-	-	-	0.6	0.0	20.0	0.0	0	0
WS04	1	50	2 (2)		---	1.00 to 2.00	300 secs	-	-	-	-	0.8	0.0	19.8	0.0	0	0
WS04	1	50	2 (2)		---	1.00 to 2.00	360 secs	-	-	-	-	1.0	0.0	19.7	0.0	0	0
WS04	1	50	2 (2)		---	1.00 to 2.00	420 secs	-	-	-	-	1.0	0.0	19.7	0.0	0	0
WS04	1	50	2 (3)	2.00	2.12	1.00 to 2.00	06/10/2017 14:29:00	-	-	-	1.90	-	-	-	-	-	-
WS04	1	50	3	2.00	---	1.00 to 2.00	13/10/2017 11:20:00	1007	1007	$0.0_{(I)}$	-	-	-	-	-	-	-
WS04	1	50	3		---	1.00 to 2.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS04	1	50	3 (2)	2.00	---	1.00 to 2.00	13/10/2017 11:21:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS04	1	50	3 (2)		---	1.00 to 2.00	15 secs	-	-	-	-	1.3	0.0	20.4	0.0	1	0
WS04	1	50	3 (2)		---	1.00 to 2.00	30 secs	-	-	-	-	1.3	0.0	19.8	0.0	0	0
WS04	1	50	3 (2)		---	1.00 to 2.00	60 secs	-	-	-	-	1.3	0.0	19.8	0.0	0	0
WS04	1	50	3 (2)		---	1.00 to 2.00	90 secs	-	-	-	-	1.3	0.0	19.8	0.0	0	0
WS04	1	50	3 (2)		---	1.00 to 2.00	120 secs	-	-	-	-	1.3	0.0	19.8	0.0	0	0
WS04	1	50	3 (2)		---	1.00 to 2.00	180 secs	-	-	-	-	1.3	0.0	19.8	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS04	1	50	3 (2)		---	1.00 to 2.00	240 secs	-	-	-	-	1.3	0.0	19.8	0.0	0	0
WS04	1	50	3 (2)		---	1.00 to 2.00	300 secs	-	-	-	-	1.3	0.0	19.8	0.0	0	0
WS04	1	50	3 (3)	2.00	2.10	1.00 to 2.00	13/10/2017 11:27:00	-	-	-	1.87	-	-	-	-	-	-
WS04	1	50	4	2.00	---	1.00 to 2.00	19/10/2017 12:03:00	995	995	$0.0_{(I)}$	-	-	-	-	-	-	-
WS04	1	50	4		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS04	1	50	4 (2)	2.00	---	1.00 to 2.00	19/10/2017 12:03:30	-	-	-	-	0.1	0.0	20.9	-	0	0
WS04	1	50	4 (2)		---	1.00 to 2.00	30 secs	-	-	-	-	1.3	0.0	20.6	-	0	0
WS04	1	50	4 (2)		---	1.00 to 2.00	45 secs	-	-	-	-	1.2	0.0	19.9	-	0	0
WS04	1	50	4 (2)		---	1.00 to 2.00	60 secs	-	-	-	-	1.2	0.0	19.9	-	0	0
WS04	1	50	4 (2)		---	1.00 to 2.00	90 secs	-	-	-	-	1.2	0.0	19.9	-	0	0
WS04	1	50	4 (2)		---	1.00 to 2.00	105 secs	-	-	-	-	1.2	0.0	19.9	-	0	0
WS04	1	50	4 (2)		---	1.00 to 2.00	150 secs	-	-	-	-	1.2	0.0	19.9	-	0	0
WS04	1	50	4 (2)		---	1.00 to 2.00	210 secs	-	-	-	-	1.2	0.0	19.9	-	0	0
WS04	1	50	4 (2)		---	1.00 to 2.00	270 secs	-	-	-	-	1.2	0.0	19.9	-	0	0
WS04	1	50	4 (3)	2.00	2.10	1.00 to 2.00	19/10/2017 12:09:00	-	-	-	1.87	-	-	-	-	-	-
WS05	1	50	1	4.00	---	2.00 to 4.00	28/09/2017	1008	1008	$-0.1_{(I)}$	-	-	-	-	-	-	-
WS05	1	50	1		---	2.00 to 4.00	30 secs	-	-	$-0.1_{(SS)}$	-	-	-	-	-	-	-

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RSK Environment Ltd, Abbey Park, Humber Road, Coventry, CV3 4AQ	Compiled By	Date	Checked By	Date	Contract Ref:
	MDStreuger	26/10/17			313583
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IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS05	1	50	1 (2)	4.00	---	2.00 to 4.00	28/09/2017 00:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS05	1	50	1 (2)		---	2.00 to 4.00	15 secs	-	-	-	-	0.3	0.0	20.1	0.0	2	0
WS05	1	50	1 (2)		---	2.00 to 4.00	30 secs	-	-	-	-	0.3	0.0	19.7	0.0	2	0
WS05	1	50	1 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	0.4	0.0	19.7	0.0	2	0
WS05	1	50	1 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	0.4	0.0	19.6	0.0	2	0
WS05	1	50	1 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	0.4	0.0	19.5	0.0	2	0
WS05	1	50	1 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	0.5	0.0	19.4	0.0	1	0
WS05	1	50	1 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	0.6	0.0	19.3	0.0	2	0
WS05	1	50	1 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	0.6	0.0	19.2	0.0	1	0
WS05	1	50	1 (3)	4.00	4.07	2.00 to 4.00	28/09/2017 00:07:00	-	-	-	DRY	-	-	-	-	-	-
WS05	1	50	2	4.00	---	2.00 to 4.00	06/10/2017 13:10:00	1008	1008	$0.0_{(I)}$	-	-	-	-	-	-	-
WS05	1	50	2		---	2.00 to 4.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS05	1	50	2 (2)	4.00	---	2.00 to 4.00	06/10/2017 13:11:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS05	1	50	2 (2)		---	2.00 to 4.00	15 secs	-	-	-	-	0.8	0.0	20.0	0.0	1	0
WS05	1	50	2 (2)		---	2.00 to 4.00	30 secs	-	-	-	-	0.8	0.0	19.0	0.0	0	0
WS05	1	50	2 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	0.8	0.0	18.8	0.0	0	0
WS05	1	50	2 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	0.8	0.0	18.8	0.0	0	0
WS05	1	50	2 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	0.9	0.0	18.7	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
MDStreuger	26/10/17			313583

Contract: **Roade Bypass**

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS05	1	50	2 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	0.9	0.0	18.6	0.0	0	0
WS05	1	50	2 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	0.9	0.0	18.6	0.0	0	0
WS05	1	50	2 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	0.9	0.0	18.6	0.0	0	0
WS05	1	50	2 (3)	4.00	4.10	2.00 to 4.00	06/10/2017 13:17:00	-	-	-	3.99	-	-	-	-	-	-
WS05	1	50	3	4.00	---	2.00 to 4.00	13/10/2017 11:12:00	-	-	$0.0_{(I)}$	-	-	-	-	-	-	-
WS05	1	50	3		---	2.00 to 4.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS05	1	50	3 (2)	4.00	---	2.00 to 4.00	13/10/2017 11:13:00	-	-	-	-	0.1	0.0	20.9	-	0	0
WS05	1	50	3 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	1.7	0.0	19.6	-	0	0
WS05	1	50	3 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	1.6	0.0	17.3	-	0	0
WS05	1	50	3 (2)		---	2.00 to 4.00	150 secs	-	-	-	-	1.6	0.0	17.2	-	0	0
WS05	1	50	3 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	1.6	0.0	17.1	-	0	0
WS05	1	50	3 (2)		---	2.00 to 4.00	210 secs	-	-	-	-	1.6	0.0	17.1	-	0	0
WS05	1	50	3 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	1.6	0.0	17.1	-	0	0
WS05	1	50	3 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	1.6	0.0	17.1	-	0	0
WS05	1	50	3 (2)		---	2.00 to 4.00	360 secs	-	-	-	-	1.6	0.0	17.1	-	0	0
WS05	1	50	3 (3)	4.00	4.10	2.00 to 4.00	13/10/2017 11:21:00	-	-	-	3.97	-	-	-	-	-	-
WS05	1	50	4	4.00	---	2.00 to 4.00	19/10/2017 11:53:00	995	995	$0.0_{(I)}$	-	-	-	-	-	-	-
WS05	1	50	4		---	2.00 to 4.00	15 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS05	1	50	4 (2)	4.00	---	2.00 to 4.00	19/10/2017 11:53:30	-	-	-	-	0.1	0.0	20.9	-	0	0
WS05	1	50	4 (2)		---	2.00 to 4.00	30 secs	-	-	-	-	1.8	0.0	19.2	-	0	0
WS05	1	50	4 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	1.7	0.0	17.3	-	0	0
WS05	1	50	4 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	1.7	0.0	17.2	-	0	0
WS05	1	50	4 (2)		---	2.00 to 4.00	150 secs	-	-	-	-	1.7	0.0	17.2	-	0	0
WS05	1	50	4 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	1.7	0.0	17.2	-	0	0
WS05	1	50	4 (2)		---	2.00 to 4.00	210 secs	-	-	-	-	1.7	0.0	17.2	-	0	0
WS05	1	50	4 (2)		---	2.00 to 4.00	270 secs	-	-	-	-	1.7	0.0	17.2	-	0	0
WS05	1	50	4 (2)		---	2.00 to 4.00	330 secs	-	-	-	-	1.7	0.0	17.2	-	0	0
WS05	1	50	4 (3)	4.00	4.07	2.00 to 4.00	19/10/2017 12:00:00	-	-	-	3.95	-	-	-	-	-	-
WS06	1	50	1	4.00	---	2.00 to 4.00	28/09/2017	1020	1008	19.4(SS)	-	-	-	-	-	-	-
WS06	1	50	1		---	2.00 to 4.00	240 secs	-	-	0.2	-	-	-	-	-	-	-
WS06	1	50	1 (2)	4.00	---	2.00 to 4.00	28/09/2017 00:04:30	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS06	1	50	1 (2)		---	2.00 to 4.00	15 secs	-	-	-	-	1.2	0.0	18.5	0.0	2	0
WS06	1	50	1 (2)		---	2.00 to 4.00	30 secs	-	-	-	-	1.2	0.0	17.9	0.0	2	0
WS06	1	50	1 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	1.2	0.0	17.9	0.0	2	0
WS06	1	50	1 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	1.2	0.0	17.9	0.0	2	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS06	1	50	1 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	1.2	0.0	17.9	0.0	2	0
WS06	1	50	1 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	1.2	0.0	17.9	0.0	2	0
WS06	1	50	1 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	1.2	0.0	17.8	0.0	2	0
WS06	1	50	1 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	1.2	0.0	17.8	0.0	2	0
WS06	1	50	1 (3)	4.00	4.18	2.00 to 4.00	28/09/2017 00:10:30	-	-	-	2.45	-	-	-	-	-	-
WS06	1	50	2	4.00	---	2.00 to 4.00	05/10/2017 12:40:00	1009	1008	$2.2_{(I)}$	-	-	-	-	-	-	-
WS06	1	50	2		---	2.00 to 4.00	120 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
WS06	1	50	2 (2)	4.00	---	2.00 to 4.00	05/10/2017 12:43:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS06	1	50	2 (2)		---	2.00 to 4.00	15 secs	-	-	-	-	1.1	0.0	19.3	0.0	2	0
WS06	1	50	2 (2)		---	2.00 to 4.00	30 secs	-	-	-	-	1.1	0.0	18.4	0.0	2	0
WS06	1	50	2 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	1.1	0.0	18.3	0.0	2	0
WS06	1	50	2 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	1.1	0.0	18.2	0.0	2	0
WS06	1	50	2 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	1.1	0.0	18.2	0.0	2	0
WS06	1	50	2 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	1.1	0.0	18.2	0.0	2	0
WS06	1	50	2 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	1.1	0.0	18.2	0.0	2	0
WS06	1	50	2 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	1.1	0.0	18.3	0.0	2	0
WS06	1	50	2 (3)	4.00	4.18	2.00 to 4.00	05/10/2017 12:49:00	-	-	-	2.36	-	-	-	-	-	-
WS06	1	50	3	4.00	---	2.00 to 4.00	13/10/2017 10:55:00	1007	1007	$-1.1_{(I)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS06	1	50	3		---	2.00 to 4.00	30 secs	-	-	-0.1 (SS)	-	-	-	-	-	-	-
WS06	1	50	3 (2)	4.00	---	2.00 to 4.00	13/10/2017 10:56:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS06	1	50	3 (2)		---	2.00 to 4.00	15 secs	-	-	-	-	0.9	0.0	19.7	0.0	2	0
WS06	1	50	3 (2)		---	2.00 to 4.00	30 secs	-	-	-	-	1.0	0.0	18.8	0.0	3	0
WS06	1	50	3 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	1.0	0.0	18.7	0.0	3	0
WS06	1	50	3 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	1.0	0.0	18.7	0.0	3	0
WS06	1	50	3 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	1.0	0.0	18.7	0.0	3	0
WS06	1	50	3 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	1.0	0.0	18.6	0.0	3	0
WS06	1	50	3 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	1.0	0.0	18.6	0.0	3	0
WS06	1	50	3 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	1.0	0.0	18.6	0.0	3	0
WS06	1	50	3 (3)	4.00	4.17	2.00 to 4.00	13/10/2017 11:02:00	-	-	-	2.40	-	-	-	-	-	-
WS06	1	50	4	4.00	---	2.00 to 4.00	19/10/2017 11:35:00	996	996	0.1 (I)	-	-	-	-	-	-	-
WS06	1	50	4		---	2.00 to 4.00	30 secs	-	-	0.1 (SS)	-	-	-	-	-	-	-
WS06	1	50	4 (2)	4.00	---	2.00 to 4.00	19/10/2017 11:36:00	-	-	-	-	0.1	0.0	20.9	-	0	0
WS06	1	50	4 (2)		---	2.00 to 4.00	15 secs	-	-	-	-	1.4	0.0	20.2	-	0	0
WS06	1	50	4 (2)		---	2.00 to 4.00	30 secs	-	-	-	-	1.4	0.0	18.7	-	0	0
WS06	1	50	4 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	1.4	0.0	18.6	-	0	0
WS06	1	50	4 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	1.4	0.0	18.6	-	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
MDStrecige?	26/10/17			313583

Contract: **Roade Bypass**

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS06	1	50	4 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	1.4	0.0	18.6	-	0	0
WS06	1	50	4 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	1.4	0.0	18.7	-	0	0
WS06	1	50	4 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	1.3	0.0	18.7	-	0	0
WS06	1	50	4 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	1.3	0.0	18.7	-	0	0
WS06	1	50	4 (2)		---	2.00 to 4.00	360 secs	-	-	-	-	1.3	0.0	18.8	-	0	0
WS06	1	50	4 (3)	4.00	4.29	2.00 to 4.00	19/10/2017 11:43:00	-	-	-	2.62	-	-	-	-	-	-
WS07	1	50	1	2.50	---	1.00 to 2.50	28/09/2017	1008	1008	-0.1(I)	-	-	-	-	-	-	-
WS07	1	50	1		---	1.00 to 2.50	30 secs	-	-	-0.1(SS)	-	-	-	-	-	-	-
WS07	1	50	1 (2)	2.50	---	1.00 to 2.50	28/09/2017 00:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS07	1	50	1 (2)		---	1.00 to 2.50	15 secs	-	-	-	-	1.4	0.0	17.2	0.0	1	0
WS07	1	50	1 (2)		---	1.00 to 2.50	30 secs	-	-	-	-	1.4	0.0	14.0	0.0	0	0
WS07	1	50	1 (2)		---	1.00 to 2.50	60 secs	-	-	-	-	1.4	0.0	13.7	0.0	0	0
WS07	1	50	1 (2)		---	1.00 to 2.50	90 secs	-	-	-	-	1.4	0.0	13.7	0.0	0	0
WS07	1	50	1 (2)		---	1.00 to 2.50	120 secs	-	-	-	-	1.4	0.0	13.7	0.0	0	0
WS07	1	50	1 (2)		---	1.00 to 2.50	180 secs	-	-	-	-	1.4	0.0	13.6	0.0	0	0
WS07	1	50	1 (2)		---	1.00 to 2.50	240 secs	-	-	-	-	1.4	0.0	13.5	0.0	0	0
WS07	1	50	1 (2)		---	1.00 to 2.50	300 secs	-	-	-	-	1.4	0.0	13.5	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS07	1	50	1 (3)	2.50	2.53	1.00 to 2.50	28/09/2017 00:07:00	-	-	-	1.91	-	-	-	-	-	-
WS07	1	50	2	2.50	---	1.00 to 2.50	05/10/2017 12:25:00	1008	1008	$0.1_{(I)}$	-	-	-	-	-	-	-
WS07	1	50	2		---	1.00 to 2.50	30 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
WS07	1	50	2 (2)	2.50	---	1.00 to 2.50	05/10/2017 12:26:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS07	1	50	2 (2)		---	1.00 to 2.50	15 secs	-	-	-	-	1.8	0.0	17.3	0.0	0	0
WS07	1	50	2 (2)		---	1.00 to 2.50	30 secs	-	-	-	-	1.8	0.0	12.9	0.0	0	0
WS07	1	50	2 (2)		---	1.00 to 2.50	60 secs	-	-	-	-	1.8	0.0	12.5	0.0	0	0
WS07	1	50	2 (2)		---	1.00 to 2.50	90 secs	-	-	-	-	1.8	0.0	12.5	0.0	0	0
WS07	1	50	2 (2)		---	1.00 to 2.50	120 secs	-	-	-	-	1.8	0.0	12.5	0.0	0	0
WS07	1	50	2 (2)		---	1.00 to 2.50	180 secs	-	-	-	-	1.8	0.0	12.5	0.0	0	0
WS07	1	50	2 (2)		---	1.00 to 2.50	240 secs	-	-	-	-	1.8	0.0	12.4	0.0	0	0
WS07	1	50	2 (2)		---	1.00 to 2.50	300 secs	-	-	-	-	1.8	0.0	12.5	0.0	0	0
WS07	1	50	2 (3)	2.50	2.54	1.00 to 2.50	05/10/2017 12:32:00	-	-	-	1.94	-	-	-	-	-	-
WS07	1	50	3	2.50	---	1.00 to 2.50	13/10/2017 10:45:00	1007	1007	$0.0_{(I)}$	-	-	-	-	-	-	-
WS07	1	50	3		---	1.00 to 2.50	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS07	1	50	3 (2)	2.50	---	1.00 to 2.50	13/10/2017 10:46:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS07	1	50	3 (2)		---	1.00 to 2.50	15 secs	-	-	-	-	1.8	0.0	18.1	0.0	0	0
WS07	1	50	3 (2)		---	1.00 to 2.50	30 secs	-	-	-	-	1.9	0.0	15.4	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS07	1	50	3 (2)		---	1.00 to 2.50	60 secs	-	-	-	-	1.9	0.0	15.1	0.0	0	0
WS07	1	50	3 (2)		---	1.00 to 2.50	90 secs	-	-	-	-	1.9	0.0	15.0	0.0	0	0
WS07	1	50	3 (2)		---	1.00 to 2.50	120 secs	-	-	-	-	1.9	0.0	15.0	0.0	0	0
WS07	1	50	3 (2)		---	1.00 to 2.50	180 secs	-	-	-	-	1.9	0.0	15.1	0.0	0	0
WS07	1	50	3 (2)		---	1.00 to 2.50	240 secs	-	-	-	-	1.9	0.0	15.1	0.0	0	0
WS07	1	50	3 (2)		---	1.00 to 2.50	300 secs	-	-	-	-	1.9	0.0	15.1	0.0	0	0
WS07	1	50	3 (3)	2.50	2.54	1.00 to 2.50	13/10/2017 10:52:00	-	-	-	2.05	-	-	-	-	-	-
WS07	1	50	4	2.50	---	1.00 to 2.50	19/10/2017 11:26:00	996	996	$0.3_{(I)}$	-	-	-	-	-	-	-
WS07	1	50	4		---	1.00 to 2.50	15 secs	-	-	$0.3_{(SS)}$	-	-	-	-	-	-	-
WS07	1	50	4 (2)	2.50	---	1.00 to 2.50	19/10/2017 11:26:30	-	-	-	-	0.1	0.0	20.8	-	0	0
WS07	1	50	4 (2)		---	1.00 to 2.50	30 secs	-	-	-	-	1.9	0.0	19.5	-	0	0
WS07	1	50	4 (2)		---	1.00 to 2.50	60 secs	-	-	-	-	1.8	0.0	17.1	-	0	0
WS07	1	50	4 (2)		---	1.00 to 2.50	90 secs	-	-	-	-	1.8	0.0	17.1	-	0	0
WS07	1	50	4 (2)		---	1.00 to 2.50	120 secs	-	-	-	-	1.8	0.0	17.1	-	0	0
WS07	1	50	4 (2)		---	1.00 to 2.50	150 secs	-	-	-	-	1.8	0.0	17.1	-	0	0
WS07	1	50	4 (2)		---	1.00 to 2.50	210 secs	-	-	-	-	1.8	0.0	17.1	-	0	0
WS07	1	50	4 (2)		---	1.00 to 2.50	270 secs	-	-	-	-	1.8	0.0	17.2	-	0	0
WS07	1	50	4 (2)		---	1.00 to 2.50	330 secs	-	-	-	-	1.8	0.0	17.2	-	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
MDStreuger	26/10/17			**313583**

Contract: **Roade Bypass**

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS07	1	50	4 (3)	2.50	2.54	1.00 to 2.50	19/10/2017 11:33:00	-	-	-	2.07	-	-	-	-	-	-
WS08	1	50	1	3.00	---	1.00 to 3.00	28/09/2017	1008	1008	$0.0_{(I)}$	-	-	-	-	-	-	-
WS08	1	50	1		---	1.00 to 3.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS08	1	50	1 (2)	3.00	---	1.00 to 3.00	28/09/2017 00:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS08	1	50	1 (2)		---	1.00 to 3.00	15 secs	-	-	-	-	2.4	0.0	18.0	0.0	2	0
WS08	1	50	1 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	2.4	0.0	15.3	0.0	0	0
WS08	1	50	1 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	2.5	0.0	15.1	0.0	0	0
WS08	1	50	1 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	2.5	0.0	15.0	0.0	0	0
WS08	1	50	1 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	2.4	0.0	15.0	0.0	0	0
WS08	1	50	1 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	2.4	0.0	14.9	0.0	0	0
WS08	1	50	1 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	2.4	0.0	14.8	0.0	0	0
WS08	1	50	1 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	2.4	0.0	14.8	0.0	0	0
WS08	1	50	1 (3)	3.00	3.10	1.00 to 3.00	28/09/2017 00:07:00	-	-	-	2.65	-	-	-	-	-	-
WS08	1	50	2	3.00	---	1.00 to 3.00	05/10/2017 12:15:00	1008	1008	$0.0_{(I)}$	-	-	-	-	-	-	-
WS08	1	50	2		---	1.00 to 3.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS08	1	50	2 (2)	3.00	---	1.00 to 3.00	05/10/2017 12:16:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS08	1	50	2 (2)		---	1.00 to 3.00	15 secs	-	-	-	-	1.8	0.0	20.1	0.0	1	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS08	1	50	2 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	1.8	0.0	19.5	0.0	0	0
WS08	1	50	2 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	1.8	0.0	19.4	0.0	0	0
WS08	1	50	2 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	1.8	0.0	19.4	0.0	0	0
WS08	1	50	2 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	1.8	0.0	19.4	0.0	0	0
WS08	1	50	2 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	1.8	0.0	19.4	0.0	0	0
WS08	1	50	2 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	1.8	0.0	19.4	0.0	0	0
WS08	1	50	2 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	1.8	0.0	19.4	0.0	0	0
WS08	1	50	2 (3)	3.00	3.09	1.00 to 3.00	05/10/2017 12:22:00	-	-	-	2.66	-	-	-	-	-	-
WS08	1	50	3	3.00	---	1.00 to 3.00	13/10/2017 13:35:00	1007	1007	$0.0_{(I)}$	-	-	-	-	-	-	-
WS08	1	50	3		---	1.00 to 3.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS08	1	50	3 (2)	3.00	---	1.00 to 3.00	13/10/2017 13:36:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS08	1	50	3 (2)		---	1.00 to 3.00	15 secs	-	-	-	-	1.8	0.0	19.7	0.0	0	0
WS08	1	50	3 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	1.8	0.0	18.9	0.0	0	0
WS08	1	50	3 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	1.8	0.0	18.8	0.0	0	0
WS08	1	50	3 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	1.9	0.0	18.8	0.0	0	0
WS08	1	50	3 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	1.9	0.0	18.8	0.0	0	0
WS08	1	50	3 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	1.9	0.0	18.8	0.0	0	0
WS08	1	50	3 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	1.9	0.0	18.8	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd, Abbey Park, Humber Road, Coventry, CV3 4AQ	Compiled By	Date	Checked By	Date	Contract Ref: 313583
	MDStreeter	26/10/17			
	Contract: Roade Bypass				Page: 35 of 48

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS08	1	50	3 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	1.9	0.0	18.8	0.0	0	0
WS08	1	50	3 (3)	3.00	3.09	1.00 to 3.00	13/10/2017 13:42:00	-	-	-	2.68	-	-	-	-	-	-
WS08	1	50	4	3.00	---	1.00 to 3.00	19/10/2017 11:17:00	996	996	$0.1_{(I)}$	-	-	-	-	-	-	-
WS08	1	50	4		---	1.00 to 3.00	15 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
WS08	1	50	4 (2)	3.00	---	1.00 to 3.00	19/10/2017 11:17:30	-	-	-	-	0.1	0.0	20.9	-	0	0
WS08	1	50	4 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	2.3	0.0	18.3	-	1	0
WS08	1	50	4 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	2.1	0.0	16.9	-	1	0
WS08	1	50	4 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	2.1	0.0	16.9	-	1	0
WS08	1	50	4 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	2.1	0.0	17.0	-	1	0
WS08	1	50	4 (2)		---	1.00 to 3.00	150 secs	-	-	-	-	2.1	0.0	17.0	-	1	0
WS08	1	50	4 (2)		---	1.00 to 3.00	210 secs	-	-	-	-	2.1	0.0	17.1	-	1	0
WS08	1	50	4 (2)		---	1.00 to 3.00	270 secs	-	-	-	-	2.1	0.0	17.2	-	1	0
WS08	1	50	4 (2)		---	1.00 to 3.00	330 secs	-	-	-	-	2.1	0.0	17.3	-	1	0
WS08	1	50	4 (3)	3.00	3.09	1.00 to 3.00	19/10/2017 11:24:00	-	-	-	2.70	-	-	-	-	-	-
WS09	1	50	1	3.00	---	1.00 to 3.00	28/09/2017 13:13:00	1006	1006	$0.1_{(I)}$	-	-	-	-	-	-	-
WS09	1	50	1		---	1.00 to 3.00	30 secs	-	-	$0.1_{(SS)}$	-	-	-	-	-	-	-
WS09	1	50	1 (2)	3.00	---	1.00 to 3.00	28/09/2017 13:14:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS09	1	50	1 (2)		---	1.00 to 3.00	15 secs	-	-	-	-	1.0	0.0	19.6	0.0	0	0
WS09	1	50	1 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	0.9	0.0	19.4	0.0	0	0
WS09	1	50	1 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	0.9	0.0	19.4	0.0	0	0
WS09	1	50	1 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	0.9	0.0	19.4	0.0	0	0
WS09	1	50	1 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	0.9	0.0	19.4	0.0	0	0
WS09	1	50	1 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	0.9	0.0	19.4	0.0	0	0
WS09	1	50	1 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	0.9	0.0	19.5	0.0	0	0
WS09	1	50	1 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	0.9	0.0	19.5	0.0	0	0
WS09	1	50	1 (3)	3.00	3.07	1.00 to 3.00	28/09/2017 13:20:00	-	-	-	DRY	-	-	-	-	-	-
WS09	1	50	2	3.00	---	1.00 to 3.00	06/10/2017 12:47:00	1003	1003	$0.0_{(I)}$	-	-	-	-	-	-	-
WS09	1	50	2		---	1.00 to 3.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS09	1	50	2 (2)	3.00	---	1.00 to 3.00	06/10/2017 12:48:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS09	1	50	2 (2)		---	1.00 to 3.00	15 secs	-	-	-	-	0.5	0.0	20.3	0.0	0	0
WS09	1	50	2 (2)		---	1.00 to 3.00	30 secs	-	-	-	-	0.5	0.0	20.2	0.0	0	0
WS09	1	50	2 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	0.5	0.0	20.2	0.0	0	1
WS09	1	50	2 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	0.5	0.0	20.2	0.0	0	1
WS09	1	50	2 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	0.5	0.0	20.2	0.0	0	1
WS09	1	50	2 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	0.5	0.0	20.2	0.0	0	1

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS09	1	50	2 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	0.5	0.0	20.2	0.0	0	1
WS09	1	50	2 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	0.5	0.0	20.2	0.0	0	1
WS09	1	50	2 (3)	3.00	3.07	1.00 to 3.00	06/10/2017 12:54:00	-	-	-	DRY	-	-	-	-	-	-
WS09	1	50	3	3.00	---	1.00 to 3.00	13/10/2017 11:45:00	1010	1010	$0.0_{(I)}$	-	-	-	-	-	-	-
WS09	1	50	3		---	1.00 to 3.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS09	1	50	3 (2)	3.00	---	1.00 to 3.00	13/10/2017 11:46:00	-	-	-	-	0.1	0.0	20.9	-	0	0
WS09	1	50	3 (2)		---	1.00 to 3.00	60 secs	-	-	-	-	0.6	0.0	20.8	-	0	0
WS09	1	50	3 (2)		---	1.00 to 3.00	90 secs	-	-	-	-	0.5	0.0	20.4	-	0	0
WS09	1	50	3 (2)		---	1.00 to 3.00	120 secs	-	-	-	-	0.5	0.0	20.4	-	0	0
WS09	1	50	3 (2)		---	1.00 to 3.00	180 secs	-	-	-	-	0.5	0.0	20.4	-	0	0
WS09	1	50	3 (2)		---	1.00 to 3.00	210 secs	-	-	-	-	0.5	0.0	20.4	-	0	0
WS09	1	50	3 (2)		---	1.00 to 3.00	240 secs	-	-	-	-	0.5	0.0	20.4	-	0	0
WS09	1	50	3 (2)		---	1.00 to 3.00	300 secs	-	-	-	-	0.5	0.0	20.4	-	0	0
WS09	1	50	3 (2)		---	1.00 to 3.00	360 secs	-	-	-	-	0.5	0.0	20.4	-	0	0
WS09	1	50	3 (2)		---	1.00 to 3.00	420 secs	-	-	-	-	0.5	0.0	20.4	-	0	0
WS09	1	50	3 (3)	3.00	3.09	1.00 to 3.00	13/10/2017 11:56:00	-	-	-	3.09	-	-	-	-	-	-
WS09	1	50	4	3.00	---	1.00 to 3.00	19/10/2017 12:13:00	994	994	$0.0_{(I)}$	-	-	-	-	-	-	-
WS09	1	50	4		---	1.00 to 3.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS09	1	50	4 (2)	3.00	---	1.00 to 3.00	19/10/2017 12:13:45	-	-	-	-	0.1	0.0	20.9	-	0	0
WS09	1	50	4 (2)		---	1.00 to 3.00	15 secs	-	-	-	-	1.0	0.0	20.3	-	0	0
WS09	1	50	4 (2)		---	1.00 to 3.00	75 secs	-	-	-	-	1.0	0.0	18.5	-	0	0
WS09	1	50	4 (2)		---	1.00 to 3.00	105 secs	-	-	-	-	1.0	0.0	18.5	-	0	0
WS09	1	50	4 (2)		---	1.00 to 3.00	135 secs	-	-	-	-	1.0	0.0	18.5	-	0	0
WS09	1	50	4 (2)		---	1.00 to 3.00	165 secs	-	-	-	-	1.0	0.0	18.5	-	0	0
WS09	1	50	4 (2)		---	1.00 to 3.00	195 secs	-	-	-	-	1.0	0.0	18.5	-	0	0
WS09	1	50	4 (2)		---	1.00 to 3.00	255 secs	-	-	-	-	1.0	0.0	18.5	-	0	0
WS09	1	50	4 (2)		---	1.00 to 3.00	315 secs	-	-	-	-	1.0	0.0	18.5	-	0	0
WS09	1	50	4 (3)	3.00	3.08	1.00 to 3.00	19/10/2017 12:21:00	-	-	-	3.08	-	-	-	-	-	-
WS10	1	50	1	4.00	---	2.00 to 4.00	28/09/2017	1006	1006	$0.0_{(I)}$	-	-	-	-	-	-	-
WS10	1	50	1		---	2.00 to 4.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS10	1	50	1 (2)	4.00	---	2.00 to 4.00	28/09/2017 00:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS10	1	50	1 (2)		---	2.00 to 4.00	15 secs	-	-	-	-	2.5	0.0	17.5	0.0	1	0
WS10	1	50	1 (2)		---	2.00 to 4.00	30 secs	-	-	-	-	2.5	0.0	14.8	0.0	1	0
WS10	1	50	1 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	2.5	0.0	14.5	0.0	1	0
WS10	1	50	1 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	2.5	0.0	14.5	0.0	1	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS10	1	50	1 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	2.5	0.0	14.6	0.0	1	0
WS10	1	50	1 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	2.5	0.0	14.6	0.0	1	0
WS10	1	50	1 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	2.5	0.0	14.6	0.0	1	0
WS10	1	50	1 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	2.5	0.0	14.6	0.0	1	0
WS10	1	50	1 (3)	4.00	4.03	2.00 to 4.00	28/09/2017 00:07:00	-	-	-	3.23	-	-	-	-	-	-
WS10	1	50	2	4.00	---	2.00 to 4.00	05/10/2017 10:10:00	1005	1005	$0.0_{(I)}$	-	-	-	-	-	-	-
WS10	1	50	2		---	2.00 to 4.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS10	1	50	2 (2)	4.00	---	2.00 to 4.00	05/10/2017 10:11:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS10	1	50	2 (2)		---	2.00 to 4.00	15 secs	-	-	-	-	2.6	0.0	18.0	0.0	0	0
WS10	1	50	2 (2)		---	2.00 to 4.00	30 secs	-	-	-	-	2.6	0.0	14.7	0.0	0	0
WS10	1	50	2 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	2.7	0.0	14.2	0.0	0	0
WS10	1	50	2 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	2.7	0.0	14.1	0.0	0	0
WS10	1	50	2 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	2.7	0.0	14.1	0.0	0	0
WS10	1	50	2 (2)		---	2.00 to 4.00	180 secs	-	-	-	-	2.7	0.0	14.1	0.0	0	0
WS10	1	50	2 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	2.7	0.0	14.0	0.0	0	0
WS10	1	50	2 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	2.7	0.0	14.0	0.0	0	0
WS10	1	50	2 (3)	4.00	4.04	2.00 to 4.00	05/10/2017 10:17:00	-	-	-	3.22	-	-	-	-	-	-
WS10	1	50	3	4.00	---	2.00 to 4.00	13/10/2017 10:36:00	1010	1010	$0.0_{(I)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS10	1	50	3		---	2.00 to 4.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS10	1	50	3 (2)	4.00	---	2.00 to 4.00	13/10/2017 10:37:00	-	-	-	-	0.1	0.0	20.9	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	60 secs	-	-	-	-	0.9	0.0	20.3	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	75 secs	-	-	-	-	1.0	0.0	19.1	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	90 secs	-	-	-	-	1.4	0.0	18.4	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	120 secs	-	-	-	-	1.9	0.0	17.5	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	150 secs	-	-	-	-	2.2	0.0	16.8	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	240 secs	-	-	-	-	2.5	0.0	16.2	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	300 secs	-	-	-	-	2.5	0.0	16.0	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	360 secs	-	-	-	-	2.6	0.0	16.0	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	390 secs	-	-	-	-	2.6	0.0	16.0	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	420 secs	-	-	-	-	2.6	0.0	16.0	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	435 secs	-	-	-	-	2.6	0.0	16.0	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	450 secs	-	-	-	-	2.6	0.0	16.0	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	480 secs	-	-	-	-	2.6	0.0	16.0	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	510 secs	-	-	-	-	2.6	0.0	16.0	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	540 secs	-	-	-	-	2.6	0.0	16.1	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	600 secs	-	-	-	-	2.6	0.0	16.2	-	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS10	1	50	3 (2)		---	2.00 to 4.00	660 secs	-	-	-	-	2.5	0.0	16.3	-	0	0
WS10	1	50	3 (2)		---	2.00 to 4.00	720 secs	-	-	-	-	2.5	0.0	16.4	-	0	0
WS10	1	50	3 (3)	4.00	4.04	2.00 to 4.00	13/10/2017 10:53:00	-	-	-	3.15	-	-	-	-	-	-
WS10	1	50	4	4.00	---	2.00 to 4.00	18/10/2017 10:44:00	1002	1002	$0.3_{(I)}$	-	-	-	-	-	-	-
WS10	1	50	4		---	2.00 to 4.00	30 secs	-	-	$0.2_{(SS)}$	-	-	-	-	-	-	-
WS10	1	50	4 (2)	4.00	---	2.00 to 4.00	18/10/2017 10:44:45	-	-	-	-	0.1	0.0	20.9	-	0	-
WS10	1	50	4 (2)		---	2.00 to 4.00	15 secs	-	-	-	-	2.5	0.0	20.3	-	0	0
WS10	1	50	4 (2)		---	2.00 to 4.00	45 secs	-	-	-	-	2.5	0.0	18.0	-	0	0
WS10	1	50	4 (2)		---	2.00 to 4.00	75 secs	-	-	-	-	2.5	0.0	17.7	-	0	0
WS10	1	50	4 (2)		---	2.00 to 4.00	105 secs	-	-	-	-	2.6	0.0	17.7	-	0	0
WS10	1	50	4 (2)		---	2.00 to 4.00	135 secs	-	-	-	-	2.6	0.0	17.7	-	0	0
WS10	1	50	4 (2)		---	2.00 to 4.00	195 secs	-	-	-	-	2.6	0.0	17.7	-	0	0
WS10	1	50	4 (2)		---	2.00 to 4.00	255 secs	-	-	-	-	2.6	0.0	17.7	-	0	0
WS10	1	50	4 (2)		---	2.00 to 4.00	315 secs	-	-	-	-	2.6	0.0	17.8	-	0	0
WS10	1	50	4 (3)	4.00	4.04	2.00 to 4.00	18/10/2017 10:55:00	-	-	-	2.75	-	-	-	-	-	-
WS11	1	50	1	5.00	---	3.00 to 5.00	28/09/2017	1003	1003	$0.0_{(I)}$	-	-	-	-	-	-	-
WS11	1	50	1		---	3.00 to 5.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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IN-SITU GAS MONITORING RESULTS

[Pressures] Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS11	1	50	1 (2)	5.00	---	3.00 to 5.00	28/09/2017 00:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS11	1	50	1 (2)		---	3.00 to 5.00	15 secs	-	-	-	-	3.9	0.0	19.1	0.0	1	0
WS11	1	50	1 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	4.0	0.0	14.6	0.0	1	0
WS11	1	50	1 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	4.0	0.0	13.8	0.0	0	0
WS11	1	50	1 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	4.0	0.0	13.7	0.0	0	0
WS11	1	50	1 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	4.0	0.0	13.7	0.0	0	0
WS11	1	50	1 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	4.0	0.0	13.6	0.0	0	0
WS11	1	50	1 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	4.0	0.0	13.6	0.0	0	0
WS11	1	50	1 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	4.0	0.0	13.6	0.0	0	0
WS11	1	50	1 (3)	5.00	4.48	3.00 to 5.00	28/09/2017 00:07:00	-	-	-	DRY	-	-	-	-	-	-
WS11	1	50	2	5.00	---	3.00 to 5.00	05/10/2017 08:40:00	1003	1003	$0.0_{(I)}$	-	-	-	-	-	-	-
WS11	1	50	2		---	3.00 to 5.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS11	1	50	2 (2)	5.00	---	3.00 to 5.00	05/10/2017 08:41:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS11	1	50	2 (2)		---	3.00 to 5.00	15 secs	-	-	-	-	1.5	0.0	20.2	0.0	0	0
WS11	1	50	2 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	1.5	0.0	19.7	0.0	0	0
WS11	1	50	2 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	1.5	0.0	19.6	0.0	0	0
WS11	1	50	2 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	1.5	0.0	19.6	0.0	0	0
WS11	1	50	2 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	1.4	0.0	19.6	0.0	0	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd, Abbey Park, Humber Road, Coventry, CV3 4AQ	Compiled By	Date	Checked By	Date	Contract Ref:
	MDStrecuge	26/10/17			**313583**
	Contract: **Roade Bypass**				Page: **43** of **48**

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS11	1	50	2 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	1.4	0.0	19.7	0.0	0	0
WS11	1	50	2 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	1.3	0.0	19.8	0.0	0	0
WS11	1	50	2 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	1.2	0.0	19.9	0.0	0	0
WS11	1	50	2 (3)	5.00	4.52	3.00 to 5.00	05/10/2017 08:47:00	-	-	-	DRY	-	-	-	-	-	-
WS11	1	50	3	5.00	---	3.00 to 5.00	13/10/2017 10:00:00	1007	1007	$0.0_{(I)}$	-	-	-	-	-	-	-
WS11	1	50	3		---	3.00 to 5.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS11	1	50	3 (2)	5.00	---	3.00 to 5.00	13/10/2017 10:01:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS11	1	50	3 (2)		---	3.00 to 5.00	15 secs	-	-	-	-	0.1	0.0	21.2	0.0	1	0
WS11	1	50	3 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	0.1	0.0	21.2	0.0	0	0
WS11	1	50	3 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	0.1	0.0	21.2	0.0	0	0
WS11	1	50	3 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	0.1	0.0	21.3	0.0	0	0
WS11	1	50	3 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	0.1	0.0	21.3	0.0	0	0
WS11	1	50	3 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	0.1	0.0	21.3	0.0	0	0
WS11	1	50	3 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	0.1	0.0	21.3	0.0	0	0
WS11	1	50	3 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	0.1	0.0	21.3	0.0	0	0
WS11	1	50	3 (3)	5.00	4.53	3.00 to 5.00	13/10/2017 10:07:00	-	-	-	DRY	-	-	-	-	-	-
WS11	1	50	4	5.00	---	3.00 to 5.00	19/10/2017 09:49:00	993	993	$0.3_{(I)}$	-	-	-	-	-	-	-
WS11	1	50	4		---	3.00 to 5.00	30 secs	-	-	$0.2_{(SS)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
MDStreagle	26/10/17			313583

Contract: **Roade Bypass**

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS11	1	50	4 (2)	5.00	---	3.00 to 5.00	19/10/2017 09:50:00	-	-	-	-	0.1	0.0	20.9	-	0	0
WS11	1	50	4 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	1.8	0.0	20.6	-	0	0
WS11	1	50	4 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	1.7	0.0	19.5	-	0	0
WS11	1	50	4 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	1.7	0.0	19.2	-	0	0
WS11	1	50	4 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	1.7	0.0	19.2	-	0	0
WS11	1	50	4 (2)		---	3.00 to 5.00	150 secs	-	-	-	-	1.7	0.0	19.2	-	0	0
WS11	1	50	4 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	1.7	0.0	19.2	-	0	0
WS11	1	50	4 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	1.7	0.0	19.1	-	0	0
WS11	1	50	4 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	1.7	0.0	19.1	-	0	0
WS11	1	50	4 (3)	5.00	4.53	3.00 to 5.00	19/10/2017 09:56:00	-	-	-	4.53	-	-	-	-	-	-
WS12	1	50	1	5.00	---	3.00 to 5.00	28/09/2017 08:53:00	1001	1001	0.0(I)	-	-	-	-	-	-	-
WS12	1	50	1		---	3.00 to 5.00	30 secs	-	-	0.0(SS)	-	-	-	-	-	-	-
WS12	1	50	1 (2)	5.00	---	3.00 to 5.00	28/09/2017 08:54:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS12	1	50	1 (2)		---	3.00 to 5.00	15 secs	-	-	-	-	4.1	0.0	17.2	0.0	1	0
WS12	1	50	1 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	3.7	0.0	16.0	0.0	1	0
WS12	1	50	1 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	3.8	0.0	15.7	0.0	1	0
WS12	1	50	1 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	3.8	0.0	15.6	0.0	1	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS12	1	50	1 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	3.8	0.0	15.6	0.0	1	0
WS12	1	50	1 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	3.9	0.0	15.5	0.0	1	0
WS12	1	50	1 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	3.9	0.0	15.5	0.0	1	0
WS12	1	50	1 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	3.9	0.0	15.4	0.0	1	0
WS12	1	50	1 (3)	5.00	5.06	3.00 to 5.00	28/09/2017 09:00:00	-	-	-	3.58	-	-	-	-	-	-
WS12	1	50	2	5.00	---	3.00 to 5.00	05/10/2017 08:52:00	999	999	$0.0_{(I)}$	-	-	-	-	-	-	-
WS12	1	50	2		---	3.00 to 5.00	30 secs	-	-	$0.0_{(SS)}$	-	-	-	-	-	-	-
WS12	1	50	2 (2)	5.00	---	3.00 to 5.00	05/10/2017 08:53:00	-	-	-	-	0.0	0.0	20.9	0.0	0	0
WS12	1	50	2 (2)		---	3.00 to 5.00	15 secs	-	-	-	-	7.9	0.0	13.9	0.0	1	0
WS12	1	50	2 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	7.5	0.0	12.4	0.0	1	0
WS12	1	50	2 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	7.6	0.0	12.0	0.0	1	0
WS12	1	50	2 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	7.7	0.0	11.9	0.0	1	0
WS12	1	50	2 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	7.7	0.0	11.9	0.0	1	0
WS12	1	50	2 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	7.7	0.0	11.8	0.0	1	0
WS12	1	50	2 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	7.7	0.0	11.8	0.0	1	0
WS12	1	50	2 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	7.7	0.0	11.8	0.0	1	0
WS12	1	50	2 (3)	5.00	5.07	3.00 to 5.00	05/10/2017 08:59:00	-	-	-	4.80	-	-	-	-	-	-
WS12	1	50	3	5.00	---	3.00 to 5.00	13/10/2017 09:43:00	1008	1008	$0.1_{(I)}$	-	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
MDStrange	26/10/17			**313583**

Contract: **Roade Bypass**

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS12	1	50	3		---	3.00 to 5.00	30 secs	-	-	0.1(SS)	-	-	-	-	-	-	-
WS12	1	50	3 (2)	5.00	---	3.00 to 5.00	13/10/2017 09:44:00	-	-	-	-	0.1	0.0	20.8	-	0	0
WS12	1	50	3 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	9.1	0.0	17.0	-	0	0
WS12	1	50	3 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	8.5	0.0	12.3	-	0	0
WS12	1	50	3 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	8.7	0.0	11.4	-	0	0
WS12	1	50	3 (2)		---	3.00 to 5.00	150 secs	-	-	-	-	8.8	0.0	11.3	-	0	0
WS12	1	50	3 (2)		---	3.00 to 5.00	180 secs	-	-	-	-	8.8	0.0	11.2	-	0	0
WS12	1	50	3 (2)		---	3.00 to 5.00	240 secs	-	-	-	-	8.8	0.0	11.2	-	0	0
WS12	1	50	3 (2)		---	3.00 to 5.00	300 secs	-	-	-	-	8.8	0.0	11.2	-	0	0
WS12	1	50	3 (2)		---	3.00 to 5.00	360 secs	-	-	-	-	8.8	0.0	11.2	-	0	0
WS12	1	50	3 (2)		---	3.00 to 5.00	420 secs	-	-	-	-	8.8	0.0	11.2	-	0	0
WS12	1	50	3 (3)	5.00	5.08	3.00 to 5.00	13/10/2017 09:51:30	-	-	-	4.64	-	-	-	-	-	-
WS12	1	50	4	5.00	---	3.00 to 5.00	19/10/2017 10:13:00	994	994	0.1(I)	-	-	-	-	-	-	-
WS12	1	50	4		---	3.00 to 5.00	15 secs	-	-	0.0(SS)	-	-	-	-	-	-	-
WS12	1	50	4 (2)	5.00	---	3.00 to 5.00	19/10/2017 10:13:30	-	-	-	-	0.1	0.0	20.8	-	0	0
WS12	1	50	4 (2)		---	3.00 to 5.00	30 secs	-	-	-	-	8.7	0.0	18.1	-	1	0
WS12	1	50	4 (2)		---	3.00 to 5.00	60 secs	-	-	-	-	8.1	0.0	12.6	-	1	0
WS12	1	50	4 (2)		---	3.00 to 5.00	90 secs	-	-	-	-	8.4	0.0	11.4	-	1	0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

[Pressures] Previous During Start End Equipment Used & Remarks

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS12	1	50	4 (2)		---	3.00 to 5.00	120 secs	-	-	-	-	8.4	0.0	11.3	-	1	0
WS12	1	50	4 (2)		---	3.00 to 5.00	150 secs	-	-	-	-	8.4	0.0	11.3	-	0	0
WS12	1	50	4 (2)		---	3.00 to 5.00	210 secs	-	-	-	-	8.4	0.0	11.2	-	0	0
WS12	1	50	4 (2)		---	3.00 to 5.00	270 secs	-	-	-	-	8.4	0.0	11.2	-	0	0
WS12	1	50	4 (2)		---	3.00 to 5.00	330 secs	-	-	-	-	8.4	0.0	11.2	-	0	0
WS12	1	50	4 (3)	5.00	5.08	3.00 to 5.00	19/10/2017 10:20:00	-	-	-	4.57	-	-	-	-	-	-

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
MDStreager	26/10/17			313583

Contract: **Roade Bypass**

APPENDIX G
GROUNDWATER MONITORING RECORDS

IN-SITU WATER MONITORING RESULTS

	Weather	Ground Conditions	Wind Conditions	Air Temperature (°C)	Equipment Used & Remarks
Round 2	Cloudy	Damp	Medium	12	GA5000 + Dipmeter

Exploratory Position ID	Pipe Ref	Pipe Diameter	Monitoring Round / Test Number	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring	Water Depth (mbgl)	pH	Redox (mV)	Conductivity (uS/cm)	Temperature (°C)	Dissolved Oxygen (mg/l)	Remarks
BH01	1	50	2 / 1	20.00	19.50	10.00 to 20.00	05/10/2017 10:01	17.17	9.00	318	4379	11.2	4.2	General Remarks: Samples taken.
BH02	1	50	2 / 1	30.00	29.02	20.00 to 30.00	05/10/2017 09:20	20.15	7.84	306	1650	11.2	3.7	General Remarks: Samples taken, cloudy grey and no odour.
BH04	1	50	2 / 1	11.00	10.87	7.00 to 11.00	06/10/2017	9.92	---	---	---	---	---	General Remarks: Samples taken but well ran dry before readings could be taken.
BH05	1	50	2 / 1	12.00	9.78	8.00 to 12.00	05/10/2017 13:40	6.92	7.84	274	2338	12.0	4.1	General Remarks: Samples taken, very cloudy grey and no odour.
WS02	1	50	2 / 1	5.00	5.00	3.00 to 5.00	05/10/2017 10:50	2.77	---	---	---	---	---	General Remarks: Samples taken, started off clear but became cloudier and no odour. Unable to take readings due to slow recharge.
WS10	1	50	2 / 1	4.00	4.04	2.00 to 4.00	05/10/2017 15:30	3.22	---	---	---	---	---	General Remarks: Samples taken, clear and no odour. Unable to take readings due to well running dry.

Key: NDA denotes 'no data available'.

RSK Environment Ltd, Abbey Park, Humber Road, Coventry, CV3 4AQ	Compiled By	Date	Checked By	Date	Contract Ref: 313583
		02/11/17			
	Contract: Roade Bypass				Page: 1 of 1

APPENDIX H
LABORATORY CERTIFICATES FOR SOIL ANALYSIS

Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 17/06450
Issue Number: 1 **Date:** 06 October, 2017

Client: RSK Environment Ltd Coventry
Humber Road, Abbey Park
Coventry
UK
CV3 4AQ

Project Manager: Darren Bench
Project Name: Roade Bypass
Project Ref: 313583
Order No: N/A
Date Samples Received: 07/09/17
Date Instructions Received: 22/09/17
Date Analysis Completed: 06/10/17

Prepared by:

Danielle Brierley
Client Manager

Approved by:

Gill Walker
Laboratory Manager

1247

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/1	17/06450/2	17/06450/3	17/06450/4	17/06450/5	17/06450/6	17/06450/7	17/06450/8	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15		
Depth to Top	0.20	0.20	0.30	0.50	0.20	0.20	0.20	0.20		
Depth To Bottom										
Date Sampled	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	08-Sep-17	07-Sep-17	07-Sep-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	6AE	6AE	6AE	6AE	6	5AE	5AE	5AE		
% Stones >10mm$_A$	<0.1	<0.1	<0.1	2.7	<0.1	1.9	1.9	3.4	% w/w	A-T-044
pH$_D^{M\#}$	7.66	7.15	8.10	8.20	6.86	7.90	7.67	7.40	pH	A-T-031s
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	0.4	<0.2	<0.2	<0.2	<0.2	mg/kg	A-T-050s
Total Organic Carbon$_D^{M\#}$	3.73	1.61	2.64	1.69	2.69	0.99	1.33	2.07	% w/w	A-T-032s
Arsenic$_D^{M\#}$	4	10	2	<1	4	11	7	8	mg/kg	A-T-024s
Cadmium$_D^{M\#}$	0.9	1.1	1.0	1.0	0.7	1.1	1.0	1.3	mg/kg	A-T-024s
Copper$_D^{M\#}$	33	16	24	15	12	15	14	15	mg/kg	A-T-024s
Chromium$_D^{M\#}$	36	26	39	37	34	26	26	35	mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-040s
Lead$_D^{M\#}$	30	24	20	16	21	96	21	22	mg/kg	A-T-024s
Mercury$_D$	<0.17	<0.17	0.30	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	A-T-024s
Nickel$_D^{M\#}$	26	24	31	30	21	27	26	29	mg/kg	A-T-024s
Selenium$_D^{M\#}$	1	1	1	<1	<1	<1	<1	<1	mg/kg	A-T-024s
Zinc$_D^{M\#}$	82	68	69	53	63	73	71	87	mg/kg	A-T-024s

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/1	17/06450/2	17/06450/3	17/06450/4	17/06450/5	17/06450/6	17/06450/7	17/06450/8	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15		
Depth to Top	0.20	0.20	0.30	0.50	0.20	0.20	0.20	0.20		
Depth To Bottom										
Date Sampled	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	08-Sep-17	07-Sep-17	07-Sep-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	6AE	6AE	6AE	6AE	6	5AE	5AE	5AE		
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD		A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/1	17/06450/2	17/06450/3	17/06450/4	17/06450/5	17/06450/6	17/06450/7	17/06450/8	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15		
Depth to Top	0.20	0.20	0.30	0.50	0.20	0.20	0.20	0.20		
Depth To Bottom										
Date Sampled	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	08-Sep-17	07-Sep-17	07-Sep-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	6AE	6AE	6AE	6AE	6	5AE	5AE	5AE		
Nitrogen Pesticides										
Ametryn$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Atraton$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Atrazine$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Prometon$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Prometryn$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Propazine$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Simazine$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Simetryn$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Terbuthylazine$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Terbutryn$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon

Envirolab Job Number: 17/06450 **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06450/1	17/06450/2	17/06450/3	17/06450/4	17/06450/5	17/06450/6	17/06450/7	17/06450/8	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15		
Depth to Top	0.20	0.20	0.30	0.50	0.20	0.20	0.20	0.20		
Depth To Bottom										
Date Sampled	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	08-Sep-17	07-Sep-17	07-Sep-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	6AE	6AE	6AE	6AE	6	5AE	5AE	5AE		
Pest-c										
Mevinphos$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Dichlorvos$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Diazinon$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Heptachlor$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Aldrin$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Methyl Parathion$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Malathion$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Fenitrothion$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Heptachlor Epoxide$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Parathion (Ethyl Parathion)$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
p,p-DDE$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
p,p-DDT$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
p,p-Methoxychlor$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
p,p-TDE (DDD)$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
o,p-DDE$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
o,p-DDT$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
o,p-Methoxychlor$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
o,p-TDE (DDD)$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Endosulphan I$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Endosulphan II$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Endosulphan Sulphate$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Endrin$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Ethion$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Dieldrin$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon
Azinphos-methyl$_A$	-	<50	-	-	-	<50	-	-	µg/kg	Subcon

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/1	17/06450/2	17/06450/3	17/06450/4	17/06450/5	17/06450/6	17/06450/7	17/06450/8	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15		
Depth to Top	0.20	0.20	0.30	0.50	0.20	0.20	0.20	0.20		
Depth To Bottom										
Date Sampled	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	08-Sep-17	07-Sep-17	07-Sep-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	6AE	6AE	6AE	6AE	6	5AE	5AE	5AE		
PAH 16										
Acenaphthene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
Anthracene$_A^{M\#}$	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.06	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	A-T-019s
PAH (total 16)$_A^{M\#}$	0.10	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	A-T-019s

Envirolab Job Number: 17/06450 **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06450/1	17/06450/2	17/06450/3	17/06450/4	17/06450/5	17/06450/6	17/06450/7	17/06450/8		
Client Sample No										
Client Sample ID	TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15		
Depth to Top	0.20	0.20	0.30	0.50	0.20	0.20	0.20	0.20		
Depth To Bottom										
Date Sampled	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	11-Sep-17	08-Sep-17	07-Sep-17	07-Sep-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	6AE	6AE	6AE	6AE	6	5AE	5AE	5AE	Units	Method ref
TPH CWG										
Ali >C5-C6$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C6-C8$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C8-C10$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C10-C12$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C12-C16$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C16-C21$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C21-C35$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Total Aliphatics$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C5-C7$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C7-C8$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C8-C9$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C9-C10$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C10-C12$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C12-C16$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C16-C21$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C21-C35$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Total Aromatics$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
TPH (Ali & Aro)$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
BTEX - Benzene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Toluene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - m & p Xylene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - o Xylene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
MTBE$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/9	17/06450/10	17/06450/11	17/06450/12	17/06450/13	17/06450/15	17/06450/16	17/06450/17		
Client Sample No										
Client Sample ID	TP15	TP16	TP16A	TP16A	TP17	WS02	WS04	WS05		
Depth to Top	1.50	0.10	0.20	0.50	0.20	0.20	0.30	0.20		
Depth To Bottom										
Date Sampled	07-Sep-17	07-Sep-17	08-Sep-17	08-Sep-17	07-Sep-17	06-Sep-17	30-Aug-17	30-Aug-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5A	4AE	4AE	5AE	5AE	5AE	5A	5AE	Units	Method ref
% Stones >10mm$_A$	<0.1	2.7	25.7	<0.1	<0.1	<0.1	<0.1	4.8	% w/w	A-T-044
pH$_D^{M\#}$	8.47	8.17	8.78	8.17	7.91	7.66	8.11	7.55	pH	A-T-031s
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	A-T-050s
Total Organic Carbon$_D^{M\#}$	<0.03	1.43	<0.03	0.58	2.19	1.19	1.93	2.56	% w/w	A-T-032s
Arsenic$_D^{M\#}$	<1	3	1	3	3	7	3	<1	mg/kg	A-T-024s
Cadmium$_D^{M\#}$	<0.5	0.8	<0.5	0.7	0.7	1.3	0.8	0.8	mg/kg	A-T-024s
Copper$_D^{M\#}$	5	12	2	10	13	13	14	20	mg/kg	A-T-024s
Chromium$_D^{M\#}$	11	18	4	20	20	33	18	25	mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-040s
Lead$_D^{M\#}$	4	18	2	13	16	19	16	16	mg/kg	A-T-024s
Mercury$_D$	<0.17	<0.17	0.31	<0.17	0.29	<0.17	0.20	<0.17	mg/kg	A-T-024s
Nickel$_D^{M\#}$	11	17	3	17	16	33	16	21	mg/kg	A-T-024s
Selenium$_D^{M\#}$	<1	<1	<1	<1	<1	1	<1	<1	mg/kg	A-T-024s
Zinc$_D^{M\#}$	16	54	5	45	50	72	52	58	mg/kg	A-T-024s

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/9	17/06450/10	17/06450/11	17/06450/12	17/06450/13	17/06450/15	17/06450/16	17/06450/17	Units	Method ref
Client Sample No										
Client Sample ID	TP15	TP16	TP16A	TP16A	TP17	WS02	WS04	WS05		
Depth to Top	1.50	0.10	0.20	0.50	0.20	0.20	0.30	0.20		
Depth To Bottom										
Date Sampled	07-Sep-17	07-Sep-17	08-Sep-17	08-Sep-17	07-Sep-17	06-Sep-17	30-Aug-17	30-Aug-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5A	4AE	4AE	5AE	5AE	5AE	5A	5AE		
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A$$^{\#}$	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD		A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/9	17/06450/10	17/06450/11	17/06450/12	17/06450/13	17/06450/15	17/06450/16	17/06450/17	Units	Method ref
Client Sample No										
Client Sample ID	TP15	TP16	TP16A	TP16A	TP17	WS02	WS04	WS05		
Depth to Top	1.50	0.10	0.20	0.50	0.20	0.20	0.30	0.20		
Depth To Bottom										
Date Sampled	07-Sep-17	07-Sep-17	08-Sep-17	08-Sep-17	07-Sep-17	06-Sep-17	30-Aug-17	30-Aug-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5A	4AE	4AE	5AE	5AE	5AE	5A	5AE		
Nitrogen Pesticides										
$Ametryn_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
$Atraton_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
$Atrazine_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
$Prometon_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
$Prometryn_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
$Propazine_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
$Simazine_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
$Simetryn_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
$Terbuthylazine_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
$Terbutryn_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon

Envirolab Job Number: 17/06450 | **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06450/9	17/06450/10	17/06450/11	17/06450/12	17/06450/13	17/06450/15	17/06450/16	17/06450/17	Units	Method ref
Client Sample No										
Client Sample ID	TP15	TP16	TP16A	TP16A	TP17	WS02	WS04	WS05		
Depth to Top	1.50	0.10	0.20	0.50	0.20	0.20	0.30	0.20		
Depth To Bottom										
Date Sampled	07-Sep-17	07-Sep-17	08-Sep-17	08-Sep-17	07-Sep-17	06-Sep-17	30-Aug-17	30-Aug-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5A	4AE	4AE	5AE	5AE	5AE	5A	5AE		
Pest-c										
Mevinphos$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Dichlorvos$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Diazinon$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Heptachlor$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Aldrin$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Methyl Parathion$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Malathion$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Fenitrothion$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Heptachlor Epoxide$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Parathion (Ethyl Parathion)$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
p,p-DDE$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
p,p-DDT$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
p,p-Methoxychlor$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
p,p-TDE (DDD)$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
o,p-DDE$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
o,p-DDT$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
o,p-Methoxychlor$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
o,p-TDE (DDD)$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Endosulphan I$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Endosulphan II$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Endosulphan Sulphate$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Endrin$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Ethion$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Dieldrin$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon
Azinphos-methyl$_A$	-	-	<50	-	<50	-	-	-	µg/kg	Subcon

Envirolab Job Number: 17/06450 **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06450/9	17/06450/10	17/06450/11	17/06450/12	17/06450/13	17/06450/15	17/06450/16	17/06450/17		
Client Sample No										
Client Sample ID	TP15	TP16	TP16A	TP16A	TP17	WS02	WS04	WS05		
Depth to Top	1.50	0.10	0.20	0.50	0.20	0.20	0.30	0.20		
Depth To Bottom										
Date Sampled	07-Sep-17	07-Sep-17	08-Sep-17	08-Sep-17	07-Sep-17	06-Sep-17	30-Aug-17	30-Aug-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5A	4AE	4AE	5AE	5AE	5AE	5A	5AE	Units	Method ref
PAH 16										
Acenaphthene$_{A}^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
Acenaphthylene$_{A}^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
Anthracene$_{A}^{M\#}$	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	A-T-019s
Benzo(a)anthracene$_{A}^{M\#}$	<0.04	<0.04	0.16	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
Benzo(a)pyrene$_{A}^{M\#}$	<0.04	<0.04	0.28	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
Benzo(b)fluoranthene$_{A}^{M\#}$	<0.05	<0.05	0.32	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	A-T-019s
Benzo(ghi)perylene$_{A}^{M\#}$	<0.05	<0.05	0.29	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	A-T-019s
Benzo(k)fluoranthene$_{A}^{M\#}$	<0.07	<0.07	0.12	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	A-T-019s
Chrysene$_{A}^{M\#}$	<0.06	<0.06	0.19	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_{A}^{M\#}$	<0.04	<0.04	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
Fluoranthene$_{A}^{M\#}$	<0.08	<0.08	0.17	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	A-T-019s
Fluorene$_{A}^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_{A}^{M\#}$	<0.03	<0.03	0.25	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
Naphthalene$_{A}^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
Phenanthrene$_{A}^{M\#}$	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
Pyrene$_{A}^{M\#}$	<0.07	<0.07	0.18	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	A-T-019s
PAH (total 16)$_{A}^{M\#}$	<0.08	<0.08	2.07	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	A-T-019s

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/9	17/06450/10	17/06450/11	17/06450/12	17/06450/13	17/06450/15	17/06450/16	17/06450/17	Units	Method ref
Client Sample No										
Client Sample ID	TP15	TP16	TP16A	TP16A	TP17	WS02	WS04	WS05		
Depth to Top	1.50	0.10	0.20	0.50	0.20	0.20	0.30	0.20		
Depth To Bottom										
Date Sampled	07-Sep-17	07-Sep-17	08-Sep-17	08-Sep-17	07-Sep-17	06-Sep-17	30-Aug-17	30-Aug-17		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5A	4AE	4AE	5AE	5AE	5AE	5A	5AE		
TPH CWG										
Ali >C5-C6$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C6-C8$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C8-C10$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C10-C12$_{A}^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C12-C16$_{A}^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C16-C21$_{A}^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C21-C35$_{A}^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Total Aliphatics$_{A}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C5-C7$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C7-C8$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C8-C9$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C9-C10$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C10-C12$_{A}^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C12-C16$_{A}^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C16-C21$_{A}^{\#}$	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C21-C35$_{A}^{\#}$	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Total Aromatics$_{A}$	<0.1	<0.1	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
TPH (Ali & Aro)$_{A}$	<0.1	<0.1	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
BTEX - Benzene$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Toluene$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - m & p Xylene$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - o Xylene$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
MTBE$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s

Envirolab Job Number: 17/06450 **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06450/18	17/06450/19	17/06450/21	17/06450/23					Units	Method ref
Client Sample No										
Client Sample ID	WS06	WS06	WS08	WS10						
Depth to Top	0.10	1.50	0.40	0.40						
Depth To Bottom										
Date Sampled	05-Sep-17	05-Sep-17	05-Sep-17	06-Sep-17						
Sample Type	Soil	Soil	Soil	Soil						
Sample Matrix Code	5AE	3E	5AE	5A						
% Stones >10mm$_A$	10.7	<0.1	<0.1	<0.1					% w/w	A-T-044
pH$_D^{M\#}$	7.66	7.75	8.02	7.97					pH	A-T-031s
Phenols - Total by HPLC$_A$	0.2	<0.2	<0.2	<0.2					mg/kg	A-T-050s
Total Organic Carbon$_D^{M\#}$	1.29	2.03	0.65	0.44					% w/w	A-T-032s
Arsenic$_D^{M\#}$	4	<1	6	6					mg/kg	A-T-024s
Cadmium$_D^{M\#}$	0.8	<0.5	1.1	0.9					mg/kg	A-T-024s
Copper$_D^{M\#}$	13	21	13	16					mg/kg	A-T-024s
Chromium$_D^{M\#}$	22	29	22	28					mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1					mg/kg	A-T-040s
Lead$_D^{M\#}$	17	16	14	13					mg/kg	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	<0.17					mg/kg	A-T-024s
Nickel$_D^{M\#}$	19	3	23	30					mg/kg	A-T-024s
Selenium$_D^{M\#}$	<1	<1	<1	<1					mg/kg	A-T-024s
Zinc$_D^{M\#}$	55	9	65	50					mg/kg	A-T-024s

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/18	17/06450/19	17/06450/21	17/06450/23					Units	Method ref
Client Sample No										
Client Sample ID	WS06	WS06	WS08	WS10						
Depth to Top	0.10	1.50	0.40	0.40						
Depth To Bottom										
Date Sampled	05-Sep-17	05-Sep-17	05-Sep-17	06-Sep-17						
Sample Type	Soil	Soil	Soil	Soil						
Sample Matrix Code	5AE	3E	5AE	5A						
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	NAD	NAD	NAD	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A						

Envirolab Job Number: 17/06450

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06450/18	17/06450/19	17/06450/21	17/06450/23					Units	Method ref
Client Sample No										
Client Sample ID	WS06	WS06	WS08	WS10						
Depth to Top	0.10	1.50	0.40	0.40						
Depth To Bottom										
Date Sampled	05-Sep-17	05-Sep-17	05-Sep-17	06-Sep-17						
Sample Type	Soil	Soil	Soil	Soil						
Sample Matrix Code	5AE	3E	5AE	5A						
PAH 16										
$Acenaphthene_A^{M\#}$	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-019s
$Acenaphthylene_A^{M\#}$	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-019s
$Anthracene_A^{M\#}$	<0.02	<0.02	<0.02	<0.02					mg/kg	A-T-019s
$Benzo(a)anthracene_A^{M\#}$	0.06	<0.04	<0.04	<0.04					mg/kg	A-T-019s
$Benzo(a)pyrene_A^{M\#}$	0.07	<0.04	<0.04	<0.04					mg/kg	A-T-019s
$Benzo(b)fluoranthene_A^{M\#}$	0.07	<0.05	<0.05	<0.05					mg/kg	A-T-019s
$Benzo(ghi)perylene_A^{M\#}$	<0.05	0.08	<0.05	<0.05					mg/kg	A-T-019s
$Benzo(k)fluoranthene_A^{M\#}$	<0.07	<0.07	<0.07	<0.07					mg/kg	A-T-019s
$Chrysene_A^{M\#}$	<0.06	<0.06	<0.06	<0.06					mg/kg	A-T-019s
$Dibenzo(ah)anthracene_A^{M\#}$	<0.04	<0.04	<0.04	<0.04					mg/kg	A-T-019s
$Fluoranthene_A^{M\#}$	0.09	<0.08	<0.08	<0.08					mg/kg	A-T-019s
$Fluorene_A^{M\#}$	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-019s
$Indeno(123\text{-}cd)pyrene_A^{M\#}$	0.05	0.06	<0.03	<0.03					mg/kg	A-T-019s
$Naphthalene_A^{M\#}$	<0.03	<0.03	<0.03	<0.03					mg/kg	A-T-019s
$Phenanthrene_A^{M\#}$	0.04	<0.03	<0.03	<0.03					mg/kg	A-T-019s
$Pyrene_A^{M\#}$	<0.07	<0.07	<0.07	<0.07					mg/kg	A-T-019s
$PAH\ (total\ 16)_A^{M\#}$	0.41	0.13	<0.08	<0.08					mg/kg	A-T-019s

Lab Sample ID	17/06450/18	17/06450/19	17/06450/21	17/06450/23					Units	Method ref
Client Sample No										
Client Sample ID	WS06	WS06	WS08	WS10						
Depth to Top	0.10	1.50	0.40	0.40						
Depth To Bottom										
Date Sampled	05-Sep-17	05-Sep-17	05-Sep-17	06-Sep-17						
Sample Type	Soil	Soil	Soil	Soil						
Sample Matrix Code	5AE	3E	5AE	5A						
TPH CWG										
Ali >C5-C6$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Ali >C6-C8$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Ali >C8-C10$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Ali >C10-C12$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Ali >C12-C16$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Ali >C16-C21$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Ali >C21-C35$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Total Aliphatics$_A$	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Aro >C5-C7$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C7-C8$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C8-C9$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C9-C10$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C10-C12$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Aro >C12-C16$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Aro >C16-C21$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Aro >C21-C35$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Total Aromatics$_A$	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
TPH (Ali & Aro)$_A$	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
BTEX - Benzene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Toluene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - m & p Xylene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - o Xylene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
MTBE$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s

REPORT NOTES

General:
This report shall not be reproduced, except in full, without written approval from Envirolab.
All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.
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 and there is insufficient sample to repeat the analysis. 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.

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.

APPENDIX I
LABORATORY CERTIFICATES FOR GROUNDWATER ANALYSIS

Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number:	17/06888	
Issue Number:	1	**Date:** 23 October, 2017

Client: RSK Environment Ltd Coventry
Humber Road, Abbey Park
Coventry
UK
CV3 4AQ

Project Manager:	Darren Bench/Michael Lawson
Project Name:	Roade Bypass
Project Ref:	313583
Order No:	N/A
Date Samples Received:	09/10/17
Date Instructions Received:	11/10/17
Date Analysis Completed:	22/10/17

Prepared by:	**Approved by:**
MMarshall	IHaslock
Melanie Marshall	Iain Haslock
Laboratory Coordinator	Analytical Consultant

UKAS TESTING
1247

Envirolab Job Number: 17/06888 **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06888/1	17/06888/2	17/06888/3	17/06888/4	17/06888/5	17/06888/6			Units	Method ref
Client Sample No										
Client Sample ID	BH01	BH02	BH04	BH05	WS02	WS10				
Depth to Top	17.17	20.15	9.92	7.00	2.80	3.25				
Depth To Bottom										
Date Sampled	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17				
Sample Type	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				
pH (w)$_A$#	6.76	6.89	6.94	7.01	6.86	7.16			pH	A-T-031w
Electrical conductivity @ 20degC (w)$_A$#	1347	839	787	1090	1785	2560			µs/cm	A-T-037w
Alkalinity (total) (w) Colorimetry$_A$#	307	296	281	340	291	301			mg/l Ca CO3	A-T-038w
Hardness Total$_A$#	758	434	452	502	1110	1840			mg/l Ca CO3	A-T-049w
Ammoniacal nitrogen (w)$_A$#	0.56	0.49	0.09	0.32	0.05	0.07			mg/l	A-T-033w
Nitrate (w)$_A$#	<0.10	0.12	2.90	<0.10	2.46	0.15			mg/l	A-T-026w
Sulphate (w)$_A$#	471	158	198	259	788	1520			mg/l	A-T-026w
DOC (w)$_A$#	3.7	3.8	4.4	2.9	2.7	2.4			mg/l	A-T-032w
Arsenic (dissolved)$_A$#	<1	<1	<1	1	<1	<1			µg/l	A-T-025w
Boron (dissolved)$_A$#	1400	2220	277	329	67	109			µg/l	A-T-025w
Cadmium (dissolved)$_A$#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			µg/l	A-T-025w
Calcium (dissolved)$_A$#	240	134	164	166	379	564			mg/l	A-T-049w
Copper (dissolved)$_A$#	<1	1	1	<1	1	2			µg/l	A-T-025w
Chromium (dissolved)$_A$#	1	3	10	<1	7	8			µg/l	A-T-025w
Chromium (hexavalent) (w)$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05			mg/l	A-T-040w
Iron (dissolved)$_A$#	137	18	19	<10	<10	29			µg/l	A-T-025w
Ferrous iron FeII (w)$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/l	Test kit
Ferric iron FeIII (w)	0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/l	Calc
Lead (dissolved)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-025w
Magnesium (dissolved)$_A$#	39	24	11	21	40	104			mg/l	A-T-049w
Mercury (dissolved)$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			µg/l	A-T-025w
Nickel (dissolved)$_A$#	8	3	8	2	29	24			µg/l	A-T-025w
Selenium (dissolved)$_A$#	1	2	5	<1	24	3			µg/l	A-T-025w
Zinc (dissolved)$_A$#	31	21	27	<1	40	139			µg/l	A-T-025w

Envirolab Job Number: 17/06888 **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06888/1	17/06888/2	17/06888/3	17/06888/4	17/06888/5	17/06888/6			Units	Method ref
Client Sample No										
Client Sample ID	BH01	BH02	BH04	BH05	WS02	WS10				
Depth to Top	17.17	20.15	9.92	7.00	2.80	3.25				
Depth To Bottom										
Date Sampled	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17				
Sample Type	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				
PAH 16MS (w)										
Acenaphthene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Acenaphthylene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Anthracene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Benzo(a)anthracene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.03			µg/l	A-T-019w
Benzo(a)pyrene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.05			µg/l	A-T-019w
Benzo(b)fluoranthene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.04			µg/l	A-T-019w
Benzo(ghi)perylene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.02			µg/l	A-T-019w
Benzo(k)fluoranthene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.02			µg/l	A-T-019w
Chrysene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.03			µg/l	A-T-019w
Dibenzo(ah)anthracene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Fluoranthene (w)$_{A}^{\#}$	<0.01	<0.01	0.02	<0.01	<0.01	0.05			µg/l	A-T-019w
Fluorene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Indeno(123-cd)pyrene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	0.03			µg/l	A-T-019w
Naphthalene (w)$_{A}^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	A-T-019w
Phenanthrene (w)$_{A}^{\#}$	<0.01	<0.01	0.02	<0.01	<0.01	0.02			µg/l	A-T-019w
Pyrene (w)$_{A}^{\#}$	<0.01	<0.01	0.02	<0.01	<0.01	0.04			µg/l	A-T-019w
PAH (total 16) (w)$_{A}^{\#}$	<0.01	<0.01	0.06	<0.01	<0.01	0.33			µg/l	A-T-019w
Phenols (speciated HPLC) (w)										
Phenol (w)$_{A}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/l	A-T-050w
Cresols (w)$_{A}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/l	A-T-050w
Xylenols (w)$_{A}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/l	A-T-050w
Resorcinol (w)$_{A}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/l	A-T-050w
Phenols - Total by HPLC (w)$_{A}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/l	A-T-050w

Envirolab Job Number: 17/06888 **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06888/1	17/06888/2	17/06888/3	17/06888/4	17/06888/5	17/06888/6			Units	Method ref
Client Sample No										
Client Sample ID	BH01	BH02	BH04	BH05	WS02	WS10				
Depth to Top	17.17	20.15	9.92	7.00	2.80	3.25				
Depth To Bottom										
Date Sampled	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17				
Sample Type	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				
SVOC (excluding PAH-16) (w)										
2,4,5-Trichlorophenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2,4,6-Trichlorophenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2,4-Dichlorophenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2,4-Dimethylphenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2,4-Dinitrotoluene$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2,6-Dinitrotoluene$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2-Chloronaphthalene$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2-Chlorophenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2-Methylnaphthalene$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2-Methylphenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
2-Nitrophenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
4-Bromophenyl phenyl ether$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
4-Chloro-3-methylphenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Bis(2-chloroisopropyl)ether$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
4-Methylphenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
4-Nitrophenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Bis(2-chloroethyl)ether$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Bis(2-chloroethoxy)methane$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Bis(2-ethylhexyl)phthalate$_A$	<20	<20	<10	<10	-	-			µg/l	A-T-052w
Butylbenzyl phthalate$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Carbazole$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Dibenzofuran$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
n-Dibutylphthalate$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
n-Dioctylphthalate$_A$	<20	<20	<10	<10	-	-			µg/l	A-T-052w
n-Nitroso-n-dipropylamine$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Diethyl phthalate$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Dimethyl phthalate$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Hexachlorobenzene$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Pentachlorophenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Phenol$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Hexachloroethane$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
Nitrobenzene$_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w

Envirolab Job Number: 17/06888 **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06888/1	17/06888/2	17/06888/3	17/06888/4	17/06888/5	17/06888/6			Units	Method ref
Client Sample No										
Client Sample ID	BH01	BH02	BH04	BH05	WS02	WS10				
Depth to Top	17.17	20.15	9.92	7.00	2.80	3.25				
Depth To Bottom										
Date Sampled	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17				
Sample Type	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				
$Isophorone_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
$Hexachlorocyclopentadiene_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w
$Perylene_A$	<2	<2	<1	<1	-	-			µg/l	A-T-052w

Envirolab Job Number: 17/06888

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06888/1	17/06888/2	17/06888/3	17/06888/4	17/06888/5	17/06888/6			Units	Method ref
Client Sample No										
Client Sample ID	BH01	BH02	BH04	BH05	WS02	WS10				
Depth to Top	17.17	20.15	9.92	7.00	2.80	3.25				
Depth To Bottom										
Date Sampled	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17				
Sample Type	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				
VOC (w)										
Dichlorodifluoromethane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Chloromethane$_A$	<10	<10	<10	<10	-	-			µg/l	A-T-006w
Vinyl Chloride$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Bromomethane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Chloroethane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Trichlorofluoromethane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
trans 1,2-Dichloroethene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Dichloromethane$_A$	<5	<5	<5	<5	-	-			µg/l	A-T-006w
Carbon Disulphide$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,1-Dichloroethene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,1-Dichloroethane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
cis 1,2-Dichloroethene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Bromochloromethane$_A^{\#}$	<5	<5	<5	<5	-	-			µg/l	A-T-006w
Chloroform$_A$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
2,2-Dichloropropane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,2-Dichloroethane$_A^{\#}$	<2	<2	<2	<2	-	-			µg/l	A-T-006w
1,1,1-Trichloroethane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,1-Dichloropropene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Benzene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Carbon Tetrachloride$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Dibromomethane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,2-Dichloropropane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Bromodichloromethane$_A^{\#}$	<10	<10	<10	<10	-	-			µg/l	A-T-006w
Trichloroethene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
cis 1,3-Dichloropropene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
trans 1,3-Dichloropropene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,1,2-Trichloroethane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Toluene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,3-Dichloropropane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Dibromochloromethane$_A^{\#}$	<3	<3	<3	<3	-	-			µg/l	A-T-006w
1,2-Dibromoethane$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Tetrachloroethene$_A^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w

Envirolab Job Number: 17/06888 **Client Project Name: Roade Bypass**

Client Project Ref: 313583

Lab Sample ID	17/06888/1	17/06888/2	17/06888/3	17/06888/4	17/06888/5	17/06888/6				
Client Sample No										
Client Sample ID	BH01	BH02	BH04	BH05	WS02	WS10				
Depth to Top	17.17	20.15	9.92	7.00	2.80	3.25				
Depth To Bottom										
Date Sampled	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17				
Sample Type	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			Units	Method ref
1,1,1,2-Tetrachloroethane$_{A}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Chlorobenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Ethylbenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
m & p Xylene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Bromoform$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Styrene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,1,2,2-Tetrachloroethane$_{A}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
o-Xylene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,2,3-Trichloropropane$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Isopropylbenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
Bromobenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
2-Chlorotoluene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
n-propylbenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
4-Chlorotoluene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,2,4-Trimethylbenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
4-Isopropyltoluene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,3,5-Trimethylbenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,2-Dichlorobenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,4-Dichlorobenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
sec-Butylbenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
tert-Butylbenzene$_{A}^{\#}$	<2	<2	<2	<2	-	-			µg/l	A-T-006w
1,3-Dichlorobenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
n-butylbenzene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w
1,2-Dibromo-3-chloropropane$_{A}^{\#}$	<2	<2	<2	<2	-	-			µg/l	A-T-006w
1,2,4-Trichlorobenzene$_{A}^{\#}$	<3	<3	<3	<3	-	-			µg/l	A-T-006w
1,2,3-Trichlorobenzene$_{A}^{\#}$	<3	<3	<3	<3	-	-			µg/l	A-T-006w
Hexachlorobutadiene$_{A}^{\#}$	<1	<1	<1	<1	-	-			µg/l	A-T-006w

Envirolab Job Number: 17/06888

Client Project Name: Roade Bypass

Client Project Ref: 313583

Lab Sample ID	17/06888/1	17/06888/2	17/06888/3	17/06888/4	17/06888/5	17/06888/6			Units	Method ref
Client Sample No										
Client Sample ID	BH01	BH02	BH04	BH05	WS02	WS10				
Depth to Top	17.17	20.15	9.92	7.00	2.80	3.25				
Depth To Bottom										
Date Sampled	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17	05-Oct-17				
Sample Type	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				
TPH CWG										
Ali >C5-C6 (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Ali >C6-C8 (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Ali >C8-C10 (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Ali >C10-C12 (w)$_A$#	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Ali >C12-C16 (w)$_A$#	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Ali >C16-C21 (w)$_A$#	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Ali >C21-C35 (w)$_A$#	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Total Aliphatics (w)$_A$	<5	<5	<5	<5	<5	<5			µg/l	A-T-022+23w
Aro >C5-C7 (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Aro >C7-C8 (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Aro >C8-C9 (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Aro >C9-C10 (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
Aro >C10-C12 (w)$_A$#	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Aro >C12-C16 (w)$_A$#	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Aro >C16-C21 (w)$_A$#	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Aro >C21-C35 (w)$_A$#	<5	<5	<5	<5	<5	<5			µg/l	A-T-023w
Total Aromatics (w)$_A$	<5	<5	<5	<5	<5	<5			µg/l	A-T-022+23w
TPH (Ali & Aro) (w)$_A$	<5	<5	<5	<5	<5	<5			µg/l	A-T-022+23w
BTEX - Benzene (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
BTEX - Toluene (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
BTEX - Ethyl Benzene (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
BTEX - m & p Xylene (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
BTEX - o Xylene (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w
MTBE (w)$_A$#	<1	<1	<1	<1	<1	<1			µg/l	A-T-022w

REPORT NOTES

General:
This report shall not be reproduced, except in full, without written approval from Envirolab.
All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.
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 and there is insufficient sample to repeat the analysis. 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.

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.

APPENDIX J
HUMAN HEALTH GENERIC ASSESSMENT CRITERIA

Generic assessment criteria for human health: commercial scenario

Background

RSK's generic assessment criteria (GAC) were initially prepared following the publication by the Environment Agency (EA) of soil guideline value (SGV) and toxicological (TOX) reports, and associated publications in 2009[1]. RSK GAC were updated following the publication of GAC by LQM/CIEH in 2009[2]. RSK GAC are periodically revised when updated information on toxicological, land use or receptor parameters is published.

Updates to the RSK GAC: 2015

In 2014, the publication of Category 4 Screening Levels (C4SL)[3,4], as part of the Defra-funded research project SP1010, included modifications to certain exposure assumptions documented within EA Science Report SC050221/SR3 (herein after referred to as SR3)[5] used in the generation of SGVs.

C4SL were published for six substances (cadmium, arsenic, benzene, benzo(a)pyrene, chromium VI and lead) for a sandy loam soil type with 6% soil organic matter, based on a low level of toxicological concern (LLTC; see Section 2.3 of research project report SP1010[3]). Where a C4SL has been published, the RSK GAC duplicates the C4SL published values using all input parameters within the SP1010 final project report[3] and associated appendices[6], and adopts them as GAC for these six substances.

For all other substances the only C4SL exposure modification relevant to a commercial end use are daily inhalation rates.

The RSK GAC have also been revised with updated toxicology published by LQM/CIEH in 2015[7], where a C4SL has not been published.

RSK GAC derivation for metals and organic compounds

Model selection

Soil assessment criteria (SAC) were calculated using the Contaminated Land Exposure Assessment (CLEA) tool v1.06, supporting EA guidance[5,8,9] and revised exposure scenarios published for the C4SL[3]. Groundwater assessment criteria (GrAC) protective of human health via the inhalation pathway were derived using the RBCA 1.3b model. RSK has updated the inputs within RBCA to reflect EA guidance[1,5,8,9]. The SAC and GrAC collectively are termed GAC.

Pathway selection

In accordance with SR3[5] the commercial scenario considers risks to a female worker who works from the age of 16 to 65 years. It should be noted that this end use is not suitable for a workplace nursery but may be appropriate for a sports centre or shopping centre where children are present. In accordance with Box 3.5, SR3[5] the pathways considered for production of the SAC in the commercial scenario are

- direct soil and dust ingestion
- dermal contact with soil both indoors and outdoors

- indoor air inhalation from soil and vapour and outdoor inhalation of soil and vapour.

The pathway considered in production of the GrAC is the volatilisation of compounds from groundwater and subsequent vapour inhalation by residents while indoors. Figure 2 illustrates this linkage. Although the outdoor air inhalation pathway is also valid, this contributes little to the overall risks owing to the dilution in outdoor air. Within RBCA, the solubility limit of the chemical restricts the extent of volatilisation, which in turn drives the indoor air inhalation pathway. While the same restriction is not built into the CLEA model, the CLEA model output cells are flagged red where the soil saturation limit has been exceeded.

With respect to volatilisation, the CLEA model assumes a simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase(9). The upper boundaries of this partitioning are represented by the maximum aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA model estimates saturated soil concentrations where these limits are reached(9). The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous- or vapour-based soil saturation limits. Model output cells are flagged red where the saturated soil concentration has been exceeded and the contribution of the indoor and outdoor vapour pathway to total exposure is greater than 10%. In this case, further consideration of the following is required(9):

- Free phase contamination may be present.
- Exposure from the vapour pathways will be over-predicted by the model, as in reality the vapour phase concentration will not increase at concentrations above saturation limits
- Where the vapour pathway contribution is greater than 90%, it is unlikely the relevant health criteria value (HCV) will be exceeded at soil concentrations at least a factor of ten higher than the relevant HCV.

Where the vapour pathway is the predominant pathway (contributes greater than 90% of exposure) or the only exposure route considered and the cell is highlighted red (SAC exceeds saturation limit), the risk based on the assumed conceptual model is likely to be negligible as the vapour risk is assumed to be tolerable at maximum possible soil concentrations. In such circumstances, the vapour pathway exposure should be considered based on the presence of free phase or non-aqueous phase liquid sources and the measured concentrations of volatile organic compounds (VOC) in the vapour phase. Screening could be considered based on setting the SAC as the modelled soil saturation limits. However, as stated within the CLEA handbook(9), this is likely to not be practical in many cases because of the very low saturation limits and, in any case, is highly conservative.

It should also be noted that for mixtures of compounds, free phase may be present where soil (or groundwater) concentrations are well below saturation limits for individual compounds.

Where the vapour pathway is only one of the exposure pathways considered, an additional approach can then be utilised as detailed within Section 4.12 of the CLEA model handbook(9), which explains how to calculate an effective assessment criterion manually.

SR3(5) states that, as a general rule of thumb, it is recognised that estimating vapour phase concentrations from dissolved and sorbed phase contamination by petroleum hydrocarbons are at least a factor of ten higher than those likely to be measured on-site. RSK has therefore applied an empirical subsurface to indoor air correction factor of 10 into the CLEA model chemical database for all petroleum hydrocarbon fractions (including BTEX, trimethylbenzenes and the polycyclic aromatic hydrocarbons (PAH) naphthalene, acenaphthene and acenaphthylene) to reduce this conservatism.

Input selection

The most up-to-date published chemical and toxicological data was obtained from EA Report SC050021/SR7[10], the EA TOX[1] reports, the C4SL SP1010 project report and associated appendices[3,6] or the 2015 LQM/CIEH report[7]. Where a C4SL has been published, the RSK GAC have duplicated the C4SL published values using all input parameters within the SP1010 final project report[3] and associated appendices[6], and has adopted them as GAC for these six substances. Toxicological and specific chemical parameters for aromatic hydrocarbon C_8–C_9 (styrene), 1,2,4-trimethylbenzene and methyl tertiary-butyl ether (MTBE) were obtained from the CL:AIRE Soil Generic Assessment Criteria report[11].

For TPH, aromatic hydrocarbons C_5–C_8 were not modelled, as this range comprises benzene and toluene, which are modelled separately. The aromatic C_8–C_9 hydrocarbon fraction comprises ethylbenzene, xylene and styrene. As ethylbenzene and xylene are being modelled separately, the physical, chemical and toxicological data for aromatic C_8–C_9 have been taken from styrene.

Owing to the lack of UK-specific data, default information in the RBCA model was used to evaluate MTBE. No published UK data was available for 1,3,5-trimethylbenzene, so information was obtained from the RBCA model. RBCA uses toxicity data for the inhalation pathway in different units to the CLEA model and cannot consider separately the mean daily intake (MDI), occupancy periods or breathing rates. Therefore, the HCV in RBCA was amended to take account of

- amendments to the MDI using Table 3.4 of SR2[8]
- an adult weighing 70kg and breathing 14.8m^3 air per day in accordance with the UK TOX reports[12] and SR3[5]. Inhalation rates used in the derivation of the GrAC have not been updated in line with the 2011 USEPA published values[12]; these will be updated in subsequent revisions of the RSK GAC.
- the 50% rule (for petroleum hydrocarbons, trimethylbenzenes and MTBE)[8,9] where MDI data is not available but background exposure is considered important in the overall exposure.

Physical parameters

For the commercial end use, the CLEA default pre-1970s three-storey office building was used. SR3[5] notes this commercial building type to be the most conservative in terms of protection from vapour intrusion. The default input building parameters presented in Table 3.10 of SR3[5] have been used.

The parameters for a sandy loam soil type were used in line with Table 4.4 of SR3[5]. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for this SOM, RSK has produced an additional set of GAC for SOM of 1% and 2.5% for all substances using the CLEA tool.

For the GrAC, the depth to groundwater was taken as 2.5m based on RSK's experience of assessing the volatilisation pathway from groundwater. The GrAC were produced using the input parameters in Table 3. Inhalation rates have not been updated.

Summary of modifications to the default CLEA 1.06/SR3[5] input parameters for a commercial land use

In summary, the RSK commercial GAC were produced using the default input parameters for soil properties, the air dispersion model, building properties and the vapour model detailed in SR3[5]. Modifications to the default SR3[5] exposure scenarios based on the C4SL exposure scenarios[3] are presented in Table 2 below. The sole modification to the default commercial input parameters is the updated inhalation rate.

The final selected GAC are presented by pathway in Table 4 with the combined GAC in Table 5.

Figure 1: Conceptual model for CLEA commercial scenario

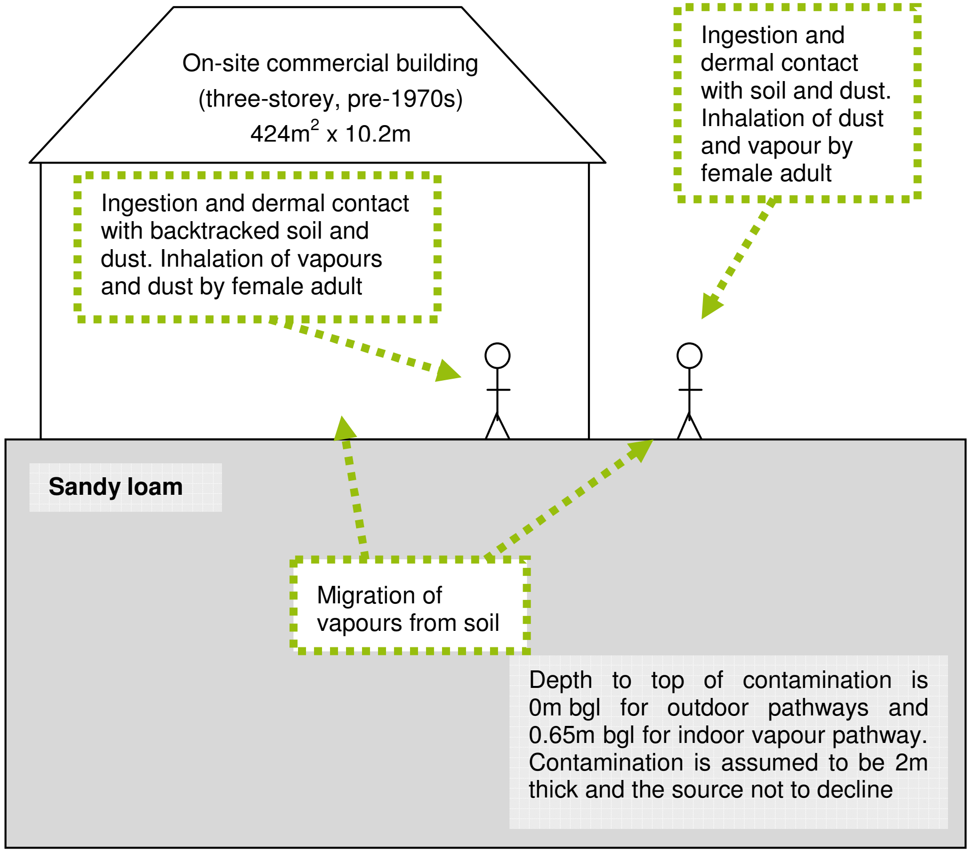

Table 1: Exposure assessment parameters for commercial scenario – inputs for CLEA model

Parameter	Value	Justification
Land use	Commercial	Chosen land use
Receptor	Female worker	Taken as female adult exposed over 49 years from age 16 to 65 years, Box 3.5, SR3[(5)]
Building	Office (pre-1970)	Key generic assumption given in Box 3.5, SR3[(5)]. Pre-1970s three-storey office building chosen as it is the most conservative in terms of protection from vapour intrusion (Section 3.4.6, SR3[(5)])
Soil type	Sandy loam	Most common UK soil type (Section 4.3.1, Table 4.4, SR3[(5)])
Start age class (AC)	17	AC corresponding to key generic assumption that the critical receptor is a working female adult exposed over a 49-year period from age 16 to 65 years. Assumption given in Box 3.5, SR3[(5)]
End AC	17	
SOM (%)	6	Representative of sandy loam according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[(13)]
	1	To provide SAC for sites where SOM < 6% as often observed by RSK
	2.5	
pH	7	Model default

Table 2: Commercial – modified receptor inputs

Parameter	Unit	Value	Justification
Inhalation rate (AC17)	$m^3\ day^{-1}$	15.7	Mean value USEPA, 2011[12]; Table 3.2, SP1010[3]

Figure 2: GrAC conceptual model for RBCA commercial scenario

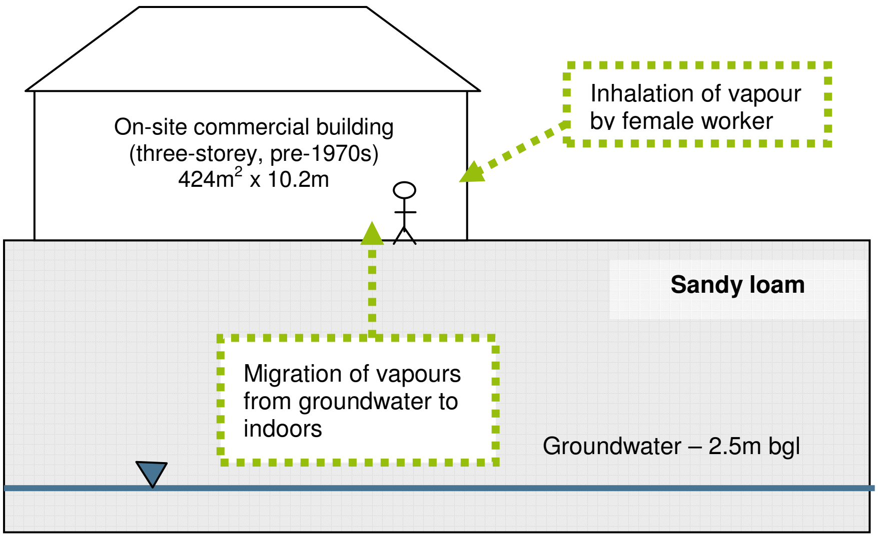

Table 3: Commercial – RBCA inputs

Parameter	Unit	Value	Justification
Receptor			
Averaging time	Years	49	From Box 3.5, SR3[5]
Receptor weight	kg	70	Female adult, Table 4.6, SR3[5]
Exposure duration	Years	49	From Box 3.5, SR3[5]
Exposure frequency	Days/yr	86.25	Weighted using occupancy period of 9 hours per day for 230 days of the year ((9hours x 230 days)/24 hours)
Soil type – sandy loam			
Total porosity	-	0.53	CLEA value for sandy loam. Parameters for sandy loam from Table 4.4, SR3[5]
Volumetric water content	-	0.33	
Volumetric air content	-	0.20	

Parameter	Unit	Value	Justification
Dry bulk density	g cm^{-3}	1.21	
Vertical hydraulic conductivity	cm s^{-1}	3.56E-3	CLEA value for saturated conductivity of sandy loam, Table 4.4, SR3(5)
Vapour permeability	m^2	3.05E-12	Calculated for sandy loam using equations in Appendix 1, SR3(5)
Capillary zone thickness	m	0.1	Professional judgement
Building			
Building volume/area ratio	m	9.6	Table 3.10, SR3(5)
Foundation area	m^2	424	Table 3.10, SR3(5)
Foundation perimeter	m	82.40	Based on square root of building area being 20.59m
Building air exchange rate	d^{-1}	24	Table 3.10, SR3(5)
Depth to bottom of foundation slab	m	0.15	
Foundation thickness	m	0.15	Table 3.10, SR3(5)
Foundation crack fraction	-	3.89E-04	Calculated from floor crack area of 0.165m^2 and building footprint of 424m^2 in Table 4.21, SR3(5)
Volumetric water content of cracks	-	0.33	Assumed equal to underlying soil type in assumption that cracks become filled with soil over time. Parameters for sandy loam from Table 4.4, SR3(5)
Volumetric air content of cracks	-	0.2	
Indoor/outdoor differential pressure	Pa	4.4	From Table 3.10, SR3(5)

References

1. Environment Agency (2009), 'Science Reports SC050021 - SGV and TOX reports for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin-like PCBs'; 'Supplementary information for the derivation of SGV for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin-like PCBs', and 'Contaminants in soil: updated collation of toxicological data and intake values for humans: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin-like PCBs'. Available at: https://www.gov.uk/government/publications/contaminants-in-soil-updated-collation-of-toxicological-data-and-intake-values-for-humans and https://www.gov.uk/government/publications/land-contamination-soil-guideline-values-sgvs (accessed 4 February 2015)

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GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL

Table 4

Human health generic assessment criteria by pathway for commercial scenario

Compound	Notes	GrAC (mg/l)	SAC appropriate to pathway SOM 1% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 2.5% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 6% (mg/kg)			Soil saturation limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Metals														
Arsenic	(a,b)	-	6.35E+02	1.25E+03	NR	NR	6.35E+02	1.25E+03	NR	NR	6.35E+02	1.25E+03	NR	NR
Cadmium	(a)	-	NR	NR	4.10E+02	NR	NR	NR	4.10E+02	NR	NR	NR	4.10E+02	NR
Chromium (III) - trivalent	(c)	-	3.31E+05	8.57E+03	8.35E+03	NR	3.31E+05	8.57E+03	8.35E+03	NR	3.31E+05	8.57E+03	8.35E+03	NR
Chromium (VI) - hexavalent	(a,d)	-	7.52E+02	4.91E+01	NR	NR	7.52E+02	4.91E+01	NR	NR	7.52E+02	4.91E+01	NR	NR
Copper		-	1.89E+05	8.96E+04	6.83E+04	NR	1.89E+05	8.96E+04	6.83E+04	NR	1.89E+05	8.96E+04	6.83E+04	NR
Lead	(a)	-	2.32E+03	NR	NR	NR	2.32E+03	NR	NR	NR	2.32E+03	NR	NR	NR
Elemental Mercury (Hg^0)	(d)	5.60E-02	NR	1.54E+01	NR	4.31E+00	NR	3.26E+01	NR	1.07E+01	NR	5.80E+01	NR	2.58E+01
Inorganic Mercury (Hg^{2+})		-	1.18E+03	1.97E+04	1.12E+03	NR	1.18E+03	1.97E+04	1.12E+03	NR	1.18E+03	1.97E+04	1.12E+03	NR
Methyl Mercury (Hg^{4+})		1.00E+02	3.38E+02	2.13E+03	2.92E+02	7.33E+01	3.38E+02	3.87E+03	3.11E+02	1.42E+02	3.38E+02	7.33E+03	3.23E+02	3.04E+02
Nickel	(d)	-	3.06E+03	9.83E+02	NR	NR	3.06E+03	9.83E+02	NR	NR	3.06E+03	9.83E+02	NR	NR
Selenium	(b)	-	1.23E+04	NR	NR	NR	1.23E+04	NR	NR	NR	1.23E+04	NR	NR	NR
Zinc	(b)	-	7.35E+05	1.97E+08	NR	NR	7.35E+05	1.97E+08	NR	NR	7.35E+05	1.97E+08	NR	NR
Cyanide		-	1.69E+04	1.95E+03	1.81E+03	NR	1.69E+04	1.95E+03	1.81E+03	NR	1.69E+04	1.95E+03	1.81E+03	NR
Volatile Organic Compounds														
Benzene	(a)	1.40E+02	1.09E+03	2.79E+01	2.72E+01	1.22E+03	1.09E+03	5.19E+01	4.96E+01	2.26E+03	1.09E+03	1.08E+02	9.80E+01	4.71E+03
Toluene		5.90E+02	4.24E+05	6.49E+04	5.63E+04	8.69E+02	4.24E+05	1.43E+05	1.07E+05	1.92E+03	4.24E+05	3.24E+05	1.84E+05	4.36E+03
Ethylbenzene		1.80E+02	1.91E+05	5.89E+03	5.71E+03	5.18E+02	1.91E+05	1.38E+04	1.28E+04	1.22E+03	1.91E+05	3.21E+04	2.75E+04	2.84E+03
Xylene - m		2.00E+02	3.43E+05	6.26E+03	6.15E+03	6.25E+02	3.43E+05	1.47E+04	1.41E+04	1.47E+03	3.43E+05	3.44E+04	3.12E+04	3.46E+03
Xylene - o		1.70E+02	3.43E+05	6.73E+03	6.60E+03	4.78E+02	3.43E+05	1.57E+04	1.50E+04	1.12E+03	3.43E+05	3.65E+04	3.30E+04	2.62E+03
Xylene - p		2.00E+02	3.43E+05	6.03E+03	5.92E+03	5.76E+02	3.43E+05	1.41E+04	1.36E+04	1.35E+03	3.43E+05	3.28E+04	3.00E+04	3.17E+03
Total xylene		2.00E+02	3.43E+05	6.03E+03	5.92E+03	6.25E+02	3.43E+05	1.41E+04	1.36E+04	1.47E+03	3.43E+05	3.28E+04	3.00E+04	3.46E+03
Methyl tertiary-Butyl ether (MTBE)		4.80E+04	5.72E+05	7.54E+04	6.66E+04	2.04E+04	5.72E+05	1.22E+05	1.01E+05	3.31E+04	5.72E+05	2.31E+05	1.65E+05	6.27E+04
Trichloroethene		3.60E+01	9.53E+02	1.23E+00	1.23E+00	1.54E+03	9.53E+02	2.58E+00	2.57E+00	3.22E+03	9.53E+02	5.72E+00	5.69E+00	7.14E+03
Tetrachloroethene		2.30E+02	1.12E+04	1.86E+01	1.86E+01	4.24E+02	1.12E+04	4.17E+01	4.16E+01	9.51E+02	1.12E+04	9.57E+01	9.49E+01	2.18E+03
1,1,1-Trichloroethane		1.30E+03	1.14E+06	6.60E+02	6.60E+02	1.43E+03	1.14E+06	1.35E+03	1.35E+03	2.92E+03	1.14E+06	2.96E+03	2.95E+03	6.39E+03
1,1,1,2 Tetrachloroethane		1.10E+03	1.10E+04	1.09E+02	1.08E+02	2.60E+03	1.10E+04	2.53E+02	2.47E+02	6.02E+03	1.10E+04	5.88E+02	5.59E+02	1.40E+04
1,1,2,2-Tetrachloroethane		1.10E+03	1.10E+04	2.81E+02	2.74E+02	2.67E+03	1.10E+04	5.75E+02	5.46E+02	5.46E+03	1.10E+04	1.26E+03	1.13E+03	1.20E+04
Carbon Tetrachloride		5.70E+00	7.62E+03	2.87E+00	2.87E+00	1.52E+03	7.62E+03	6.29E+00	6.28E+00	3.32E+03	7.62E+03	1.43E+01	1.42E+01	7.54E+03
1,2-Dichloroethane		6.10E+00	2.29E+02	6.73E-01	6.71E-01	3.41E+03	2.29E+02	9.71E-01	9.67E-01	4.91E+03	2.29E+02	1.67E+00	1.65E+00	8.43E+03
Vinyl Chloride		4.10E-01	2.67E+01	5.95E-02	5.94E-02	1.36E+03	2.67E+01	7.70E-02	7.67E-02	1.76E+03	2.67E+01	1.18E-01	1.17E-01	2.69E+03
1,2,4-Trimethylbenzene		5.70E+01	NR	3.29E+02	NR	4.74E+02	NR	6.41E+02	NR	1.16E+03	NR	1.04E+03	NR	2.76E+03
1,3,5-Trimethylbenzene	(e)	3.80E+01	NR	NR	NR	2.30E+02	NR	NR	NR	5.52E+02	NR	NR	NR	1.30E+03
Semi-Volatile Organic Compounds														
Acenaphthene		3.20E+00	1.10E+05	2.75E+06	1.06E+05	5.70E+01	1.10E+05	5.36E+06	1.08E+05	1.41E+02	1.10E+05	8.83E+06	1.08E+05	3.36E+02
Acenaphthylene		1.61E+01	1.10E+05	2.68E+06	1.05E+05	8.61E+01	1.10E+05	5.23E+06	1.07E+05	2.12E+02	1.10E+05	8.65E+06	1.08E+05	5.06E+02
Anthracene		2.10E-02	5.49E+05	1.13E+07	5.23E+05	1.17E+00	5.49E+05	2.35E+07	5.36E+05	2.91E+00	5.49E+05	4.13E+07	5.42E+05	6.96E+00
Benzo(a)anthracene		3.80E-03	2.84E+02	4.08E+02	1.67E+02	1.71E+00	2.84E+02	4.47E+02	1.74E+02	4.28E+00	2.84E+02	4.67E+02	1.76E+02	1.03E+01
Benzo(b)fluoranthene		2.00E-03	7.13E+01	1.17E+02	4.43E+01	1.22E+00	7.13E+01	1.20E+02	4.47E+01	3.04E+00	7.13E+01	1.21E+02	4.49E+01	7.29E+00
Benzo(g,h,i)perylene		2.60E-04	6.29E+03	1.05E+04	3.93E+03	1.54E-02	6.29E+03	1.06E+04	3.95E+03	3.85E-02	6.29E+03	1.07E+04	3.96E+03	9.23E-02
Benzo(k)fluoranthene		8.00E-04	1.88E+03	3.11E+03	1.17E+03	6.87E-01	1.88E+03	3.17E+03	1.18E+03	1.72E+00	1.88E+03	3.21E+03	1.19E+03	4.12E+00
Chrysene		2.00E-03	5.67E+02	8.89E+02	3.46E+02	4.40E-01	5.67E+02	9.25E+02	3.52E+02	1.10E+00	5.67E+02	9.47E+02	3.55E+02	2.64E+00
Dibenzo(a,h)anthracene		6.00E-04	5.67E+00	9.32E+00	3.53E+00	3.93E-03	5.67E+00	9.52E+00	3.55E+00	9.82E-03	5.67E+00	9.64E+00	3.57E+00	2.36E-02
Fluoranthene		2.30E-01	2.29E+04	1.89E+06	2.26E+04	1.89E+01	2.29E+04	2.72E+06	2.27E+04	4.73E+01	2.29E+04	3.32E+06	2.27E+04	1.13E+02
Fluorene		1.90E+00	7.31E+04	4.55E+05	6.30E+04	3.09E+01	7.31E+04	1.06E+06	6.84E+04	7.65E+01	7.31E+04	2.24E+06	7.08E+04	1.83E+02
Indeno(1,2,3-cd)pyrene		2.00E-04	8.10E+02	1.31E+03	5.01E+02	6.13E-02	8.10E+02	1.35E+03	5.06E+02	1.53E-01	8.10E+02	1.37E+03	5.09E+02	3.68E-01
Phenanthrene		5.30E-01	2.28E+04	5.35E+05	2.19E+04	3.60E+01	2.28E+04	1.09E+06	2.24E+04	8.96E+01	2.28E+04	1.86E+06	2.25E+04	2.14E+02
Pyrene		1.30E-01	5.49E+04	4.47E+06	5.42E+04	2.20E+00	5.49E+04	6.46E+06	5.44E+04	5.49E+00	5.49E+04	7.91E+06	5.45E+04	1.32E+01
Benzo(a)pyrene	(a)	3.80E-03	7.68E+01	2.04E+02	5.58E+01	9.11E-01	7.68E+01	2.09E+02	5.61E+01	2.28E+00	7.68E+01	2.11E+02	5.63E+01	5.46E+00
Naphthalene		1.90E+01	3.64E+04	1.87E+03	1.78E+03	7.64E+01	3.64E+04	4.39E+03	3.92E+03	1.83E+02	3.64E+04	9.94E+03	7.81E+03	4.32E+02
Phenol		-	1.10E+06	2.65E+04	2.59E+04	2.42E+04	1.10E+06	3.04E+04	2.96E+04	3.81E+04	1.10E+06	3.46E+04	3.35E+04	7.03E+04

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL

Table 4

Human health generic assessment criteria by pathway for commercial scenario

Compound	Notes	GrAC (mg/l)	SAC appropriate to pathway SOM 1% (mg/kg) Oral	Inhalation	Combined	Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 2.5% (mg/kg) Oral	Inhalation	Combined	Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 6% (mg/kg) Oral	Inhalation	Combined	Soil saturation limit (mg/kg)
Total petroleum hydrocarbons														
Aliphatic hydrocarbons EC5-EC6		3.60E+01	4.77E+06	3.19E+03	3.19E+03	3.04E+02	4.77E+06	5.86E+03	5.86E+03	5.58E+02	4.77E+06	1.21E+04	1.21E+04	1.15E+03
Aliphatic hydrocarbons >EC6-EC8		5.40E+00	4.77E+06	7.79E+03	7.78E+03	1.44E+02	4.77E+06	1.74E+04	1.74E+04	3.22E+02	4.77E+06	3.97E+04	3.96E+04	7.36E+02
Aliphatic hydrocarbons >EC8-EC10		4.30E-01	9.53E+04	2.02E+03	2.00E+03	7.77E+01	9.53E+04	4.91E+03	4.85E+03	1.90E+02	9.53E+04	1.17E+04	1.13E+04	4.51E+02
Aliphatic hydrocarbons >EC10-EC12		3.40E-02	9.53E+04	9.97E+03	9.69E+03	4.75E+01	9.53E+04	2.47E+04	2.29E+04	1.18E+02	9.53E+04	5.89E+04	4.73E+04	2.83E+02
Aliphatic hydrocarbons >EC12-EC16		7.60E-04	9.53E+04	8.26E+04	5.88E+04	2.37E+01	9.53E+04	2.04E+05	8.17E+04	5.91E+01	9.53E+04	4.81E+05	9.02E+04	1.42E+02
Aliphatic hydrocarbons >EC16-EC35	(b)	-	1.58E+06	NR	NR	8.48E+00	1.75E+06	NR	NR	2.12E+01	1.83E+06	NR	NR	5.09E+01
Aliphatic hydrocarbons >EC35-EC44	(b)	-	1.58E+06	NR	NR	8.48E+00	1.75E+06	NR	NR	2.12E+01	1.83E+06	NR	NR	5.09E+01
Aromatic hydrocarbons >EC8-EC9 (styrene)		6.50E+01	2.29E+04	3.66E+04	1.41E+04	6.26E+02	2.29E+04	8.39E+04	1.80E+04	1.44E+03	2.29E+04	1.93E+05	2.04E+04	3.35E+03
Aromatic hydrocarbons >EC_9-EC_{10}		6.50E+01	3.81E+04	3.55E+03	3.46E+03	6.13E+02	3.81E+04	8.66E+03	8.11E+03	1.50E+03	3.81E+04	2.05E+04	1.70E+04	3.58E+03
Aromatic hydrocarbons >EC10-EC12		2.50E+01	3.81E+04	1.92E+04	1.62E+04	3.64E+02	3.81E+04	4.69E+04	2.79E+04	8.99E+02	3.81E+04	1.10E+05	3.42E+04	2.15E+03
Aromatic hydrocarbons >EC12-EC16		5.80E+00	3.81E+04	2.02E+05	3.62E+04	1.69E+02	3.81E+04	4.76E+05	3.73E+04	4.19E+02	3.81E+04	1.03E+06	3.78E+04	1.00E+03
Aromatic hydrocarbons >EC16-EC21	(b)	-	2.82E+04	NR	NR	5.37E+01	2.83E+04	NR	NR	1.34E+02	2.84E+04	NR	NR	3.21E+02
Aromatic hydrocarbons >EC21-EC35	(b)	-	2.84E+04	NR	NR	4.83E+00	2.84E+04	NR	NR	1.21E+01	2.84E+04	NR	NR	2.90E+01
Aromatic hydrocarbons >EC35-EC44	(b)	-	2.84E+04	NR	NR	4.83E+00	2.84E+04	NR	NR	1.21E+01	2.84E+04	NR	NR	2.90E+01

Notes:

EC - equivalent carbon. GrAC - groundwater screening value. SAC - soil screening value.

The CLEA model output is colour coded depending upon whether the soil saturation limit has been exceeded.

Calculated SAC exceeds soil saturation limit and may significantly affect the interpretation of any exceedances as the contribution of the indoor and outdoor vapour pathway to total exposure is >10%. This shading has also been used for the RBCA output where the theoretical solubility limit has been exceeded.

Calculated SAC exceeds soil saturation limit but the exceedance will not affect the SAC significantly as the contribution of the indoor and outdoor vapour pathway to total exposure is <10%.

Calculated SAC does not exceed the soil saturation limit.

For consistency where the theoretical solubility limit within RBCA has been exceeded in production of the GrAC, these cellls have also been hatched red and the GrAC set at the solubility limit.

The SAC for organic compounds are dependant upon soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway (Section 10.1.1, SR3)

(a) SAC for arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead are derived using the C4SL toxicology data.

(b) SAC for selenium should not include the inhalation pathway as no expert group HCV has been derived; aliphatic and aromatic hydrocarbons >EC16 should not include inhalation pathway due to their non-volatile nature and inhalation exposure being minimal (oral, dermal and inhalation exposure is compared to the oral HCV); arsenic should only be based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The Oral SAC should be adopted for zinc and benzo(a)pyrene.

(c) SAC for CrIII should be based on the lower of the oral and inhalation SAC (see LQM/CIEH 2015 Section 6.8)

(d) SAC for elemental mercury, chromium VI and nickel should be based on the inhalation pathway only.

(e) SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used.

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL

Table 5
Human Health Generic Assessment Criteria for Commercial Scenario

Compound	GrAC for Groundwater (mg/l)	SAC for Soil SOM 1% (mg/kg)	SAC for Soil SOM 2.5% (mg/kg)	SAC for Soil SOM 6% (mg/kg)
Metals				
Arsenic	-	640	640	640
Cadmium	-	410	410	410
Chromium (III) - trivalent	-	8,600	8,600	8,600
Chromium (VI) - hexavalent	-	49	49	49
Copper	-	68,000	68,000	68,000
Lead	-	2,320	2,320	2,320
Elemental Mercury (Hg^0)	0.056	15 (4)	33 (11)	58 (26)
Inorganic Mercury (Hg^{2+})	-	1,120	1,120	1,120
Methyl Mercury (Hg^{4+})	100	290 (73)	310	320
Nickel	-	980	980	980
Selenium	-	12,000	12,000	12,000
Zinc	-	740,000	740,000	740,000
Cyanide	-	1,800	1,800	1,800
Volatile Organic Compounds				
Benzene	140	27	50	98
Toluene	590	56,000 (869)	107,000 (1,916)	184,000 (4,357)
Ethylbenzene	180	6,000 (518)	13,000 (1,216)	27,000 (2,844)
Xylene - m	200	6,200 (625)	14,100 (1,474)	31,200 (3,457)
Xylene - o	170	6,600 (478)	15,000 (1,120)	33,000 (2,618)
Xylene - p	200	5,900 (576)	13,600 (1,353)	30,000 (3,167)
Total xylene	200	5,900 (625)	13,600 (1,474)	30,000 (3,457)
Methyl tertiary-Butyl ether (MTBE)	48000	67,000 (20,400)	101,000 (33,100)	165,000 (62,700)
Trichloroethene	36	1	3	6
Tetrachloroethene	230	20	40	90
1,1,1-Trichloroethane	1300	700	1,300	3,000
1,1,1,2 Tetrachloroethane	1100	110	250	560
1,1,2,2-Tetrachloroethane	1100	270	550	1,130
Carbon Tetrachloride	5.7	2.9	6.3	14.2
1,2-Dichloroethane	6.1	0.67	0.97	1.65
Vinyl Chloride	0.41	0.06	0.08	0.12
1,2,4-Trimethylbenzene	57	330	640	1,040
1,3,5-Trimethylbenzene	38	NR	NR	NR
Semi-Volatile Organic Compounds				
Acenaphthene	3.2	110,000 (57)	110,000 (141)	110,000
Acenaphthylene	16	110,000 (86)	110,000 (212)	110,000
Anthracene	0.021	520,000	540,000	540,000
Benzo(a)anthracene	0.0038	170	170	180
Benzo(b)fluoranthene	0.002	44	45	45
Benzo(g,h,i)perylene	0.00026	3,900	3,900	4,000
Benzo(k)fluoranthene	0.0008	1,200	1,200	1,200
Chrysene	0.002	350	350	350
Dibenzo(a,h)anthracene	0.0006	3.5	3.6	3.6
Fluoranthene	0.23	23,000	23,000	23,000
Fluorene	1.9	63,000 (31)	68,000	71,000
Indeno(1,2,3-cd)pyrene	0.0002	500	510	510
Phenanthrene	0.53	22,000	22,000	23,000
Pyrene	0.13	54,000	54,000	54,000
Benzo(a)pyrene	0.0038	77	77	77
Naphthalene	19	1,800 (76)	3,900 (183)	7,800 (432)
Phenol	-	440*	690*	1,300*
Total Petroleum Hydrocarbons				
Aliphatic hydrocarbons EC_5-EC_6	36	3,200 (304)	5,900 (558)	12,100 (1,150)
Aliphatic hydrocarbons >EC_6-EC_8	5.4	7,800 (144)	17,400 (322)	39,600 (736)
Aliphatic hydrocarbons >EC_8-EC_{10}	0.43	2,000 (78)	4,800 (190)	11,300 (451)
Aliphatic hydrocarbons >EC_{10}-EC_{12}	0.034	9,700 (48)	22,900 (118)	47,300 (283)
Aliphatic hydrocarbons >EC_{12}-EC_{16}	0.00076	59,000 (24)	82,000 (59)	90,000 (142)
Aliphatic hydrocarbons >EC_{16}-EC_{35}	-	1,000,000**	1,000,000**	1,000,000**
Aliphatic hydrocarbons >EC_{35}-EC_{44}	-	1,000,000**	1,000,000**	1,000,000**
Aromatic hydrocarbons >EC_8-EC_9 (styrene)	65	14,000 (626)	18,000 (1,440)	20,000 (3,350)
Aromatic hydrocarbons >EC_9-EC_{10}	65	3,500 (613)	8,100 (1,503)	17,000 (3,580)
Aromatic hydrocarbons >EC_{10}-EC_{12}	25	16,000 (364)	28,000 (899)	34,000 (2,150)
Aromatic hydrocarbons >EC_{12}-EC_{16}	5.8	36,000 (169)	37,000	38,000
Aromatic hydrocarbons >EC_{16}-EC_{21}	-	28,000	28,000	28,000
Aromatic hydrocarbons >EC_{21}-EC_{35}	-	28,000	28,000	28,000
Aromatic hydrocarbons >EC_{35}-EC_{44}	-	28,000	28,000	28,000

Notes:
'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data.
NR - SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used
EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.
* The GAC for Phenol is based on a threshold which is protective of direct contact (SC050021/Phenol SGV report)
** Denoted SAC calculated exceeds 100% contaminant, hence 100% (1,000,000mg/kg) has been taken as SAC

The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

(VALUE IN BRACKETS) The SAC has been set as the model calculated SAC with the saturation limit shown in brackets.
RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limits given in brackets.

(VALUE IN BRACKETS) For consistency where the GrAC exceeds the solubility limit, GrAC has been set at the solubility limit. The GrAC is conservative since concentrations of the chemical are very unlikely to be at sufficient concentration to result in an exceedance of the health criteria value at the point of exposure (i.e. indoor air) provided free-phase product is absent.

APPENDIX K
GENERIC ASSESSMENT CRITERIA FOR PHYTOTOXIC EFFECTS

APPENDIX D
GENERIC ASSESSMENT CRITERIA FOR PHYTOTOXIC EFFECTS

Several compounds can inhibit plant growth; hence it is important to have generic assessment criteria (GAC) to promote healthy plant growth. In the absence of other published GAC, the GAC have been obtained from legislation (UK and European) and guidance related to the use of sewage sludge on agricultural fields.

The Council of European Communities Sewage Sludge Directive (86/278/EEC) dated 1986, has been transposed into UK law by Statutory Instrument No. 1263, The Sludge (use in Agriculture) Regulations 1989 (Public Health England, Wales and Scotland), as amended in 1990 and The Sludge (use in Agriculture) Regulations (Northern Ireland) SR No, 245, 1990. In addition the Department of Environment (DoE) produced a Code of Practice (CoP) (Updated 2nd Edition) in 2006 which provided guidance on the application of sewage sludge on agricultural land (however the status of this document is unclear as it is on the archive section of the Defra website).

The directive seeks to encourage the use of sewage sludge in agriculture and to regulate its use in such a way as to "***prevent harmful effects on soil, vegetation, animals and man".*** To this end, it prohibits the use of untreated sludge on agricultural land unless it is injected or incorporated into the soil. Treated sludge is defined as having undergone "biological, chemical or heat treatment, long-term storage or any other appropriate process so as significantly to reduce its fermentability and the health hazards resulting from its use". To provide protection against potential health risks from residual pathogens, sludge must not be applied to soil in which fruit and vegetable crops are growing, or less than ten months before fruit and vegetable crops are to be harvested. Grazing animals must not be allowed access to grassland or forage land less than three weeks after the application of sludge.

The specified limits of concentrations of selected elements in soil are presented in Table 4 of the updated 2nd Edition of the DoE Code of Practice and are designed to protect plant growth. It is noted that these values are more stringent than the values set in current UK regulations. However since they were amended following recommendations from the Independent Scientific Committee in 1993. (MAFF/DOE 1993). The GAC are presented in Table 1.

Table 1: Generic assessment criteria

Determinant	Generic assessment criteria (mg/kg)			
	pH 5.0 < 5.5	pH 5.5 < 6.0	pH 6.0 < 7.0	pH >7.0
Zinc	200	200	200	300
Copper	80	100	135	200
Nickel	50	60	75	110
Lead	300	300	300	300
Cadmium	3	3	3	3
Mercury	1	1	1	1
Note: Only compounds with assessment criteria documented within the Directive 86/278/EEC have been included, although criteria for 5 additional compounds have been presented within the 2006 CoP.				

APPENDIX L
GENERIC ASSESSMENT CRITERIA FOR CONTROLLED WATERS

GENERIC ASSESSMENT CRITERIA FOR CONTROLLED WATERS

The water environment in the United Kingdom is protected under a number of regulatory regimes. The relevant environmental regulator is consulted where there may be a risk that pollution of 'controlled waters' may occur or may have occurred in the past. Controlled waters are coastal waters, inland freshwaters and groundwater. The EU Water Framework Directive (WFD) (2000/60/EC) is implemented via domestic regulations and guidance, covering aspects of groundwater, surface water and drinking water supply policy. Domestic legislation and guidance will vary across the United Kingdom. Therefore, the relevant legislation for England, Wales, Northern Ireland and Scotland should be reviewed, alongside guidance provided by the Environment Agency (EA), Natural Resource Wales (NRW), the Scottish Environmental Protection Agency (SEPA) or the Northern Ireland Environment Agency (NIEA), as appropriate.

The main objectives of the protection and remediation of groundwater under threat from land contamination are set out in the Environment Agency's Groundwater Protection: Principles and Practice (GP3) document(1). When assessing risks to groundwater the following need to be taken into consideration:

- Where pollutants have not yet entered groundwater, all necessary and reasonable measures must be taken to
    - *prevent the input of hazardous substances into groundwater (see description of hazardous substances below)*
    - *limit the entry of other (non-hazardous) pollutants into groundwater so as to avoid pollution, and to avoid deterioration of the status of groundwater bodies or sustained, upward trends in pollutant concentration.*
- Where hazardous substances or non-hazardous pollutants have already entered groundwater, the priority is to
    - *minimise further entry of hazardous substances and non-hazardous pollutants into groundwater*
    - *take necessary and reasonable measures to limit the pollution of groundwater or impact on the status of the groundwater body from the future expansion of a contaminant 'plume', if necessary by actively reducing its extent if the economic, social and environmental benefits of doing so outweigh the costs.*

DEFINITIONS

Hazardous substances are defined in the Water Framework Directive 2000/60/EC as 'substances or groups of substances that are toxic, persistent and liable to bio-accumulate, and other substances or groups of substances that give rise to an equivalent level of concern.' All List 1 substances under the old Groundwater Directive (80/68/EEC) are hazardous substances, all radioactive substances are hazardous substances.

Non-hazardous substances are defined as 'substances capable of causing pollution that have not been classified as hazardous substances'. The non-hazardous list of pollutants does not simply replace the old WFD List II but includes a wider range of pollutants.

For the current list of classified substances please visit the UKTAG website www.wfduk.org./jagdag/

When assessing the risks to surface waters, various standards apply, including Environmental Quality Standards (EQS) which are protective of the water ecology.

The Water Supply (Water Quality) Regulations[2] are the primary source for assessing water bodies that may be used for public water supplies. The Private Water Supplies Regulations[3] may be applicable in some cases.

This appendix presents the generic assessment criteria (GAC) that RSK considers are suitable for assessing risks to controlled waters.

The RSK GAC for controlled waters are presented in Table 1. In line with the Environment Agency's Remedial Targets Methodology, the GAC for controlled waters are termed 'target concentrations'.

The target concentration can be derived by several means with consideration to

- whether the substance is classified as hazardous or non-hazardous by the EU under the WFD (2000/60/EC) and Groundwater Daughter Directive (2006/118/EC) implemented though the Environmental Permitting Regulations 2010
- background concentrations in the aquifer
- published guidance such as EQS that are protective of ecology or The Water Supply (Water Quality) Regulations 2010 that are protective of drinking water
- minimum reporting values (MRV) (or method detection limits if MRV are not provided).

It is important to remember that the WFD and GP3[1] guidance allow a risk-based and a cost-benefit approach to be applied to groundwater contamination. Exceedance of any target concentration does not necessarily imply that an unacceptable risk exists or that remediation is required either on a technical or cost-benefit basis. If pollutant concentrations at a site exceed target concentrations please speak to a member of the QRA group who will assist in making an appropriate assessment and recommendations.

Table 1: Target concentrations for controlled waters

Analytes in bold are hazardous, *analytes in italics are non-hazardous*, analytes in plain text are unclassified; according to JAGDAG Determination List June 2010 (revised June 2012).

Target concentrations shaded in	GREEN are statutory values usually for drinking water or a surface watercourse	ORANGE are non-statutory values

Determinant	Target concentrations (mg/l)			
	Minimum reporting value	UK drinking water standard or best equivalent	EQS or best equivalent	
			Freshwater	Transitional (estuaries) and coastal waters
Metals				
Arsenic	-	0.01(2)	0.05(5a)	0.025(5a)
Cadmium	0.0001(6)	0.005(2)	≤0.00008, 0.00008, 0.00009, 0.00015, 0.00025 (5b)	0.0002(15c)
Chromium (total)	-	0.05(2)	Sum values for chromium III and VI	
Chromium (III)	-	Use value for total chromium	0.0047(5a)	-
Chromium (VI)			0.0034(5a)	0.0006(5a)
Copper	-	2.0(2)	0.001 bioavailable(7)	0.00376 dissolved, where DOC ≤1mg/l(7)
				0.00376 + (0.002677 x ((DOC/2) – 0.0005)) µg/l dissolved, where DOC >1mg/l(7)
Lead	-	0.025 (before 25/12/2013), 0.01 (after 25/12/2013)(2)	0.0072(5c)	0.0072(5c)

Determinant	Target concentrations (mg/l)			
	Minimum reporting value	UK drinking water standard or best equivalent	EQS or best equivalent	
			Freshwater	Transitional (estuaries) and coastal waters
Mercury	0.00001 (6)	0.001 (2)	0.00005 (5c)	0.00005 (5c)
Nickel	-	0.02 (2)	0.02 (5c)	0.02 (5c)
Selenium	-	0.01 (2)	-	-
Zinc	-	3 **(4)**	0.0109 bioavailable plus ambient background concentration (dissolved) (7)	0.0068 dissolved plus ambient background concentration (7)
Chlorinated solvents				
Trichloroethene	0.0001 (6)	0.01 (2)	0.01 (5c)	0.01 (5c)
Tetrachloroethene	0.0001 (6)	0.01 (2)	0.01 (5c)	0.01 (5c)
Tetrachloroethane	-	-	0.14 (17)	-
1,1,1-Trichloroethane	0.0001 (6)	-	0.1 (5c)	0.1 (5c)
1,1,2-Trichloroethane	0.0001 (6)	-	0.4 (5c)	0.3 (5c)
Carbon tetrachloride (tetrachloromethane)	0.0001 (6)	0.003 (2)	0.012 (5c)	0.012 (5c)
1,2-Dichloroethane	0.001 (6)	0.003 (2)	0.01 (5c)	0.01 (5c)
Vinyl chloride (chloroethene)	-	0.0005 (2)	-	-
Trihalomethanes	-	0.1 (2, 8)	-	-
Chloroform (trichloromethane) (one of the trihalomethanes included above)	0.0001 (6)	0.1 (2, 8)	0.0025 (5c)	0.0025 (5c)

Determinant	Target concentrations (mg/l)			
	Minimum reporting value	UK drinking water standard or best equivalent	EQS or best equivalent	
			Freshwater	Transitional (estuaries) and coastal waters
Polycyclic aromatic hydrocarbons				
Acenaphthene	-	-	0.0058 (9)	
Acenaphthylene	-	-	0.0058 (9)	
Anthracene	-	-	0.0001 (5c)	0.0001 (15c)
Benzo(a)anthracene	-	-	0.000018 (9)	
Benzo(b)fluoranthene	-	0.0001 (2)	0.00003 (15f)	0.00003 (5f)
Benzo(k)fluoranthene	-			
Benzo(g,h,i)perylene	-		0.000002 (15g)	0.000002 (5g)
Indeno(1,2,3-cd)pyrene	-			
Chrysene	-	-	0.00001 (9)	
Dibenzo(a,h)anthracene	-	-	0.00001 (9)	
Fluoranthene	-	-	0.0001 (5c)	0.0001 (5c)
Fluorene	-	-	0.0021 (9)	
Phenanthrene	-	-	0.003 (9)	
Pyrene	-	-	0.00004 (9)	
Benzo(a)pyrene	-	0.00001 (2)	0.00005 (5c)	0.00005 (5c)
Naphthalene	-	-	0.0024 (5c)	0.0012 (15c)
Petroleum hydrocarbons				
Total petroleum hydrocarbons	-	0.01 (11)	0.01 (10,11)	
Benzene	0.001 (6)	0.001 (2)	0.01 (5c)	0.008 (5c)

Determinant	Target concentrations (mg/l)			
	Minimum reporting value	UK drinking water standard or best equivalent	EQS or best equivalent	
			Freshwater	Transitional (estuaries) and coastal waters
Toluene	0.004[6]	0.7[12]	0.074[7]	0.074[7]
Ethylbenzene	-	0.3[12]	0.02[14]	0.02[14]
Xylene	0.003[6]	0.5[12]	0.03[5c]	0.03[15c]
Methyl tertiary butyl ether (MTBE)	-	0.015[13]		
Pesticides and herbicides				
Aldrin	0.000003[6]	0.00003[2]	0.00001[5d]	0.000005[5d]
Dieldrin	0.003[6]	0.00003[2]		
Endrin	0.000003[6]	0.0006[12]		
Isodrin	0.000003[6]	-		
Heptachlor	-	0.00003[2]		
Heptachlor epoxide	-	0.00003[2]		
Other individual pesticides	-	0.0001[2]		
Total pesticides	-	0.0005[2]		
Total DDT	0.000006[6]	0.001[12]	0.000025[5c]	0.000025[15c]
Azinphos – methyl	0.000001[6]	-	0.00001[1]	
Cyfluthrin	0.0001[6]	-	0.000001[14]	
Demetons	0.00005[6]	-	0.0005[14]	
Dichlorvos	-	-	0.000001[5c]	0.00004[5c]
Dimethoate	0.00001[6]	-	0.00048[5a]	0.00048[5a]
Endosulphan	0.000005[6]	-	0.000005[5c]	0.0000005[5c]

Determinant	Target concentrations (mg/l)			
	Minimum reporting value	UK drinking water standard or best equivalent	EQS or best equivalent	
			Freshwater	Transitional (estuaries) and coastal waters
Fenitrothion	0.000001[6]	-	0.00001[5c]	0.00001[5c]
Flucofuron	0.0001[6]	-	0.001[14]	
Malathion	0.000001[6]	-	0.00001[5c]	0.00002[5c]
Mevinphos	0.000005[6]	-	0.00002[14]	-
Omethoate	0.0001[6]	-	0.00001[14]	
PCSDs (cyfluthrin, sulcofuron, flucofuron and **permethrin**)	-	-	0.00005[14]	
Permethrin	0.000001[6]	-	0.00001[5a]	0.00001[5]
Sulcofuron	0.0001[6]	-	0.025[14]	
Triazaphos	0.0001[6]	-	0.000005[15]	
Atrazine	0.00003[6]	-	0.0006[5c]	0.0006[5c]
Simazine	0.00003[6]	-	0.001[5c]	0.001[5c]
Bentazone	0.1[6]	-	0.5[5c]	0.5[5a]
Linuron	0.0001[6]	-	0.0005[5a]	0.0005[5a]
Mecoprop	0.00004[6]	-	0.018[5a]	0.018[5a]
Trifluralin	0.00001[6]	-	0.00003[5c]	0.00003[5c]
Miscellaneous				
Cyanide (Hydrogen cyanide)	-	0.05[2]	0.001[5a]	0.001[5a]
Phenol	0.0005[6]	-	0.0077[5a]	0.0077[5a]
Sodium	-	200[2]	-	

Determinant	Target concentrations (mg/l)			
	Minimum reporting value	UK drinking water standard or best equivalent	EQS or best equivalent	
			Freshwater	Transitional (estuaries) and coastal waters
Chloride	-	250[2]	250[14]	-
Total ammonia[$] (ammonium (as NH_4^+) plus ammonia (NH_3)	-	0.5[2]	0.3[16]	-
Ammonia un-ionised (NH_3)	-	-	-	0.021[7]
Sulphate	-	250[2]	400[14]	-
Iron	-	0.20[2]	1[5a]	1[5a]
Manganese	-	0.05[2]	0.123 bioavailable[7]	No EQS required
Aluminium	-	0.2[2]	-	
Nitrate (as NO_3)	-	50[2]	-	
Nitrite (as NO_2)	-	0.1[2]	0.01[17]	-

Analytes in bold are hazardous, *analytes in italics are non hazardous*, analytes in plain text are unclassified. According to JAGDAG Determination List June 2010

Note: '-' A target concentration is not available.

[$]Please note that total ammonia (NH_4^+ and NH_3) is equivalent to ammoniacal nitrogen in laboratory reports

"Bioavailable" in relation to copper, zinc and manganese is the generic $EQS_{bioavailable}$[7] derived from the Metal Bioavailability Assessment Tool (M-BAT) developed by the Water Framework Directive UK Technical Advisory Group (WFDTAG). Exceedance of this value should prompt a site-specific assessment using the M-BAT with pH, DOC and Ca to derive a site-specific EQS termed the $PNEC_{dissolved}$. http://www.wfduk.org/resources/rivers-lakes-metal-bioavailability-assessment-tool-m-bat

Notes

1. Environment Agency (2013), 'Groundwater Protection: Principles and Policy (GP3) v1.1'.
2. The Water Supply (Water Quality) Regulations 2000 (SI 2000/3184), as amended by SI 2001/2885, SI 2002/2469, SI 2005/2035, SI 2007/2734 and SI 2010/991.
3. The Private Water Supplies Regulations 1991. SI 1991 / 2790.
4. The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996 (as amended). SI 1996 / 3001.
5. The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010.

5a. Annual mean concentration (mg/l) for 'Good' standard

5b. Applies to hardness ranges of <40mg/l $CaCO_3$, 40–<50mg/l $CaCO_3$, 50–<100mg/l $CaCO_3$, 100–<200mg/l $CaCO_3$ and >/=200mg/l $CaCO_3$. The target concentrations included in Table 1 are listed in order of increasing calcium carbonate concentrations.

5c. Annual average EQS (surface waters)

5d. Sum of aldrin, dieldrin, endrin and isodrin

5e. Applies to hardness ranges of 0–50mg/l $CaCO_3$, 50–100mg/l $CaCO_3$, 100–250mg/l $CaCO_3$ and >250mg/l $CaCO_3$. The target concentrations included in Table 1 are listed in order of increasing calcium carbonate concentrations; applies to annual mean concentration (mg/l) of $CaCO_3$. Applies to annual mean concentration of metal (mg/l) for 'Good' standard.

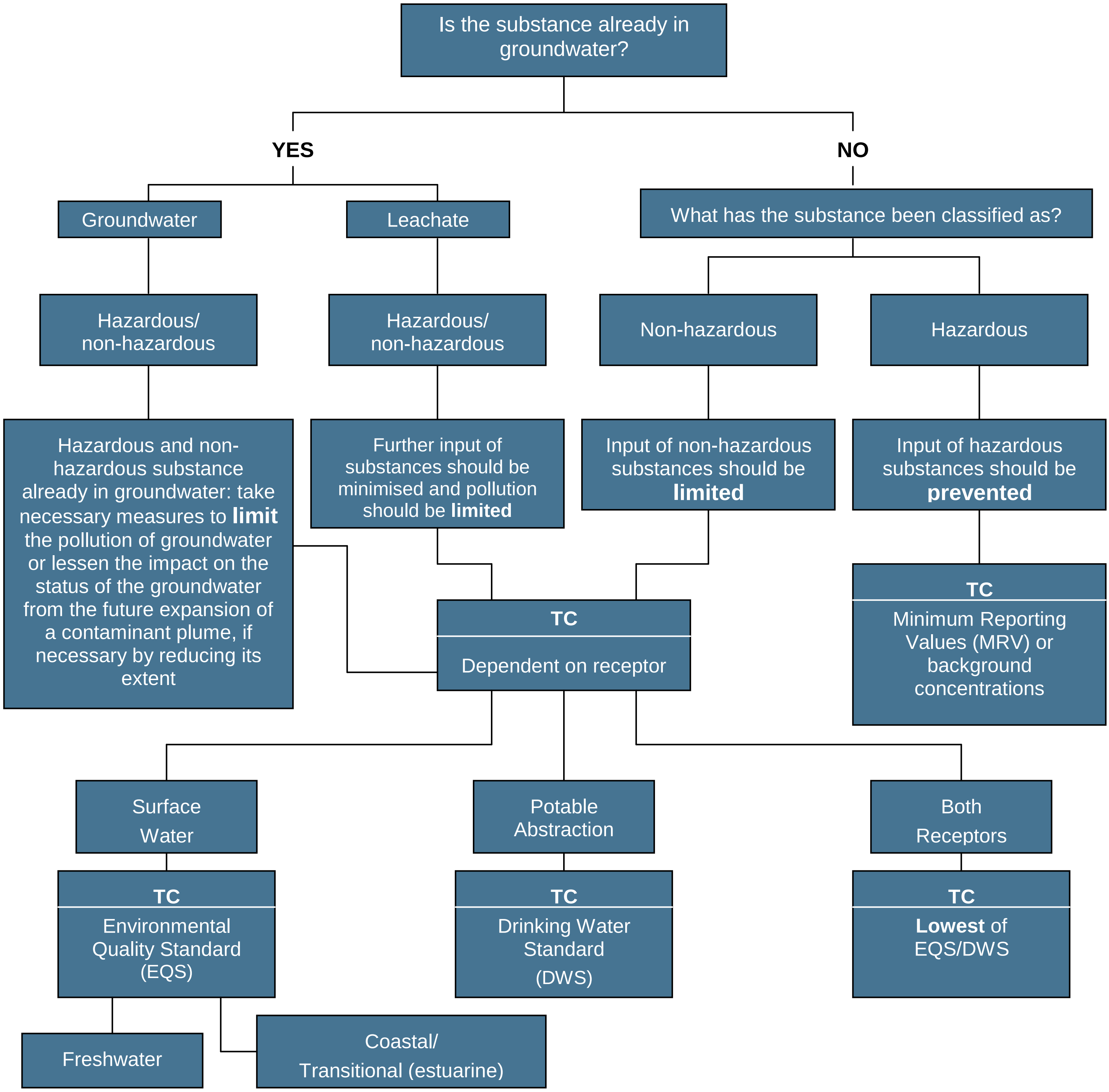
5f. Sum of benzo(b)fluoranthene and benzo(k)fluoranthene

5g. Sum of benzo(g,h,i)perylene and indeno(1,2,3-cd)pyrene

6. Minimum reporting values listed in Annex (J) of Horizontal Guidance Note H1 (H1 Environmental Risk Assessment Framework, Environment Agency, April 2010 v2.0). Note target concentration for xylenes is 0.003mg/l each for o-xylene and m/p xylene.
7. DEFRA (2014). Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment. Table 5.2a: Proposed standards for 29 specific pollutants – long-term mean value. Additional information on the Metal Bioavailability Assessment Tool (M-BAT) is available at http://www.wfduk.org/resources/rivers-lakes-metal-bioavailability-assessment-tool-m-bat .
8. The Water Supply (Water Quality) Regulations 2000. (SI 2000 / 3184) – sum of chloroform, bromoform, dibromochloromethane and bromodichloromethane.
9. WRc plc (2002), R&D Technical Report P45. Where predicted no-effect concentration is below the laboratory method detection limit (LMDL) for chrysene, dibenzo(a,h)anthracene and fluoranthene, the target concentration has been set at the LMDL of 0.00001mg/l.
10. Please note this is a very conservative value. If necessary please refer to EA (2009). *Petroleum hydrocarbons in Groundwater Supplementary Guidance for Hydrogeological Risk Assessment, which* provides advice on risk rankings of TPH CWG fractions. It may be possible to eliminate low risk fractions and/or those not detected above LMDL from concern.
11. Environment Agency (2009), 'Petroleum hydrocarbons in groundwater: supplementary guidance for hydrogeological risk assessment'.
12. WHO (2004), *Guidelines for drinking-water quality*, 3rd edn.

13. Drinking Water Inspectorate (London, UK). Environmental Information Request on MTBE in drinking water. Ref. DWI 1/10/18; dated 28 November 2006. Value is based on the odour threshold for MTBE, which is lower than a health-based guideline value.
14. Council Directive on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment of the Community (Dangerous Substances Directive) - List II Substances (76/464/EEC).
15. The Water Framework Directive (200/60/EC). Freshwater Environmental Quality Standards.
16. UK TAG January 2008. Proposals for Environmental Quality standards for Annex VIII Substances. Long term 90%ile for upland low alkalinity water. The value for lowland high alkalinity waters is 0.6mg/l. (UKTAG recommends the adoption of the total ammonia standard from the UK Environmental Standards and Conditions (Phase 1) report dated August 2006. UKTAG believes that this approach will provide an effective level of protection for both total and unionised ammonia in freshwaters).
17. Council Directive on the Quality of Fresh Waters Needing Protection or Improvement in Order to Support Fish Life (Freshwater Fish Directive) (78/659/EEC)

FLOW CHART TO ASSIST WITH SELECTION OF TARGET CONCENTRATIONS



TC = Target concentration

When leachate is being assessed the 'compliance point' is the groundwater body. Therefore dilution within the groundwater body may be applied <u>with caution</u> before comparing with the TC.

When directly assessing a receptor, e.g., a river, the appropriate TC should be selected.

APPENDIX M
GENERIC ASSESSMENT CRITERIA FOR POTABLE WATER SUPPLY PIPES

A range of pipe materials is available and careful selection, design and installation is required to ensure that water supply pipes are satisfactorily installed and meet the requirements of the Water Supply (Water Fittings) Regulations 1999 in England and Wales, the Byelaws 2000 in Scotland and the Northern Ireland Water Regulations. The regulations include a requirement to use only suitable materials when laying water pipes and laying water pipes without protection is not permitted at contaminated sites. The water supply company has a statutory duty to enforce the regulations.

Contaminants in the ground can pose a risk to human health by permeating potable water supply pipes. To fulfil their statutory obligation, UK water supply companies require robust evidence from developers to demonstrate either that the ground in which new plastic supply pipes will be laid is free from specific contaminants, or that the proposed remedial strategy will mitigate any existing risk. If these requirements cannot be demonstrated to the satisfaction of the relevant water company, it becomes necessary to specify an alternative pipe material on the whole development or in specific zones.

In 2010, UK Water Industry Research (UKWIR) published *Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites* (Report Ref. No. 10/WM/03/21). This report reviewed previously published industry guidelines and threshold concentrations adopted by individual water supply companies.

The focus of the UKWIR research project was to develop clear and concise procedures, which provide consistency in the pipe selection decision process. It was intended to provide guidance that can be used to ensure compliance with current regulations and to prevent water supply pipe failing prematurely due to the presence of contamination.

The report concluded that in most circumstances only organic contaminants pose a potential risk to plastic pipe materials and Table 3.1 of the report provides threshold concentrations for polyethylene (PE) and polyvinyl chloride (PVC) pipes for the organic contaminants of concern. The report also makes recommendations for the procedures to be adopted in the design of site investigations and sampling strategies, and the assessment of data, to ensure that the ground through which water supply pipes will be laid is adequately characterised.

Risks to water supply pipes have therefore been assessed against the threshold concentrations for PE and PVC pipe specified in Table 3.1 of Report 10/WM/03/21, which have been adopted as the GAC for this linkage and are reproduced in Table A3 below.

Since water supply pipes are typically laid at a minimum depth of 0.75m below finished ground levels, sample results from depths between 0.5m and 1.5m below finished level are generally considered suitable for assessing risks to water supply. Samples outside these depths can be used, providing the stratum is the same as that in which water supply pipes are likely to be located. The report specifies that sampling should characterise the ground conditions to a minimum of 0.5m below the proposed depth of the pipe.

It should be noted that the assessment provided in this report is a guide and the method of assessment and recommendations should be checked with the relevant water supply company.

Table A3: Generic assessment criteria for water supply pipes

		Pipe material	
		GAC (mg/kg)	
	Parameter group	PE	PVC
1	Extended VOC suite by purge and trap or head space and GC-MS with TIC (Not including compounds within group 1a)	0.5	0.125
1a	• BTEX + MTBE	0.1	0.03
2	SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C_5–C_{10}) (Not including compounds within group 2e and 2f)	2	1.4
2e	• Phenols	2	0.4
2f	• Cresols and chlorinated phenols	2	0.04
3	Mineral oil C_{11}–C_{20}	10	Suitable
4	Mineral oil C_{21}–C_{40}	500	Suitable
5	Corrosive (conductivity, redox and pH)	Suitable	Suitable
Specific suite identified as relevant following site investigation			
2a	Ethers	0.5	1
2b	Nitrobenzene	0.5	0.4
2c	Ketones	0.5	0.02
2d	Aldehydes	0.5	0.02
6	Amines	Not suitable	Suitable
Notes: where indicated as 'suitable', the material is considered resistant to permeation or degradation and no threshold concentration has been specified by UKWIR.			

APPENDIX N
COMPARISON OF SOIL ANALYSIS TO HUMAN HEALTH CRITERIA

313583- Roade Bypass- Human Health Risk Assessment Soil Results Summary Table and Direct Comparison

Sample Identity		Industrial/Commercial Screening Value (1% SOM)	TP01	TP02	TP03	TP04	TP05	TP12	TP14
Depth		GACs	0.20	0.20	0.30	0.50	0.20	0.20	0.20
Strata									
Determinants	Units								
Visual Fibre Screen			NAD	NAD	NAD	NAD	NAD	NAD	NAD
pH	pH		7.66	7.15	8.1	8.2	6.86	7.9	7.67
Total Organic Carbon	% w/w		3.73	1.61	2.64	1.69	2.69	0.99	1.33
Metals									
Arsenic	mg/kg	640	4	10	2	<1	4	11	7
Cadmium	mg/kg	410	0.9	1.1	1	1	0.7	1.1	1
Copper	mg/kg	68000	33	16	24	15	12	15	14
Chromium	mg/kg	8600	36	26	39	37	34	26	26
Chromium (hexavalent)	mg/kg	49	<1	<1	<1	<1	<1	<1	<1
Lead	mg/kg	2300	30	24	20	16	21	96	21
Mercury	mg/kg	1120	<0.17	<0.17	0.3	<0.17	<0.17	<0.17	<0.17
Nickel	mg/kg	980	26	24	31	30	21	27	26
Selenium	mg/kg	12000	1	1	1	<1	<1	<1	<1
Zinc	mg/kg	740000	82	68	69	53	63	73	71
Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG)									
Ali >C5-C6	mg/kg	3200	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C6-C8	mg/kg	7800	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C8-C10	mg/kg	2000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C10-C12	mg/kg	9700	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C12-C16	mg/kg	59000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C16-C21	mg/kg	Assess as sum below	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C21-C35	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C16-C35	mg/kg	1000000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Aliphatics	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C5-C7	mg/kg	27	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C7-C8	mg/kg	56000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C8-C9	mg/kg	14000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C9-C10	mg/kg	3500	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C10-C12	mg/kg	16000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C12-C16	mg/kg	36000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C16-C21	mg/kg	28000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C21-C35	mg/kg	28000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Aromatics	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TPH (Ali & Aro)	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BTEX - Benzene	mg/kg	27	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - Toluene	mg/kg	56000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - Ethyl Benzene	mg/kg	6000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - m & p Xylene	mg/kg	5900	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - o Xylene	mg/kg	6600	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MTBE	mg/kg	67000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAHs (Polycyclic Aromatic Hydrocarbons)									
Acenapthene	mg/kg	110000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenapthylene	mg/kg	110000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	520000	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(a)anthracene	mg/kg	170	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(a)pyrene	mg/kg	77	0.06	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(b)fluoranthene	mg/kg	44	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	mg/kg	3900	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	1200	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chrysene	mg/kg	350	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Dibenzo(ah)anthracene	mg/kg	3.5	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Fluoranthene	mg/kg	23000	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Fluorene	mg/kg	63000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123-cd)pyrene	mg/kg	500	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Napthalene	mg/kg	1800	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	mg/kg	22000	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Pyrene	mg/kg	54000	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Total PAH	mg/kg		0.1	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Organo Chlorine Pesticides (OCP) and Organo Phosphorous Pesticides (OPP)									
Mevinphos	µg/kg			<50				<50	
Dichlorvos	µg/kg	140000		<50				<50	
alpha-Hexachlorocyclohexane (HCH)	µg/kg	170000		<50				<50	
Diazinon	µg/kg			<50				<50	
gamma-Hexachlorocyclohexane (HCH / Lindane)	µg/kg	67000		<50				<50	
Heptachlor	µg/kg			<50				<50	
Aldrin	µg/kg	170000		<50				<50	
beta-Hexachlorocyclohexane (HCH)	µg/kg	65000		<50				<50	
Methyl Parathion	µg/kg			<50				<50	
Malathion	µg/kg			<50				<50	
Fenitrothion	µg/kg			<50				<50	
Heptachlor Epoxide	µg/kg			<50				<50	
Parathion (Ethyl Parathion)	µg/kg			<50				<50	
p,p-DDE	µg/kg			<50				<50	
p,p-DDT	µg/kg			<50				<50	
p,p-Methoxychlor	µg/kg			<50				<50	
p,p-TDE (DDD)	µg/kg			<50				<50	
o,p-DDE	µg/kg			<50				<50	
o,p-DDT	µg/kg			<50				<50	
o,p-Methoxychlor	µg/kg			<50				<50	
o,p-TDE (DDD)	µg/kg			<50				<50	
Endosulphan I	µg/kg	5600000		<50				<50	
Endosulphan II	µg/kg	6300000		<50				<50	
Endosulphan Sulphate	µg/kg			<50				<50	
Endrin	µg/kg			<50				<50	
Ethion	µg/kg			<50				<50	
Dieldrin	µg/kg	170000		<50				<50	
Azinphos-methyl	µg/kg			<50				<50	
Nitrogen Pests									
Ametryn	µg/kg			<50				<50	
Atraton	µg/kg			<50				<50	
Atrazine	µg/kg	9300000		<50				<50	
Prometon	µg/kg			<50				<50	
Prometryn	µg/kg			<50				<50	
Propazine	µg/kg			<50				<50	
Simazine	µg/kg			<50				<50	
Simetryn	µg/kg			<50				<50	
Terbuthylazine	µg/kg			<50				<50	
Terbutryn	µg/kg			<50				<50	

= Exceedence of GAC for an industrial/commercial end-use

All GACs calculated by RSK or taken from EIC/AGS/CLAIRE Generic Assessment Criteria; and LQM/CIEH Generic Assessment Criteria

313583- Roade Bypass- Human Health Risk Assessment Soil Results Summary Table and Direct Comparison

Sample Identity		Industrial/Commercial Screening Value (1% SOM)	TP15	TP15	TP16	TP16A	TP16A	TP17	WS02	WS04
Depth		GACs	0.20	1.50	0.10	0.20	0.50	0.20	0.20	0.30
Strata										
Determinants	Units									
Visual Fibre Screen			NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
pH	pH		7.4	8.47	8.17	8.78	8.17	7.91	7.66	8.11
Total Organic Carbon	% w/w		2.07	<0.03	1.43	<0.03	0.58	2.19	1.19	1.93
Metals										
Arsenic	mg/kg	640	8	<1	3	1	3	3	7	3
Cadmium	mg/kg	410	1.3	<0.5	0.8	<0.5	0.7	0.7	1.3	0.8
Copper	mg/kg	68000	15	5	12	2	10	13	13	14
Chromium	mg/kg	8600	35	11	18	4	20	20	33	18
Chromium (hexavalent)	mg/kg	49	<1	<1	<1	<1	<1	<1	<1	<1
Lead	mg/kg	2300	22	4	18	2	13	16	19	16
Mercury	mg/kg	1120	<0.17	<0.17	<0.17	0.31	<0.17	0.29	<0.17	0.2
Nickel	mg/kg	980	29	11	17	3	17	16	33	16
Selenium	mg/kg	12000	<1	<1	<1	<1	<1	<1	1	<1
Zinc	mg/kg	740000	87	16	54	5	45	50	72	52
Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG)										
Ali >C5-C6	mg/kg	3200	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C6-C8	mg/kg	7800	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C8-C10	mg/kg	2000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C10-C12	mg/kg	9700	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C12-C16	mg/kg	59000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C16-C21	mg/kg	Assess as sum below	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C21-C35	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C16-C35	mg/kg	1000000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Aliphatics	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C5-C7	mg/kg	27	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C7-C8	mg/kg	56000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C8-C9	mg/kg	14000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C9-C10	mg/kg	3500	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C10-C12	mg/kg	16000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C12-C16	mg/kg	36000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C16-C21	mg/kg	28000	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1
Aro >C21-C35	mg/kg	28000	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1
Total Aromatics	mg/kg		<0.1	<0.1	<0.1	0.8	<0.1	<0.1	<0.1	<0.1
TPH (Ali & Aro)	mg/kg		<0.1	<0.1	<0.1	0.8	<0.1	<0.1	<0.1	<0.1
BTEX - Benzene	mg/kg	27	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - Toluene	mg/kg	56000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - Ethyl Benzene	mg/kg	6000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - m & p Xylene	mg/kg	5900	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - o Xylene	mg/kg	6600	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MTBE	mg/kg	67000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAHs (Polycyclic Aromatic Hydrocarbons)										
Acenapthene	mg/kg	110000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenapthylene	mg/kg	110000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	520000	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
Benzo(a)anthracene	mg/kg	170	<0.04	<0.04	<0.04	0.16	<0.04	<0.04	<0.04	<0.04
Benzo(a)pyrene	mg/kg	77	<0.04	<0.04	<0.04	0.28	<0.04	<0.04	<0.04	<0.04
Benzo(b)fluoranthene	mg/kg	44	<0.05	<0.05	<0.05	0.32	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	mg/kg	3900	<0.05	<0.05	<0.05	0.29	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	1200	<0.07	<0.07	<0.07	0.12	<0.07	<0.07	<0.07	<0.07
Chrysene	mg/kg	350	<0.06	<0.06	<0.06	0.19	<0.06	<0.06	<0.06	<0.06
Dibenzo(ah)anthracene	mg/kg	3.5	<0.04	<0.04	<0.04	0.05	<0.04	<0.04	<0.04	<0.04
Fluoranthene	mg/kg	23000	<0.08	<0.08	<0.08	0.17	<0.08	<0.08	<0.08	<0.08
Fluorene	mg/kg	63000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123-cd)pyrene	mg/kg	500	<0.03	<0.03	<0.03	0.25	<0.03	<0.03	<0.03	<0.03
Napthalene	mg/kg	1800	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	mg/kg	22000	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03
Pyrene	mg/kg	54000	<0.07	<0.07	<0.07	0.18	<0.07	<0.07	<0.07	<0.07
Total PAH	mg/kg		<0.08	<0.08	<0.08	2.07	<0.08	<0.08	<0.08	<0.08
Organo Chlorine Pesticides (OCP) and Organo Phosphorous Pesticides (OPP)										
Mevinphos	µg/kg					<50		<50		
Dichlorvos	µg/kg	140000				<50		<50		
alpha-Hexachlorocyclohexane (HCH)	µg/kg	170000				<50		<50		
Diazinon	µg/kg					<50		<50		
gamma-Hexachlorocyclohexane (HCH / Lindane)	µg/kg	67000				<50		<50		
Heptachlor	µg/kg					<50		<50		
Aldrin	µg/kg	170000				<50		<50		
beta-Hexachlorocyclohexane (HCH)	µg/kg	65000				<50		<50		
Methyl Parathion	µg/kg					<50		<50		
Malathion	µg/kg					<50		<50		
Fenitrothion	µg/kg					<50		<50		
Heptachlor Epoxide	µg/kg					<50		<50		
Parathion (Ethyl Parathion)	µg/kg					<50		<50		
p,p-DDE	µg/kg					<50		<50		
p,p-DDT	µg/kg					<50		<50		
p,p-Methoxychlor	µg/kg					<50		<50		
p,p-TDE (DDD)	µg/kg					<50		<50		
o,p-DDE	µg/kg					<50		<50		
o,p-DDT	µg/kg					<50		<50		
o,p-Methoxychlor	µg/kg					<50		<50		
o,p-TDE (DDD)	µg/kg					<50		<50		
Endosulphan I	µg/kg	5600000				<50		<50		
Endosulphan II	µg/kg	6300000				<50		<50		
Endosulphan Sulphate	µg/kg					<50		<50		
Endrin	µg/kg					<50		<50		
Ethion	µg/kg					<50		<50		
Dieldrin	µg/kg	170000				<50		<50		
Azinphos-methyl	µg/kg					<50		<50		
Nitrogen Pests										
Ametryn	µg/kg					<50		<50		
Atraton	µg/kg					<50		<50		
Atrazine	µg/kg	9300000				<50		<50		
Prometon	µg/kg					<50		<50		
Prometryn	µg/kg					<50		<50		
Propazine	µg/kg					<50		<50		
Simazine	µg/kg					<50		<50		
Simetryn	µg/kg					<50		<50		
Terbuthylazine	µg/kg					<50		<50		
Terbutryn	µg/kg					<50		<50		

= Exceedence of GAC for an industrial/commercial end-use

All GACs calculated by RSK or taken from EIC/AGS/CLAIRE Generic Assessment Criteria; and

313583- Roade Bypass- Human Health Risk Assessment Soil Results Summary Table and Direct Comparison

Sample Identity		Industrial/Commercial Screening Value (1% SOM)	WS05	WS06	WS06	WS08	WS10
Depth		**GACs**	**0.20**	**0.10**	**1.50**	**0.40**	**0.40**
Strata							
Determinants	**Units**						
Visual Fibre Screen			NAD	NAD	NAD	NAD	NAD
pH	pH		7.55	7.66	7.75	8.02	7.97
Total Organic Carbon	% w/w		2.56	1.29	2.03	0.65	0.44
Metals							
Arsenic	mg/kg	640	<1	4	<1	6	6
Cadmium	mg/kg	410	0.8	0.8	<0.5	1.1	0.9
Copper	mg/kg	68000	20	13	21	13	16
Chromium	mg/kg	8600	25	22	29	22	28
Chromium (hexavalent)	mg/kg	49	<1	<1	<1	<1	<1
Lead	mg/kg	2300	16	17	16	14	13
Mercury	mg/kg	1120	<0.17	<0.17	<0.17	<0.17	<0.17
Nickel	mg/kg	980	21	19	3	23	30
Selenium	mg/kg	12000	<1	<1	<1	<1	<1
Zinc	mg/kg	740000	58	55	9	65	50
Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG)							
Ali >C5-C6	mg/kg	3200	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C6-C8	mg/kg	7800	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C8-C10	mg/kg	2000	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C10-C12	mg/kg	9700	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C12-C16	mg/kg	59000	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C16-C21	mg/kg	Assess as sum below	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C21-C35	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C16-C35	mg/kg	1000000	<0.1	<0.1	<0.1	<0.1	<0.1
Total Aliphatics	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C5-C7	mg/kg	27	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C7-C8	mg/kg	56000	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C8-C9	mg/kg	14000	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C9-C10	mg/kg	3500	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C10-C12	mg/kg	16000	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C12-C16	mg/kg	36000	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C16-C21	mg/kg	28000	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C21-C35	mg/kg	28000	<0.1	<0.1	<0.1	<0.1	<0.1
Total Aromatics	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
TPH (Ali & Aro)	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
BTEX - Benzene	mg/kg	27	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - Toluene	mg/kg	56000	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - Ethyl Benzene	mg/kg	6000	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - m & p Xylene	mg/kg	5900	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - o Xylene	mg/kg	6600	<0.01	<0.01	<0.01	<0.01	<0.01
MTBE	mg/kg	67000	<0.01	<0.01	<0.01	<0.01	<0.01
PAHs (Polycyclic Aromatic Hydrocarbons)							
Acenapthene	mg/kg	110000	<0.01	<0.01	<0.01	<0.01	<0.01
Acenapthylene	mg/kg	110000	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	520000	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(a)anthracene	mg/kg	170	<0.04	0.06	<0.04	<0.04	<0.04
Benzo(a)pyrene	mg/kg	77	<0.04	0.07	<0.04	<0.04	<0.04
Benzo(b)fluoranthene	mg/kg	44	<0.05	0.07	<0.05	<0.05	<0.05
Benzo(ghi)perylene	mg/kg	3900	<0.05	<0.05	0.08	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	1200	<0.07	<0.07	<0.07	<0.07	<0.07
Chrysene	mg/kg	350	<0.06	<0.06	<0.06	<0.06	<0.06
Dibenzo(ah)anthracene	mg/kg	3.5	<0.04	<0.04	<0.04	<0.04	<0.04
Fluoranthene	mg/kg	23000	<0.08	0.09	<0.08	<0.08	<0.08
Fluorene	mg/kg	63000	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123-cd)pyrene	mg/kg	500	<0.03	0.05	0.06	<0.03	<0.03
Napthalene	mg/kg	1800	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	mg/kg	22000	<0.03	0.04	<0.03	<0.03	<0.03
Pyrene	mg/kg	54000	<0.07	<0.07	<0.07	<0.07	<0.07
Total PAH	mg/kg		<0.08	0.41	0.13	<0.08	<0.08
Organo Chlorine Pesticides (OCP) and Organo Phosphorous Pesticides (OPP)							
Mevinphos	µg/kg						
Dichlorvos	µg/kg	140000					
alpha-Hexachlorocyclohexane (HCH)	µg/kg	170000					
Diazinon	µg/kg						
gamma-Hexachlorocyclohexane (HCH / Lindane)	µg/kg	67000					
Heptachlor	µg/kg						
Aldrin	µg/kg	170000					
beta-Hexachlorocyclohexane (HCH)	µg/kg	65000					
Methyl Parathion	µg/kg						
Malathion	µg/kg						
Fenitrothion	µg/kg						
Heptachlor Epoxide	µg/kg						
Parathion (Ethyl Parathion)	µg/kg						
p,p-DDE	µg/kg						
p,p-DDT	µg/kg						
p,p-Methoxychlor	µg/kg						
p,p-TDE (DDD)	µg/kg						
o,p-DDE	µg/kg						
o,p-DDT	µg/kg						
o,p-Methoxychlor	µg/kg						
o,p-TDE (DDD)	µg/kg						
Endosulphan I	µg/kg	5600000					
Endosulphan II	µg/kg	6300000					
Endosulphan Sulphate	µg/kg						
Endrin	µg/kg						
Ethion	µg/kg						
Dieldrin	µg/kg	170000					
Azinphos-methyl	µg/kg						
Nitrogen Pests							
Ametryn	µg/kg						
Atraton	µg/kg						
Atrazine	µg/kg	9300000					
Prometon	µg/kg						
Prometryn	µg/kg						
Propazine	µg/kg						
Simazine	µg/kg						
Simetryn	µg/kg						
Terbuthylazine	µg/kg						
Terbutryn	µg/kg						

= Exceedence of GAC for an industrial/commercial end-use

All GACs calculated by RSK or taken from EIC/AGS/CLAIRE Generic Assessment Criteria; and

APPENDIX O
COMPARISON OF WATER LABORATORY DATA TO CONTROLLED WATERS GAC

313583 - *Roade Bypass* - Controlled Waters Risk Assessment Groundwater Results Summary Table and Direct Comparison

Sample Identity		Tier 2 Target Concentration (LTC2)					BH01	BH02	BH04	BH05	WS02	WS10
Depth							17.17	20.15	9.92	7.00	2.80	3.25
		Environmental Quality Standard or Best Equivalent										
Strata		**Freshwater EQS**	**UK/EC DWS**	**WHO DWS**	**Dutch Intervention Value**	**US Regional Screening Levels (RSLs) - Tapwater**						
Determinants	**Units**											
pH	pH		6.5-9.5				6.76	6.89	6.94	7.01	6.86	7.16
Hardness	mg/l Ca CO3						758	434	452	502	1110	1840
Sulphate	mg/l		250				471	158	198	259	788	1520
Phenols (total)	µg/l	7.7					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
DOC	mg/l						3.7	3.8	4.4	2.9	2.7	2.4
Nitrates	µg/l		50000				<0.10	0.12	2.9	<0.10	2.46	0.15
Metals												
Arsenic (dissolved)	µg/l		10				<1	<1	<1	1	<1	<1
Boron (dissolved)	µg/l		1000				1400	2220	277	329	67	109
Cadmium (dissolved)	µg/l		5				<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium	mg/l						240	134	164	166	379	564
Copper (dissolved)	µg/l		2000				<1	1	1	<1	1	2
Chromium (dissolved) (III + VI)	µg/l		50				1	3	10	<1	7	8
Chromium (dissolved) (VI)	mg/l		0.05				<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
Lead (dissolved)	µg/l		10				<1	<1	<1	<1	<1	<1
Mercury (dissolved)	µg/l		1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel (dissolved)	µg/l		20				8	3	8	2	29	24
Selenium (dissolved)	µg/l		10				1	2	5	<1	24	3
Zinc (dissolved)	µg/l		3000				31	21	27	<1	40	139
Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG)												
BTEX - Benzene	µg/l		1				<1	<1	<1	<1	<1	<1
BTEX - Ethyl Benzene	µg/l			300			<1	<1	<1	<1	<1	<1
BTEX - Toluene	µg/l			700			<1	<1	<1	<1	<1	<1
BTEX - m & p Xylene	µg/l						<1	<1	<1	<1	<1	<1
BTEX - o Xylene	µg/l						<1	<1	<1	<1	<1	<1
Sum of xylenes	µg/l			500			<1	<1	<1	<1	<1	<1
MTBE	µg/l		15		9200		<1	<1	<1	<1	<1	<1
Ali >C5-C6	µg/l			15000			<1	<1	<1	<1	<1	<1
Ali >C6-C8	µg/l			15000			<1	<1	<1	<1	<1	<1
Ali >C8-C10	µg/l			300			<1	<1	<1	<1	<1	<1
Ali >C10-C12	µg/l			300			<5	<5	<5	<5	<5	<5
Ali >C12-C16	µg/l			300			<5	<5	<5	<5	<5	<5
Ali >C16-C21	µg/l						<5	<5	<5	<5	<5	<5
Ali >C21-C35	µg/l						<5	<5	<5	<5	<5	<5
Total Aliphatics	µg/l						<5	<5	<5	<5	<5	<5
Aro >C5-C7	µg/l			10			<1	<1	<1	<1	<1	<1
Aro >C7-C8	µg/l			700			<1	<1	<1	<1	<1	<1
Aro >C8-C9	µg/l			300			<1	<1	<1	<1	<1	<1
Aro >C9-C10	µg/l						<1	<1	<1	<1	<1	<1
Aro >C10-C12	µg/l			90			<5	<5	<5	<5	<5	<5
Aro >C12-C16	µg/l			90			<5	<5	<5	<5	<5	<5
Aro >C16-C21	µg/l			90			<5	<5	<5	<5	<5	<5
Aro >C21-C35	µg/l			90			<5	<5	<5	<5	<5	<5
Total Aromatics	µg/l						<5	<5	<5	<5	<5	<5
TPH (Ali & Aro)	µg/l						<5	<5	<5	<5	<5	<5
PAHs (Polycyclic Aromatic Hydrocarbons)												
Acenapthene	µg/l					2200	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenapthylene	µg/l	5.8					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	µg/l	0.1					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	µg/l				0.5		<0.01	<0.01	<0.01	<0.01	<0.01	0.03
Benzo(a)pyrene	µg/l		0.01				<0.01	<0.01	<0.01	<0.01	<0.01	0.05
Benzo(b)fluoranthene	µg/l		Sum				<0.01	<0.01	<0.01	<0.01	<0.01	0.04
Benzo(ghi)perylene	µg/l		Sum				<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Benzo(k)fluoranthene	µg/l		Sum				<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Chrysene	µg/l				0.2		<0.01	<0.01	<0.01	<0.01	<0.01	0.03
Dibenzo(ah)anthracene	µg/l						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	µg/l					1500	<0.01	<0.01	0.02	<0.01	<0.01	0.05
Fluorene	µg/l					240	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123-cd)pyrene	µg/l		Sum				<0.01	<0.01	<0.01	<0.01	<0.01	0.03
Naphthalene	µg/l						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/l				5		<0.01	<0.01	0.02	<0.01	<0.01	0.02
Pyrene	µg/l					1100	<0.01	<0.01	0.02	<0.01	<0.01	0.04
Total PAH (sum of Benzo(b), benzo(k), benzo(ghi) and indeno (1,2,3-cd)	µg/l		0.1*				<0.01	<0.01	0.06	<0.01	<0.01	0.33
Semi-Volatile Organic Compounds (SVOCs)												
2,4,5-Trichlorophenol	µg/l						<2	<2	<1	<1		
2,4,6-Trichlorophenol	µg/l						<2	<2	<1	<1		
2,4-Dichlorophenol	µg/l	4.2					<2	<2	<1	<1		
2,4-Dimethylphenol	µg/l						<2	<2	<1	<1		
2,4-Dinitrotoluene	µg/l						<2	<2	<1	<1		
2,6-Dinitrotoluene	µg/l						<2	<2	<1	<1		
2-Chloronaphthalene	µg/l						<2	<2	<1	<1		
2-Chlorophenol	µg/l	50					<2	<2	<1	<1		
2-Methylnaphthalene	µg/l						<2	<2	<1	<1		
2-Methylphenol	µg/l						<2	<2	<1	<1		
2-Nitrophenol	µg/l						<2	<2	<1	<1		
4-Bromophenyl phenyl ether	µg/l						<2	<2	<1	<1		
4-Chloro-3-methylphenol	µg/l	40					<2	<2	<1	<1		
Bis(2-chloroisopropyl)ether	µg/l						<2	<2	<1	<1		
4-Methylphenol	µg/l						<2	<2	<1	<1		
4-Nitrophenol	µg/l						<2	<2	<1	<1		
Bis(2-chloroethyl)ether	µg/l						<2	<2	<1	<1		
Bis(2-chloroethoxy)methane	µg/l						<2	<2	<1	<1		
Bis(2-ethylhexyl)phthalate	µg/l		8				<20	<20	<10	<10		
Butylbenzyl phthalate SVOC	µg/l	7.5					<2	<2	<1	<1		
Carbazole	µg/l						<2	<2	<1	<1		
Dibenzofuran	µg/l						<2	<2	<1	<1		
n-Dibutylphthalate	µg/l	8					<2	<2	<1	<1		
n-Dioctylphthalate	µg/l						<20	<20	<10	<10		
n-Nitroso-n-dipropylamine	µg/l						<2	<2	<1	<1		
Diethyl phthalate	µg/l	200					<2	<2	<1	<1		
Dimethyl phthalate	µg/l	800					<2	<2	<1	<1		
Hexachlorobenzene	µg/l	0.05					<2	<2	<1	<1		
Pentachlorophenol	µg/l		9				<2	<2	<1	<1		
Phenol SVOC	µg/l	7.7					<2	<2	<1	<1		
Nitrobenzene	µg/l						<2	<2	<1	<1		
Isophorone	µg/l						<2	<2	<1	<1		
Hexachlorocyclopentadiene	µg/l						<2	<2	<1	<1		
Phenanthrene SVOC	µg/l				5		<2	<2	<1	<1		
Perylene	µg/l						<2	<2	<1	<1		
Volatile Organic Compounds (VOCs) - (i.e. Envirolab Data)												
Dichlorodifluoromethane	µg/l						<1	<1	<1	<1		
Chloromethane	µg/l					190	<10	<10	<10	<10		
Vinyl Chloride	µg/l		0.5				<1	<1	<1	<1		
Bromomethane	µg/l						<1	<1	<1	<1		
Chloroethane	µg/l						<1	<1	<1	<1		
Trichlorofluoromethane	µg/l						<1	<1	<1	<1		
trans-1,2-Dichloroethylene :- {tran	µg/l					110	<1	<1	<1	<1		
Dichloromethane	µg/l		20	20			<5	<5	<5	<5		
Carbon Disulphide	µg/l						<1	<1	<1	<1		
1,1-Dichloroethylene :- {1,1-Dichlo	µg/l			30			<1	<1	<1	<1		
1,1-Dichloroethane	µg/l				900		<1	<1	<1	<1		
cis-1,2-Dichloroethylene :- {cis-1,2	µg/l			50			<1	<1	<1	<1		
Bromochloromethane	µg/l						<5	<5	<5	<5		
Chloroform :- {Trichloromethane}	µg/l		100	300			<1	<1	<1	<1		
2,2-Dichloropropane	µg/l				80		<1	<1	<1	<1		
1,2-Dichloroethane	µg/l		3				<2	<2	<2	<2		
1,1,1-Trichloroethane	µg/l	100					<1	<1	<1	<1		
1,1-Dichloropropylene :- {1,1-Dich	µg/l						<1	<1	<1	<1		
Benzene	µg/l		1				<1	<1	<1	<1		
Carbon tetrachloride :- {Tetrachlor	µg/l		3				<1	<1	<1	<1		
Dibromomethane	µg/l					8.2	<1	<1	<1	<1		
1,2-Dichloropropane	µg/l			40			<1	<1	<1	<1		
Bromodichloromethane	µg/l			60			<10	<10	<10	<10		
Trichloroethylene :- {Trichloroethe	µg/l		10				<1	<1	<1	<1		
cis-1,3-Dichloropropylene :- {cis-1,	µg/l					40	<1	<1	<1	<1		
trans-1,3-Dichloropropylene :- {tra	µg/l					40	<1	<1	<1	<1		
1,1,2-Trichloroethane	µg/l						<1	<1	<1	<1		
Toluene :- {Methylbenzene}	µg/l	74		700			<1	<1	<1	<1		
1,3-Dichloropropane	µg/l				80		<1	<1	<1	<1		
Dibromochloromethane	µg/l			100			<3	<3	<3	<3		
1,2-Dibromoethane	µg/l			0.4			<1	<1	<1	<1		
Tetrachloroethylene :- {Perchloroe	µg/l		10				<1	<1	<1	<1		
1,1,1,2-Tetrachloroethane	µg/l	Sum				1100	<1	<1	<1	<1		
Chlorobenzene	µg/l			10			<1	<1	<1	<1		
Ethylbenzene	µg/l			300			<1	<1	<1	<1		

Sample Identity		Tier 2 Target Concentration (LTC2)					BH01	BH02	BH04	BH05	WS02	WS10
Depth							17.17	20.15	9.92	7.00	2.80	3.25
		Environmental Quality Standard or Best Equivalent										
Strata		Freshwater EQS	UK/EC DWS	WHO DWS	Dutch Intervention Value	US Regional Screening Levels (RSLs) - Tapwater						
Determinants	Units											
DiMeBenzene 13+14 (m&p Xylene	µg/l	Sum					<1	<1	<1	<1		
Bromoform :- {Tribromomethane}	µg/l			100			<1	<1	<1	<1		
Styrene :- {Vinylbenzene}	µg/l			20			<1	<1	<1	<1		
1,1,2,2-Tetrachloroethane	µg/l					150	<1	<1	<1	<1		
1,2-Dimethylbenzene :- {o-Xylene}	µg/l	Sum					<1	<1	<1	<1		
1,2,3-Trichloropropane	µg/l					0.62	<1	<1	<1	<1		
Isopropylbenzene	µg/l						<1	<1	<1	<1		
Bromobenzene	µg/l					88	<1	<1	<1	<1		
2-Chlorotoluene :- {1-Chloro-2-me	µg/l					730	<1	<1	<1	<1		
n-Propylbenzene :- {1-phenylpropa	µg/l					1300	<1	<1	<1	<1		
4-Chlorotoluene :- {1-Chloro-4-me	µg/l						<1	<1	<1	<1		
1,2,4-Trimethylbenzene	µg/l					15	<1	<1	<1	<1		
4-Isopropyltoluene :- {4-methyl-Iso	µg/l						<1	<1	<1	<1		
1,3,5-Trimethylbenzene :- {Mesityl	µg/l					370	<1	<1	<1	<1		
1,2-Dichlorobenzene	µg/l			1000			<1	<1	<1	<1		
1,4-Dichlorobenzene	µg/l			300			<1	<1	<1	<1		
sec-Butylbenzene :- {1-Methylprop	µg/l						<1	<1	<1	<1		
tert-Butylbenzene :- {(1,1-Dimethy	µg/l						<2	<2	<2	<2		
1,3-Dichlorobenzene	µg/l						<1	<1	<1	<1		
n-ButylBenzene :- {1-Phenylbutan	µg/l						<1	<1	<1	<1		
1,2-Dibromo-3-chloropropane	µg/l			1			<2	<2	<2	<2		
1,2,4-Trichlorobenzene	µg/l			5 to 30			<3	<3	<3	<3		
1,2,3-Trichlorobenzene	µg/l			10			<3	<3	<3	<3		
Hexachlorobutadiene	µg/l			0.6			<1	<1	<1	<1		

* QS (0.1) assessed via comparison of guideline = exceedance of Tier 2 target concentrations ...pounds (benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene and indeno(1,2,3-cd)perylene) = below the laboratory limit of detection

** = assessed using the guidance value for benzene

APPENDIX P
CERTIFICATES OF GEOTECHNICAL ANALYSIS

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: **02/11/2017 15:24:39**.

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

Approved Signatory
Mark Athorne (Laboratory Manager)

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

Castleford Laboratory
The Potteries, Pottery Street
Castleford
West Yorkshire
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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: **M1 Junction 15 Roade Bypass**	Job No: **782814**

STRUCTURAL SOILS LTD

TEST REPORT

Report No. 782814 R1 | 1774

Date	02-November-2017	Contract	M1 Junction 15 Roade Bypass

Client: RSK Environment Ltd
Address: Spring Lodge
172 Chester Road
Helsby
Cheshire WA6 0AR

For the Attention of: Michael Lawson

Samples submitted by client	29/09/2017	Client Reference	313583
Testing Started	02/10/2017	Client Order No.	
Testing Completed	02/11/2017	Instruction Type	Written

Ukas Accredited Tests Underatken

Moisture Content (oven drying method) BS1377:Part 2:1990,clause 3.2 (superseded)**
Liquid Limit (one point method) BS1377:Part 2:1990,clause 4.4
Plastic Limit BS1377:Part 2:1990,clause 5.3
Plasticity Index Derivation BS1377:Part 2:1990,clause 5.4
Particle Size Distribution wet sieve method BS1377:Part 2:1990,clause 9.2
Dry density/moisture content relationship 4.5kg rammer method BS1377:Part 4:1990 clause 3.5/3.6

Non Ukas Accredited Tests Undertaken

Particle Size Distribution sedimentation hydrometer method BS1377:Part 2: 1990,clause 9.5

Tests Undertaken at our Bristol Laboratory

Summary of Water Content Tests ISRM 2007
Point Load ISRM 2007
Unconfined Compressive Strength (in house method based on ISRM 2007)
Permeability (triaxial cell method) BS1377:Part 6:1990,clause 6
Sulphate content (acid extract) BS1377:Part 3:1990,clause 5.2
Sulphate content (water extract) BS1377:Part 3:1990,clause 5.3
pH Value BS1377:Part 3:1990,clause 9.5

* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of.
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd, The Potteries, Pottery Street, Castleford, WF10 1NJ Tel.01977 552255. E-mail mark.athorne@soils.co.uk

SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

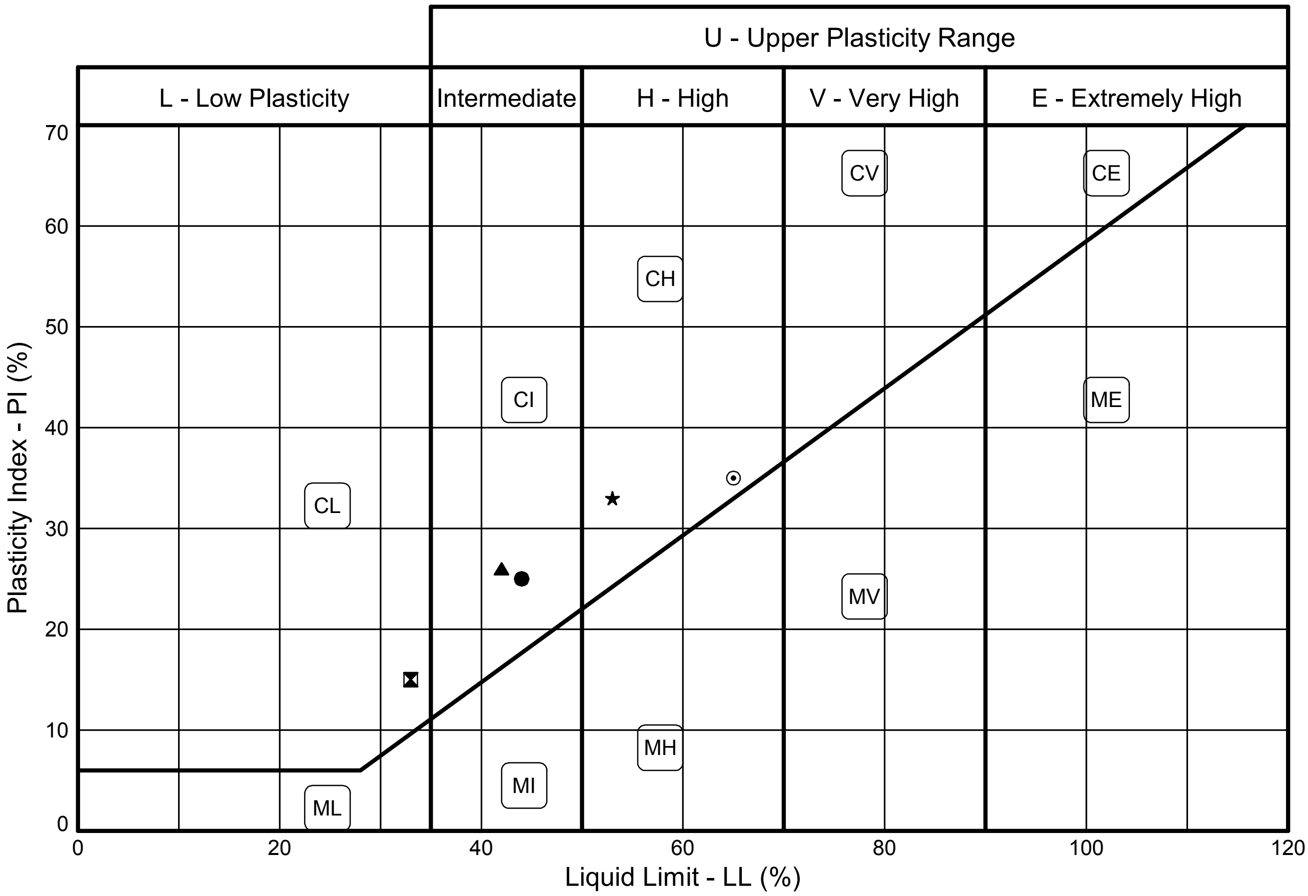
Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425um	Description of Sample
TP12	1	B	1.00	10					Light brown very sandy slightly gravelly CLAY
TP14	1	B	0.50	23					Brown slightly sandy slightly gravelly CLAY
TP16	1	B	0.60	11	44	19	25	67	Brown slightly sandy slightly gravelly CLAY
TP17	1	B	0.50	17	33	18	15	66	Light brown slightly sandy gravelly CLAY
TP20	1	D	0.50	14	42	16	26	72	Brown slightly sandy slightly gravelly CLAY
WS01	1	B	0.90	16	53	20	33	89	Dark brown slightly sandy slightly gravelly CLAY
WS03	1	B	0.20	16					Light brown sandy slightly gravelly CLAY
WS05	1	B	0.80	27	65	30	35	91	Grey sandy gravelly CLAY

STRUCTURAL SOILS LTD	Contract: M1 Junction 15 Roade Bypass	Contract Ref: 782814

AGS

PLASTICITY CHART - PI Vs LL

In accordance with BS5930:2015
Testing in accordance with BS1377-2:1990



Sample Identification				BS Test Method #	Preparation Method +	MC %	LL %	PL %	PI %	<425um %	Lab location	
	Exploratory Position ID	Sample	Depth (m)									
●	TP16	1B	0.60	3.2/4.4/5.3/5.4	4.2.4	11	44	19	25	67	C	
⧗	TP17	1B	0.50	3.2/4.4/5.3/5.4	4.2.4	17	33	18	15	66	C	
▲	TP20	1D	0.50	3.2/4.4/5.3/5.4	4.2.4	14	42	16	26	72	C	
★	WS01	1B	0.90	3.2/4.4/5.3/5.4	4.2.4	16	53	20	33	89	C	
⊙	WS05	1B	0.80	3.2/4.4/5.3/5.4	4.2.4	27	65	30	35	91	C	

Tested in accordance with the following clauses of BS1377-2:1990.

3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non-standard test, NP = Non plastic.

Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By		Date
M. Fisher .	MAUREEN FISHER	02/11/17

Contract	Contract Ref:
M1 Junction 15 Roade Bypass	**782814**

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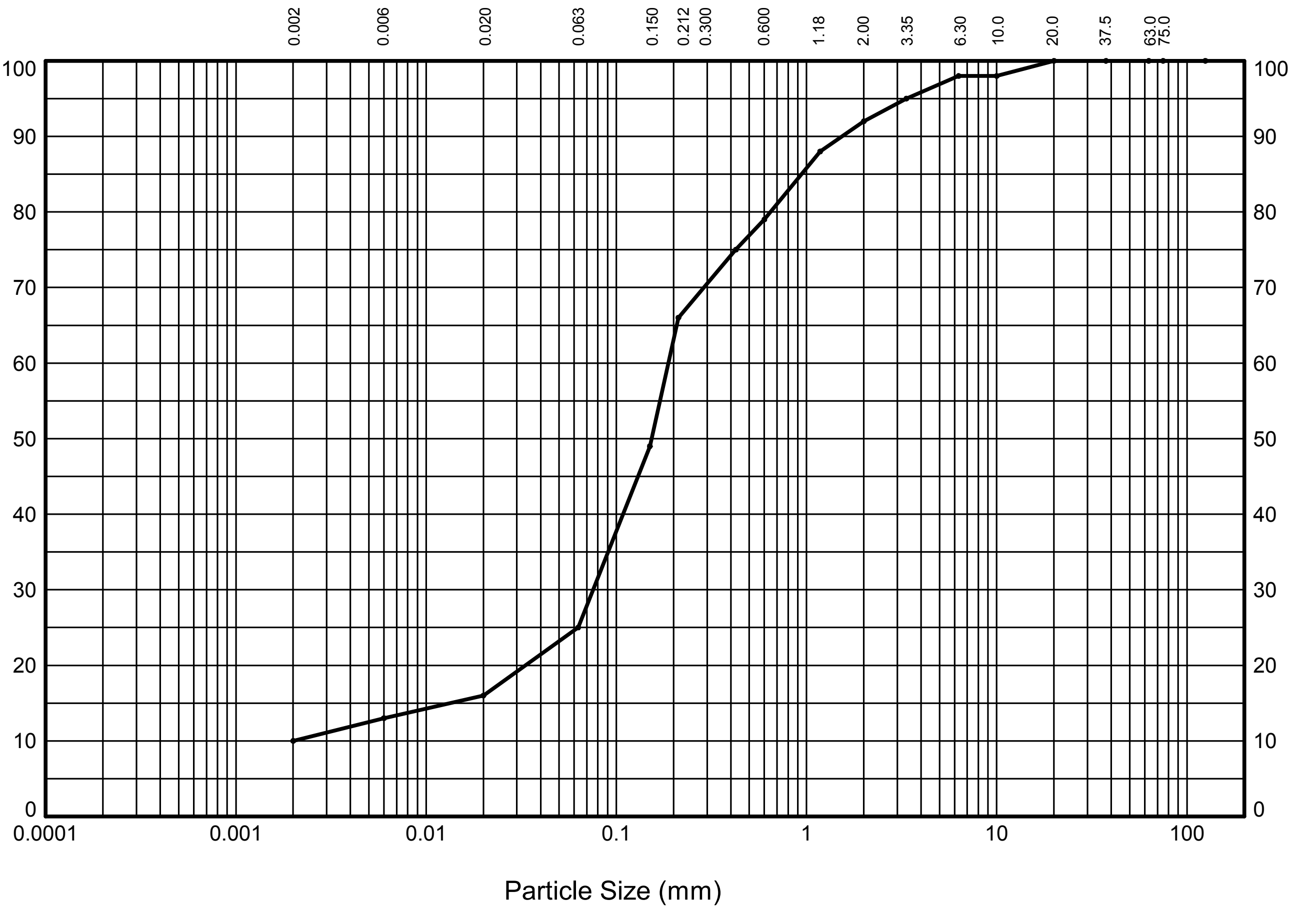
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2, 9.5 of BS1377:Part 2:1990

Trial Pit: **TP12** Sample Ref: **1** Sample Type: **B** Depth (m): **1.00**



CLAY	SILT			SAND			GRAVEL			COBBLES
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**100**
10.0	**98**
6.30	**98**
3.35	**95**
2.00	**92**
1.18	**88**
0.600	**79**
0.425	**75**
0.212	**66**
0.150	**49**
0.063	**25**

Particle Diameter (mm)	Percent Passing (%)
0.02	**16**
0.006	**13**
0.002	**10**

Sedimentation sample was not pre-treated

Soil Fraction	Sieve Percentage (%)
GRAVEL	**8**
SAND	**67**
SILT	**15**
CLAY	**10**

Soil Description:

Light brown very sandy slightly gravelly CLAY

STRUCTURAL SOILS
The Potteries
Pottery Street
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W. Yorkshire WF10 1NJ

Compiled By		Date
C Cole	**CATHERINE COLE**	**02/11/17**

Contract	Contract Ref:
M1 Junction 15 Roade Bypass	**782814**

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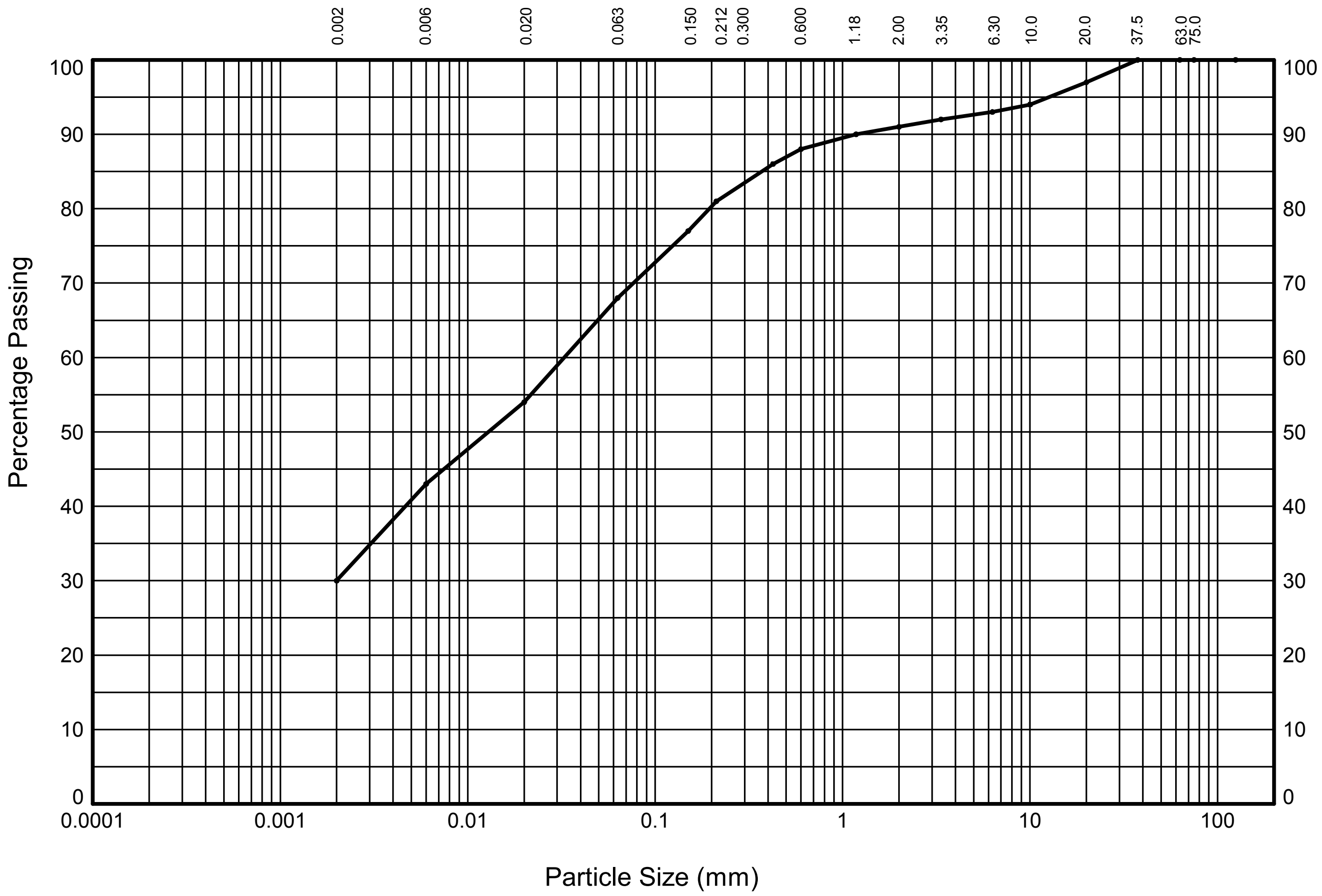
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2, 9.5 of BS1377:Part 2:1990

Trial Pit: **TP14** Sample Ref: **1** Sample Type: **B** Depth (m): **0.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**97**
10.0	**94**
6.30	**93**
3.35	**92**
2.00	**91**
1.18	**90**
0.600	**88**
0.425	**86**
0.212	**81**
0.150	**77**
0.063	**68**

Particle Diameter (mm)	Percent Passing (%)
0.02	**54**
0.006	**43**
0.002	**30**

Sedimentation sample was not pre-treated

Soil Fraction	Sieve Percentage (%)
GRAVEL	**9**
SAND	**23**
SILT	**38**
CLAY	**30**

Soil Description:
Brown slightly sandy slightly gravelly CLAY

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By		Date
C Cole	**CATHERINE COLE**	**02/11/17**

Contract	Contract Ref:
M1 Junction 15 Roade Bypass	**782814**

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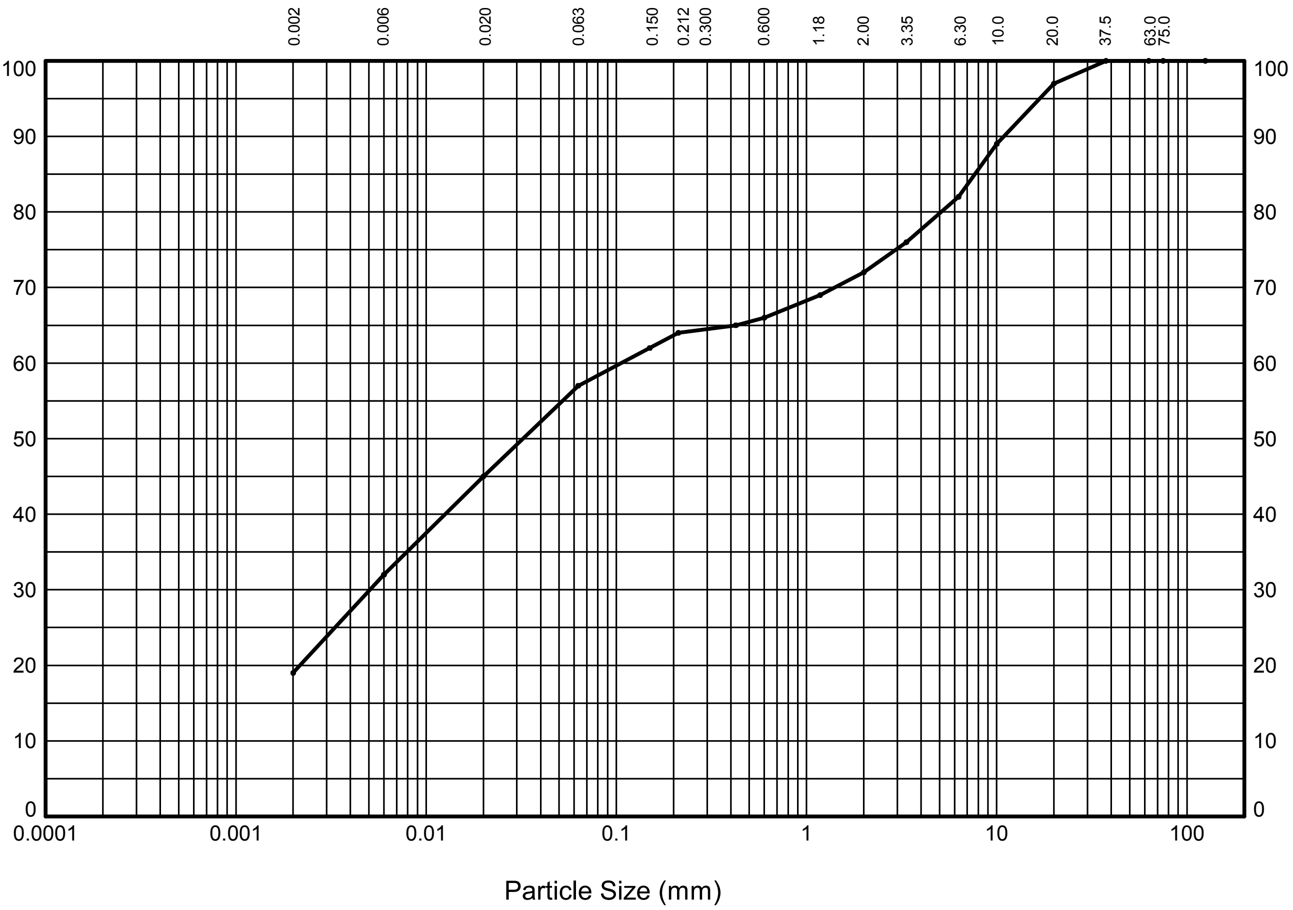
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2, 9.5 of BS1377:Part 2:1990

Trial Pit: **TP16** Sample Ref: **1** Sample Type: **B** Depth (m): **0.60**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**97**
10.0	**89**
6.30	**82**
3.35	**76**
2.00	**72**
1.18	**69**
0.600	**66**
0.425	**65**
0.212	**64**
0.150	**62**
0.063	**57**

Particle Diameter (mm)	Percent Passing (%)
0.02	**45**
0.006	**32**
0.002	**19**

Sedimentation sample was not pre-treated

Soil Fraction	Sieve Percentage (%)
GRAVEL	**28**
SAND	**15**
SILT	**38**
CLAY	**19**

Soil Description:

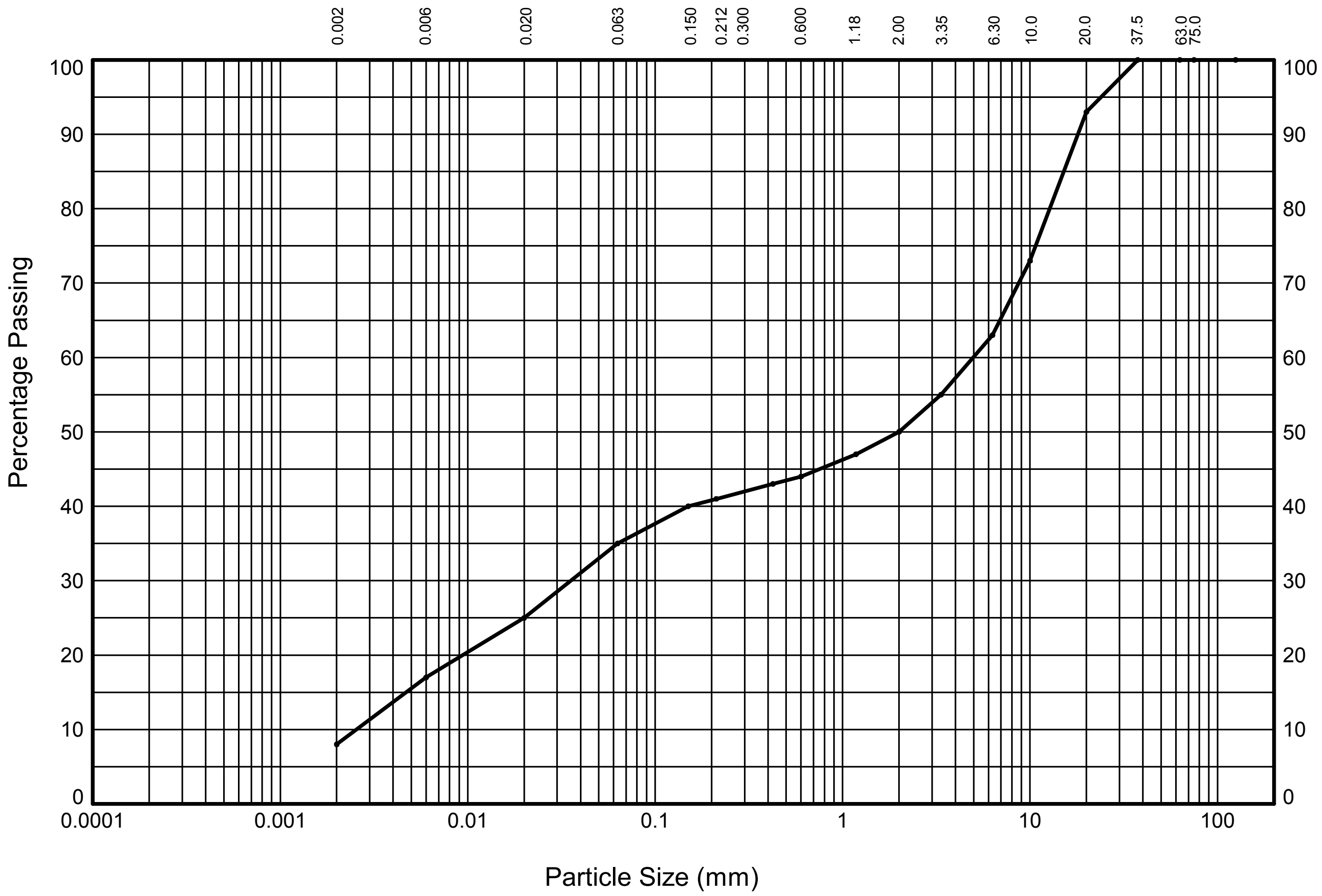
Brown slightly sandy slightly gravelly CLAY

STRUCTURAL SOILS The Potteries Pottery Street Castleford W. Yorkshire WF10 1NJ	Compiled By		Date
	C Cole	**CATHERINE COLE**	**02/11/17**
	Contract **M1 Junction 15 Roade Bypass**	Contract Ref: **782814**	AGS

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2, 9.5 of BS1377:Part 2:1990

Trial Pit: **TP17** Sample Ref: **1** Sample Type: **B** Depth (m): **0.50**



CLAY	SILT			SAND			GRAVEL			COBBLES
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**93**
10.0	**73**
6.30	**63**
3.35	**55**
2.00	**50**
1.18	**47**
0.600	**44**
0.425	**43**
0.212	**41**
0.150	**40**
0.063	**35**

Particle Diameter (mm)	Percent Passing (%)
0.02	**25**
0.006	**17**
0.002	**8**

Sedimentation sample was not pre-treated

Soil Fraction	Sieve Percentage (%)
GRAVEL	**50**
SAND	**15**
SILT	**27**
CLAY	**8**

Soil Description:

Light brown slightly sandy gravelly CLAY

STRUCTURAL SOILS
The Potteries
Pottery Street
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Compiled By		Date
M. Fisher .	**MAUREEN FISHER**	**02/11/17**

Contract	Contract Ref:
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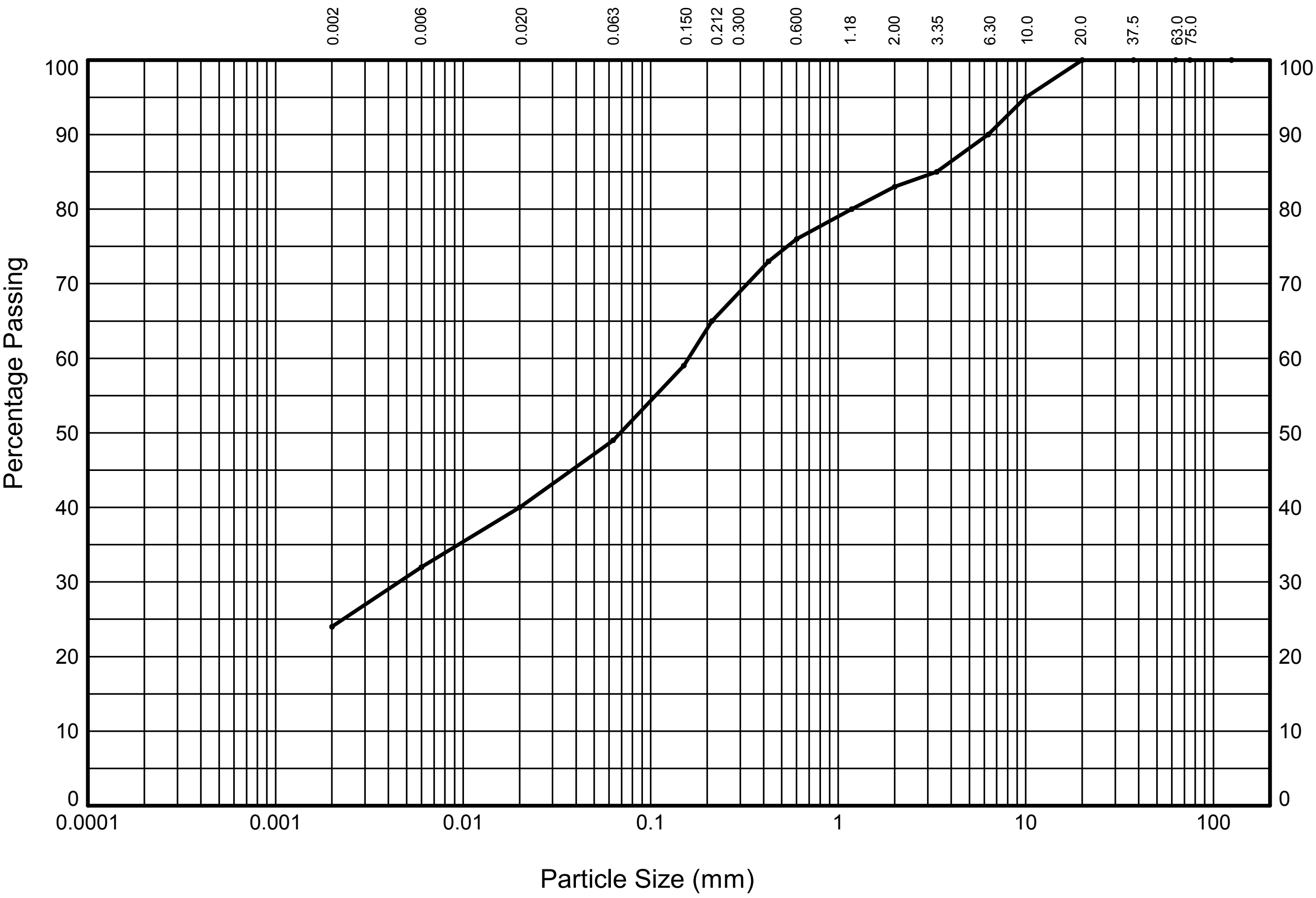
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2, 9.5 of BS1377:Part 2:1990

Trial Pit: **TP20** Sample Ref: **1** Sample Type: **D** Depth (m): **0.50**



CLAY	SILT			SAND			GRAVEL			COBBLES
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**100**
10.0	**95**
6.30	**90**
3.35	**85**
2.00	**83**
1.18	**80**
0.600	**76**
0.425	**73**
0.212	**65**
0.150	**59**
0.063	**49**

Particle Diameter (mm)	Percent Passing (%)
0.02	**40**
0.006	**32**
0.002	**24**

Sedimentation sample was not pre-treated

Soil Fraction	Sieve Percentage (%)
GRAVEL	**17**
SAND	**34**
SILT	**25**
CLAY	**24**

Soil Description:

Brown slightly sandy slightly gravelly CLAY

STRUCTURAL SOILS
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Compiled By		Date
M. Fisher	**MAUREEN FISHER**	**02/11/17**

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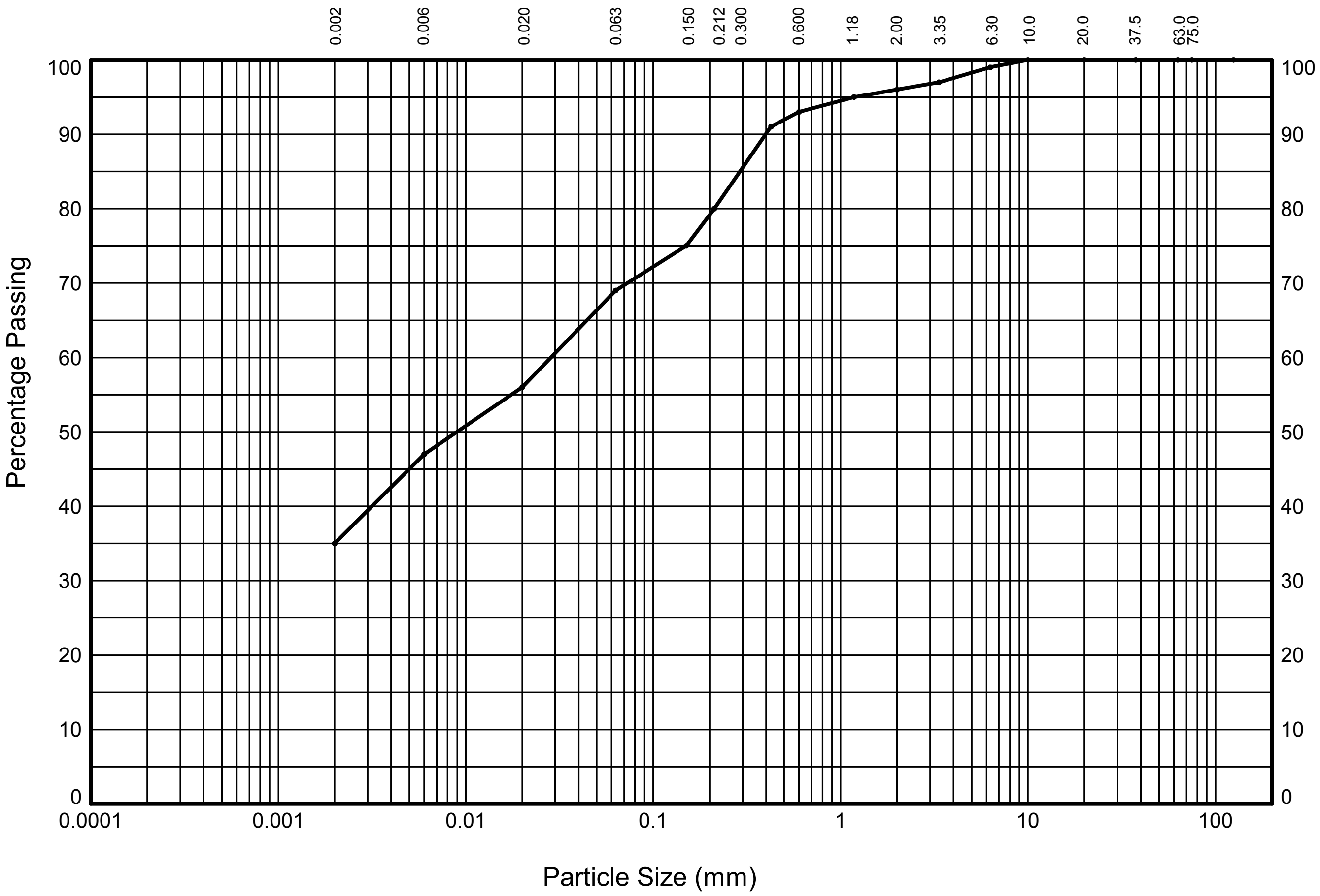
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2, 9.5 of BS1377:Part 2:1990

Window Sample: **WS01** Sample Ref: **1** Sample Type: **B** Depth (m): **0.90**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**100**
10.0	**100**
6.30	**99**
3.35	**97**
2.00	**96**
1.18	**95**
0.600	**93**
0.425	**91**
0.212	**80**
0.150	**75**
0.063	**69**

Particle Diameter (mm)	Percent Passing (%)
0.02	**56**
0.006	**47**
0.002	**35**

Sedimentation sample was not pre-treated

Soil Fraction	Sieve Percentage (%)
GRAVEL	**4**
SAND	**27**
SILT	**34**
CLAY	**35**

Soil Description:

Dark brown slightly sandy slightly gravelly CLAY

STRUCTURAL SOILS
The Potteries
Pottery Street
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Compiled By		Date
C Cole	**CATHERINE COLE**	**02/11/17**

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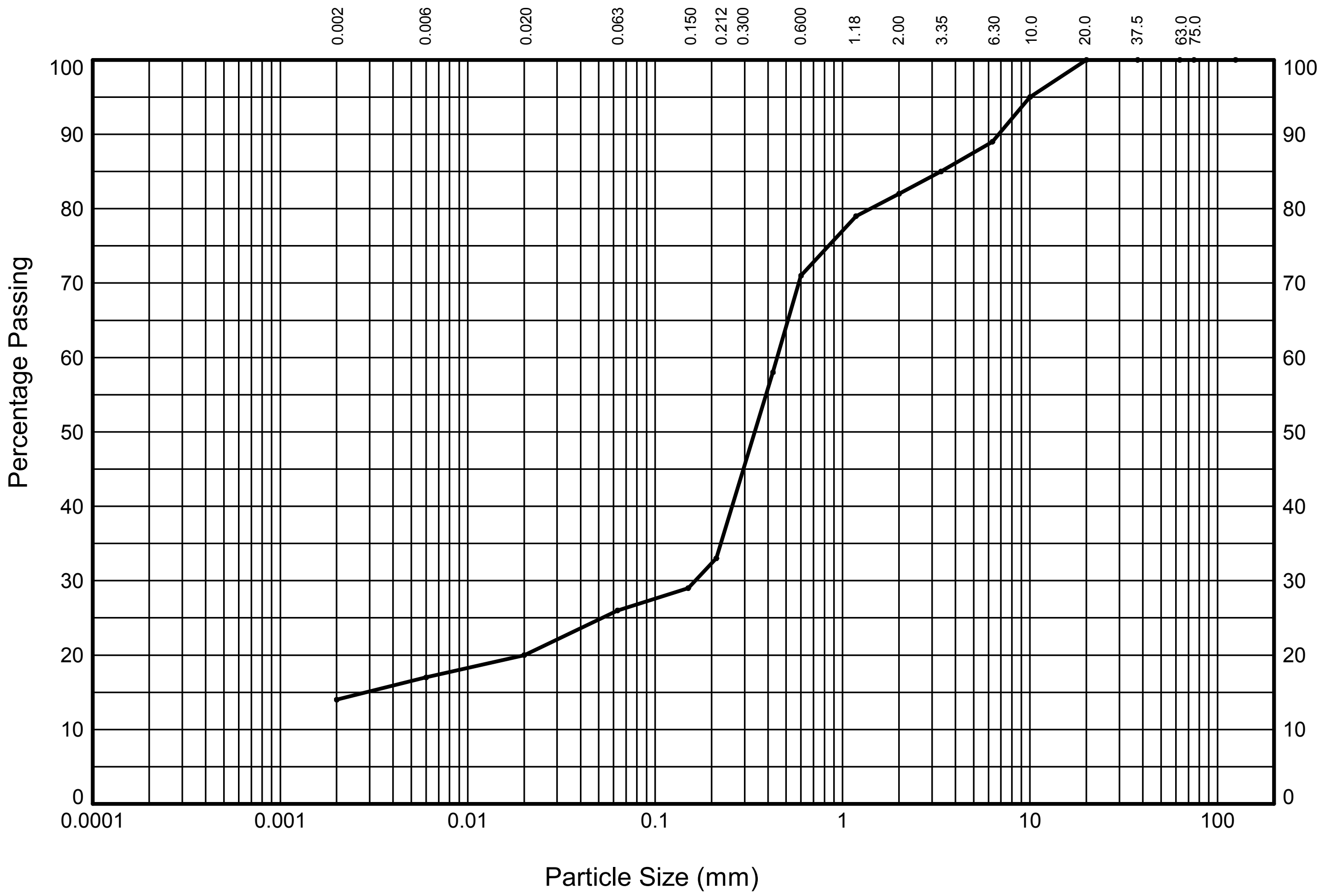
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2, 9.5 of BS1377:Part 2:1990

Window Sample: **WS03** Sample Ref: **1** Sample Type: **B** Depth (m): **0.20**



CLAY	SILT			SAND			GRAVEL			COBBLES
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**100**
10.0	**95**
6.30	**89**
3.35	**85**
2.00	**82**
1.18	**79**
0.600	**71**
0.425	**58**
0.212	**33**
0.150	**29**
0.063	**26**

Particle Diameter (mm)	Percent Passing (%)
0.02	**20**
0.006	**17**
0.002	**14**

Sedimentation sample was not pre-treated

Soil Fraction	Sieve Percentage (%)
GRAVEL	**18**
SAND	**56**
SILT	**12**
CLAY	**14**

Soil Description:

Light brown sandy slightly gravelly CLAY

STRUCTURAL SOILS
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Compiled By		Date
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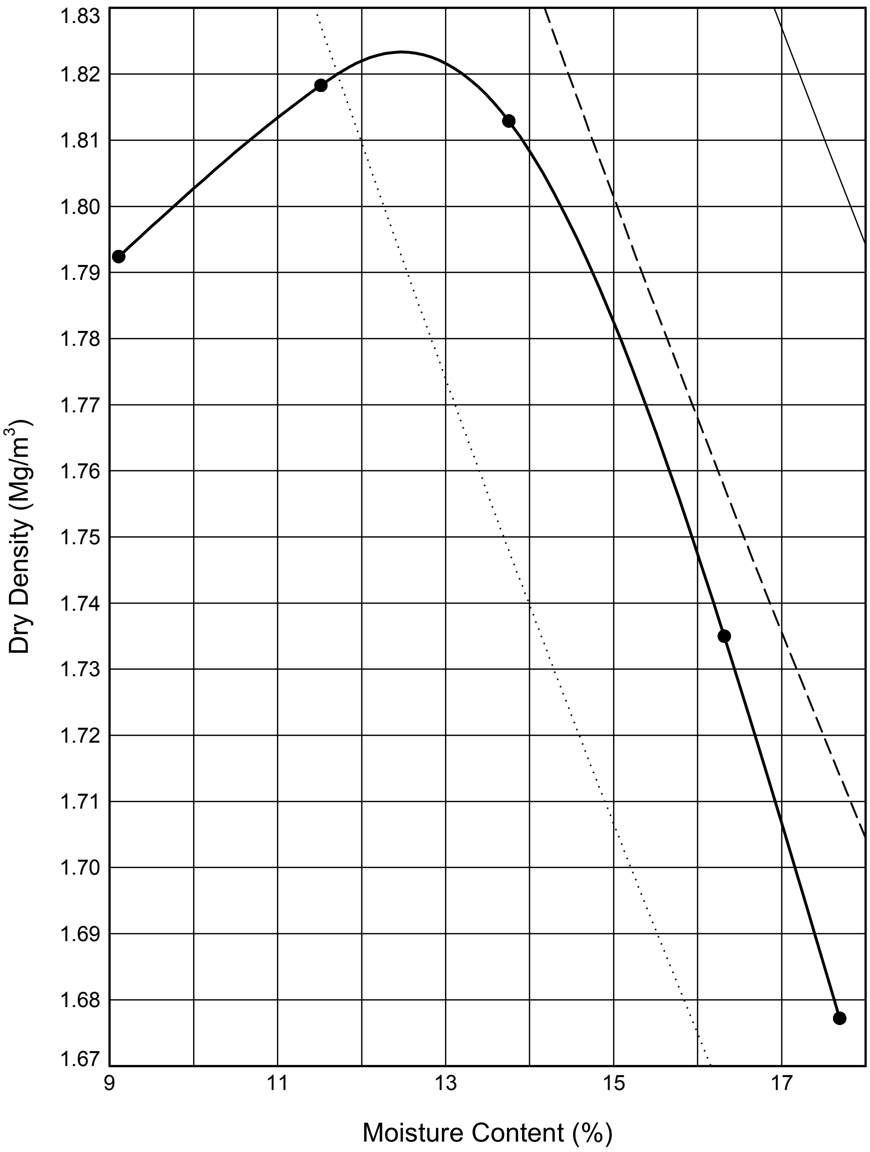
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP TEST

In accordance with clauses 3.3,3.4,3.5,3.6,3.7 of BS1377:Part 4:1990

Trial Pit: **TP12** Sample Ref: **1** Sample Type: **B** Depth (m): **1.00**



Initial Sample Conditions			Test Details		Test Results	
Initial Moisture Content (%)	:	**16**	Compaction Type :	**Heavy**	Maximum Dry Density (Mg/m^3) :	**1.82**
% Retained on 37.5mm BS Sieve	:	**0**	Mass of Rammer (kg):	**4.5**	Optimum Moisture Content (%) :	**13**
% Retained on 20.0mm BS Sieve	:	**0**	Type of Mould :	**Proctor**	Method Used:	**Clause 3.5**
Particle Density - assumed (Mg/m^3)	:	**2.65**			Remarks:	
Size of Soil Pieces	:	**<20mm**	Separate samples were used.			

Sample Description	Key to Air Voids Lines		
Light brown very sandy slightly gravelly CLAY	——— 0%	– – – – 5%	·········· 10%

STRUCTURAL SOILS
The Potteries
Pottery Street
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W. Yorkshire WF10 1NJ

Compiled By		Date
M. Athorne	**MARK ATHORNE**	**02/11/17**

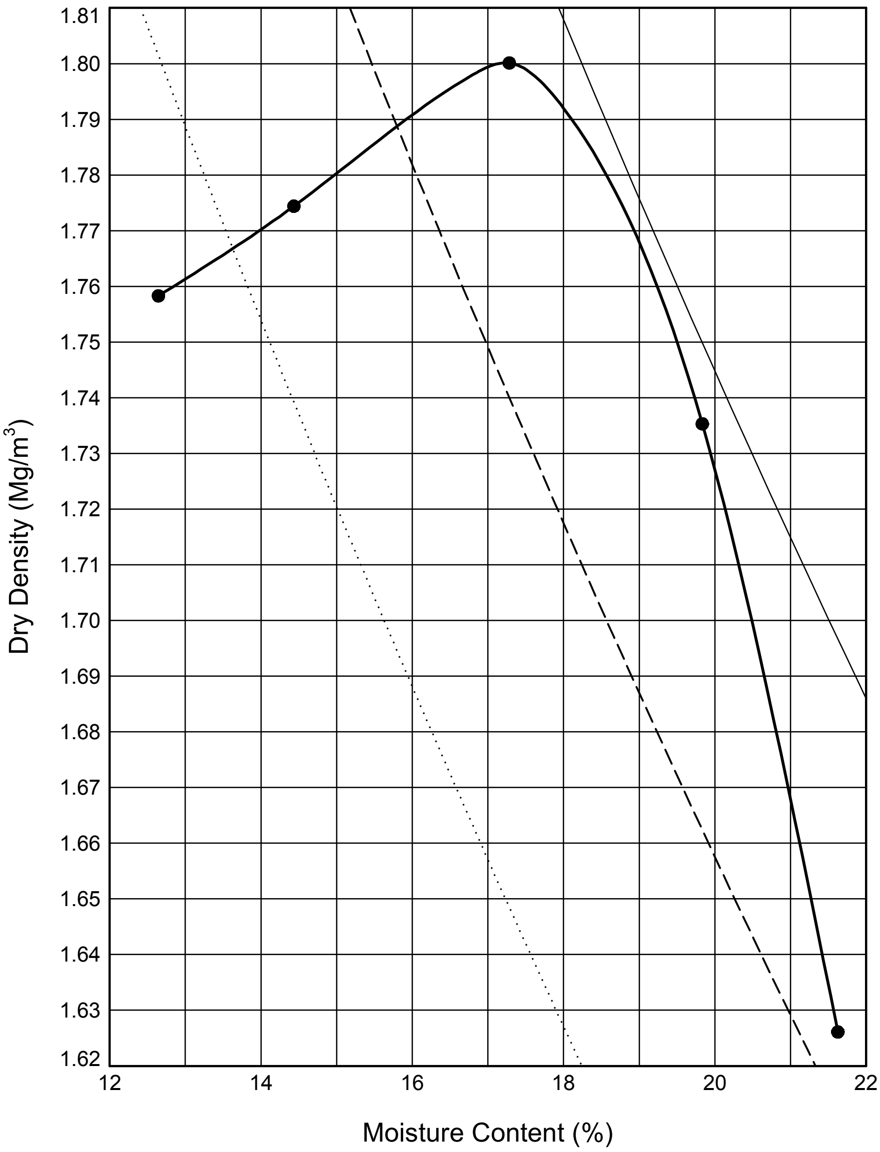
Contract	Contract Ref:
M1 Junction 15 Roade Bypass	**782814**

AGS

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP TEST

In accordance with clauses 3.3,3.4,3.5,3.6,3.7 of BS1377:Part 4:1990

Trial Pit: **TP14** Sample Ref: **1** Sample Type: **B** Depth (m): **0.50**



Initial Sample Conditions		Test Details		Test Results	
Initial Moisture Content (%)	: **13**	Compaction Type	: **Heavy**	Maximum Dry Density (Mg/m^3)	: **1.80**
% Retained on 37.5mm BS Sieve	: **0**	Mass of Rammer (kg):	**4.5**	Optimum Moisture Content (%)	: **17**
% Retained on 20.0mm BS Sieve	: **2**	Type of Mould	: **Proctor**	Method Used:	**Clause 3.5**
Particle Density - assumed (Mg/m^3)	: **2.68**			Remarks:	
Size of Soil Pieces	: **<20mm**	Separate samples were used.			

Sample Description	Key to Air Voids Lines		
Brown slightly sandy slightly gravelly CLAY	——— 0%	– – – – 5%	········· 10%

STRUCTURAL SOILS
The Potteries
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W. Yorkshire WF10 1NJ

Compiled By		Date
M. Athorne	**MARK ATHORNE**	**02/11/17**

Contract	Contract Ref:
M1 Junction 15 Roade Bypass	**782814**

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SUMMARY OF WATER CONTENT TESTS

RT08 Water Content of Rock (in accordance with ISRM 2007)

Exploratory Position ID	Sample Ref	Depth (m)	Sample Type	Water Content (%)	Lab	
BH02	**2**	**11.15**	**C**	**4.7**	**B**	

Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
	EMY HOWARD	01/11/17

Contract:	Contract Ref:
Roade Bypass 313583	**782814**

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_018 PrjVersion: v8_06 - Core+Geotech Lab-Castleford - 008 | GrfcTbl L - SUMMARY OF ROCK STANDALONE WC - A4P | 782814 - M1 JUNCTION 15 ROADE BYPASS.GPJ - v8_06.
Structural Soils Ltd, Head Office - Bristol: The Old School, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk. | 01/11/17 - 10:25 | AF3 |

DETERMINATION OF POINT LOAD STRENGTH

RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	9.00	D	50	90	0.260	90	0.03	1.30	0.04 (✓)	27	MUDSTONE	**B**
BH01	9.00	A	90	55	0.200	79	0.03	1.23	0.04 (✓)	27	MUDSTONE	**B**

Results

$I_s(50)$ Mean Axial tests = **0.04** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.04** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.07** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular,
[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date	Contract Ref:
[signature]	EMY HOWARD	01.11.17	782814
Contract: Roade Bypass 313583			

DETERMINATION OF POINT LOAD STRENGTH

RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	11.83	D	80	87	2.095	87	0.28	1.28	0.36 (✓)	9.5	LIMESTONE	**B**
BH01	11.83	A	87	88	1.345	99	0.14	1.36	0.19 (✓)	9.5	LIMESTONE	**B**

Results

I_s(50) Mean Axial tests = **0.19** MN/m^2
I_s(50) Mean Diametral tests = **0.36** MN/m^2
I_a(50) Strength Anisotropy Index = **1.9** (calculated from highest and lowest diametral and axial I_s(50) ratio)
Note: Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular,
[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date	Contract Ref:
[signature]	**EMY HOWARD**	**01.11.17**	**782814**
Contract: **Roade Bypass 313583**			

DETERMINATION OF POINT LOAD STRENGTH

RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	14.80	D	105	88	5.130	88	0.66	1.29	0.85 (✓)	4.7	LIMESTONE	**B**
BH01	14.80	A	88	50	10.710	75	1.91	1.20	2.29 (✓)	4.7	LIMESTONE	**B**

Results

I_s(50) Mean Axial tests = **2.29** MN/m^2
I_s(50) Mean Diametral tests = **0.85** MN/m^2
I_a(50) Strength Anisotropy Index = **2.68** (calculated from highest and lowest diametral and axial I_s(50) ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular,
[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date	Contract Ref:
[signature]	**EMY HOWARD**	**01.11.17**	**782814**
Contract:	**Roade Bypass 313583**		

AGS

DETERMINATION OF POINT LOAD STRENGTH

RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	16.70	D	65	88	1.315	88	0.17	1.29	0.22 (✓)	7.3	LIMESTONE	**B**
BH01	16.70	A	88	68	0.980	87	0.13	1.28	0.17 (✓)	7.3	LIMESTONE	**B**

Results

$I_s(50)$ Mean Axial tests = **0.17** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.22** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.33** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note: Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular,
[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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BS3 4AG

Compiled By		Date	Contract Ref:
[signature]	**EMY HOWARD**	**01.11.17**	**782814**
Contract: **Roade Bypass 313583**			

AGS

DETERMINATION OF POINT LOAD STRENGTH

RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH01	23.80	D	95	87	15.510	87	2.05	1.28	2.63 (✓)	1.7	LIMESTONE	**B**
BH01	23.80	A	87	84	24.815	96	2.67	1.34	3.58 (✓)	1.7	LIMESTONE	**B**

Results

$I_s(50)$ Mean Axial tests = **3.58** MN/m^2
$I_s(50)$ Mean Diametral tests = **2.63** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.36** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note: Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular,
[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
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RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	16.00	D	100	87	22.560	87	2.98	1.28	3.82 (✓)	2.0	LIMESTONE	**B**
BH02	16.00	A	87	105	25.935	108	2.23	1.41	3.15 (✓)	2.0	LIMESTONE	**B**

Results

$I_s(50)$ Mean Axial tests = **3.15** MN/m^2
$I_s(50)$ Mean Diametral tests = **3.82** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.21** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note: Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular,
[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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DETERMINATION OF POINT LOAD STRENGTH

RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	18.30	D	78	87	1.330	87	0.18	1.28	0.23 (✓)	6.6	LIMESTONE	**B**
BH02	18.30	A	87	74	1.990	91	0.24	1.31	0.32 (✓)	6.6	LIMESTONE	**B**

Results

I_s(50) Mean Axial tests = **0.32** MN/m^2
I_s(50) Mean Diametral tests = **0.23** MN/m^2
I_a(50) Strength Anisotropy Index = **1.41** (calculated from highest and lowest diametral and axial I_s(50) ratio)
Note:Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

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[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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	Contract: **Roade Bypass 313583**			

DETERMINATION OF POINT LOAD STRENGTH

RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	22.17	D	100	87	0.635	87	0.08	1.28	0.11 (✓)	13	LIMESTONE	**B**
BH02	22.17	A	87	44	0.705	70	0.14	1.16	0.17 (✓)	13	LIMESTONE	**B**

Results

$I_s(50)$ Mean Axial tests = **0.17** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.11** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.56** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note: Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular,
[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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DETERMINATION OF POINT LOAD STRENGTH

RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	25.05	D	85	87	1.470	87	0.19	1.28	0.25 (✓)	10	LIMESTONE	**B**
BH02	25.05	A	87	64	1.160	84	0.16	1.26	0.21 (✓)	10	LIMESTONE	**B**

Results

$I_s(50)$ Mean Axial tests = **0.21** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.25** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **1.2** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note: Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular,
[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG	Compiled By: EMY HOWARD	Date: 01.11.17	Contract Ref: **782814**
	Contract: **Roade Bypass 313583**		

DETERMINATION OF POINT LOAD STRENGTH

RT03 Point Load Testing (in accordance with ISRM 2007)

Exploratory Position ID	Depth (m)	Type of Test	Width or Length (W or L) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MN/m^2)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MN/m^2)	Water Content (%)	Rock Type	Lab location
BH02	29.10	D	95	88	1.075	88	0.14	1.29	0.18 (✓)	8.3	MUDSTONE	**B**
BH02	29.10	A	88	77	0.585	93	0.07	1.32	0.09 (✓)	8.3	MUDSTONE	**B**

Results

$I_s(50)$ Mean Axial tests = **0.09** MN/m^2
$I_s(50)$ Mean Diametral tests = **0.18** MN/m^2
$I_a(50)$ Strength Anisotropy Index = **2** (calculated from highest and lowest diametral and axial $I_s(50)$ ratio)
Note: Size Correction Factor (F) calculated using $F = (D_e/50)^{0.45}$ (where D_e is equivalent core diameter).

Key

Type of Test column:, A = Axial, D = Diametral, I = Irregular, B = Block, L = Parallel, P = Perpendicular,
[NS] denotes Non-standard Test.
Point Load Index column: (✓) = included in mean calculations, (χ) = excluded from mean calculations
Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

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UNCONFINED COMPRESSIVE STRENGTH

RT05 UCS of Rock-Sample Preparation (In-house method based on ASTM D4543-08 and Eurocode 7 Part 2 W.1.1)
RT06 UCS of Rock (In-house method based on ISRM 2007, ASTM D4543-08 and Eurocode 7 Part 2 W.1.1)

Borehole: **BH01** Sample Ref: **4** Sample Type: **C** Depth (m): **14.80**

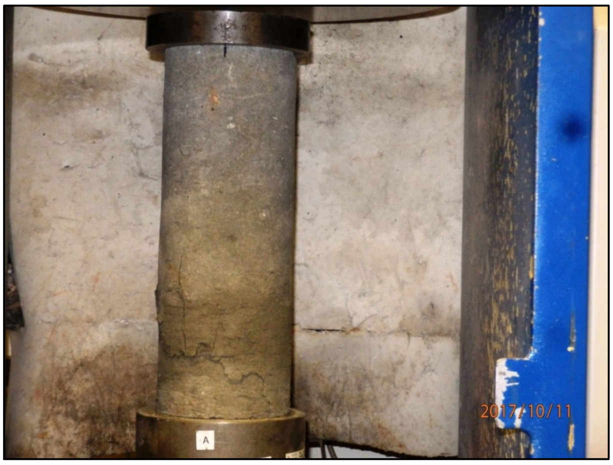
Bulk Density (Mg/m^3): **2.48** Dry Density (Mg/m^3): **2.37** Moisture Content (%): **4.7**
Length (mm): **234.73** Diameter (mm): **86.25** Length/Diameter Ratio: **2.72**
Test Duration (mins:secs): **3:42** Stress Rate (kN/min): **12** Load at Failure (kN): **35.0**
UCS (MPa): **6.0** Failure Type: **Axial cleavage**

Note: **Axis of loading parallel to core axis**
Description: **Grey LIMESTONE**
Specimen Preparation: **Specimen was not recored.**
Sample tolerance checks: Straightness: **FAIL**. Flatness: **PASS**. Perpendicularity: **PASS**.

Front view (pre-test)

Rear view (pre-test)

Front view (post-test)



Rear view (post-test)

Samples delivered from site to storage facility. Samples are stored in a frost free environment, at temperatures >4^{o}C
Compression machine: Impact CT340 2000kN Auto Compression Machine Serial No. CT340-22. SSL No. 011076

STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG	Compiled By		Date
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	Contract **Roade Bypass 313583**	Job No **782814**	

UNCONFINED COMPRESSIVE STRENGTH

RT05 UCS of Rock-Sample Preparation (In-house method based on ASTM D4543-08 and Eurocode 7 Part 2 W.1.1)
RT06 UCS of Rock (In-house method based on ISRM 2007, ASTM D4543-08 and Eurocode 7 Part 2 W.1.1)

Borehole: **BH02** Sample Ref: **3** Sample Type: **C** Depth (m): **12.27**

Bulk Density (Mg/m^3): **2.49** Dry Density (Mg/m^3): **2.37** Moisture Content (%): **5.0**
Length (mm): **222.08** Diameter (mm): **86.06** Length/Diameter Ratio: **2.58**
Test Duration (mins:secs): **6:58** Stress Rate (kN/min): **12** Load at Failure (kN): **160.6**
UCS (MPa): **27.6** Failure Type: **Axial cleavage**

Note: **Axis of loading parallel to core axis**
Description: **Grey LIMESTONE**
Specimen Preparation: **Specimen was not recored.**
Sample tolerance checks: Straightness: **FAIL**. Flatness: **PASS**. Perpendicularity: **PASS**.

Front view (pre-test)

Rear view (pre-test)

Front view (post-test)

Rear view (post-test)

Samples delivered from site to storage facility. Samples are stored in a frost free environment, at temperatures >4°C
Compression machine: Impact CT340 2000kN Auto Compression Machine Serial No. CT340-22. SSL No. 011076

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SUMMARY OF CHEMICAL ANALYSES

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Acid Soluble Sulphate (% SO_4)	Aqueous Extract Sulphate (mg/l SO_4)	pH	Total Sulphur (%)	Description
BH01	1	C	9.00	0.06	290	9.04	0.70	Dark brownish grey MUDSTONE
BH01	4	C	14.80	0.41	652	6.63	1.44	Grey LIMESTONE
BH02	3	C	12.27	0.19	239	7.44	0.13	Grey LIMESTONE
BH02	7	C	18.30	0.20	158	8.29	0.70	Grey LIMESTONE
BH03	1	C	14.02	0.42	530	7.85	1.39	Grey MUDSTONE
BH04	1	C	12.00	0.23	260	8.25	0.54	Grey MUDSTONE
BH05	1	C	12.30	0.03	119	8.35	0.40	Grey MUDSTONE

NOTES:- Chemical tests were undertaken by Envirolab

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APPENDIX Q
UPDATED GEOTECHNICAL RISK REGISTER

Preliminary Geotechnical Risk Register

It is understood that the site is being considered for a new bypass from the A508 (Northampton Road) north of the town of Roade, around its western extents, and rejoining the A508 (Stratford Road), south of Roade, as shown in Figure 1. At this stage, two possible routes are proposed, as indicated on Figure 2
Site levels along the proposed route of the new bypass are undulating, and a cut and fill exercise is likely to be undertaken in order to reduce the level changes along the proposed route.

Geotechnical Risk Register

The Geotechnical Risk Register has been compiled to show the degree of risk attached to various ground related aspects of the proposed development. The purpose of the register is to provide an assessment of the risk to the project posed by common ground related problems, and to identify suitable mitigation measures for the control of risk to an acceptable level. The risk register should be developed and refined as the geotechnical design and assessment progresses such that the register will allow the management of the geotechnical risks.

The inclusion of a risk in the register does not constitute confirmation that the problem actually exists at the site. A probability of 'very unlikely' is indicative of a condition which the available data suggests should not be present. The calculated risk is not the risk that the impact will occur it is the risk that the mitigation will be required to enable the project to progress. For the purposes of this risk register the magnitude of each impact and the resulting severity of risk is measured against that which would could 'normally' be expected for each element. Before incorporation into a project risk register the impacts and risks for each element should be moderated by an assessment of the cost and time implication of individual mitigation measures.

The Geotechnical Risk Register has been developed in general accordance with the guidance presented in ICE/DETR Document 'Managing Geotechnical Risk' (2001) and the HA documents HD41/03 and HD22/02. The degree of risk (R) is determined by combining an assessment of the probability (P) of the hazard occurring with an assessment of the Impact (I) the hazard and associated mitigation will cause if it occurs (R = P x I). The scale against which the probability and impact are measure and the resulting degree of risk determined is presented below.

Probability	(P)
Very Likely (VLk)	5
Likely (Lk)	4
Plausible (P)	3
Unlikely (U)	2
Very Unlikely (VU)	1

x

Impact	(I)
Very High (VH)	5
High (H)	4
Medium (M)	3
Low (Lw)	2
Very Low (VLw)	1

=

(R)	Risk
20 – 25	Severe (Sv)
15 – 19	Substantial (Sb)
10 – 14	Moderate (Md)
5 – 9	Minor (Mn)
1 – 4	None / Negligible (N)

	Site / Ground Conditions	Hazard	Potential Impact	Before Control			Comments and Proposed Mitigation	RR
				P	I	R		
Contaminated Land	Previous site use	Contaminated Ground	Health and safety, environmental damage, pollution requiring Remediation	U 2	H 2	N 4	The site appears to be primarily greenfield with the exception of a small areas around various roads, existing railways, and disused railway land, and only negligible amounts of Made Ground are likely in localised areas. Comparison of soil samples to relevant GAC indicate no exceedances are present and therefore it is considered low risk.	N
Underground Voids	Mine Shafts	Shaft Collapse	Surface deformation, structural damage. Health and Safety	VU 1	H 4	N 4	Site is not within mining area as defined on Coal Authority (CA) gazetteer and web site. No evidence of mine shafts observed on site.	N
	Shallow Mining	Workings Collapse crown holes, subsidence	Surface deformation, structural damage.	VU 1	H 4	N 4	Site is not within mining area as defined on Coal Authority (CA) gazetteer and web site. No evidence of shallow mining observed on site.	N
	Deep Mining	Workings Consolidation, subsidence	Surface deformation	VU 1	M 3	N 3	Site is not within mining area as defined on Coal Authority (CA) gazetteer and web site. No evidence of deep mining observed on site.	N
	Natural cavities; solution features, Caves and Gulls	Unstable natural ground	Surface deformation, structural damage. Health and Safety	VU 1	M 3	N 3	Geology unlikley to be conducive to the formation of solution features. No evidence of natural cavities or solution features observed on site.	N
	Other voids; basements, sumps, tanks, wells and adits etc.	Collapse, subsidence	Surface deformation, structural damage. Health and Safety	P 2	Lw 2	N 4	The vast majority of the site is undisturbed farm land. The walkover nor the ground investigation has not indicated any possible voids, man made or otherwise, at the site. **Vigilance required during construction works in order to ensure that any voids encountered are appropriately remediated and backfilled.**	N

	Condition	Hazard	Impact	P	I	R	Comment / Mitigation	RR
Slopes and Earthworks	Existing steep slopes on site	Slope failure	Site stability; surface deformation at crest, structural damage to services , highways and adjoining property.	Lk 4	VH 5	Sv 20	The existing railway line crossing the north of the site is located in a steep deep cutting, which is, in parts, a protected site (the Roade Cutting), and will require bridging as part of the development. Ground Investigation has confirmed the ground model and strata properties, however no slope stability assessment has been undertaken at this preliminary stage as it is assumed that piled foundation solutions will be utilised to transfer the laods of teh proposed bridge down to the solid deposits well below the cutting, thereby avoiding adding destabilising laods to the cutting.	Md
	Gradient on site	Earthworks or retaining walls required to accommodate layout	Increased cost of development	VLk 5	H 3	Sb 15	Cut to fill earthworks will be required to develop the site to form suitable highway vertical alignments. Therefore slopes may be created as part of the finished design. Drainage will be important in the design of these slopes. No final earthworks plan has been made available to RSK for full earthworks design, howver it is anticipated that natural deposist woudl be usable as a cut and fill excercise and would be possible tpo form suitable safe low embankments and cutting slopes.	Md
	As-dug cut material unsuitable as fill	Unstable earthworks	Surface deformation, structural damage	P 3	H 4	Md 12	It is anticipated that the majority of materials within the cut areas will be suitable for reuse, however these materials are expected to be sensitive to moisture content change and could be wet of optimum allowable ranges to allow structural reuse. Therefore soils may need modification or stabilisation in structural fill areas and will need careful handling throughout the works. Further investigation of the geotechnical properties of material is required for full earthworks design at detailed design stage.	Md
	Embankment Stability	Slope failure	Site stability; surface deformation at crest, structural damage to services , highways and adjoining property.	P 3	VH 5	Sb 15	Embankments will need to be carefully designed and will need to accommodate suitable side slope angles, drainage systems and foundations. No earthworks plan has been supplied to RSK and therefore, no assessment to embankment stability can be made. Further investigation of the geotechnical properties of material is required for full earthworks design at detailed design stage.	Md
	Cutting Stability	Slope failure	Site stability; surface deformation at crest, structural damage to services , highways and adjoining property.	P 3	VH 5	Sb 15	Slopes will need to be carefully designed and will need to accommodate suitable drainage systems. No earthworks plan has been supplied to RSK and therefore, no assessment to cutting stability can be made. Further investigation of the geotechnical properties of material is required for full earthworks design at detailed design stage.	Md
	Insufficient suitable fill	Import required to achieve design levels	Increased cost of development	P	H	Md	A careful cut to fill balance should be achieved to avoid the unnecessary importation of fill materials. No earthworks plan has been supplied to RSK and therefore unable to complete a material balance assessment. Available information suggests that all	Md

	Condition	Hazard	Impact	P	I	R	Comment / Mitigation	RR
				3	4	12	natural materials identified to be present should be suitable for reuse. Further investigation of the geotechnical properties of material is required for full earthworks design at detailed design stage.	
	Condition	Hazard	Impact	P	I	R	Comment / Mitigation	RR
Foundations & Substructures	Loose or soft, compressible soils at shallow depth	Ground unsuitable for conventional shallow footings	Excess settlement or alternative foundations	P 3	H 4	Md 12	Ground investigation has revealed that the site is predominately underlain by Glacial Till, which is known to be an overconsolidated clay. **These materials are unlikly to be suseptible to significant selttlment although care will need to be taken on the design of the railway overbridge approaches where limited historic fill (derived from natural soils) is thought to have been identified and it is possible that this may need to be removed and re-engineered into place.**	Md
	Adjacent Structures	Works on site affecting stability of adjacent structures	Alternative design or altered development layout.	P 3	H 4	Md 12	No buildings immediately adjacent to the site. However the design of cuttings and embankments will need to be suitably robust and take account of the proximity of the railway cutting, Blisworth Road and the A508 respectively. Further detailed investigation of the area near the Roade railway cutting will be required at detailed design stage, howver initial information suggests piled or deep tradditional foundation options might be feaible with good solid strata present beneath the brdige abutments.	Md
	Differential Settlement	Settlements / heave beneath proposed road as a result of cut to fill works.	Damage to floors and structures.	P 3	H 4	Md 12	Careful design has to be undertaken to smooth the transition from cut insitu materials to engineered fill materials.	Mn
	Aggressive Ground Chemistry	Attack of buried concrete	Protection required	Lk 4	M 3	Md 12	Available information suggests that gypsum a naturally occurring sulphate could be present within several strata at depth beneath the site and this will require more resistant concrete mix designs to be used to protect in ground concrete from attack. Ground Investigation has indicated elevated levels of sulphate within groundwater. The Blisworth Limestone Formation is a member of the Blue Lias Group which are known to bear pyritic strata. Special concrete mix designs will be required for ingroudn concrete.	Mn

	Condition	Hazard	Impact	P	I	R	Comment / Mitigation	RR
Floor slabs and Road Pavements	Soft and compressible near surface soil	Ground unsuitable for conventional highway foundations	Alternative highway bridge foundation designs	VU 1	M 3	N 3	Geology is not anticipated to be particularly susceptible to significant risks of settlement and is not anticipated to be particularly soft, loose or of poor bearing capacity. Traditional highway foundation and design construction is anticipated. Design will need to take account of specification for earthworks which may need to include soil stabilisation improvement. Any stabilisation needs to take account of the risk of heave from the presence of naturally occurring high sulphate concentrations in the soils. Ground Investigations have confirmed the ground mdoel and strata classifications. The strata present will all be suitable for reuse in cut and fill earthworks provided they are handled correctly. Further more, detailed earthworks investigations may be necessary at detailed design stage to inform earthworks specification.	Mn
	Soft and compressible near surface soil	Low CBR due to soft formation	Surface damage possible exceeding serviceability tolerances requiring increased highway foundation thickness or alternative ground improvement or reinforcement.	U 2	M 3	Mn 6		Mn
	Frost susceptible soils	Frost Heave	Surface damage or alternative design	P 3	M 3	Mn 9	Road pavement construction thickness design should incorporate this risk.	Mn
Drainage & Flooding	High permeability Strata	Ineffective storm water attenuation ponds/water & ecology features	Ponds need lining if required to retain water.	U 2	M 3	Mn 6	Shallow soils across the majority of the site are anticipated to be cohesive and are likely to retain water. Locally, granular soils were only observed within the central part of the propsed route, near eexploratory positions WS03, BH04. Designs need to take account of the prevailing ground conditions at the proposed locations and depths.	Mn
	Low Permeability Strata	Ineffective soakaways	Alternative drainage required	VLk 5	M 3	Sb 15	Shallow soils are anticipated to be cohesive and are likely to retain water. Locally, granular soils were only observed within the central part of the propsed route, near eexploratory positions WS03, BH04. Designs need to take account of the prevailing ground conditions at the proposed locations and depths. Soakawy tests failed confirming shallow strata at pond locations are unlikely to be suitable for soakage.	Md
	High groundwater	Effects plateau and cutting levels & foundation designs, in particular cutting depths.	Alternative vertical alignment/plateau levels required affecting cut fill balance feasibility	P 3	H 4	Md 12	The site is generally underlain by low permeability, unproductive strata (Oadby Member), and pockets of perched water were encountered within shallow soils. A deep groundwater table is present within the Blisworth Limestone Formation/ Rutland Formation but this does not appear to affect the proposed scheme.	N
	Embankment earthworks and cutting slopes will require drainage.	Insufficient attenuation soakaways/ponds to accommodate earthworks drainage	Flooding	Lk 4	M 3	Md 12	Drainage designs to accommodate expected drainage from earthworks slopes and cutting drains in addition to highways surface water run off.	Mn
	Local watercourse	Flooding	Flood protection required	P 3	H 4	Md 12	The site is located within localised areas potentially at risk of surface and groundwater flooding relating to streams and groundwater. Specialist flood risk assessment and drainage designs are being undertaken by others to mitigate these potential risks.	Mn

	Condition	Hazard	Impact	P	I	R	Comment / Mitigation	RR
Temporary Works & Construction Issues	Loose or unstable strata at shallow depth	Excavation Instability	Collapse or support required. Health and safety	P 3	H 4	Md 12	The majority of strata present across the site are anticipated to be generally stable in the short term during excavation as seen within the trial pit excavation as all remained stable.	Mn
	Hard Strata / obstructions at shallow depth	Hard Digging	Increase cost and delay	P 3	M 3	Mn 9	Hard strata in the form of limestone and mudstone bedrock may be present at depth within the solid geology and could be encountered as part of the major earthworks depending upon the proposed vertical alignment. Shallower limestone beds were encountered within trial pits towards the northern part of the proposed route however it is anticipated that the highway alignment will closely follow the exisiting groundlevels for the most part and therefore the risk of encountering hard strata is anticipated to be low.	Mn
	Presence of unrecorded sensitive underground services.	Damage during works posing risk to H&S of personnel and public	Increased cost of delay and for unplanned diversions and protection or repair.	U 2	H 4	Mn 8	Vigilance throughout works. Ensure up to date service drawings are obtained and site is scanned before works commence. Ensure all utilities diverted.	Mn
	Shallow Groundwater	Inundation of Excavations	Increase cost and delay. Health and safety	P 3	M 3	Mn 9	Shallow perched groundwater tables may be possible within the shallow Glacial till in granular pockets and any Glaciofluvial Deposits and could be intersected by earthworks cuttings and foundations. Ground Investigation has proven localised perched water within glacial till but these are not thought to be a continuous water table.	Mn
	Contaminated Ground	Precautions for Ground workers	Increase cost and delay. Health and safety	U 2	M 3	Mn 6	Vigilance throughout works. Seek advice of Environmental Engineer if any identified unusual odorous or visually contaminated materials encountered. No contaminated land has been encountered during the site investigation. Should potentially contaminated ground be encnountered during the groundworks, seek advice from environmental engineer.	Mn
	Contaminated Ground	Increased Disposal Costs	Increase cost and delay. Health and safety	U 2	M 3	Mn 6		

Note: The register only considers geotechnical risk other risks may be present on site, including in-ground risks such as; ecology, archaeology, buried services, UXO etc., which are outside the scope of this assessment.

APPENDIX R
UPDATED CONTAMINATED LAND REGISTER

Contaminated Land Risk Assessment

In accordance with Environment Agency publication CLR 11 '*Model Procedures for the Management of Land Contamination*', a preliminary contaminated land risk assessment has been developed for the Site.

The risk assessment has been carried out using the risk model defined and outlined in the following table.

Potential sources have been identified from the desk study information and the guidance provided in EA publication CLR 8 '*Potential Contaminants for the Assessment of Land*'.

Hazard linkages will be determined by the proposed investigation and the risk re-assessed on the basis of the viability of the linkage.

If the hazard linkage is confirmed then remediation or management solutions will be proposed to ensure that no unacceptable risk remains following development.

	Category	Definition
Potential Severity	***Severe***	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters
	Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures
	Mild	Pollution of non sensitive waters, minor damage to buildings or structures
	Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non sensitive ecosystems or species
Probability of Risk	***High Likelihood***	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
	Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
	Low Likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
	Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

		Potential severity			
		Severe	***Medium***	***Mild***	***Minor***
Probability of Risk	***High Likelihood***	Very High	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Negligible
	Unlikely	Moderate/Low	Low	Negligible	Negligible

Contaminated Land Risk Assessment (Conceptual Site Model)

Source (type and location)	Pathway	Receptor	Initial Assessment from Desk Study Information			Proposed Investigation /Comments	Hazard Linkage	Revised Risk	Proposed Remediation / Management	Residual Risk
			Severity	Prob.	Risk					
Petroleum hydrocarbon compounds (petrol, diesel & oil) and associated volatile organic compounds within shallow soil / groundwater **(associated with minor spills and releases within agricultural fields and on and adjacent to active and former railway land**	Inhalation of vapour	Site workers	Medium	Unlikely	**Low**	Only potential source identified relates to the railway land, including the active line in the centre of the site, and the disused land at its southern extent, There is a potential for isolated areas of spills and leaks from agricultural machinery in other areas of the site however this is very unlikely and would be anticipated to be very localised and very minor. Watching brief and testing to be undertaken during site strip and enabling works. **Ground Investigation was undertaken** in areas not previously investigated to inform detailed design and to confirm these assumptions. No materials thought to be contaminated by visual or olfactory means were identified. A screening spread of samples from the shallow and near surface soils were tested to confirm chemical status of the extended area site and no significant contamination was identified. Groundwater monitoring wells were installed and where feasible groundwater samples were taken and tested to confirm existing groundwater quality in areas not previously investigated and no significant contamination was identified.	Absent	Negligible	Vigilance to be maintained throughout the earthworks and enabling works. Should any suspicious, unexpected strata, materials or Made Ground materials be identified visually or by means of strange odours the advice of a specialist Geo-environmental Engineer should be sought. The Geo-Environmental advisor shall provide advice on immediate actions and undertake investigation, testing and liaison with regulators and contractors on how to proceed safely.	Negligible
		End users	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Ingestion and absorption via direct contact	Site workers	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
		End users	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Migration by surface run-off	Surface water drainage	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Migration by liquid flow	Surface water drainage	Medium	Unlikely	**Low**		Absent	Negligible		
		Aquifer	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Plant uptake	Local flora	Mild	Unlikely	**Negligible**		Absent	Negligible		Negligible
Toxic & phytotoxic heavy metals and semi metals within shallow soil / groundwater associated with natural soils and fertilisers and soil improvers (possible use of sewerage sludge's)	Inhalation of fugitive dust	Site workers	Medium	Unlikely	**Low**	Only potential source of heavy metals identified relates to the railway land, including the active line in the centre of the site, and the disused land at its southern extent, no other sources of heavy metals identified across the site although past use of soil improvers and/or sewerage sludge's to fertilise the land could have resulted in some metals. Natural soil concentrations may also be present. Slightly elevated arsenic maybe encountered within natural soils but is anticipated to be below acceptable commercial end use values. Watching brief and testing to be undertaken during site strip and enabling works. **Ground Investigation was undertaken** in areas not previously investigated to inform detailed design and to confirm these assumptions. No Made Ground was identified, or materials thought to be contaminated by visual or olfactory means. A screening spread of samples from the shallow and near surface soils were tested to confirm chemical status of the extended area site and no significant contamination was identified. Groundwater monitoring wells were installed and where feasible groundwater samples were taken and tested to confirm existing groundwater quality in areas not previously investigated and no significant contamination was identified.	Absent	Negligible	Vigilance to be maintained throughout the earthworks and enabling works. Should any suspicious, unexpected strata, materials or Made Ground materials be identified visually or by means of strange odours the advice of a specialist Geo-environmental Engineer should be sought. The Geo-Environmental advisor shall provide advice on immediate actions and undertake investigation, testing and liaison with regulators and contractors on how to proceed safely.	Negligible
		End users	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Ingestion and absorption via direct contact	Site workers	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
		End users	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Migration by surface run-off	Surface water drainage	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Migration in solution via groundwater	Surface water drainage	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
		Aquifer	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Plant uptake	Local flora	Mild	Unlikely	**Negligible**		Absent	Negligible		Negligible
Fly Tipped Material	Ingestion and absorption via direct contact	Site workers	Medium	Unlikely	**Low**	Site walkover suggests there is no evidence of fly tipped material at the site during desk based study and intrusive investigation works.	Absent	Negligible		Negligible
		End users	Medium	Unlikely	**Low**					

Source (type and location)	Pathway	Receptor	Initial Assessment from Desk Study Information			Proposed Investigation	Hazard Linkage	Revised Risk	Proposed Remediation / Management	Residual Risk
			Severity	Prob.	Risk					
Asbestos within Soil	Inhalation of fugitive dust	Site workers	Medium	Low Likelihood	**Moderate to Low**	No buildings along the present route that would need removal and no evidence of asbestos past or present. **Ground Investigation was undertaken** in areas not previously investigated to inform detailed design and to confirm these assumptions. No Made Ground was identified, or materials thought to be contaminated by visual or olfactory means. A screening spread of samples from the shallow and near surface soils were tested to confirm chemical status of the extended area site and no asbestos contamination was identified.	Absent	Negligible	Vigilance to be maintained throughout the earthworks and enabling works. Should any suspicious, unexpected strata, materials or Made Ground materials be identified visually or by means of strange odours the advice of a specialist Geo-environmental Engineer should be sought. The Geo-Environmental advisor shall provide advice on immediate actions and undertake investigation, testing and liaison with regulators and contractors on how to proceed safely	Negligible
		End users	Medium	Low Likelihood	**Moderate to Low**		Absent	Negligible		Negligible
Ground Gas from Made Ground and natural strata	Migration in to excavations	Site workers	Severe	Unlikely	**Moderate to Low**	Site appears to be greenfield with no naturally occurring organic soils likely to be a potential source of soil gas. **Ground Investigation was undertaken** in areas not previously investigated to inform detailed design and to confirm these assumptions. No Made Ground was identified, or materials thought to be likely to generate soil gas. No significant contamination was identified. Monitoring of instrumentation installed in boreholes has confirmed there is no significant soil gas present that would be considered a risk to the proposed scheme or end users. It should be noted that cohesive soils present across the site would prevent/ limit potential pathways from any perceived off site sources migrating on to the site.	Absent	Negligible	Construction workers should still ensure that any works that need to be undertaken below ground level or within excavation are treated as confined space works and all normal confined space H&S protocols are adopted including but not limited to atmosphere testing and suitable excavation support.	Negligible
	Migration in to development, service ducting etc.	End Users	Severe	Unlikely	**Moderate to Low**		Absent	Negligible		Negligible
Aggressive substances (sulphates, acids, phenols, petroleum) in Shallow soils / groundwater	Direct contact with construction materials	Buried Structures	Medium	Low Likelihood	**Moderate to Low**	Available data suggests the potential presence of naturally occurring high sulphates levels might be present at depth within the strata present. **This has been confirmed by ground investigation sample testing.**	Absent	Negligible	Design of in ground concrete will take account of the anticipated ground conditions and available test results to ensure a suitably robust concrete mix design is utilised in accordance with BRE SD1:2005.	Negligible
		Buried Services	Medium	Low Likelihood	**Moderate to Low**		Absent	Negligible		Negligible
Herbicides and Pesticides within shallow soil **(associated with the arable fields)**	Inhalation of vapour	Site workers	Medium	Unlikely	**Low**	Site is a modern arable farm. Modern arable farming should only utilise non persistent biodegradable safe pesticides and herbicides for crop production which are licensed and controlled. However, the use of environmentally persistent pesticides and herbicides may have historically been used in arable farming and as such the presence of widespread soil contamination by older uncontrolled and unlicensed persistent and dangerous herbicides and pesticides is considered possible though is unlikely. **Ground Investigation was undertaken** in areas not previously investigated to inform detailed design and to confirm these assumptions. No Made Ground was identified, or materials thought to be contaminated by visual or olfactory means. A screening spread of samples from the shallow and near surface soils were tested to confirm chemical status of the extended area site and no significant pesticides or herbicide contamination was identified.	Absent	Negligible	Vigilance to be maintained throughout the earthworks and enabling works. Should any suspicious, unexpected strata, materials or Made Ground materials be identified visually or by means of strange odours the advice of a specialist Geo-environmental Engineer should be sought. The Geo-Environmental advisor shall provide advice on immediate actions and undertake investigation, testing and liaison with regulators and contractors on how to proceed safely.	Negligible
		End users	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Ingestion and absorption via direct contact	Site workers	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
		End users	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Migration by surface run-off	Surface water drainage	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Migration by liquid flow	Surface water drainage	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
		Aquifer	Medium	Unlikely	**Low**		Absent	Negligible		Negligible
	Plant uptake	Local flora	Medium	Unlikely	**Low**		Absent	Negligible		Negligible

						Groundwater monitoring wells were installed and where feasible groundwater samples were taken and tested to confirm existing groundwater quality in areas not previously investigated and no significant contamination was identified.				
Ground Gas migration from landfill south-east of the site.	Migration in to excavations	Site workers	Severe	Unlikely	**Moderate to Low**	Currently active and historic refuse facilities and landfill located south-east of the site, beyond the A508. Site appears to be Greenfield with no naturally occurring organic soils likely to be a potential source of soil gas. **Ground Investigation was undertaken** in areas not previously investigated to inform detailed design and to confirm these assumptions. No Made Ground was identified, or materials thought to be likely to generate soil gas. No significant contamination was identified. Monitoring of instrumentation installed in boreholes has confirmed there is no significant soil gas present that would be considered a risk to the proposed scheme or end users. It should be noted that cohesive soils present across the site would prevent/ limit potential pathways from any perceived off site sources migrating on to the site.	Absent	Negligible	Vigilance to be maintained throughout the earthworks and enabling works. Should any suspicious, unexpected strata, materials or Made Ground materials be identified visually or by means of strange odours the advice of a specialist Geo-environmental Engineer should be sought. The Geo-Environmental advisor shall provide advice on immediate actions and undertake investigation, testing and liaison with regulators and contractors on how to proceed safely.	Negligible
	Migration in to development	End Users	Severe	Unlikely	**Moderate to Low**		Absent	Negligible		Negligible

APPENDIX S
HASWASTE

Haswaste, developed by Dr. Iain Haslock.

Roade Bypass 313583

TP/WS/BH			TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15	TP15
Depth (m)			0.20	0.20	0.30	0.50	0.20	0.20	0.20	0.20	1.50
Envirolab reference											
% Moisture		%									
pH (soil)			7.66	7.15	8.10	8.20	6.86	7.90	7.67	7.40	8.47
pH (leachate)											
Arsenic		mg/kg	4	10	2	<1	4	11	7	8	<1
Cadmium	updated v5.4ei	mg/kg	0.9	1.1	1.0	1.0	0.7	1.1	1.0	1.3	<0.5
Copper		mg/kg	33	16	24	15	12	15	14	15	5
CrVI or Chromium		mg/kg	36	26	39	37	34	26	26	35	11
Lead		mg/kg	30	24	20	16	21	96	21	22	4
Mercury		mg/kg	0.17	0.17	0.30	0.17	0.17	0.17	0.17	0.17	0.17
Nickel		mg/kg	26	24	31	30	21	27	26	29	11
Selenium		mg/kg	1	1	1	1	1	1	1	1	1
Zinc	updated v5.4ei	mg/kg	82	68	69	53	63	73	71	87	16
Barium		mg/kg									
Beryllium		mg/kg									
Vanadium		mg/kg									
Cobalt	updated v5.4ei	mg/kg									
Manganese	updated v5.4ei	mg/kg									
Molybdenum		mg/kg									
Antimony		mg/kg									
Aluminium		mg/kg									
Bismuth		mg/kg									
CrIII		mg/kg									
Iron	updated v5.4ei	mg/kg									
Strontium		mg/kg									
Tellurium		mg/kg									
Thallium		mg/kg									
Titanium		mg/kg									
Tungsten		mg/kg									
Ammoniacal N		mg/kg									
ws Boron		mg/kg									
PAH (Input Total PAH **OR** individual PAH results)											
Acenaphthene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Acenaphthylene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Anthracene		mg/kg	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Benzo(a)anthracene		mg/kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Benzo(a)pyrene		mg/kg	0.06	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Benzo(b)fluoranthene		mg/kg	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Benzo(ghi)perylene		mg/kg	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Benzo(k)fluoranthene		mg/kg	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Chrysene		mg/kg	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Dibenzo(ah)anthracene		mg/kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Fluoranthene		mg/kg	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Fluorene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Indeno(123cd)pyrene		mg/kg	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Naphthalene		mg/kg	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Phenanthrene		mg/kg	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Pyrene		mg/kg	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Coronene		mg/kg									
Total PAHs (16 or 17)		mg/kg									
TPH											
Petrol		mg/kg									
Diesel		mg/kg									
Lube Oil		mg/kg									
Crude Oil		mg/kg									
White Spirit / Kerosene		mg/kg									
Creosote		mg/kg									
Unknown TPH with ID		mg/kg									
Unknown TPHCWG		mg/kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Sulphide		mg/kg									
Complex Cyanide		mg/kg									
Free (or Total) Cyanide		mg/kg									
Thiocyanate		mg/kg									
Elemental/Free Sulphur		mg/kg									
Phenols Input Total Phenols HPLC **OR** individual Phenol results.											
Phenol		mg/kg									
Cresols		mg/kg									
Xylenols		mg/kg									
Resourcinol		mg/kg									
Phenols Total by HPLC		mg/kg									
BTEX Input Total BTEX **OR** individual BTEX results.											
Benzene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Toluene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ethylbenzene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Xylenes		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total BTEX		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
PCBs (POPs)											
PCBs Total (eg EC7/WHO12)		mg/kg									
PBBs (POPs)											
Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)		mg/kg									

Haswaste, developed by Dr. Iain Haslock.

Roade Bypass 313583

TP/WS/BH			TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15	TP15
Depth (m)			0.20	0.20	0.30	0.50	0.20	0.20	0.20	0.20	1.50
Envirolab reference											
POPs Dioxins and Furans Input Total Dioxins and Furans **OR** individual Dioxin and Furan results.											
2,3,7,8-TeCDD		mg/kg									
1,2,3,7,8-PeCDD		mg/kg									
1,2,3,4,7,8-HxCDD		mg/kg									
1,2,3,6,7,8-HxCDD		mg/kg									
1,2,3,7,8,9-HxCDD		mg/kg									
1,2,3,4,6,7,8-HpCDD		mg/kg									
OCDD		mg/kg									
2,3,7,8-TeCDF		mg/kg									
1,2,3,7,8-PeCDF		mg/kg									
2,3,4,7,8-PeCDF		mg/kg									
1,2,3,4,7,8-HxCDF		mg/kg									
1,2,3,6,7,8-HxCDF		mg/kg									
2,3,4,6,7,8-HxCDF		mg/kg									
1,2,3,7,8,9-HxCDF		mg/kg									
1,2,3,4,6,7,8-HpCDF		mg/kg									
1,2,3,4,7,8,9-HpCDF		mg/kg									
OCDF		mg/kg									
Total Dioxins and Furans		mg/kg									
Some Pesticides (POPs unless otherwise stated)											
Aldrin		mg/kg		0.050000				0.050000			
α Hexachlorocyclohexane (alpha-HCH) *(leave empty if total HCH results used)*		mg/kg		0.050000				0.050000			
β Hexachlorocyclohexane (beta-HCH) *(leave empty if total HCH results used)*		mg/kg		0.050000				0.050000			
α Cis-Chlordane (alpha) ***OR*** *Total Chlordane*		mg/kg									
δ Hexachlorocyclohexane (delta-HCH) *(leave empty if total HCH results used)*		mg/kg									
Dieldrin	updated v5.4ei	mg/kg		0.050000				0.050000			
Endrin		mg/kg		0.050000				0.050000			
χ Hexachlorocyclohexane (gamma-HCH) (lindane) ***OR*** *Total HCH*	updated v5.4ei	mg/kg		0.050000				0.050000			
Heptachlor		mg/kg		0.050000				0.050000			
Hexachlorobenzene		mg/kg									
o,p'-DDT *(leave empty if total DDT results used)*		mg/kg									
p,p'-DDT ***OR*** *Total DDT*	updated v5.4ei	mg/kg									
χ Trans-Chlordane (gamma) *(leave empty if total Chlordane results used)*		mg/kg									
Chlordecone (kepone)		mg/kg									
Pentachlorobenzene		mg/kg									
Mirex		mg/kg									
Toxaphene (camphechlor)		mg/kg									
Tin											
Tin *(leave empty if Organotin and Tin excl Organotin results used)*		mg/kg									
Organotin											
Dibutyltin; DiBT		mg/kg									
Tributyltin; TriBT		mg/kg									
Triphenyltin; TriPT		mg/kg									
Tetrabutyltin; TeBT		mg/kg									
Tin excluding Organotin											
Tin excl Organotin		mg/kg									

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Roade Bypass 313583

TP/WS/BH			TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15	TP15
Depth (m)			0.20	0.20	0.30	0.50	0.20	0.20	0.20	0.20	1.50
Envirolab reference											

Asbestos in Soil	Thresholds										
Asbestos detected in Soil (enter Y or N)	Y		NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)	see "Carc HP7 % Asbestos in Soil (Fibres)" below	%									
Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces)	≥0.1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)	Y		NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD

Asbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7

If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1%", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You cannot use Asbestos % results when visual identifiable pieces are present.

If visual identifiable pieces of asbestos are present, you cannot use Asbestos % results and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06 05. Therefore, if Asbestos in Soil above is "Y", the Asbestos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste.

Identifiable Pieces are Cement, Fragments, Board, Rope etc. ie anything ACM that is not Loose Fibres.

All visual asbestos pieces need to be removed leaving only fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste.

Hazardous Property	Thresholds	Cut Off Value	TP01	TP02	TP03	TP04	TP05	TP12	TP14	TP15	TP15
Corrosive HP8	≥5%	<1%	0.00744	0.00631	0.00775	#VALUE!	0.00706	0.00644	0.00592	0.00778	#VALUE!
Irritant HP4	≥10%	<1%	0.00426	0.00313	0.00298	#VALUE!	0.00188	0.00315	0.00251	0.00275	#VALUE!
Irritant HP4	≥20%	<1%	0.00900	0.00667	0.00899	0.00777	0.00562	0.00717	0.00685	0.00757	0.00281
Specifc Target Organ Toxicity HP5	≥1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specifc Target Organ Toxicity HP5	≥20%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specifc Target Organ Toxicity HP5	≥1%		0.00691	0.00499	0.00749	0.00710	0.00653	0.00545	0.00525	0.00672	0.00222
Specifc Target Organ Toxicity HP5	≥10%		0.00300	0.00240	0.00200	0.00160	0.00210	0.00960	0.00210	0.00220	0.00040
Aspiration Toxicity HP5	≥10%		0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
Acute Toxicity HP6	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.25%	<0.1%	0.00055	0.00135	0.00029	#VALUE!	0.00055	0.00148	0.00094	0.00107	#VALUE!
Acute Toxicity HP6	≥5%	<0.1%	0.00705	0.00516	0.00763	0.00725	0.00667	0.00516	0.00513	0.00686	0.00225
Acute Toxicity HP6	≥25%	<1%	0.01209	0.00918	0.01109	0.00947	0.00778	0.01687	0.00905	0.00990	#VALUE!
Acute Toxicity HP6	≥0.25%	<0.1%	0.00002	0.00002	0.00003	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
Acute Toxicity HP6	≥2.5%	<0.1%	0.00691	0.00500	0.00749	0.00710	0.00653	0.00500	0.00499	0.00672	0.00211
Acute Toxicity HP6	≥15%	<0.1%	0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥55%	<1%	0.00009	0.00013	0.00010	0.00010	0.00007	0.00013	0.00010	0.00013	#VALUE!
Acute Toxicity HP6	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.5%	<0.1%	0.00702	0.00512	0.00762	0.00722	0.00662	0.00512	0.00511	0.00687	#VALUE!
Acute Toxicity HP6	≥3.5%	<0.1%	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014
Acute Toxicity HP6	≥22.5%	<1%	0.01198	0.00906	0.01098	0.00936	0.00770	0.01676	0.00894	0.00976	0.00319
Carcinogenic HP7	≥0.1%		0.00691	0.00499	0.00749	#VALUE!	0.00653	0.00960	0.00525	0.00672	#VALUE!
Carcinogenic HP7	≥0.1%		0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
Carcinogenic HP7	≥1%		0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only)	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		7.66	7.15	8.10	8.20	6.86	7.90	7.67	7.40	8.47
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		7.66	7.15	8.10	8.20	6.86	7.90	7.67	7.40	8.47
Toxic for Reproduction HP10	≥0.3%		0.00525	0.00485	0.00626	0.00606	0.00424	0.00960	0.00525	0.00586	0.00222
Toxic for Reproduction HP10	≥3%		0.00691	0.00499	0.00749	0.00710	0.00653	0.00499	0.00499	0.00672	0.00211
Mutagenic HP11	≥0.1%		0.00691	0.00499	0.00749	0.00710	0.00653	0.00499	0.00499	0.00672	0.00211
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only)	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Mutagenic HP11	≥1%		0.00525	0.00485	0.00626	0.00606	0.00424	0.00545	0.00525	0.00586	0.00222
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HP13 Sensitising	≥10%		0.00691	0.00499	0.00749	0.00710	0.00653	0.00545	0.00525	0.00672	0.00222
Ecotoxic HP14	≥1.0	<0.1% (except CompCN + Thiocyanate + Xylene + BTEX 1%).	0.11992	0.09692	0.11072	#VALUE!	0.09166	0.13072	0.09616	0.11500	#VALUE!
Ecotoxic HP14	≥25%	<0.1%	0.02998	0.02423	0.02768	#VALUE!	0.02292	0.03268	0.02404	0.02875	#VALUE!
Ecotoxic HP14	≥25%	<0.1% (except CompCN + Thiocyanate + Xylene + BTEX 1%).	0.02999	0.02424	0.02769	#VALUE!	0.02293	0.03269	0.02405	0.02876	#VALUE!
Ecotoxic HP14 individual substance specific thresholds (Benzo(a)anthracene, Dibenz(ah)anthracene (or Total PAH if only used), Sn, TriPT)	≥0.0025%		0.000004	0.000004	0.000004	0.000004	0.000004	0.000004	0.000004	0.000004	0.000004
Ecotoxic HP14 individual substance specific thresholds (Co, γ-HCH, DiBT, TriBT)	≥0.025%		0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000
Persistent Organic Pollutant (PCB, PBB or POP Pesticides)	>0.005%		0.00000000	0.00000500	0.00000000	0.00000000	0.00000000	0.00000500	0.00000000	0.00000000	0.00000000
Persistent Organic Pollutant (Total Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
Persistent Organic Pollutant (Individual Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000

If other contaminants need adding to Haswaste, please contact Envirolab.

Table 3.1 of the CLP, CL Inventory, ATPs, IARC, Concawe, MSDSs, REACH + Pesticide Properties databases. Worst case REACH + MSDS's used for "*" STOT + Acute Toxicity.

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TP/WS/BH			TP16	TP16A	TP16A	TP17	WS02	WS04	WS05	WS06	WS06	WS08	WS10
Depth (m)			0.10	0.20	0.50	0.20	0.20	0.30	0.20	0.10	1.50	0.40	0.40
Envirolab reference													
% Moisture		%											
pH (soil)			8.17	8.78	8.17	7.91	7.66	8.11	7.55	7.66	7.75	8.02	7.97
pH (leachate)													
Arsenic		mg/kg	3	1	3	3	7	3	<1	4	<1	6	6
Cadmium	updated v5.4ei	mg/kg	0.8	<0.5	0.7	0.7	1.3	0.8	0.8	0.8	<0.5	1.1	0.9
Copper		mg/kg	12	2	10	13	13	14	20	13	21	13	16
CrVI or Chromium		mg/kg	18	4	20	20	33	18	25	22	29	22	28
Lead		mg/kg	18	2	13	16	19	16	16	17	16	14	13
Mercury		mg/kg	0.17	0.31	0.17	0.29	0.17	0.20	0.17	0.17	0.17	0.17	0.17
Nickel		mg/kg	17	3	17	16	33	16	21	19	3	23	30
Selenium		mg/kg	1	1	1	1	1	1	1	1	1	1	1
Zinc	updated v5.4ei	mg/kg	54	5	45	50	72	52	58	55	9	65	50
Barium		mg/kg											
Beryllium		mg/kg											
Vanadium		mg/kg											
Cobalt	updated v5.4ei	mg/kg											
Manganese	updated v5.4ei	mg/kg											
Molybdenum		mg/kg											
Antimony		mg/kg											
Aluminium		mg/kg											
Bismuth		mg/kg											
CrIII		mg/kg											
Iron	updated v5.4ei	mg/kg											
Strontium		mg/kg											
Tellurium		mg/kg											
Thallium		mg/kg											
Titanium		mg/kg											
Tungsten		mg/kg											
Ammoniacal N		mg/kg											
ws Boron		mg/kg											
PAH (Input Total PAH **OR** individual PAH results)													
Acenaphthene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Acenaphthylene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Anthracene		mg/kg	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Benzo(a)anthracene		mg/kg	0.04	0.16	0.04	0.04	0.04	0.04	0.04	0.06	0.04	0.04	0.04
Benzo(a)pyrene		mg/kg	0.04	0.28	0.04	0.04	0.04	0.04	0.04	0.07	0.04	0.04	0.04
Benzo(b)fluoranthene		mg/kg	0.05	0.32	0.05	0.05	0.05	0.05	0.05	0.07	0.05	0.05	0.05
Benzo(ghi)perylene		mg/kg	0.05	0.29	0.05	0.05	0.05	0.05	0.05	0.05	0.08	0.05	0.05
Benzo(k)fluoranthene		mg/kg	0.07	0.12	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Chrysene		mg/kg	0.06	0.19	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Dibenzo(ah)anthracene		mg/kg	0.04	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Fluoranthene		mg/kg	0.08	0.17	0.08	0.08	0.08	0.08	0.08	0.09	0.08	0.08	0.08
Fluorene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Indeno(123cd)pyrene		mg/kg	0.03	0.25	0.03	0.03	0.03	0.03	0.03	0.05	0.06	0.03	0.03
Naphthalene		mg/kg	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Phenanthrene		mg/kg	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03
Pyrene		mg/kg	0.07	0.18	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Coronene		mg/kg											
Total PAHs (16 or 17)		mg/kg											
TPH													
Petrol		mg/kg											
Diesel		mg/kg											
Lube Oil		mg/kg											
Crude Oil		mg/kg											
White Spirit / Kerosene		mg/kg											
Creosote		mg/kg											
Unknown TPH with ID		mg/kg											
Unknown TPHCWG		mg/kg	0.1	0.8	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Sulphide		mg/kg											
Complex Cyanide		mg/kg											
Free (or Total) Cyanide		mg/kg											
Thiocyanate		mg/kg											
Elemental/Free Sulphur		mg/kg											
Phenols Input Total Phenols HPLC **OR** individual Phenol results.													
Phenol		mg/kg											
Cresols		mg/kg											
Xylenols		mg/kg											
Resourcinol		mg/kg											
Phenols Total by HPLC		mg/kg											
BTEX Input Total BTEX **OR** individual BTEX results.													
Benzene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Toluene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ethylbenzene		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Xylenes		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total BTEX		mg/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
PCBs (POPs)													
PCBs Total (eg EC7/WHO12)		mg/kg											
PBBs (POPs)													
Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)		mg/kg											

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TP/WS/BH			TP16	TP16A	TP16A	TP17	WS02	WS04	WS05	WS06	WS06	WS08	WS10
Depth (m)			0.10	0.20	0.50	0.20	0.20	0.30	0.20	0.10	1.50	0.40	0.40
Envirolab reference													

POPs Dioxins and Furans Input Total Dioxins and Furans **OR** individual Dioxin and Furan results.

2,3,7,8-TeCDD		mg/kg											
1,2,3,7,8-PeCDD		mg/kg											
1,2,3,4,7,8-HxCDD		mg/kg											
1,2,3,6,7,8-HxCDD		mg/kg											
1,2,3,7,8,9-HxCDD		mg/kg											
1,2,3,4,6,7,8-HpCDD		mg/kg											
OCDD		mg/kg											
2,3,7,8-TeCDF		mg/kg											
1,2,3,7,8-PeCDF		mg/kg											
2,3,4,7,8-PeCDF		mg/kg											
1,2,3,4,7,8-HxCDF		mg/kg											
1,2,3,6,7,8-HxCDF		mg/kg											
2,3,4,6,7,8-HxCDF		mg/kg											
1,2,3,7,8,9-HxCDF		mg/kg											
1,2,3,4,6,7,8-HpCDF		mg/kg											
1,2,3,4,7,8,9-HpCDF		mg/kg											
OCDF		mg/kg											
Total Dioxins and Furans		mg/kg											

Some Pesticides (POPs unless otherwise stated)

Aldrin		mg/kg		0.050000		0.050000							
α Hexachlorocyclohexane (alpha-HCH) *(leave empty if total HCH results used)*		mg/kg		0.050000		0.050000							
β Hexachlorocyclohexane (beta-HCH) *(leave empty if total HCH results used)*		mg/kg		0.050000		0.050000							
α Cis-Chlordane (alpha) ***OR*** *Total Chlordane*		mg/kg											
δ Hexachlorocyclohexane (delta-HCH) *(leave empty if total HCH results used)*		mg/kg											
Dieldrin	updated v5.4ei	mg/kg		0.050000		0.050000							
Endrin		mg/kg		0.050000		0.050000							
χ Hexachlorocyclohexane (gamma-HCH) (lindane) ***OR*** *Total HCH*	updated v5.4ei	mg/kg		0.050000		0.050000							
Heptachlor		mg/kg		0.050000		0.050000							
Hexachlorobenzene		mg/kg											
o,p'-DDT *(leave empty if total DDT results used)*		mg/kg											
p,p'-DDT ***OR*** *Total DDT*	updated v5.4ei	mg/kg											
χ Trans-Chlordane (gamma) *(leave empty if total Chlordane results used)*		mg/kg											
Chlordecone (kepone)		mg/kg											
Pentachlorobenzene		mg/kg											
Mirex		mg/kg											
Toxaphene (camphechlor)		mg/kg											

Tin

Tin *(leave empty if Organotin and Tin excl Organotin results used)*		mg/kg											

Organotin

Dibutyltin; DiBT		mg/kg											
Tributyltin; TriBT		mg/kg											
Triphenyltin; TriPT		mg/kg											
Tetrabutyltin; TeBT		mg/kg											

Tin excluding Organotin

Tin excl Organotin		mg/kg											

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TP/WS/BH	TP16	TP16A	TP16A	TP17	WS02	WS04	WS05	WS06	WS06	WS08	WS10
Depth (m)	0.10	0.20	0.50	0.20	0.20	0.30	0.20	0.10	1.50	0.40	0.40
Envirolab reference											

Asbestos in Soil	Thresholds		TP16	TP16A	TP16A	TP17	WS02	WS04	WS05	WS06	WS06	WS08	WS10
Asbestos detected in Soil (enter Y or N)	Y		NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)	see "Carc HP7 % Asbestos in Soil (Fibres)" below	%											
Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces)	≥0.1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)	Y		NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD

Asbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7

If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1%", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You cannot use Asbestos % results when visual identifiable pieces are present. If Asbestos in Soil above is "Y", but Asbestos

If visual identifiable pieces of asbestos are present, you cannot use Asbestos % results and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06 05. If visual identifiable pieces of asbestos are p
Therefore, if Asbestos in Soil above is "Y", the Asbestos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste. Therefore, if Asbestos in Soil a

Identifiable Pieces are Cement, Fragments, Board, Rope etc. ie anything ACM that is not Loose Fibres.

All visual asbestos pieces need to be removed leaving only fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste. All visual asbestos pieces need to l

Hazardous Property	Thresholds	Cut Off Value	TP16	TP16A	TP16A	TP17	WS02	WS04	WS05	WS06	WS06	WS08	WS10
Corrosive HP8	≥5%	<1%	0.00385	0.00090	0.00424	0.00424	0.00726	0.00385	#VALUE!	0.00475	#VALUE!	0.00502	0.00617
Irritant HP4	≥10%	<1%	0.00175	0.00036	0.00153	0.00187	0.00239	0.00198	#VALUE!	0.00200	#VALUE!	0.00226	0.00260
Irritant HP4	≥20%	<1%	0.00481	0.00086	0.00458	0.00472	0.00815	0.00483	0.00652	0.00533	0.00300	0.00613	0.00789
Specifc Target Organ Toxicity HP5	≥1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specifc Target Organ Toxicity HP5	≥20%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specifc Target Organ Toxicity HP5	≥1%		0.00346	0.00077	0.00384	0.00384	0.00667	0.00346	0.00480	0.00422	0.00557	0.00465	0.00606
Specifc Target Organ Toxicity HP5	≥10%		0.00180	0.00020	0.00130	0.00160	0.00190	0.00160	0.00160	0.00170	0.00160	0.00140	0.00130
Aspiration Toxicity HP5	≥10%		0.00002	0.00009	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
Acute Toxicity HP6	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.25%	<0.1%	0.00041	0.00017	0.00041	0.00044	0.00094	0.00042	#VALUE!	0.00055	#VALUE!	0.00081	0.00081
Acute Toxicity HP6	≥5%	<0.1%	0.00360	0.00093	0.00398	0.00401	0.00648	0.00360	0.00494	0.00437	0.00571	0.00437	0.00552
Acute Toxicity HP6	≥25%	<1%	0.00669	#VALUE!	0.00595	0.00639	0.01018	0.00651	0.00820	0.00710	#VALUE!	0.00764	0.00927
Acute Toxicity HP6	≥0.25%	<0.1%	0.00002	0.00004	0.00002	0.00003	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
Acute Toxicity HP6	≥2.5%	<0.1%	0.00346	0.00077	0.00384	0.00385	0.00634	0.00346	0.00480	0.00422	0.00557	0.00422	0.00538
Acute Toxicity HP6	≥15%	<0.1%	0.00000	0.00001	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥55%	<1%	0.00008	#VALUE!	0.00007	0.00009	0.00013	0.00008	0.00008	0.00008	#VALUE!	0.00011	0.00009
Acute Toxicity HP6	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.5%	<0.1%	0.00355	#VALUE!	0.00393	0.00394	0.00648	0.00356	0.00490	0.00432	#VALUE!	0.00435	0.00548
Acute Toxicity HP6	≥3.5%	<0.1%	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014
Acute Toxicity HP6	≥22.5%	<1%	0.00659	0.00104	0.00587	0.00631	0.01004	0.00642	0.00811	0.00701	0.00458	0.00752	0.00917
Carcinogenic HP7	≥0.1%		0.00346	0.00077	0.00384	0.00384	0.00667	0.00346	#VALUE!	0.00422	#VALUE!	0.00465	0.00606
Carcinogenic HP7	≥0.1%		0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
Carcinogenic HP7	≥1%		0.00000	0.00003	0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00001	0.00000	0.00000
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only)	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		8.17	8.78	8.17	7.91	7.66	8.11	7.55	7.66	7.75	8.02	7.97
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		8.17	8.78	8.17	7.91	7.66	8.11	7.55	7.66	7.75	8.02	7.97
Toxic for Reproduction HP10	≥0.3%		0.00343	0.00061	0.00343	0.00323	0.00667	0.00323	0.00424	0.00384	0.00160	0.00465	0.00606
Toxic for Reproduction HP10	≥3%		0.00346	0.00077	0.00384	0.00384	0.00634	0.00346	0.00480	0.00422	0.00557	0.00422	0.00538
Mutagenic HP11	≥0.1%		0.00346	0.00077	0.00384	0.00384	0.00634	0.00346	0.00480	0.00422	0.00557	0.00422	0.00538
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only)	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Mutagenic HP11	≥1%		0.00343	0.00061	0.00343	0.00323	0.00667	0.00323	0.00424	0.00384	0.00061	0.00465	0.00606
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HP13 Sensitising	≥10%		0.00346	0.00077	0.00384	0.00384	0.00667	0.00346	0.00480	0.00422	0.00557	0.00465	0.00606
Ecotoxic HP14	≥1.0	<0.1% (except CompCN + Thiocyanate + Xylene + BTEX 1%).	0.06995	#VALUE!	0.06404	0.06848	0.10656	0.06826	#VALUE!	0.07575	#VALUE!	0.08393	0.08757
Ecotoxic HP14	≥25%	<0.1%	0.01749	#VALUE!	0.01601	0.01712	0.02664	0.01707	#VALUE!	0.01894	#VALUE!	0.02098	0.02189
Ecotoxic HP14	≥25%	<0.1% (except CompCN + Thiocyanate + Xylene + BTEX 1%).	0.01750	#VALUE!	0.01602	0.01713	0.02665	0.01708	#VALUE!	0.01895	#VALUE!	0.02099	0.02190
Ecotoxic HP14 individual substance specific thresholds (Benzo(a)anthracene, Dibenz(ah)anthracene (or Total PAH if only used), Sn, TriPT)	≥0.0025%		0.000004	0.000016	0.000004	0.000004	0.000004	0.000004	0.000004	0.000006	0.000004	0.000004	0.000004
Ecotoxic HP14 individual substance specific thresholds (Co, γ-HCH, DiBT, TriBT)	≥0.025%		0.00000	0.00001	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Persistent Organic Pollutant (PCB, PBB or POP Pesticides)	>0.005%		0.00000000	0.00000500	0.00000000	0.00000500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Persistent Organic Pollutant (Total Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
Persistent Organic Pollutant (Individual Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000

If other contaminants need adding to Haswaste, please contact

Table 3.1 of the CLP, CL Inventory, ATPs, IARC, Concawe, MSDSs, REACH + Pesticide Properties databases. Worst case REACH + MSDS's used for "*" STOT + Acute Toxicity.