STRATA RENEWABLES LTD

GROUND INVESTIGATION REPORT

Report No. SRL454

Land at Belle Vue

Leek

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Report No. SRL454

Land at Belle Vue

Leek

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1. INTRODUCTION

This report sets out the results of the field work and laboratory testing for a ground investigation carried out by Strata Renewables Limited at the request of Mr Paul Hare.

The investigation was required in connection with the construction if residential dwellings.

No Desk Study Phase 1 Risk Assessment Report was required for this report

The object of the investigation was to obtain information on the ground conditions and soil properties for use in the design and construction of foundations on the site and for the initial assessment of the potentially contaminated soil risk.

The ground investigation has been carried out in accordance with the relevant standards for ground investigation. Details of the relevant standards are given in the references to this report.

2. SITE DESCRIPTION

The site comprises a small rectangular area located off a cobbled drive. The following photographs show the site setting.



Main Development area – part grassed and part with concrete hard standing.



Main Development area – part grassed and part with concrete hard standing.



Main Development area – part grassed and part with concrete hard standing.



Lower area with small retaining wall at the rear.

3. SITE GEOLOGY

The published British Geological Survey (BGS) map for Buxton Sheet Number 111 shows the site is underlain by:

Drift Geology: The mapping shows the drift as absent at the site.

Bedrock Geology: Triassic Chester Pebble Beds Formation. Sandstone, fine- to coarse-grained, commonly pebbly, with conglomerates and sporadic siltstones; cross-stratified.

4. FIELDWORK

The fieldwork was carried out during the period on 26th June 2017 and consisted of three dynamically driven, continuously sampled boreholes ranging from 3.0m to 3.0m below the existing ground surface level using an AEC 150 self propelled, tracked dynamic sounding and sampling machine. Samples were recovered in eighty-four mm diameter, 1.00m long plastic liners, which were returned to the laboratory for description, sub-sampling and testing. A Standard Penetration Test (N_{300}) type test was undertaken at the end of each sample run in accordance with BS EN ISO 22476-3:2005 (formerly BS 1377 Part 9:1990), as described in Appendix 1.

Additional investigation was carried out on 6th July 2017. These works consisted of three and excavated pits in the lower area below the main site. The base of the pit was hand probed to determine the terminating soils.

Environmental Soil (ES) samples were recovered at appropriate depth to sample the shallow soils make up. Each ES sample comprise of : 1No 1kg plastic, 1No 250g glass jar and 1No 60ml glass. All the glass jar samples are placed in a cool box with icepack and returned to the laboratory within 24hrs for refrigeration prior to selection for the contamination testing.

Detailed results of the strata met, depths and levels of changes, thickness of strata, samples taken, groundwater observations and Continuous Dynamic Sample SOT (N_{300}) values from the dynamic penetration tests are given on the borehole record sheets in Appendix 2.1. The detailed results of the Standard Penetration Test (SPT) are presented in the table in Appendix 2.2

The positions of the boreholes are given on the Borehole Location Plan in Appendix 4.

A Site Location Plan is given in Appendix 5.

Ground levels at the borehole were not available for the compilation of this report.

Appendix 1 contains statements of the Terminology used in

Soil Descriptions

Standard Penetration Tests

Continuous Dynamic Sounding (Dynamic Probe Super Heavy (DPSH)

5. LABORATORY TESTING

A testing programme was agreed with the project engineer and the tests were carried out as specified by B.S. 1377:1990 Methods of Test for Soils for Civil Engineering Purposes.

The following tests were undertaken:-

Soluble Sulphate	2
pH	2

Concept Life Sciences (SAL) carried out chemical contamination tests on two selected samples. Samples tested were:

Concept Reference	665468 001	665468 002
Customer Sample Reference	WS01	WS03
Bottom Depth	0.50	1.00
Date Sampled	30-JUN-2017	30-JUN-2017
Matrix Class	Topsoil	Sandy Soil

Each sample was tested for

Comprehensive – Suite 1
Total Metals : As, Ba, Be, Cd, Cr, Cu, Hg, Ni, Se, Vn, Zn.
Water Soluble Boron
Hexavalent Chromium
Total Cyanide
Phenols
Total Sulphate
Sulphide
pH
PAHs - 16 USEPA Priority Pollutants by GC

Suite 2 - Speciated Total Petroleum Hydrocarbon (TPH)
Suite 6 - Asbestos

6. SUMMARY OF GROUND CONDITIONS

The Continuous Dynamic Sample boreholes, show the following sequence of strata.

Made Ground	Concrete surfacing in the general area. At the borehole locations the surface soils comprise broken brick and broken concrete rubble with a dark brown fine-medium sand matrix. WS01 to 0.2m, WS2 0.3m and WS03 0.2m. Below the surface Made Ground is a mixed fill of broken concrete broken brick inclusions of broken pottery - cinder/ash – broken glass in a matrix of black and dark reddish brown sand to a depth of: WS01 0.2-1.34m, WS02 0.3-2.45m and WS03 0.2-2.35m
Sand	At WS01 (1.34-1.64m), WS01 (2.45-2.79m) and WS03 (2.35-2.85m). Generally reddish brown and orangey brown fine-coarse Sand
Sandstone	Reddish brown completely weathered weakly cemented very dense fine-medium. From a depth in the range and proved to WS01 - 1.94m: WS02 – 3.20m: WS03 – 2.85m The SPTN value at termination was in the range of 50/102mm, 50/275mm and 50/95mm.

At the lower elevation there was no access to the Continuous Dynamic Sample drilling rig. Investigation comprised had excavated pits with a hand probe at the base to prove the consistency of the base.

Natural ground was encountered at a depth in the range:

HD01 – 1.0m; HD02 – 1.30m: HD03 – 1.40m

The pits terminated at what was interpreted as weathered Sandstone in the range:

HD01 – 1.40m; HD02 – 1.650m: HD03 – 1.60m

No groundwater was encountered in the sampling.

7. GEOTECHNICAL ASSESSMENT

Foundations

The site area is formed as a series of terraced platforms on what would have been steeply sloping ground. The main development platform had Made Ground to a depth in the range 1.3-2.60m.

At the lower level the hand excavated pits encountered the Made Ground over the completely weathered destructed Sandstone at depth shown in the table above.

We would recommend that the foundations for the proposed development should be taken to a depth were the top of the weathered brown sandstone is encountered. This will be in the range 1.65m to 2.8m at the higher level and 1.3m to 1.50m at the lower level.

At that depth the bearing pressure should be limited to 150 kN/m². Due to the deep and variable thickness of the Made Ground a fully suspended ground floor slab should be adopted.

The depths of excavation may result in unstable trench sides and thus we recommend that trench sheet or light weight sheet piles are to hand to support excavations prior to placing mass fill concrete.

Concrete in Aggressive Ground

With reference to BRE Special Digest 1 the site should be considered as brownfield with static groundwater.

The testing for sulphates shows low concentration of soluble sulfate in the Made Ground and low sulfate content in the ground water.

Therefore the Site Design Sulphate Class is DS1 and the Aggressive Chemical Environment for Concrete (ACEC) is AC1s.

8. CONTAMINATION ASSESSMENT

CONTAMINATED SOIL

In 2012 the Nation Planning Policy Framework (NPPF) was established and the requirement s for the assessment of contaminated land is given in Section 120 and 121

120. To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

121. 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.*

The Definition in Part IIA:

2.1 Section 78A(2) defines CONTAMINATED LAND for the purposes of Part IIA 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 -

"(a) SIGNIFICANT HARM is being caused or there is a SIGNIFICANT POSSIBILITY of such harm being caused; or

"(b) POLLUTION OF CONTROLLED WATERS is being, or is likely to be, caused".

In assessing the potential risk of environmental impact the CLR 11 (Model Procedures for the management of Land Contamination) Source – Pathway – Receptor Model is followed. In assessing the potential risk of environmental impact the CLR 11 (Model Procedures for the management of Land Contamination) Source – Pathway – Receptor Model is followed.

The assessment of Contaminated Land is Part IIA of the Environmental Protection Act (1990) Contaminated Land Regime and the development controls of the relevant Town and Country Planning acts. EA/DEFRA has produced four reports and assessment software to assist in the assessment of the potential harmful effects of contaminated land to the users of the land and the risk to the general environment. The EA/DEFRA has withdrawn all published SGV (Soil Guidance Values) for certain target compounds and contaminants and these are used for a Generic Risk Assessment. Updated TOX reports have been issued.

For assessment of the results of contamination tests we make reference to the LQM/CIEH Suitable for Use Levels (S4ULs) commercial database for Generic Assessment Criteria (GAC). . We have based these on the default assumptions provided in the CLEA report which we understand will be used in development of the Soil Guideline Values by Defra and the Environment Agency.

In the assessment of the results of testing comparisons to published LQM-CIEH S4ULs,

The disposal of construction spoil that is considered waste will need to be assessed in line with current Land Fill regulations. The Landfill (England and Wales) (Amendment) Regulations 2004 have introduced a set of analysis requirements for the classification of waste into

Inert Waste
Non-reactive hazardous Waste
Hazardous Waste.

If excavation spoil is to be taken off site for disposal additional testing for the Waste Acceptance Criteria will be required.

This investigation of contaminated soil must only be considered as the preliminary phase of works where there is an identified contamination hazard. The results of the analyses of a sample can only be relied on as evidence as to what is in the sample and not what may be in the surrounding or adjacent area. Additional works may be necessary to assess the hazard of any contamination on site and the local environmental impact. Additional investigation may be necessary to evaluate the extent and hence volume of any contaminated soil. The assessment of the contaminated soil must take account of the limited access as part of the of the contamination investigation.

This investigation of contaminated soil must only be considered as the preliminary phase of works where there is an identified contamination hazard. The results of the analyses of a sample can only be relied on as evidence as to what is in the sample and not what may be in the surrounding or adjacent area. Additional works may be necessary to assess the hazard of any contamination on site and the local environmental impact. Additional investigation may be necessary to evaluate the extent and hence volume of any contaminated soil. The assessment of the contaminated soil must take account of the limited access as part of the of the contamination investigation.

Samples were taken from two hand excavated sampling pits/boreholes located at WS01 and WS03.

Basic screening analyse were undertaken to confirm the Human Health Risk Assessment for CLEA Risk Model Residential with No Home Grown Vegetables.

The test results for the Concept Life Sciences (SAL) Certificate 665468-1 Date of Report: 12th July 2017, presented in Appendix 3.2.

The test results have been assessed using the LQM/CIEH Suitable for Use Limits (S4ULs). The assessment tables are based on the determined with reference to the Soil Organic Matter from the test results.

The Soil Organic Matter from the test is >6% and the 6% S4ULs Generic Assessment Criteria are used.

The following tables show the assessment.

CLEA Metals and Non-Metallic Analystes.

	WS01 0.5m	WS03 1.0m	N = value is greater than GAC Y = value is less than GAC	6% SOM LQM/CIEH	1% SOM LQM/CIEH
Arsenic	21	23	Y	40	
Barium*	240	340	Y	1300 EIC/AGS/CL:AIRE	
Beryllium	<2	<2	Y	1.7	
Boron (water-soluble)	<1	<1	Y	11000	
Cadmium	<1	<1	Y	85	
Chromium III	15	17	Y	910	
Chromium VI	<0.1	<0.1	Y	6	
Copper	62	140	Y	7100	
Lead	**270**	**360**	N	200 SP1010 pC4SL	
Mercury	**2**	1	N	1.2	
Nickel	25	25	Y	180	
Selenium	<3	<3	Y	430	
Vanadium	23	26	Y	1200	
Zinc	400	290	Y	40000	
Cyanide(Total)	<1	<1	Y	34 AtriskSoil	
Phenols(Mono)	<1	<1	Y	1200	440
SO4(Total) %	0.09	0.18			
Sulphide	<10	<10			
pH	7.5	7.4	5-9 *		
Soil Organic Matter	14.5	15.3			

The results show that Lead and one sample (WS01) of Mercury exceed the Generic Assessment Criteria. It should be noted that the Generic Assessment Criteria for lead is taken from SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – 2014: CLAIRE.

Speciated Poly Aromatic Hydrocarbons

	WS01 0.5m	WS03 1.0m	N = value is greater thanGAC Y = value is less than GAC	6% Soil Organic Matter LQM/CIEH	
Naphthalene	<1.0	0.5	Y	**13**	
Acenaphthylene	<1.0	<0.1	Y	**6000**	**506**
Acenaphthene	<1.0	0.1	Y	**6000**	**336**
Fluorene	<1.0	0.1	Y	**4500**	**183**
Phenanthrene	1.3	1.1	Y	**1500**	
Anthracene	<1.0	0.3	Y	**37000**	
Fluoranthene	3.3	1.6	Y	**1600**	
Pyrene	3	1.4	Y	**3800**	
Benzo(a)Anthracene	1.5	1.1	Y	**15**	
Chrysene	1.7	1.1	Y	**32**	
Benzo(b/k)Fluoranthene	1.4	1.5	Y	**4**	
	1.6	1.1	Y	**110**	
Benzo(a)Pyrene	1.5	1.5	Y	**3.2**	
Indeno(123-cd)Pyrene	<1.0	1	Y	**13**	
Dibenzo(ah)Anthracene	<1.0	0.5	Y	**0.32**	
Benzo(ghi)Perylene	<1.0	0.9	Y	**360**	
PAH(total)	15	14			

Note: * Value exceeds saturation Limit shown underlined

None of the Poly Aromatic Hydrocarbons analytes exceed the relevant Generic Assessment Criteria (SOM 6%)

Benzene Toluene Ethylbenzene and Xylene (BTEX) and Speciated Total Petroleum Hydrocarbons

	WS01 0.5m	WS03 1.0m	N = value is greater than GAC Y = value is less than GAC	6% Soil Organic Matter LQM/CIEH
Benzene	<0.01	<0.01	Y	**1.4**
Toluene	<0.01	<0.01	Y	**3900**
EthylBenzene	<0.01	<0.01	Y	**440**
M/P Xylene	<0.01	<0.01	Y	**450**
			Y	**430**
O Xylene	<0.01	<0.01	Y	**480**
MTBE			Y	
TPH aliphatic C5-C6	<0.100	<0.100	Y	**160**
TPH aliphatic C6-C8	<0.10	<0.10	Y	**530**
TPH aliphatic C8-C10	<0.10	<0.10	Y	**150**
TPH aliphatic C10-C12	1	2	Y	**770**
TPH aliphatic C12-C16	3	3	Y	**4400**
TPH aliphatic C16-C21	2	3	Y	**C16-C35 110000**
TPH aliphatic C21-C35	8	98	Y	
TPH aromatic C5-C7 (benzene)	<0.10	<0.10	Y	**1400**
TPH aromatic C7-C8 (toluene)	<0.10	<0.10	Y	**3900**
TPH aromatic C8-C10	<0.10	<0.10	Y	**270**
TPH aromatic C10-C12	4	3	Y	**1200**
TPH aromatic C12-C16	10	8	Y	**2500**
TPH aromatic C16-C21	20	15	Y	**1900**
TPH aromatic C21-C35	60	54	Y	**1900**

None of the Poly Aromatic Hydrocarbons analytes exceed the relevant Generic Assessment Criteria (SOM 6%)

CONCLUSION

The results of the contamination screening tests on two selected samples show that the soils have Lead and Mercury that exceed the relevant Generic Assessment Criteria for the selected CLEA Risk Model.

The development plan shows a very small area of soft landscaping to the front of the house.

The presence of soils with the elevated Lead are describes as:

> WS01 - Made Ground of dark brown slightly gravelly TOPSOIL with some broken brick and cinder; gravel is fine to medium sub-angular, some rootlets present.
>
> WS03 - Made Ground of loose brown TOPSOIL with lots of broken brick, masonry, glass, cinder and small pieces of wood; includes some rootlets

It is apparent that the shallow soils have been impacted with ash/cinder and broken brick that contains lead in the fines.

The formation of the private enclosed gardens will need to be designed to break the pathway of the impacted soil and the rend-user. The simplest option would be to adopt a Simple Engineered Cover System composed of a total of 600mm of cover made up of:

> 150mm certificated and validated Topsoil.
>
> 300mm of certificated and validated sub-soil or as dug natural sand
>
> 150mm of certificated and validated free-draining selected granular fill. We would recommend that a lightweight separator geotextile is placed between the sub-soil and the granular fill to stop fines migration.

Any imported Topsoil, must comply with BS3882:2015 and a certificate of analysis should be obtained to confirm the soil is suitable for use.

WE have discussed above that the foundations are to be taken through the Made Ground and thus a large volume of excavation spoil will result. All test results should be supplied to the groundworks contractor and the receiving landfill site to determine the suitability of the soil for land filling. We would suggest that prior to full construction a trial pit is carried out and an amalgamated sample over the full thickness of the Made Ground is taken and a Waste Acceptance Criteria test is undertaken. The Waste Acceptance Criteria test will take at least 10 working days for analysis and reporting.

STANDARD REFERENCES

British Standards Institute BS 5930:2015, Code of practice for site investigations.

BS EN 1997-2:2007: Eurocode 7. Geotechnical design. Ground investigation and testing

BS EN ISO 22475-1:2006: Geotechnical investigation and testing. Sampling methods and groundwater measurements. Technical principles for execution

BS EN ISO 14688-1:2002: Geotechnical investigation and testing. Identification and classification of soil. Identification and description

BS EN ISO 14688-2:2004: Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification

BS EN ISO 14689-1:2003: Geotechnical investigation and testing. Identification and classification of rock. Identification and description

BS EN ISO 22476-2:2005: Geotechnical investigation and testing. Field testing. Dynamic probing

BS EN ISO 22476-3:2005: Geotechnical investigation and testing. Field testing. Standard penetration test

B.S. 1377:1990 Methods of Test for Soils for Civil Engineering Purposes.

BS.10175: 2011 + A1: 2013 Investigations into Potentially Contaminated Sites.

APPENDIX 1 STANDARD STATEMENTS

Terminology used in Soil Descriptions

Standard Penetration Tests

Terminology Used in Soil Descriptions

The procedure and principles given in BS EN ISO 14688 part 1 & 2 and the amended BS 5930 (1999) Revision Section 6 in accordance to have been adopted in producing the soils description contained in this report.
A soil's characteristics are based on the particle size grading of the coarser particles and the plasticity of the finer particles. The classification is therefore based on the following.
While describing a soil the main characteristics should be preferably stated in a standard word order, however the word order can be adjusted if required for clarity.

a) Mass characteristics	b) Material characteristics	c) Stratum Name
1a) Relative density / consistency	1b) Colour	1c) Geological formations, age and type of deposit where possible
2a) Discontinuities	2b) Particle shape, size grading and composition.	
3a) Bedding	3b) Soil name (capital e.g. SAND),based on grading and plasticity.	

Mass Characteristics
Strength scale for fine and coarse soils is as follows:-

Term used for coarse soils	SPT N Values blows/300mm
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very Dense	over 50

Consistency terms	Consistency description
Very soft	Finger easily pushed in up to 25mm, Exudes between fingers.
Soft	Finger pushed in up to 10mm. Moulds by light finger pressure
Firm	Thumb makes impression easily. Cannot be moulded by fingers rolls in the hand to a 3mm thick thread without breaking or crumbling
Stiff	Can be indented slightly by thumb. Crumbles in rolling a 3mm thick thread but can be remoulded into a lump
Very Stiff	Can be indented by thumb nail. Cannot be moulded but crumbles under pressure
Hard	Can be scratched by thumbnail

Terms based on Measurement for fine soils	Undrained strength kPa
Extremely low	<10
Very low	10 – 20
Low	20 –40
Medium	40 – 75
High	75 – 150
Very high	150 – 300
Extremely high/ Extremely weak mudstone	300 - 600

Relative density of sands and gravel may only be determined by the standard penetration test scale in terms of N-Values, however it should not be used for very coarse soils. The use of empirical relationships between standard penetration test 'N' values and strength of fine soils may also be useful but should not be used to provide strength descriptors on field records.
An undrained strength can be given on the field record when measurement of the undrained shear strength is made in the field by hand vane or in the laboratory by triaxial test.
Silts depending on their grading, may behave either as a coarse soil or fine soil; consistency term (density/strength) shall be used accordingly.

Description of Discontinuities and Beddding.

When describing discontinuities the type should be stated e.g. fissures, faults, shear planes and the spacing detailed as below. Their persistence, openness and surface texture (e.g. rough, smooth, polished, striated) should be described and where possible orientation and trend should be stated.

Discontinuities Scale of spacing	Mean Spacing mm	Other qualifying terms for Discontinuities	Bedding Scale of bedding	Mean Thickness mm	Other qualifying terms for Bedding	
Very Widely	Over 2000	Fissured:- breaks in blocks along unpolished Discontinuities.	Very thickly bedded	Over 2000	Inter bedded	Alternating layers of different types
Widely	2000 to600	Sheared:- breaks in blocks along polished discontinuities.	Thickly bedded	2000 to600	Interlaminated	Prequalified by thickness term if in equal proportions.
Medium	600 to 200		Medium bedded	600 to 200		
Closely	200 to 60		Thinly Bedded	200 to 60		Otherwise thickness of and spacing between subordinate layers defined.
Very Closely	60 to 20	Spacing terms also used for distance between partings, isolated beds or laminae, desiccation cracks roots etc	Very thinly bedded	60 to 20		
Extremely Closely	under 20		Thickly laminated	20 to 6		
			Thinly Laminated	under 6		

Terminology Used in Soil Descriptions - cont.

Material Characteristics of Soils.

Material characteristics refer to those characteristics that can be described from visual and mutual examination of disturbed or undisturbed samples. Characteristics include colour, particle shape, particle grading and particle composition.

Colour

Colour given should be an overall impression. Colour differences can be emphasised separately by the use of terms such as spotted, mottled, streaked or multi-coloured. Details of colours are given below:-
Tertiary descriptor- Light / Dark
Secondary descriptor- Pinkish, reddish, yellowish, orangish, brownish, greenish, bluish, greyish
Primary descriptor- Pink, red, yellow, orange, brown, green, blue, white, grey, black
(Changes due to oxidization, desiccation for example should be noted.)

Particle Shape**:-** The recommended terms to describe particle shape of gravel size or larger particles are as follows

Angularity	Form	Surface texture.	
Very- angular Angular Sub-angular Sub-rounded Rounded Well rounded	Flat / Tubular elongated cubic	rough smooth	The surfaces of the particles may be described for example as etched, pitted, honeycombed or polished

Particle Grading:-Coarse: The distribution of particle sizes within sands and gravel should be described stating predominant size fraction present e.g. fine to medium SAND. Subangular elongated smooth fine gravel. Absence of these adjectives means that they are all present in roughly equal proportion.
Very Coarse: The proportion of cobbles in a boulder deposit (or visa-versa) may be quantified using the terms with a little, with some, or with much; very coarse soils with secondary finer material (coarse and fine soil) should be described likewise e.g. COBBLES with much sandy CLAY.

Finer material (coarse and fine soil) with very coarse secondary fraction should be described as follows

Fraction	Percentage by mass	Term
Boulders	< 5 5 to 20 > 20	Low boulder content Medium boulder content High boulder content
Cobbles	< 10 10 to 20 > 20	Low boulder content Medium boulder content High boulder content

It is recommended that the dominant secondary fraction comes immediately before the principal soil term. To avoid ambiguity, if any of the constituent sizes require qualifying adjectives, these should be added in separate sentences after the main description; such as the estimated percentage proportion or consistency,
e.g.'' Gravelly very clayey SAND. Gravel (10%) is fine of rounded quartz. Clay is firm''.

Principal Soil Type and Secondary Constituents**.**
The soil name is based on particle size of the coarse fraction and/or the plasticity of the fine fraction
The basic soil types and their subdivisions are defined by the range of their particle sizes as shown.

Soil Group.	Particle Size	Principal Soil	Term Before	Principal Term	Term After	Approx. % Secondary Constituent
Very Coarse	>630	LARGE BOULDERS		BOULDER	With a little cobbles Or gravel or sand	<5
	200	BOULDERS			With some sand	5-20
	63	COBBLES		COBBLES	With much boulders	20-50
Coarse Soils (over about 65% Sand and Gravel)	Coarse 20	GRAVEL	Slightly clayey Or silty or sandy (Very gravely*) * or describe as a fine soil depending on assessed engineering behavior	SAND		> 5
	Medium 6.3			GRAVEL		5 - 20
	Fine 2					>20
	Coarse 0.63	SAND		SAND and Gravel	and(sand*) or and (Gravel*)	about equal proportions
	Medium 0.2					
	Fine 0.063					
			Term Before	**Principal Term**	**Term After**	**Approx. % Secondary Constituent**
Fine Soil Over 35% silt And clay size) t	Coarse 0.02	SILT	Slightly (sandy*) or gravelly	CLAY**		<35
	Medium 0.0063		(Sandy*) or gravelly	Or		35-65
	Fine 0.002	CLAY/SILT CLAY	(Very Sandy*) or gravelly	SILT		>65

* describe as coarse soil depending on assessed engineering behavior. ** Can be silty CLAY or clayey SILT.

Fines soils:- contain 35% or more of fine material (omitting boulder and cobbles)is described as CLAY or SILT depending on the plasticity.
With less than 35% fine material it is described as a coarse material SAND or GRAVEL. The description of plasticity may be carried out using terms provided in BS EN ISO14688-1 2002

The description of 'finer material' is made ignoring the very coarse fraction; descriptions with cumulative proportions of various fractions, excluding cobbles and boulders, exceeding 100% are incorrect.

Coarse soils:-

Very coarse soils:-

For mixtures involving very coarse soils, the principal soil type name in the fine material may also be given in capital letters, e.g. COBBLES with some sandy CLAY

The location of individual cobbles and boulders should be noted on the logs. The term large boulder does not have an upper size limit, so dimension should be stated wherever available.

Minor constituents: where soil contain minor quantities (less than about 10% in fine soil and 1% coarse) which are relevant to geology can be included before the principal soil type using 'slightly micaceous' or 'very shelly' or at the end of description using qualitative terms such as 'rare', ' occasional' or 'frequent', e.g.'SAND with rare gravel size brick fragments'.

Man-made soils: are the soils which are placed by man and can be divided into those composed of reworked natural soils and those composed of man-made materials. 'Fill' is placed in controlled manner, and 'made ground' is placed without strict engineering control. Description of such soils should include following

.

a) Origin of the material	b) Presence of large objects e.g. concrete, mortar etc	c) Presence of voids/ collapsible hollow objects
d) Chemical waste and hazardous substances	e) Organic matter	f) Odours smell
g) Striking colour tints	h) Any dates readable on buried papers etc.	i) Signs of heat or combustion under ground e.g steam emerging from borehole
j) Structure, variability and mention of placement.		

Peat is classified according to the degree of decomposition and condition as given in following table

Organic Soils and Peats:-(see BS 5930. 41.3.6)

Condition	Field Test
Firm	Fibres compressed
Spongy	Very compressed and open structure
Plastic	Can be moulded in hand and smears along fingers

Terms	Decomposition	Remains	Squeeze
Fibrous	Not	Clearly recognizable	Only water no solids
pseudo-fibrous	Moderate	Recognizable	Turbid water < 50% soilds
amorphous	Full	Not recognizable	Paste > 50% solids

Term	Colour	Weight % of dry mass BS EN 14688-2
Slightly organic	Grey	2 - 6
Organic	Dark grey	6 - 20
Very organic	Black	> 20
PEAT: Low density, dark coloured, distinctive odour		

Geological formation, age and type of deposit: is given on the maps of the British Geological Survey or its Antecedents and it should be written with at least capital initial letters. The geological formation should be named where this can be done with confidence (not easy to tell in a particular borehole or exposure).

References:

BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004
BS EN ISO 14688-1 & 2 2002 Geotechnical investigation and testing – Identification and classification of soil
BS 5930:1999 Revision 'Code of Practice for Site Investigation.'
Norbury D.R;, G.H Child and T.W Spink 1986:'A critical Review of Section 8(BS 5930)Soil and Rock Descriptions'. Proc 20th Regional meeting of the Engineering Group of the Geological Society. Site Investigation Practice. Assessing BS5930. Univ of Surrey pp353-369(original proceedings).

Standard Penetration Test

BS EN ISO 22476-3:2005 (formerly BS 1377 Part 9:1990)

The full procedure of carrying out the Standard Penetration Tests (SPT) is given in BS 1377:1990 : Methods of Tests for Soils and Civil Engineering Purposes Test 9:3.

Essentially the tests consists of driving a 50mm external diameter split barrel sampler into the soil using a 65kg hammer dropping 760mm. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration (test drive) below a seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows for the 300mm test drive penetration is recorded on the borehole logs as the N - value.

A full record of the number of blows required to drive the sample at 75mm intervals throughout the total 450mm drive is also tabulated along with the groundwater levels at the time of test.

The test is normally performed on sands, but may also be used in gravels, weak rocks and glacial tills in which case the driving shoe may be replaced by a cone. When attempting the standard penetration tests in very dense materials or weathered bedrock it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner:

a) Seating Drive - using standard blows the seating drive is a penetration of 150mm or 25 blows whichever is first reached

b) Test Drive - the number of blows required for a further penetration of 300mm. If 300mm cannot be achieved in 50 blows the test can be terminated Record the number of blows per 75mm for both seating and test drives. If either the seating drive or the test drive is terminated before full penetration record the depth of penetration for the 25 blows or 50 blows respectively

c) In soft rock the test drive should be terminated after 100 blows if a penetration of 300mm has not been achieved The N - value obtained from the Standard Penetration Tests may be used to assess the relative density of sands and gravels in accordance with Clause 41.3.2 of BS 5930:1999 : Code of Practice for Site Investigation as follows:

Strength	Blows/300mm		Blows/300mm
Very Loose	0	-	4
Loose	4	-	10
Medium Dense	10	-	30
Dense	30	-	50
Very Dense	Over		50

In soft strata when the sampler assembly is lowered to the bottom of the borehole on the drive rods with the drive assembly on top the sampler may penetrate under self-weight. This initial penetration should be measured and recorded. If the initial penetration exceeds 450mm omit the seating and test drives and report the N value as zero.

APPENDIX 2 RECORDS OF FIELDWORK

APPENDIX 2.1 Continuous Dynamic Sample Boreholes

SRL
STRATA RENEWABLES LTD

Job No.: **SRL654**

Location **Land off Belle Vue Leek**

Client: **Mr P Hare**

Project Ref.:

Borehole No. **WS01**

Equipment and methods **CDSa**

Start Date:	End Date:	Final Depth:	Casing Diameter	Casing Depth
26/06/2017		**2.00m**	**113mm**	**1.70m**

FIELD RECORDS	Samples / Tests					Description	Strata		
SPT Energy Ratio	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) {Cu}		Depth & Thickness m	Reduced Level (m)	Legend
		0.20	0.30	ES1		Made Ground of broken brick and broken concrete rubble	(0.20)		
						Made Ground dark brown slightly clayey fine-medium SAND (topsoil) with broken brick ash/cinder some wood fragments some roots	0.20		
		0.50	0.60	ES2			(0.60)		
							0.80		
	1.00	1.00	1.45	S 1	(51)	Made Ground composed of dark brown sandy CLAY (topsoil) with inclusions of broken brick cinder/ash broken pottery. Some orangey brown fine-coarse Sand			
		1.00	1.10	ES3	51/285mm		(0.54)		
							1.34		
						Dense orangey/reddish brown fine-coarse SAND with sparse fine-coarse subangular and subrounded gravel	(0.30)		
	1.70	1.70	1.82	S 2	(50)	Highly weathered destructed reddish brown fine-coarse SANDSTONE	1.64		
					50/112mm		(0.30)		
--{26/06/2017}--						Sampling Terminated	1.94		

Remarks

1) CAT screen
2) Hand dug pit for services and contamination samples
3) No groundwater encountered
4) CDSa terminated at 1.94

Tip Depth	Date	Depth	Level mAD

Logged by CAF

Drilled by RC

Ground level

Co-ordinates:

Piezometer Tip

Response Zone

SRL
STRATA RENEWABLES LTD

Job No.: **SRL654**

Location **Land off Belle Vue Leek**

Client: **Mr P Hare** Project Ref.:

Borehole No. **WS02**

Equipment and methods **CDSa**

Start Date:	End Date:	Final Depth:	Casing Diameter	Casing Depth
26/06/2017		**3.20m**	**113mm**	**2.80m**

FIELD RECORDS	Samples / Tests					Description	Strata		
SPT Energy Ratio	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) {Cu}		Depth & Thickness m	Reduced Level (m)	Legend
		0.20	0.30	ES1		Made Ground broken brick sandstone fragments with dark brown sandy topsoil	(0.30)		
							0.30		
		0.50	0.60	ES2		Made Ground composed of dark brown slightly clayey Sand (topsoil) with inclusions of pottery and cinder/ash. Some roots			
	1.00	1.00	1.45	S 1	(4) 4/300mm		(2.15)		
		1.00	1.10	ES3					
	2.00	2.00	2.45	S 2	(10) 10/300mm				
							2.45		
						Compact orangery brown fine-coarse SAND	(0.34)		
	2.80	2.80	3.10	S 3	(50) 50/250mm		2.79		
						Highly weathered destructed reddish brown fine-coarse SANDSTONE	(0.41)		
--{26/06/2017}--						Sampling Terminated	3.20		

Remarks

1) CAT screen
2) Hand dug pit for services and contamination samples
3 No groundwater encountered
4) CDSa terminated at 3.20m

Tip Depth	Date	Depth	Level mAD

Logged by CAF

Drilled by RC

Ground level

Co-ordinates:

Piezometer Tip

Response Zone

SRL
STRATA RENEWABLES LTD

Job No.: **SRL654**

Location **Land off Belle Vue Leek**

Client: **Mr P Hare**

Project Ref.:

Borehole No. **WS03**

Equipment and methods **CDSa**

Start Date:	End Date:	Final Depth:	Casing Diameter	Casing Depth
26/06/2017		**2.90m**	**113mm**	**2.60m**

FIELD RECORDS	Samples / Tests					Description	Strata		
SPT Energy Ratio	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) {Cu}		Depth & Thickness m	Reduced Level (m)	Legend
		0.20	0.30	ES1		Made Ground composed of broken brick and broken sandstone and broken concrete and broken paving slabs	(0.20) 0.20		
		0.50	0.60	ES2		Made Ground composed of brown and dark brown slightly clayey fine-coarse SAND (topsoil) with inclusions of broken brick masonry pieces broken glass and pottery some wood. Some ash and cinder/ash	(1.15)		
	1.00	1.00 1.00	1.45 1.10	S 1 ES3	(4) 4/300mm		1.35		
						Made Ground composed of brown fine-medium SAND (topsoil) with ash/cinder and roots	(1.00)		
	2.00	2.00	2.45	S 2	(27) 27/300mm		2.35		
						Very dense brown fine-medium SAND. Possible weathered SANDSTONE	(0.50)		
	2.60	2.60	2.85	S 3	(50) 50/95mm				
--{26/06/2017}--						Sampling Terminated	2.85		

Remarks

1) CAT screen
2) Hand dug pit for services and contamination samples
3) No groundwater encountered
4) CDSa terminated at 2.85m

Tip Depth	Date	Depth	Level mAD

Logged by CAF

Drilled by RC

Ground level

Co-ordinates:

Piezometer Tip

Response Zone

STRATA RENEWABLES LTD

RECORD SHEET SYMBOL KEY

SAMPLES/TESTS

U	Undisturbed 100mm open tube driven sample (depth records recovered length from start of test). OS-T/W(100mm with liner) * Indicates a sample with Nil Recovery {x.xx} indicates the water at the sample depth.
D	Small disturbed sample (depth records the interval of sample).
ES EW	Environmental samples (SOIL/WATER). Small disturbed samples for contamination analysis comprising glass and plastic tubs.
B	Large disturbed sample (Bulk) depth records recorded interval.
S	Standard penetration test (SPT; BS EN ISO 22476-3) recovered as a small disturbed sample. * Indicates a sample with Nil Recovery. {x.xx} indicates the water at the sample depth.
C	Solid Cone Penetration test, in rock and coarse granular soils.
W	Water sample.
L	Continuous Dynamic Sample 84mm 1.0m long

FIELD RECORD COLUMN

This column is used to present depth related information of site activity. The column will always show progress, details of water strikes and rises, field records of the SPT test and the Undisturbed sample blows. Other data may be present in this column and details of codes will be given in the remarks box at the bottom of the record sheet page.

Water Level Codes

M1 2.00 Water strike (with sequential number of the strike) recorded depth.

T1 1.90 Temporary rest level after 20 minutes with recorded depth.

Progress Codes

-{07/08/2002}-Records the date at the depth of the borehole when the borehole takes more than one day to complete. Also indicated on completion. Recorded for start of second day and subsequent shifts.

(TSL 3.00m) Represents the water rest level at the start of the shift (AM) or the end of the borehole shown with the date of observation.

Field Records

1,2-3,4,5,6 Detailed SPT records for each 75mm test interval (incomplete penetration tests will be recorded showing blows for measured penetration).

[U60] U100 open tube sampler blows to drive the sampler the full length

ROTARY CORE DRILLING RECORDS

Details of the rock fracture state are given in the Mechanical Log portion of the sheet SCR TCR and RQD are described in BS EN ISO 22475-1 (and BS 5930 Section 44.4.4) If is average fracture spacing over a particular lithology, Where the core is fully broken 0 indicates Non-Intact

MONITORING INSTALLATIONS

Standpipe piezometer or groundwater monitoring wells and water level information may be shown on the standard record sheet or a separate installation sheet. Bentonite seals, filter zones and installation depths are indicated. Details of installation are given in the report.

Legend symbols are those given BS5930:1999 (ISO 710-1-7) but for clarity may only the show major constituent.
Strata descriptions are compiled by visual examination of samples obtained during boring, after BS EN 14689-1:2003 and BS EN ISO 14689-1:2003: Geotechnical investigation and testing. Identification and classification of rock. Identification and description. Laboratory test results where applicable.

APPENDIX 2.2 Detailed Results of Standard Penetration Tests

Client: Mr P Hare

Job No.: SRL654

Site Name: Land off Belle Vue, Leek.

Detailed SPT Summary

Borehole Number	Depth m	Test Type	Sample Ref	Sample Description	SPT N Value	Depth to water	Depth of casing at test depth	Increment 1 Blows (mm)		Increment 2 Blows (mm)		Increment 3 Blows (mm)		Increment 4 Blows (mm)		Increment 5 Blows (mm)		Increment 6 Blows (mm)		Reported SPT N Value
BH01	1.00	S	1	Made Ground of dark brown and black slightly clayey sand (topsoil) inclusions of fine-coarse subangular and subrounded gravel	51		1.00	1		0		2		15		16		18		51/285mm
BH01	1.70	S	2	Highly weathered destructed reddish bron fine-coarse SANDSTONE	51		1.00	1		0		2		15		16		18		51/285mm
BH02	1.00	S	1	Made Ground composed of dark brown slightly clayey fine-medium Sand (topsoil) with inclusions of broken brick and cinder some roots. Poacket of orangey brown fine-coarse Sand	4		1.00	1		0		1		1		1		1		4/300mm
BH02	2.00	S	2	Made Ground dark brown slightly clayey fine-medium Sand (topsoil) with inclusions of fine-medium angular gravel of cinder/ash	10		2.00	1		0		1		1		4		4		10/300mm
BH02	2.80	S	3	Nil Recovery	50		2.80	12		13	70	10		10		12		18	50	50/250mm
BH03	1.00	S	1	Made Ground brown slightly clayey fine-medium Sand (topsoil) with inclusions of broken brick and ash/cinder	4		1.00	1		0		1		1		1		1		4/300mm
BH03	2.00	S	2	Brown fine-medium SAND some rootlets	27		2.00	1		1		2		4		6		15		27/300mm
BH03	2.60	S	3	Nil Recovery	50		2.60	9		16		28		22	20					50/95mm

Note: See Appendix sheet in the main report for the explanation of the SPT N Value.

APPENDIX 2.3 Hand Excavated Pits

Location	Depth from to	Stratum Description
HD01	GL-0.10m	Paving slab over Concrete
	0.10-0.50m	Made Ground of Black / dark brown fine-medium Sand some fine gravel brick fragments
	0.5-1.20m	Loose brown fine-medium grained Sand are fine-coarse subangular gravel of sandstone with fine rootlets
	1.20-1.40m	Reddish brown fine-medium grained Sand Proved by hand probe to 1.40m Possible weathered Sandstone
HD02	GL-0.10m	Paving slab over Concrete
	0.1-1.0m	Made Ground of brown and dark brown fine-coarse gravel of ash/cinder broken brick broken glass
	1.00-1.65m	Reddish brown fine-medium grained Sand with some rootlets Proved by hand probe to 1.65m Possible weathered Sandstone
HD03	GL-0.10m	Paving slab over Concrete
	0.1-0.20m	Made Ground of broken brick and broken paving with roots in a dark brown sand matrix. Inclusions of ash/cinder and some plastic pieces.
	0.2-0.6m	Made Ground of dark brown fine-medium sand with inclusions of broken brick. Some rootlets
	0.6-1.40m	Made Ground of reddish brown fine-coarse Sand with inclusions of broken brick
	1.4-1.60m	Reddish brown fine-medium Sand. Sparse fine-medium gravel of sandstone Proved by hand probe to 1.60m Possible weathered Sandstone

APPENDIX 3 LABORATORY TEST RESULTS

APPENDIX 3.1 Summary of Test Results

Client: Paul Hare

Job No.: SRL654

Site Name: Belle Vue Road Leek

Date 04/07/2017

Laboratory Test Result Summary

B.S.1377:1990:part 3

					Chemical				
Location Number	Sample Type No.	Sample Depth Top m	Sample Depth Bottom m	Description	pH	SO_4 % Total	SO_4 mg/l 2:1 Extract	SO_4 mg/l in Water	Cl_2 %
WS01	D1	1.00	1.10	Black brown fine-medium sandy TOPSOIL	6.4		16.46		
WS02	D1	1.00	1.10	Black brown fine-medium sandy TOPSOIL	6.2		8.23		

APPENDIX 3.2 Chemical Contamination Tests

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

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Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 665468-1

Date of Report: 12-Jul-2017

Customer: Strata Renewables Ltd
Jodrell Bank Service Station
Knutsford
Cranage
Cheshire
CW4 8HU.

Customer Contact: Mr Carl Forster

Customer Job Reference: SRL654
Customer Purchase Order: Carl-3617
Customer Site Reference: Belle Vue Road, Leek
Date Job Received at Concept: 03-Jul-2017
Date Analysis Started: 04-Jul-2017
Date Analysis Completed: 12-Jul-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

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

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept SOPs

All results have been reviewed in accordance with Section 25 of the Concept, Analytical Quality Quality Manual

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :
Stefan Kondziela
Project Manager

Issued by :
Stefan Kondziela
Project Manager

Concept Reference: 665468
Project Site: Belle Vue Road, Leek
Customer Reference: SRL654

Soil Analysed as Soil
MCERTS Preparation

Concept Reference	**665468 001**	**665468 002**
Customer Sample Reference	**WS01**	**WS03**
Bottom Depth	**0.50**	**1.00**
Date Sampled	**30-JUN-2017**	**30-JUN-2017**
Matrix Class	**Topsoil**	**Sandy Soil**

Determinand	Method	Test Sample	LOD	Units		
Moisture @105C	T162	AR	0.1	%	**19**	**13**
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1

Concept Reference: 665468
Project Site: Belle Vue Road, Leek
Customer Reference: SRL654

Soil Analysed as Soil
Inorganics

Concept Reference	**665468 001**	**665468 002**
Customer Sample Reference	**WS01**	**WS03**
Bottom Depth	**0.50**	**1.00**
Date Sampled	**30-JUN-2017**	**30-JUN-2017**
Matrix Class	**Topsoil**	**Sandy Soil**

Determinand	Method	Test Sample	LOD	Units		
Arsenic	T6	M40	2	mg/kg	**21**	**23**
Barium	T6	A40	1	mg/kg	**240**	**340**
Beryllium	T6	A40	2	mg/kg	<2	<2
Cadmium	T6	M40	1	mg/kg	<1	<1
Boron (water-soluble)	T6	AR	1	mg/kg	<1	<1
Chromium	T6	M40	1	mg/kg	**15**	**17**
Chromium (hexavalent)	T6	AR	0.1	mg/kg	<0.1	<0.1
Copper	T6	M40	1	mg/kg	**62**	**140**
Lead	T6	M40	1	mg/kg	**270**	**360**
Mercury	T6	M40	1	mg/kg	**2**	**1**
Nickel	T6	M40	1	mg/kg	**25**	**25**
Selenium	T6	M40	3	mg/kg	<3	<3
Vanadium	T6	M40	1	mg/kg	**23**	**26**
Zinc	T6	M40	1	mg/kg	**400**	**290**
Cyanide(Total)	T921	AR	1	mg/kg	<1	<1
Phenols(Mono)	T921	AR	1	mg/kg	<1	<1
SO4(Total)	T102	M40	0.02	%	**0.09**	**0.18**
Sulphide	T4	AR	10	mg/kg	<10	<10
Organic Matter	T2	A40	0.1	%	**14.5**	**15.3**
pH	T7	AR			**7.5**	**7.4**

Concept Reference: 665468
Project Site: Belle Vue Road, Leek
Customer Reference: SRL654

Soil Analysed as Soil
Strata Suite 6 - Asbestos ID

Concept Reference	**665468 001**	**665468 002**
Customer Sample Reference	**WS01**	**WS03**
Bottom Depth	**0.50**	**1.00**
Date Sampled	**30-JUN-2017**	**30-JUN-2017**
Matrix Class	**Topsoil**	**Sandy Soil**

Determinand	Method	Test Sample	LOD	Units		
Asbestos ID	T27	AR			N.D.	N.D.

Concept Reference: 665468
Project Site: Belle Vue Road, Leek
Customer Reference: SRL654

Soil Analysed as Soil
PAH US EPA 16 (B and K split)

				Concept Reference	**665468 001**	**665468 002**
				Customer Sample Reference	**WS01**	**WS03**
				Bottom Depth	**0.50**	**1.00**
				Date Sampled	**30-JUN-2017**	**30-JUN-2017**
				Matrix Class	**Topsoil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Naphthalene	T207	M105	0.1	mg/kg	(9) <1.0	**0.5**
Acenaphthylene	T207	M105	0.1	mg/kg	(9) <1.0	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	(9) <1.0	**0.1**
Fluorene	T207	M105	0.1	mg/kg	(9) <1.0	**0.1**
Phenanthrene	T207	M105	0.1	mg/kg	**1.3**	**1.1**
Anthracene	T207	M105	0.1	mg/kg	(9) <1.0	**0.3**
Fluoranthene	T207	M105	0.1	mg/kg	**3.3**	**1.6**
Pyrene	T207	M105	0.1	mg/kg	**3.0**	**1.4**
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	**1.5**	**1.1**
Chrysene	T207	M105	0.1	mg/kg	**1.7**	**1.1**
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	**1.4**	**1.5**
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	**1.6**	**1.1**
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	**1.5**	**1.5**
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	(9) <1.0	**1.0**
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	(9) <1.0	**0.5**
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	(9) <1.0	**0.9**
PAH(total)	T207	M105	0.1	mg/kg	**15**	**14**

Concept Reference: 665468
Project Site: Belle Vue Road, Leek
Customer Reference: SRL654

Soil Analysed as Soil
Strata Suite 2 - TPH CWG Inc BTEX - Soils

				Concept Reference	**665468 001**	**665468 002**
				Customer Sample Reference	**WS01**	**WS03**
				Bottom Depth	**0.50**	**1.00**
				Date Sampled	**30-JUN-2017**	**30-JUN-2017**
				Matrix Class	**Topsoil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Benzene	T209	M105	10	µg/kg	(13) <10	(13) <10
Toluene	T209	M105	10	µg/kg	<10	<10
EthylBenzene	T209	M105	10	µg/kg	<10	<10
M/P Xylene	T209	M105	10	µg/kg	<10	<10
O Xylene	T209	M105	10	µg/kg	<10	<10
TPH (C5-C6 aliphatic)	T209	M105	0.100	mg/kg	<0.100	<0.100
TPH (C6-C8 aliphatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C8-C10 aliphatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C10-C12 aliphatic)	T909	M105	1	mg/kg	(13) **1**	(13) **2**
TPH (C12-C16 aliphatic)	T909	M105	1	mg/kg	(13) **3**	(13) **3**
TPH (C16-C21 aliphatic)	T909	M105	1	mg/kg	(13) **2**	(13) **3**
TPH (C21-C35 aliphatic)	T909	M105	2	mg/kg	(13) **8**	(13) **98**
TPH (C6-C7 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C7-C8 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C8-C10 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C10-C12 aromatic)	T909	M105	2	mg/kg	(13) **4**	(13) **3**
TPH (C12-C16 aromatic)	T909	M105	1	mg/kg	(13) **10**	(13) **8**
TPH (C16-C21 aromatic)	T909	M105	1	mg/kg	(13) **20**	(13) **15**
TPH (C21-C35 aromatic)	T909	M105	1	mg/kg	(13) **60**	(13) **54**

Index to symbols used in 665468-1

Value	Description
AR	As Received
A40	Assisted dried < 40C
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
N.D.	Not Detected
13	Results have been blank corrected.
9	LOD raised due to dilution of sample
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos was subcontracted to REC Asbestos.

Method Index

Value	Description
T6	ICP/OES
T102	ICP/OES (HCl extract)
T209	GC/MS (Head Space)(MCERTS)
T921	Colorimetry (CF) (MCERT)
T4	Colorimetry
T162	Grav (1 Dec) (105 C)
T2	Grav
T7	Probe
T207	GC/MS (MCERTS)
T27	PLM
T909	GCxGC

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Asbestos ID	T27	AR			SU	001-002
Moisture @105C	T162	AR	0.1	%	N	001-002
Retained on 10mm sieve	T2	M40	0.1	%	N	001-002
Arsenic	T6	M40	2	mg/kg	M	001-002
Barium	T6	A40	1	mg/kg	U	001-002
Beryllium	T6	A40	2	mg/kg	U	001-002
Cadmium	T6	M40	1	mg/kg	M	001-002
Boron (water-soluble)	T6	AR	1	mg/kg	N	001-002
Chromium	T6	M40	1	mg/kg	M	001-002
Chromium (hexavalent)	T6	AR	0.1	mg/kg	N	001-002
Copper	T6	M40	1	mg/kg	M	001-002
Lead	T6	M40	1	mg/kg	M	001-002
Mercury	T6	M40	1	mg/kg	M	001-002
Nickel	T6	M40	1	mg/kg	M	001-002
Selenium	T6	M40	3	mg/kg	M	001-002
Vanadium	T6	M40	1	mg/kg	M	001-002
Zinc	T6	M40	1	mg/kg	M	001-002
Cyanide(Total)	T921	AR	1	mg/kg	M	001-002
Phenols(Mono)	T921	AR	1	mg/kg	M	001-002
SO4(Total)	T102	M40	0.02	%	M	001-002
Sulphide	T4	AR	10	mg/kg	N	001-002
Organic Matter	T2	A40	0.1	%	N	001-002
pH	T7	AR			M	001-002
Naphthalene	T207	M105	0.1	mg/kg	M	001-002
Acenaphthylene	T207	M105	0.1	mg/kg	U	001-002
Acenaphthene	T207	M105	0.1	mg/kg	M	001-002
Fluorene	T207	M105	0.1	mg/kg	M	001-002
Phenanthrene	T207	M105	0.1	mg/kg	M	001-002
Anthracene	T207	M105	0.1	mg/kg	U	001-002
Fluoranthene	T207	M105	0.1	mg/kg	M	001-002

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Pyrene	T207	M105	0.1	mg/kg	M	001-002
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	001-002
Chrysene	T207	M105	0.1	mg/kg	M	001-002
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	M	001-002
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	M	001-002
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	001-002
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	001-002
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	M	001-002
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	001-002
PAH(total)	T207	M105	0.1	mg/kg	U	001-002
Benzene	T209	M105	10	µg/kg	M	001-002
Toluene	T209	M105	10	µg/kg	M	001-002
EthylBenzene	T209	M105	10	µg/kg	M	001-002
M/P Xylene	T209	M105	10	µg/kg	M	001-002
O Xylene	T209	M105	10	µg/kg	M	001-002
TPH (C5-C6 aliphatic)	T209	M105	0.100	mg/kg	N	001-002
TPH (C6-C8 aliphatic)	T209	M105	0.10	mg/kg	N	001-002
TPH (C8-C10 aliphatic)	T209	M105	0.10	mg/kg	N	001-002
TPH (C10-C12 aliphatic)	T909	M105	1	mg/kg	M	001-002
TPH (C12-C16 aliphatic)	T909	M105	1	mg/kg	M	001-002
TPH (C16-C21 aliphatic)	T909	M105	1	mg/kg	M	001-002
TPH (C21-C35 aliphatic)	T909	M105	2	mg/kg	M	001-002
TPH (C6-C7 aromatic)	T209	M105	0.10	mg/kg	N	001-002
TPH (C7-C8 aromatic)	T209	M105	0.10	mg/kg	N	001-002
TPH (C8-C10 aromatic)	T209	M105	0.10	mg/kg	N	001-002
TPH (C10-C12 aromatic)	T909	M105	2	mg/kg	M	001-002
TPH (C12-C16 aromatic)	T909	M105	1	mg/kg	M	001-002
TPH (C16-C21 aromatic)	T909	M105	1	mg/kg	M	001-002
TPH (C21-C35 aromatic)	T909	M105	1	mg/kg	M	001-002

APPENDIX 4 BOREHOLE LOCATION PLAN

Job No. SRL654



APPENDIX 5 SITE LOCATION PLAN

