LAND AT WHITES BAKERY LIMITED
CHARLES STREET
WORSBOROUGH BRIDGE
BARNSLEY
SOUTH YORKSHIRE

PHASE 2 REPORT ON
GROUND INVESTIGATION

Prepared by

SILKSTONE ENVIRONMENTAL LTD

For

LONGDEN DESIGN

OCTOBER 2014

14201

Silkstone
Environmental Ltd
www.silkstoneenvironmental.co.uk
Geotechnical, Mineral, Waste Management & Environmental Consultancy for Industry

7 Hall Annex,
Thorncliffe Park,
Chapeltown,
Sheffield.
S35 2PH.
Tel: 0114 2573487
Fax: 0114 2573459
www.silkstoneenvironmental.co.uk

DOCUMENT ISSUE RECORD

Contract No:	14201
Client:	Longden Design
Contract:	Whites Bakery Development, Worsborough, Barnsley, S35 2PH.
Document:	Phase 2 Report on Ground Investigation

Prepared By;

C. Evans
BSc (Hons) MSc CGeol FGS
Engineering Geologist
Silkstone Environmental Ltd.

Appraised by;

T. CLIFFORD
B.Eng (Hons)
Senior Geotechnical Engineer
Silkstone Environmental Ltd

Certified by;

M.A. BARRETT
B.Sc. (Hons) MSc CEng
Managing Director
Silkstone Environmental Ltd

REVISION RECORD

Revision	Date	Description	Prepared by
0	23/10/14	Phase 2 Report on Ground Investigation	CE

EXECUTIVE (Non-Technical) SUMMARY

Silkstone Environmental Ltd, (SEL) have carried out this investigation on the instructions of Longden Design. This investigation has been undertaken to confirm the findings of the Phase 1 Preliminary Risk Assessment (Desk Study) report prepared by Hannah Reed and Associates Ltd in May 2011 that should be read alongside this latest report.

Following the desk study the purpose of the work was to investigate ground conditions, provide information for the design of foundations for a proposed residential development and to assess the contamination status of the site. The work included an intrusive investigation, laboratory testing and the preparation of this report.

The site is Whites Bakery, located off Park Road, Barnsley, South Yorkshire, approximately 3 km southeast of Barnsley town centre. The majority of the site is occupied by the Whites Bakery that is situated in the south east part of the site. A row of smaller outbuildings exists at the northeast corner of the site and were accessed behind a retaining wall at the sites northeast entrance.

The remainder of the site comprised hard standing of tarmac or concrete with bushes and vegetation situated on higher unused land to the west of the central car park. The unused land was uneven and contained a number of raised areas with extensive overgrowth.

A lower grassed area follows the course of Snape Sike which runs along the south boundary of the site.

The fieldwork was carried out between 30 September and 1 October 2014 and comprised thirteen window sample boreholes. Geotechnical and contamination testing was carried out on samples as scheduled by SEL.

The geology was generally found to comprise a descending sequence of made ground above sandy gravelly clay of completely weathered mudstone and sandstone. This graded to competent rock within all of the window sample boreholes that penetrated to between 1.9m and 4.8m below current ground levels.

A shallow poor quality coal seam was encountered in three window sample boreholes at the north of the site below thicknesses of superficial weathered rock. The seam was penetrated below window sample borehole WS07 where it was interpreted as 0.60m thick, however locally it could be encountered in thicknesses exceeding of 1.0m.

Shallow excavations for earthworks and service trenches should be straightforward for standard plant. Hydraulic breaking plant will be required to remove the surface material in places and any relic foundations that remain after demolition of the existing structure. Observations should be made of the relic foundations below the principal building at the southeast corner of the site, as a minor occurrence of asbestos fibres was identified here.

We anticipate potential groundwater ingress into shallow excavations on lower ground at the south of the site and it is recommended that the scheduled restructuring of a semi-culverted watercourse at the site should be undertaken before the general site works. Compaction characteristics of the material that is likely to be excavated, provided a maximum dry density of 2.01Mg/m^3 at an optimum moisture content of 11 for a 4.5kg compaction.

It is recommended that foundations be taken down to the underlying competent rock material, encountered at depths of between 0.70 and 1.60m below made ground at the site and corresponding to 0.7m to 3.00m below existing ground levels. Following the interpretation of the likely plasticity behaviour of these soils a minimum foundation depth of 0.90m has been recommended.

At these depths we would recommend an undrained shear strength for design purposes of 50kPa can be achieved and that care should be taken to found at least 1.0m above or preferably below any coal seams encountered at the site.

Based on this, the net allowable bearing capacity for a nominal 0.75m square pad foundation would be 100kPa, and for a strip footing would be 80kPa. It is important to ensure that the foundations are located on similar material across the site / each building. The founding strata should be inspected by a suitably qualified person to ensure its consistency.

We recommend using a CBR value of 1% for the initial pavement design with consideration to the improvement or removal of any soft spots or areas of hard ground that may require to be treated to establish consistency.

The Design Sulphate Class is DS-1 and the ACEC class is AC-1s where consideration has been given to preventing disturbance of the ground within these potentially pyritic soils, however a degree of sulphate resistance should be agreed for some foundation designs.

The vast majority of contaminants fell below their respective guideline value. The exception was a single exceedance of arsenic, which is not deemed to be representative as it was taken in close proximity to a former bonfire at the site.

Site materials also consistently gave hydrocarbon values that would deem it an inert classification within more extensive Waste Acceptance Criteria (WAC) leachate testing. It is considered that such testing would likely prove favourable to site soils which would require retesting before sending to landfill.

Following development, NHBC approval will require a clean cover system to be emplaced below areas of garden only and this will require to be validated. At the time of writing SEL are not aware of the proposed finished site levels involved, but understand that an additional (600mm) clean imported or reused topsoil, will not be too difficult to achieve. The cover thickness should be further validated by survey.

The majority of surface materials at this site have been found to be reusable below areas of garden with respect to contaminant levels, however in addition to any imported materials, these would require further testing, in order to achieve the recognised consistency and the appropriate frequency of contaminant testing.

Asbestos testing was also undertaken on five samples and this presented one occurrence of chrysotile free fibres. These are believed to have resulted from relic structures at the site and a recommendation that care is taken when removing demolished structures from the site. The final environmental risk assessment attributes a Very Low to Low risk to the site.

CONTENTS

TABLES

References:

A. Contaminated Land Report 11 – *Model Procedures for the Management of Land Contamination*. Environment Agency (September 2004).

B. Verification Requirements for Cover Systems; *Technical Guidance for Developers, Landowners and Consultants by Yorkshire and Humberside Pollution Advisory Council* Version 1.2 November 2010

C. Town and Country Planning Act, 1990

D. National Planning Policy Framework

E. BS 5930:1999 *Code of Practice for Site Investigations: including amendment A2* (2010)

F. BS 10175: 2011 *Investigation of potentially contaminated sites: Code of practice.*

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

H. BS EN ISO 14688-1:2004 *Geotechnical investigation and testing – Identification and classification of soil: Part 2: Principles for a classification*

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

J. BS 1377:1990 *Methods of Test for Soils for Civil Engineering Purposes*

K. *Health and Safety in Construction,* HSG150, HSE, 1996

L. NHBC Standards, Chapter 4.2, 2011 *Building Near Trees*

M. BRE Special Digest 1 (SD1) (2005) *Concrete in Aggressive Ground Part 1: Assessing the aggressive chemical environment*. Third Edition

N. Tomlinson, M.J. *Foundation Design and Construction* 6th Edition

1 INTRODUCTION

1.1 Brief

Silkstone Environmental Ltd (SEL) have carried out this investigation on the instructions of Longden Design (LD).

This investigation has been undertaken to confirm the findings of the Phase 1 Preliminary Risk Assessment (Desk Study) report prepared by Hannah Reed and Associates in May 2011 (Ref. D211161) that should be read alongside this latest report.

The purpose of the work was to investigate ground conditions, provide information for the design of foundations for a proposed residential development and to assess the contamination status of the site. A culverted watercourse will also be redirected within the site area. The work included an intrusive investigation, laboratory testing and the preparation of this report.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and laboratory testing results, and it gives recommendations relating to foundation design, pavement design and reuse of soils.

This report was prepared by Silkstone Environmental Limited for the sole and exclusive use of Longden Design in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

1.2 Legislative and Regulatory Context

This report has been produced in line with relevant guidance and best practice.

The ground investigation has been carried out in general accordance with the recommendations of BS5930: 1999 Code of Practice for Site Investigations and BS10175 Investigation of Potentially Contaminated Sites: Code of Practice (2011).

If land proposed to be developed is suspected to be contaminated either historically or by its current use, an investigation may be requested by the Local Authority under the Town and Country Planning Act (1990) and the National Planning Policy Framework (NPPF) to determine the level of risk and extent of remediation that is necessary. Under the stated regime, investigations were carried out to establish current ground conditions to determine if the site is suitable for its proposed development.

The contaminated land Risk Assessment has been carried out using the guidance and information provided in the Atkins 'ATRISK Soils' system, to which SEL subscribe. The 'ATRISK Soils' system provides Soil Screening Values (SSVs) applicable to the UK for common contaminants, where detected values are at or below the SSV for any given situation then it is reasonable to assume that there is little or no risk to human health. The system is regularly updated by Atkins to take account of developments in regulation, guidance and good practice (principally the Environment Agency's Contaminated Land Exposure Assessment (CLEA) model), and is used by many regulatory and commercial organizations.

1.3 Guidance and Information Sources Used Within This Report

This report has been produced in line with relevant guidance and best practice, and in particular Ref. A.

2 PHASE 2 (GROUND INVESTIGATION)

2.1 Objectives of Phase 2 Intrusive Investigation

The objectives of the Phase 2 Investigation were as follows:

- To confirm the findings of the Phase 1 Report by identifying the potential sources of contamination and likely pathways for contamination to reach the receptors.
- To characterise the site and develop the conceptual site model and environmental risk assessment.
- To make recommendations for any remediation or further work.
- To provide information to assist the design of foundations and highways with basic recommendations.

2.2 Site Location

The site is Whites Bakery, located off Park Road, Barnsley, South Yorkshire, approximately 3 kilometre (km) southeast of Barnsley town centre, as shown on the Site Location Plan in Appendix A. The site centre is National Grid Reference (NGR) 435368, 403847.

2.3 Historical Land-Use

The historical records for the site are summarised by the desk study report as follows, *"the current site structures look to have existed since the early 1960's. The site was initially surrounded by open farm land, with a few small buildings located in the proximity of the current entrance to the site. Smaller buildings have existed on the site since the early part of the twentieth century at approximately the same location as the current buildings, at which time an adjacent housing estate was developed with allotments. The local area this has slowly been advanced to include railways, steelworks, schools, churches, factories and housing estates.*

A watercourse named "Snape Sike" is initially indicated as originating at Ward Green Cross Roads. This follows a south easterly route across the south of the site. After 1966 this watercourse is no longer indicated crossing the site and it is understood to have been culverted at or before this date".

2.4 Site Description

The original site walkover was undertaken by others on 17 May 2011, subsequently the site was revisited as part of the Phase 2 investigation in September / October 2014.

The majority of the site is occupied by the Whites Bakery, which occupies the south east part of the site, while the remainder comprises hard standing of tarmac or concrete with an unused area of bushes and vegetation to the west of a central car park. A number of uneven soil areas exist within the area of vegetation. These were not previously described within the context of the original desk study.

The watercourse named Snape Sike was clearly identified at the south of the site and window sample boreholes WS09, 10, 11, 12 and 13 were located along it. The site was predominantly level at the centre, but had clearly been formed within ground that would have risen northwards by several metres across the site.

A row of smaller outbuildings exists at the northeast corner of the site and were accessed behind a retaining wall at the sites northeast entrance. A second retaining wall existed at the north of the site, between the access road and the principal bakery building on its south side. Window sample borehole WS01 was placed behind the highest wall in order to interpret the material behind it. This was found to be made ground to a depth of 1.30m above stiff clay which graded to competent rock at approximately 2.30m. Window sampling above the area of the access roadway was not possible as the access was in constant use.

Land to the north of the site had clearly been engineered at a steep angle corresponding to the reformed levels of the site and this was held in place by a series of stone filled gabions.

2.5 Additional Features

During the Phase 2 investigation a localised area of soft ground was encountered below window sample borehole WS10. This was in association with a faint sulphurous smell. It was reasoned that this may relate to a previously unidentified area of drainage from the car park. A sample was taken here at 0.30m, however the loss of sample between 1.00m and 1.90m prevented an accurate definition of made ground depth in this area. Following laboratory testing no significant contaminants were identified at this location.

2.6 Elevated Ground at West of the Site

Due to the comparatively uneven and overgrown ground in the west of the site the window sampling access was restricted, however window sample WS05 and WS13 were specifically located alongside local elevations and minor soil piles within this area.

It seems likely that made ground here has resulted from site restructuring and it is therefore considered highly unlikely that localised soil piles represent material that differs significantly from that which has been investigated. Never the less these should be carefully screened during site clearance.

2.7 Geology

Information relating to the geology of the site was provided by various sources and is summarised in the table below.

Table 1:Geological summary

Maps / Publications Referenced	The Geological Survey Map of England and Wales, Sheet 87, Barnsley, Solid and Drift, 1:50,000 scale. The British Geological Survey (BGS) Geoindex Website.
Drift Geology	None shown.
Made Ground	No recorded. Made ground exists for the site in variable thicknesses in addition numerous drains. A known culvert crosses the site.
Solid Geology	The Kent's Rock and Pennine Middle Coal Measures Formation of Sandstone, Mudstone and Siltstone from the Upper Carboniferous period.
Dip of Solid Strata	Faults local to the site are down thrown in a Southeast direction
Faults	The local area is heavily faulted typically in association with near surface coal seams.
Ground Stability	Compressible ground may result where unconsolidated clays and or organic material exists at the site.
Coal Seams	A Coal Mining Report previously obtained for the site indicates that there are 8 coal seams within 70m to 400m depth below the site. The conclusions within, Hannah Reed Report number D211162 of May 2011 states that, "Past coal mining is unlikely to present an issue to the development." It should be noted that this investigation has identified a significant thickness of coal within foundation depths.

3 FIELDWORK

3.1 Scope of Site Investigation

The fieldwork was carried out between 30 September and 1 October 2014 and comprised thirteen window sample boreholes, as shown on the Exploratory Hole Location Plan at Appendix A.

The positions were selected and set out by SEL in agreement with the current site operatives, and where necessary adjusted to take account of buried or overhead services, or other restrictions.

The rationale behind the positioning of the holes is given in the table below.

Table 2:Exploratory Hole Rationale

Hole ID	Position	Rationale for Hole Position
WS1	N E Corner	To define material behind retaining wall in the NE of the site.
WS2	On grass N of access roadway	General site coverage and potential material below existing roadway.
WS3	Within tarmac at the loading bay of the bakery.	General site coverage and material below the tarmacked area.
WS4	Base of ramp up to soil at the west of the site.	General site coverage and material below the tarmacked area.
WS5	Furthest penetrable part west of the site within thick overgrowth and on uneven ground.	General site coverage, to consider soil piles at the site and potential new access roadway.
WS6	East side of recent housing just outside of the north west part of the site.	General site coverage, to consider made ground at the site and potential new buildings below this part of the site.
WS7	Middle of the north part of the site above the ramp up to soil in the west of the site.	General site coverage, to consider made ground at the site and potential new buildings below this part of the site.
WS8	Mid way along the east boundary of the site.	General site coverage, to measure concrete thickness in this area and record sub base type.
WS9	SE corner of the site between Snape Sike and bakery building.	General site coverage, to examine potential made ground below the largest building structure and to provide information to any development at the site watercourse.
WS10	Behind loading bay of the bakery.	To profile and sample made ground in this area.
WS11	At the south of the site along Snape Sike.	General site coverage and to provide information to any development at the site watercourse
WS12	SW along Snape Sike	General site coverage and to provide information to any development at the site watercourse
WS13	SW of WS12 along Snape Sike	Located next to a soil mound for general site coverage and to provide information to any development at the site watercourse.

3.2 Site Investigation Methodology

The site investigation was supervised by a suitably qualified SEL Engineer.

The exploratory holes were logged by an Engineer in general accordance with the recommendations of BS5930: 1999 (2010 Amendment 2, which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1). All exploratory hole logs are presented in Appendix B.

Prior to intrusive investigation a services scan was carried out using a Cable Avoidance Tool (CAT) by a suitably trained and qualified person.

Positions located on concrete were cored prior to window sampling.

The window sample exploratory holes were drilled using an Archway Competitor tracked rig which uses a chain driven drop weight to drive the sample tubes. Steel sample tubes containing a plastic sample liner were used.

Small disturbed and bulk soil samples were subsampled from the window samples at regular intervals.

Standard Penetration Tests (SPT) were carried out at regular intervals in the window sample holes.

Contamination samples were recovered from all holes. Material was extracted and placed in appropriate (glass and plastic) sealed containers. These containers were labelled and placed in cool boxes, where they were kept until despatch to appropriately accredited laboratories for testing.

On completion, all exploratory holes were backfilled with arisings and bentonite pellets. Where applicable the concrete cores were replaced and sealed, the holes located on tarmac were also reinstated.

4 LABORATORY TESTING

Samples for potential geotechnical testing were transported to a geotechnical testing laboratory and those for potential contamination testing were sent to an accredited chemical testing laboratory.

Geotechnical and contamination tests were scheduled by SEL.

4.1 Geotechnical Analysis

Geotechnical laboratory testing was generally carried out in accordance with BS1377: 1990, *Methods of Test for Soils for Civil Engineering Purposes*, unless indicated otherwise. The results are reported in tabular and/or graphical form and included as Appendix C of this report.

The table below summarises the plasticity testing carried out.

Table 3:Geotechnical Laboratory Testing Summary

Test	Units	No of Tests	Results		Comment
			Min	Max	
Moisture content	%	5	17	27	-
Liquid Limit	%	5	37	55	High or Intermediate Plasticity.
Plastic Limit	%	5	19	25	
Plasticity Index	%	5	18	30	
% Passing 0.425mm sieve	%	5	82	96	-

One sample from window sample borehole WS13, that was believed to be representative of natural clay materials which may require to be excavated from site and compacted, was also tested for its compaction characteristics.

The sample had an initial moisture content of 17% and an assumed particle density of 2.70Mg/m^3. After compaction to the appropriate BS1377 standard, this recorded a maximum dry density of 2.01Mg/m^3, corresponding to an optimum moisture 11% at a compaction of 4.5Kg.

4.2 Contamination Analysis

Contamination testing was carried out in accordance with MCERTs/UKAS standards. The results are reported in Appendix C of this report. Eight soil samples were tested for the following suite of contaminants:

Arsenic, cadmium, chromium (total), lead, mercury, selenium, copper, nickel, zinc, speciated polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (banded EPH), organic matter, soluble sulphate and pH. Five samples were also tested for the presence of asbestos.

5 GROUND CONDITIONS

5.1 General

The exploratory holes were logged by an Engineer and the ground conditions encountered are detailed on the logs contained in Appendix B and are summarised below.

The geology was generally found to comprise a descending sequence of made ground above sandy gravelly clay of completely weathered bedrock materials.

5.2 Made Ground

Made ground in the majority of the site comprised more than two layers, the upper layers comprising tarmac, concrete, topsoil, slightly gravelly sand and clayey gravel of limestone or concrete. These are discussed below.

5.2.1 Tarmac

Tarmac was only encountered below window sample borehole WS03 where it was 0.03m in thickness above a mixed gravel of loose tarmac ash and concrete to a total thickness of 0.20m.

5.2.2 Concrete

Concrete was only penetrated by window sample borehole WS08 which was relocated from an original position at the corner of the existing buildings. At this first location it was thicker than could be penetrated by the coring machines and consequently deemed thicker than 500mm. The second core located approximately 6m north of the first position penetrated the concrete at 0.14m below which was a light grey limestone gravel.

5.2.3 Topsoil

Topsoil was encountered below window sample borehole WS04, 06, 07, 10, 11 and 12 in thicknesses of between 0.05m in window sample borehole WS10 to 0.40m in WS07. Typically this was grass covered and was sandy clay or very clayey sand in nature with roots. In WS07 only, this stratum was in association with rare fine to coarse sub angular gravel of brick or concrete.

5.2.4 Slightly gravelly sand with occasional cobbles

Slightly gravelly sand with occasional cobbles was encountered below window sample boreholes WS01 and WS02 from ground level to a depths of 0.60m and 0.30m respectively. This was in association with fibrous roots and the non-cohesive constituents comprised remnant building waste such as brick and concrete.

5.2.5 Clayey gravel of limestone or concrete

Clayey gravel of limestone or concrete was encountered in window sample boreholes WS02, 03, 04 and 08. In thicknesses of between 0.20 in WS02 where it overlay natural ground and 1.10 in WS09, where it comprised compacted ground below existing light buildings.

5.2.6 Lower Made Ground

Lower made ground and that associated with the soils at the west of the study site, typically comprised sandy gravelly clay or sandy gravel and cobbles, in which the non-cohesive constituents comprised remnant building waste, such as brick, concrete, sandstone, mudstone, glass, slag or coal. This strata was locally associated with thin layers of ash, sand and tree roots.

This ground type was described in window sample boreholes WS01, 05, 06, 08, 09, 10, 11, 12 and 13 in thicknesses of between 0.20m in window sample borehole WS08 and 1.90m in window sample borehole WS05.

In all cases, this layer was penetrated to natural ground at depths of between 0.55m in window sample borehole WS11 and 1.90m in window sample boreholes WS05 and WS10. WS05 was located to the west of the site within piles of soil and WS10 recovered only 30% between 1.0m and 1.90m indicating that made ground may be thinner in this location.

5.3 Natural Ground

Natural ground was encountered in all sample locations at depths of between 0.50m and 1.90m, where it comprised a firm or stiff locally soft yellow or grey brown sandy gravelly clay with occasional cobbles of completely weathered bedrock material. Locally the strata was thinly laminated, associated with coal traces or organic lithorelics.

5.4 Coal Seams

A thin dirty coal seam was encountered in window sample boreholes WS01, 02 and 07. This measured approximately 1.0m in thickness in WS01 and 0.60m in WS02 where it was too strong to be penetrated. The strata was penetrated in window sample borehole WS07 where it measured 0.60m in thickness, however in this case it did not grade into coal with lustre which infers that the true seam is only present in the north and eastern part of the site.

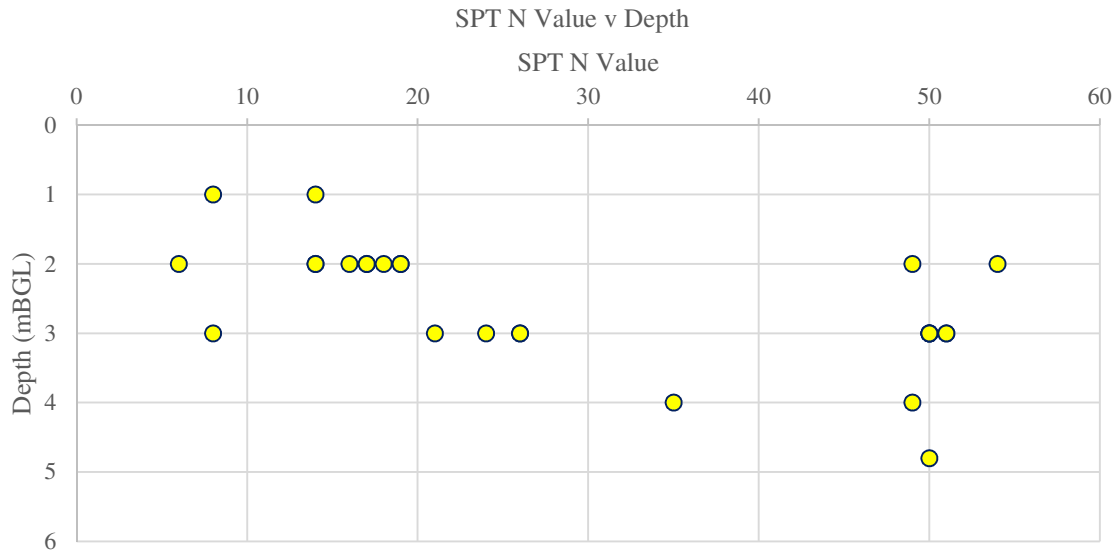
It is not acceptable to form a building foundation directly on to coal due to the elevated risk of combustion and or the potential migration of mine gasses or contaminants. In the event that

coal were to be encountered at the founding depths this would require to be removed or suitably blinded by concrete in accordance with the coal authority's specification. The resulting foundation design will also require inclusion of gas membranes and basic gas protection in order to conform to an NHBC approved design.

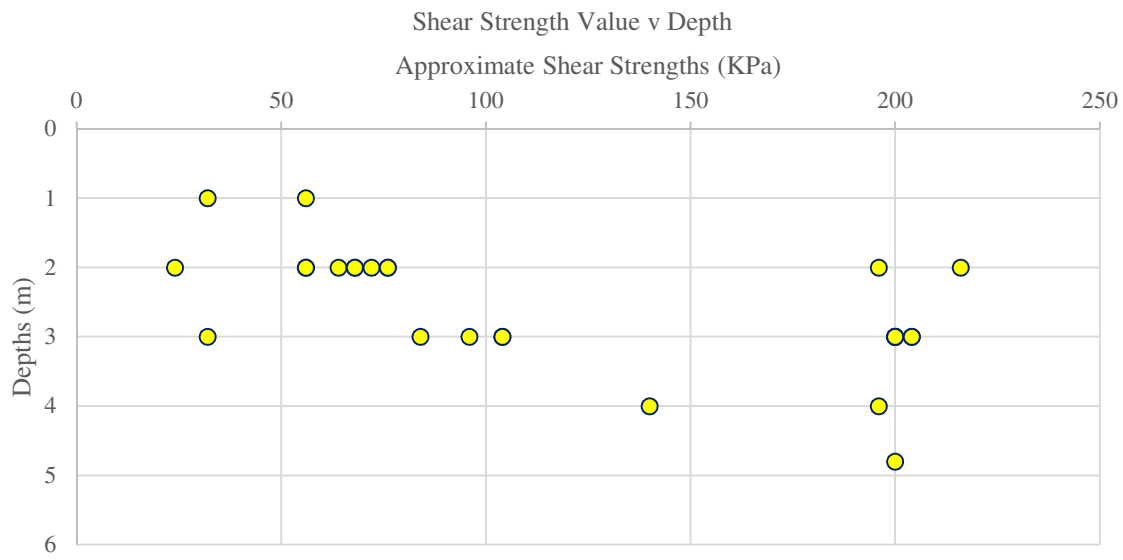
Potential onsite mining risk was addressed by the May 2011 desk study undertaken by Hanna Reed and Associates (Report number D211161). This would have also included a consideration of the Coal Authorities comments upon potential coal gasses. In the unlikely event that during site clearance any strong depressions or suspected mine subsidence has occurred, it will be appropriate to contact the Coal Authority immediately.

5.5 In-situ Testing

Standard Penetration Testing (SPT) was carried out in all of the window sample holes and these have been plotted against depth on the graph below. Made ground is not suitable material for founding upon and these values or those for the first 0.5m of penetration below made ground have not been included.



Using the correlation between PI and SPT N values, presented in Fig 1.4 of Tomlinson (Ref N), we can derive a correlation factor of greater than 4 for the clay materials. Using these we have converted the SPT N values to undrained shear strength and these are plotted on the graph below against depth.



5.6 Indications of Contamination

There were variable thickness of made ground identified across the site, which included some ash based material, however there were generally no significant visual or olfactory signs of contamination.

The exceptions to this was in WS05 and WS10. Window sample borehole WS05 was located on uneven ground at the western part of the site and found to be above 1.90m of dry made ground without odour that comprised predominantly of remnant building waste.

WS10 was located in close proximity to a site watercourse and may have corresponded to a localised area of drainage into it. Here the ground was wet below the surface and contained a slight sulphurous odour.

The resulting borehole was left open on completion and groundwater was found to be 0.90 m from ground level before backfilling. Made ground here was encountered to 1.0m and natural ground from 1.90m depth however loss of core between 1.00m and 2.00m prevented accurate definition of the made ground thickness in this boprehole.

5.7 Groundwater

In most of the window sample holes there was no groundwater encountered. Water strikes were made in boreholes in close proximity to the onsite watercourse and consequently it was deemed appropriate to leave all of these holes open on completion and to measure the depths to water before backfilling.

Table 4:Groundwater Records

Hole ID	Depth to Groundwater on Completion (m)
WS09	1.60
WS10	0.90
WS12	0.90

6 DISCUSSIONS AND RECOMMENDATIONS

6.1 Proposed Development

It is understood that the proposed development is to include residential housing with associated gardens, driveways and access roads.

6.2 Site Preparation

Shallow excavations for earthworks and service trenches should be straightforward for standard plant, hydraulic breaking plant will be required to remove the surface material in places and any relic foundations that remain after demolition of the existing structure.

All excavations should be planned and due consideration given to providing temporary support or suitable battering. Excavations should be regularly inspected by a competent person to ensure continued safety. Further advice on the safety of excavations is given in *Health and Safety in Construction*.

The groundwater level was recorded at 0.90mBGL in WS10 and WS12, at the south of the site corresponding to the edge of an onsite watercourse and the lowest topographical part of the site. As such we would not anticipate significant groundwater ingress into shallow excavations in the majority of the site. Inflows could, however, be greater around periods of heavy rain and the proposed development of culverts for the watercourse should be undertaken as a priority to development.

Localised softening of the formation may be experienced within trenches due to precipitation or where possible perched water seepages are left unchecked. As such the base of excavations should be blinded as soon as practicable after excavation.

6.3 Shrinkage and Swelling

The results for the Plasticity Index (PI) for the clay strata are shown below. These are presented along with the modified PI for the >0.425mm fraction and volume change potentials, according to the NHBC Standards, Chapter 4.2 Building Near Trees.

Table 5:Volume Change Potential Summary

Stratum	Average PI (%)	Modified PI (%)	Volume Change Potential
Weathered mudstone/sandstone	24.0	26.7	Medium

6.4 Foundations

Due to the variable thickness and nature of the made ground across the site is not considered a suitable bearing stratum for foundations. Similarly the near surface clays have been shown to be soft to firm, with material at shallower than 0.70m penetration into natural soils yielding SPT N values of less than 8.

It is therefore recommended that foundations be taken down to the underlying weathered rock head, found to be between 0.70 and 3.00m below existing ground levels. For design purposes an undrained shear strength of 50kPa can be used for clays below these depths.

In consideration of the shrinking and or swelling potential of these soils a minimum depth of founding should be 0.90m below final ground levels, although where there is thicker made ground these will be deeper anyway.

Following the guidance from NHBC Standards, Chapter 4.2 Building Near Trees, these depths may require to be increased where potential root growth can be interpreted as capable of influencing the design. A number of trees will remain at the boundaries of the site and tree roots were noted in window sample borehole WS12.

Acceptable bearing for the strata described above would for a nominal 0.75m square pad foundation would be around 100kPa, and for a strip footing would be 80kPa. Calculations of the resulting settlements at these loads have also been carried out by others and yielded settlements of less than 25mm.

It is important to ensure that the foundations are located on similar material across the site / each building. This is particularly important in areas where the made ground or weathering has been shown to be deeper, such as on the higher ground in the west of the site the south east corner around WS10. The founding strata should be inspected by a suitably qualified person to ensure its consistency.

6.5 Floor Slab

It is expected that a suspended floor slab will be used and designed in accordance with NHBC guidelines. This will require to conform to the required gas membrane requirement.

6.6 Soakaway / SUDS Design

No soakaway testing has been undertaken on the site as it is considered that soakaways would not be suitable for the ground conditions encountered.

6.7 Pavement Design

In-situ CBR tests have not been carried out, however anticipated CBR values will fall in the order of 1/25 of the shear strength values recorded for firm or soft clays. Consequently in natural materials at depths of approximately 1.0m from existing ground levels at the site, these can be expected to be between 0.8% and 3.0%.

Based on these results we recommend using a CBR value of 1% for the initial pavement design. After site strip it may be practical to carry out further in-situ testing at formation level. Areas of made ground or softer natural soil will require to be excavated and relayed to prevent either soft spots or localized hard ground from being present below the site roads.

6.8 Protection of Buried Concrete

The site is classed as brownfield and any groundwater is assumed to be static with the recommended foundation depths. Soil pH values were recorded from 6.0 to 11.5, with the characteristic value calculated as 9.4. The water-soluble sulphate results range from 11mg/l to 98mg/l, with a characteristic value of 72mg/l.

These values fall into Design Sulphate Class DS-1 in Table C2 of BRE Special Digest 1 (SD1). The Aggressive Chemical Environment for this Concrete (ACEC) class would be AC-1s.

Because of the potentially pyritic nature of the soils at this site the pyritic suite for Total Potential Sulphate (TPS) and Oxidisable Sulphides (OS) as $\%SO_4$ was also interpreted following BRE SD1. The values for TPS were calculated between 0.03 and 0.15% and all values for OS were below 0.3%. Therefore it is unlikely that pyrite was present in the samples tested.

It should be noted that there may be strata within founding depths which do contain pyrite and it is recommended that further laboratory testing be undertaken during the development, on samples from the foundation trenches.

6.9 Contamination

The initial screening risk assessment has been carried out using the Atkins Atrisk-soils™ system, to which SEL are subscribers. This system comprises a list of Site Specific Values (SSV) for different land uses; the SSV's being values below which there is no significant risk for the stated land use.

Due to copyright restrictions, the complete set of Atkins Atrisk values cannot be published herein, therefore only values applicable to determinants which have exceeded the SSV's are included.

The Atrisk SSV values for "Residential with the consumption of home grown produce with 1% Soil Organic Matter and a sand soil type" have been selected as those judged to most closely match the site conditions.

A conceptual (source-pathway-receptor) model is required for the site in order to establish a risk. In this instance, the model would simply consist of any contamination (the 'source') in the ground passing through a 'pathway' (direct contact, or by plant uptake from a derivative soil) to reach a 'receptor' (human, site operative, resident or visitor). This risk assessment considers the 'source' term initially; where the source term, through screening, is not considered to present a significant risk then further modelling is not required. If the initial screening assessment does not conclude that a significant risk exists at the source term, then further work on this model is not required.

6.10 Interpretation of Results

The vast majority of contaminants fell below their respective guideline value.

The exception was a single exceedance of arsenic corresponding to window sample borehole WS07 located within topsoil material at 0.30m depth. Here an isolated value of 42mg/kg was recorded. This single value is not considered representative in consideration of a guideline value of 32mg/kg, where values across the site fell at or below 13.0 mg/kg and gave a site average below 14.5mg/kg.

Window sample borehole WS07 was located in close proximity to the remains of a bonfire and it is wholly possible that arsenic had been locally concentrated by the process of burning.

6.11 Asbestos

Asbestos testing was also undertaken for five samples. One occurrence of chrysotile free fibres was found at 0.40m below ground level in window sample borehole WS09. This is the most common form of asbestos and commonly associated with relic building materials.

Window sample borehole WS09 was deliberately situated to give an interpretation of the likely ground conditions at or below the foundations of the current principal building on the site. It is considered that the result was most likely derived from relic structures that were demolished and removed from the site prior to the latest construction. The current structures would be subject to an asbestos survey prior to demolition.

When the current structures are demolished, care should be taken to monitor materials from within or below any relic foundation for the presence of localised asbestos, which will require to be removed from site by a specialist contractor.

6.12 Soil Reuse

Minor amounts of topsoil reuse may be salvaged from the site subject to approval by the local authority and warrantee provider.

The regulators will typically require such site processing that will remove any relic building waste, asbestos or unacceptable materials and provide a specific soils range acceptable to guidance such as the British Standard BS: 3882: 2007.

In addition to the required structural soils tests, the won material would typically be retested for contaminants at a frequency of six tests per $100m^3$ as described in Reference B that should be read alongside this report and summarised by Table 8 in Section 7. The screening values from this guidance include asbestos and all of the potential contaminants that have been found to be within acceptable limits by the testing so far.

6.13 Removal of Site Soils

In order to attain the appropriate site levels it may become necessary to remove thicknesses of made ground and superficial soils from the site and to send them to land fill. In this event the made ground constituents would be subject to Waste Acceptance Criteria (WAC) testing. Contractors would require additional WAC testing as a means to classify the appropriate treatment and processing of the material.

No WAC testing has so far been undertaken within this ground investigation, however this material also consistently gave hydrocarbon values that would deem it an inert classification within more extensive WAC leachate testing. Leachability testing often provides a fraction of mobile contaminant in comparison to the total amount present and in this respect also the site soils are likely to also give favourable values.

6.14 Final Conceptual Site Model

As the investigations has shown there to be no significant levels of contaminations the Final Conceptual Site Model (CSM) is summarised in the table below.

Table 6:Final Conceptual Site Model

Potential Pollutant (Source)	Potential Linkage (Pathway)	Receptor
Soils and made ground, including elevated ground, relic foundations and organic soils or near surface coals.	Inhalation of soil gas, vapors or dust.	Construction/ maintenance workers. & Site End-users (residents)
	Ingestion of, and dermal contact with, contaminated soil or dust.	
	Migration of soluble contaminants into groundwater on or off site.	Groundwater

6.15 Final Environmental Risk Assessment

This section aims to expand the CSM to assess the level of risk for each potential pollutant linkage.

Table 7:Final Environmental Risk Assessment

Receptor	Potential Pollutant Linkage	Estimated Degree of Risk to Receptor
Site users	Inhalation of soil gas, vapours or dust.	Low *
	Ingestion of, and dermal contact with, contaminated soil or dust.	Low
Construction/ maintenance workers	Inhalation of soil gas, odours or dust.	Low*
	Ingestion of, and skin contact with, contaminated soil.	Low**
Buildings and Structures	Flow of soil gas vapours into new buildings. Concrete in contact with pyritic soils.	Low *
Groundwater	Migration of soluble contaminants into groundwater on or off site.	Very Low
Surface water	Migration of soluble contaminants and/or direct run-off of contaminants.	Very Low

* Presumed that gas membranes will be incorporated within an NHBC approved foundation design.

** Presumed that basic PPE will be a requirement for all sit operatives.

In this risk assessment, a **Very Low to Low** risk has been applied based on the proposed land use and current condition of the site. This assumes that a clean cover system will be used at the site and that any areas inaccessible during this investigation will be visually inspected before removal or site reuse. It also presumed that basic gas protection methods will be incorporated into the NHBC approved foundation design and that a degree of sulphate resistance will be considered for concrete structures.

7 CONCLUSIONS AND REMEDIATION

Based on a hypothetical sensitive land use (residential with gardens) at the Whites Bakery site in Barnsley, it is considered that there would be a very low to low risk to future site users and workers from contamination where site soils are to be graded for site management where removal or reuse may be considered an option.

7.1 Clean Cover and Validation

Following development NHBC approval will require a clean cover system to be emplaced below areas of garden only and this will require to be validated as follows.

This recommendation is supported by a document named Verification Requirements for Cover Systems; Technical Guidance for Developers, Landowners and Consultants by Yorkshire and Humberside Pollution Advisory Council Version 1.2 November 2010 (Ref B.) that should be read alongside these recommendations.

At the time of writing we are not aware of the finished site levels with respect to the current site layout, but understand that an additional (600mm) of clean reused or imported topsoil will not be too difficult to achieve.

To begin, the site levels in areas of garden and landscaping will require to be reduced to a minimum of 600mm from their finished elevation. By this point in the development any asbestos or suspect material must have been identified and removed from site. The services should have been laid within the appropriate guidance as it is not desired to re-excavate the clean cover system after it has been laid.

Excavation areas below proposed foundation areas may provide further materials that will require removal from site as clean soil. It is considered that where finished buildings will exist above foundations made to the prescribed design and containing the required membranes any pathway to potentially contaminated land or migratory gasses will have been broken. This is also considered to be the case where hard surfacing, engineered roadways or appropriately designed permeable paving has been agreed.

It is recommended that upon completion of the site clearance any surface areas of obvious discoloration, staining or odorous ground is also removed from site if necessary to an appropriate licenced facility. The finished site levels should then be surveyed in order to accurately establish the base depths for the clean cover system. The cover thickness should be further validated by survey.

The majority of surface materials at this site have been found to be reusable below areas of garden. These and imported materials will require to be tested and validated as described below.

The table below is an extract from 'Appendix 1a - Characterisation of Materials Matrix' of Ref B.

Table 8: The Validation Testing Requirements for Materials Brought to Site

Type	Number of Sample	Testing Schedule	Assessment Criteria
Virgin Quarried Material	1-2 depending on type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids	This needs to be agreed with the Local Authority. The assessment criteria needs to be UK based, e.g SGV's LQM or other similarly derived GAC's.
Crushed Hardcore, Stone, Brick	Minimum 1 per 1000m^3	Standard metals/metalloids PAH (speciated) and asbestos. Leachate analysis	
From Greenfield Soils	3 soil tests or 1 per 250m^3 whichever is greater.	Standard metals/metalloids PAH (speciated) and asbestos.	
From Brownfield Soils	6 soil tests or 1 per 100m^3 whichever is greater.	Standard metals/metalloids PAH (speciated), TPH (speciated), asbestos and additional testing as indicated by the donor site history.	

Subject to screening much of the existing soil at the site will be reusable as clean cover material. Where imported, clean cover materials should preferably be tested at source and ideally laid immediately upon arrival. Otherwise they should be suitably quarantined by use of plastic sheeting immediately when brought to site. This is to avoid cross contamination with existing unsuitable site soils.

In preference to a survey it may be deemed acceptable by the local authority, NHBC or other regulators to excavate isolated areas of the finished system, in order to measure and photograph the minimum thicknesses achieved. They would need to agree the number of verification areas per property, plot, landscaped area or garden area (at least 2 per plot is typically recommended).

7.2 Protection of Services

With respect to protecting plastic pipes and services, our advice is that the requirements vary very much between different service providers. In order to mitigate any potential problem there are a number of coverings and mitigation designs available. It is always prudent advice that this would be best to discuss alongside the results of the contaminant testing contained in Appendix C of this report with the appropriate service provider. In order to prevent disturbance to the completed clean cover system it will be a requirement that this work is undertaken before the clean cover system is emplaced at the site.

APPENDIX A

(i) Site Location Plan

(ii) Exploratory Hole Location Plan

Silkstone
Environmental Ltd

www.silkstoneenvironmental.co.uk

7, Hall Annex, Thorncliffe Park, Chapeltown, Sheffield, S35 2PH
Tel (0114) 2573487 Fax (0114) 2573459

Client: Longden Design

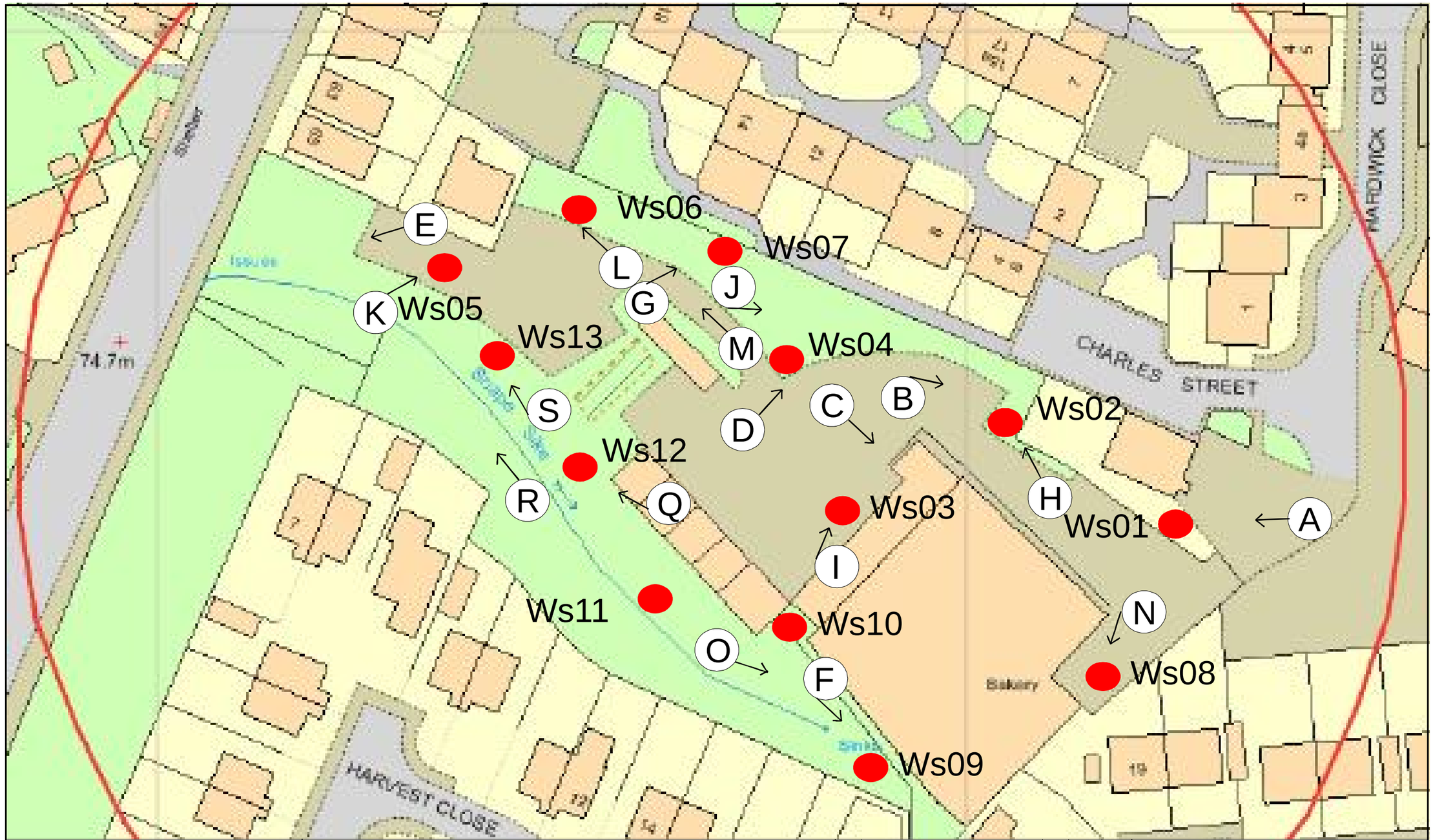
Project: Whites Bakery, Worsbrough, Barnsley

Plan Title: SITE LOCATION PLAN

Drawing No. 14201/101

Date: October 2014

Scale: 1:50,000 @ A4



Silkstone
Environmental Ltd
www.silkstoneenvironmental.co.uk

7, Hall Annex, Thorncliffe Park, Chapeltown, Sheffield, S35 2PH
Tel (0114) 2573487 Fax (0114) 2573459

LEGEND

Ws09 Window sample position

A Photo location and ID

Rev	Description	Date	Drawn	Chkd

Client: LONGDEN DESIGN

Project: WHITE BAKERY
BARNSLEY

Plan Title: EXPLORATORY HOLE LOCATION PLAN

Drawing No. 14201/100 Rev

Date: OCTOBER 2014 Scale: NTS

APPENDIX B

(i) Window Sample Logs

Silkstone
Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS01**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	30-09-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.30	ES					(0.60) 0.60	Made Ground, Yellow brown slightly gravelly sand with occasional cobbles. Gravel is fine to coarse gravel and cobbles angular to subangular and consists of brick and concrete. Strata has fine fibrous roots.		
0.70	ES						Made Ground, Grey brown very sandy gravelly clay. Gravel is fine to coarse angular to subangular and consists of, brick, concrete, metal fragments and ash. Circa 0.90-1.00 One number whole brick.		
1.00		N9				(0.70) 1.30			
1.40	D						Stiff yellow brown sandy gravelly CLAY. Gravel is fine to coarse, angular to subangular and predominantly consist of sandstone.		
2.00		N14				(1.00) 2.30			
2.30-3.00	B						Stiff brown mottled grey sandy CLAY of compleetly weathered mudstone with rare dark organic lithorelics.		
3.00		N51				(1.20) 3.50			
3.70	ES						Extremely weak dark brown / black organic mudstone with coal traces (Dirty Coal) grading to coal with lustre at depth.		
						(0.95) 4.45			

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole Dry
Hole Backfilled with Arrisings

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 9/10/14

Silkstone Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS02**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	30-09-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.20	ES					0.30	Made Ground, Grass above yellow brown slightly gravelly sand. Gravel is fine to coarse subangular and consists of concrete and roots.		
						0.50	Made Ground, Grey sandy fine to coarse gravel of concrete.		
0.80	ES					(0.80)	Stiff yellow brown sandy gravelly CLAY with occasional cobbles of completly weathered sandstone.		
0.85	D								
1.00		N14				1.30			
						(0.60)	Extremely weak dark brown / black organic mudstone with coal traces (Dirty Coal) grading to coal with lustre.		
2.00		N49				1.90			

Hole Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery

From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole Dry
Hole Backfilled with Arrisings

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 7/10/14

Silkstone Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS03**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	30-09-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.20	Made Ground, Tarmac above mixed gravel of loose tarmac, ash and concrete.		
						(0.45) 0.65	Made Ground, Light grey sandy fine to coarse angular gravel of limestone.		
						0.80	Yellow brown slightly clayey sand and gravel of sandstone and mudstone.		
0.90	ES						Stiff yelolow brown sandy gravelly CLAY of compleetly weathered mudstone with occasional organic lithorelics.		
1.00		N21							
1.10-2.00	B								
						(2.20)			
2.00-3.00	B								
2.00		N16							
						3.00			
3.00		N21					Stiff grey brown gravelly clay of completly weathered MUDSTONE. Circa 3.90-4.00 strata is highly organic with coal traces.		
						(1.00)			
						4.00			
4.00		N49/ 240 mm							

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole Dry
Hole Backfilled with Arrisings

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 7/10/14

Silkstone Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS04**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	30-09-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
						0.08	Made Ground, Grass above sandy clay topsoil and rootes.			
						(0.52)	Made Ground, Light grey sandy fine to coarse angular gravel of limestone.			
						0.60	Stiff grey brown sandy very gravelly CLAY of compleetly weathered mudstone with rare fine gravell sized fragments of coal.			
1.00		N18								
2.00		N19				(2.85)				
3.00		N50								
						3.45				

Hole Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery

From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole Dry
Hole Backfilled with Arrisings

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 7/10/14

Silkstone Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS05**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	30-09-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.20-0.80	B						Made Ground Dark brown very sandy gravelly clay and cobbles. Gravel is fine to coarse angular to subangular and consists of brick, sandstone concrete ash and slag. Cobbles angular concrete sandstone or brick.		
0.50	ES								
1.00		N3				(1.90)			
1.20-1.80	B								
						1.90			
2.00		N5					Soft to firm grey brown sandy gravelly clay of compleetly weathered MUDSTONE.		
						(1.60)			
3.00		N8							
						3.50			
							Extremly weak brown mottled grey, highly weathered MUDSTONE.		
4.00		N35				(1.30)			
						4.80			
4.80		N50/ 170 mm							

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole Dry
Hole Backfilled with Arrisings

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 9/10/14

Silkstone
Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS06**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	30-09-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.20	Made Ground Dark brown very clayey sand topsoil and roots.		
0.20	ES						Made Ground Dark brown very sandy gravel and cobbles. Gravel is fine to coarse angular to subangular and consists of brick, sandstone concrete ash and glass. Cobbles angular concrete sandstone or brick.		
0.75	ES					(1.10)			
1.00		N8				1.30			
							Firm to stiff yellow brown sandy gravelly CLAY of completly weathered mudstone. Gravel is fine to coarse subangular and consists of mudstone.		
1.60	D								
2.00		N6				(1.70)			
2.90	D					3.00			
3.00		N50/ 250 mm							

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole Dry
Hole Backfilled with Arrisings

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 9/10/14

Silkstone Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS07**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	30-09-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.30	ES					(0.40) 0.40	Made Ground, Grey brown sandy clay topsoil with roots and rare fine to coarse subangular gravel of brick and concrete.		
0.70	D					(2.10) 2.50	Firm to stiff yellow brown sandy gravelly CLAY. Gravel is fine to coarse subangular and consists of sandstone and mudstone.		
0.80	ES								
1.00		N8							
2.00		N19							
3.00		N51				(0.60) 3.10	Extremely weak dark brown / black organic mudstone with coal traces (Dirty Coal)		
						(0.90) 4.00	Stiff grey brown sandy clay of completley weathered MUDSTONE. (Probable seatearth)		

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole Dry
Hole Backfilled with Arrisings

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 9/10/14

Silkstone
Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS08**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	01-10-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.14	Made Ground: Concrete.		
						0.40	Made Ground: Light grey limestone gravel.		
						0.60	Made Ground Grey brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular and consists of concrete, mudstone and coal traces. Circa 0.90 One number sub-angular brick. Run 1.00-2.00 30% Recovery.		
0.50	ES								
0.80	ES								
0.90	D					(1.00)			
1.00		N4					Soft yellow brown sandy gravelly CLAY. Gravel is fine to coarse subangular and predominantly consists of sandstone.		
						1.60			
						1.85	Stiff dark brown mottled black sandy slightly gravelly organic clay of compleetley weathered MUDSTONE.		
2.00		N14				(1.15)	Stiff dark brown mottled black sandy slightly gravelly clay of compleetley weathered MUDSTONE. Gravel is fine subangular and consists of organic mudstone and rare coal traces.		
2.80	D					3.00			
3.00		N50/ 255 mm							

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole Dry
Hole Backfilled with Arrisings

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 9/10/14

Silkstone Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS09**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	01-10-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.40	ES					(1.10)	Made Ground Light Grey fine to coarse subangular clayey gravel of limestone and concrete. Circa 0.30-0.50 strata is very gravelly clay.		
1.00		N21				1.10			
1.10-1.50	B		1			(0.45)	Made Ground Grey brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular and consists of concrete, sandstone, mudstone. Circa 0.90 One number sub-angular brick. Run 1.00-2.00 30% Recovery.		
						1.55			
						(0.45)	Stiff yellow brown sandy gravelly CLAY with occasional cobbles of completly weathered sandstone.		
2.00		N54				2.00			

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole left open and measured by the end of drilling at 1.60m below current ground level. Hole backfilled with arrisings.

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 7/10/14

Silkstone
Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS10**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	01-10-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA					
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.05	Made Ground, Grass above grey clayey sand topsoil with roots.		
0.30	ES						Made Ground Grey brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular and consists of concrete, sandstone, mudstone. Circa 0.90 One number sub-angular brick. Run 1.00-2.00 30% Recovery.		
1.00		N4	1			(1.85)			
						1.90			
1.90	D						Firm grey mottled brown sandy CLAY with occasional fine organic lithorelics.		
2.00		N23				(0.55)			
						2.45			
						2.75	Grey brown clayey gravel and cobbles of iron rich MUDSTONE.		
						3.00	Extreamly weak thinley laminated brown ironstained highly weathered MUDSTONE.		
3.00		N50/ 235 mm							

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole left open and measured by the end of drilling at 0.90m below current ground level. Hole backfilled with arrisings.

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 7/10/14

Silkstone Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS11**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	01-10-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.08	Made Ground, Grass above grey clayey sand topsoil with roots.		
0.30	ES					(0.47) 0.55	Made Ground Grey brown sandy gravelly clay. Gravel is fine to coarse angular to sub-angular and consists of concrete, sandstone, glass and brick fragments. Strata contains fine fibrous roots.		
						0.75	Dark brown slightly gravelly SILT. Gravel is coarse subangular and consists of iron rick mudstone.		
0.90	D					1.00			
1.00	ES						Stiff yellow brown sandy gravelly CLAY. Gravel is fine to coarse subangular and predominantly consists of sandstone.		
1.00		N8							
1.20-1.80	B					(0.90)	Soft to firm yellow brown sandy gravelly CLAY. Gravel is fine to coarse subangular and predominantly consists of sandstone.		
						1.90			
2.00		N17				(0.85)	Stiff dark brown mottled black sandy slightly gravelly clay of compleetley weathered MUDSTONE. Gravel is fine subangular and consists of organic mudstone ans rare coal traces.		
						2.75			
						3.00	Extremley weak thinley laminated grey brown highly weathered MUDSTONE.		
3.00		N26							

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole left open and measured by the end of drilling as dry. Hole backfilled with arrisings.

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 7/10/14

Silkstone Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS12**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	01-10-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA					
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.06	Made Ground, Grass above grey clayey sand topsoil with roots.		
0.50	ES		1			(0.84)	Made Ground, Brown clayey sandy gravel of concrete mudstone and tree roots.		
						0.90			
1.00		N12				(0.90)	Stiff yellow brown sandy gravelly CLAY. Gravel is fine to coarse subangular and consists of sandstone and mudstone.		
						1.80			
2.00		N17				(1.60)	Extremley weak thinley laminated grey brown highly weathered MUDSTONE.		
3.00		N24				3.40			

Hole Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery			
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole left open and measured by the end of drilling at 0.90m below current ground level. Hole backfilled with arrisings.

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

WINDOW SAMPLE LOG 14201 WHITES BAKERY.GPJ GINT STD AGS 3_1.GDT 7/10/14

Silkstone
Environmental Ltd
www.silkstoneenvironmental.co.uk

SILKSTONE ENVIRONMENTAL LTD
7 Hall Annex, Thornecliffe Park, Chapeltown
Sheffield, S35 2PH
Telephone: 0114 257 3487
Fax: 0114 257 3459

WINDOW SAMPLE LOG

Project				Window Sample No
Whites Bakery				**WS13**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
14201	01-10-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.20	ES					(0.80) 0.80	Made Ground, Grey brown sandy gravelly clay with occasional cobbles. Gravel is fine to coarse angular to sub-angular and consists of sandstone, brick and limestone. Cobbles angular brick and sandstone.		
0.80	ES					(1.10) 1.90	Stiff yellow brown sandy gravelly CLAY. Gravel is fine to coarse subangular and consists of sandstone and mudstone.		
0.90	D								
1.00-2.00	B								
1.00		N14							
2.00		N18				(0.60) 2.50	Stiff gray sandy CLAY.		
3.00		N26				(1.50) 4.00	Extremley weak thinley laminated grey brown highly weathered organic MUDSTONE with occasional coal traces.		

Hole Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Window Sample Recovery

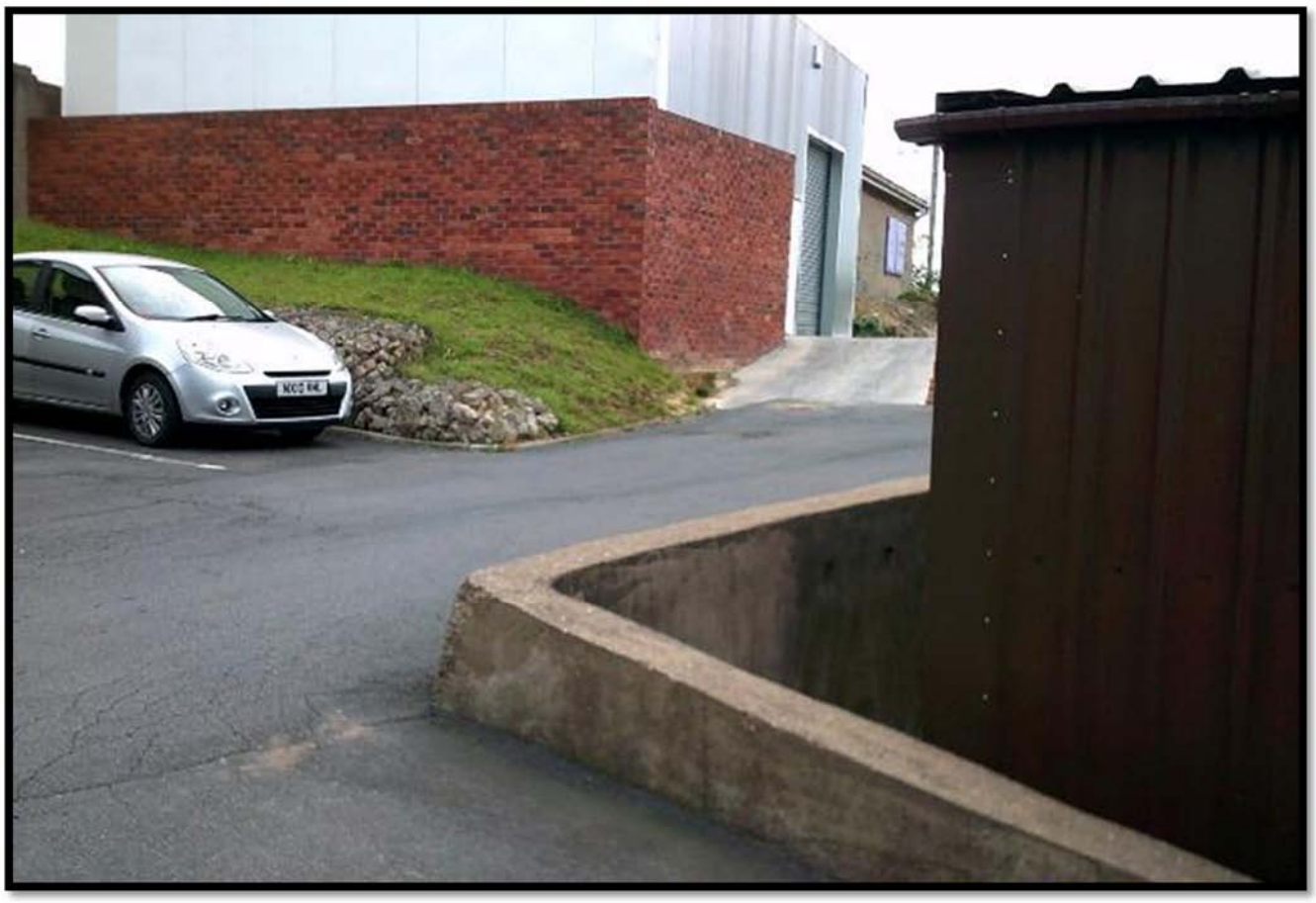
From	To	Dia (m)	Rec (%)

GENERAL REMARKS

Hole left open and measured by the end of drilling as dry. Hole backfilled with arrisings.

All dimensions in metres Scale 1:50	Client Longden Design	Method/ Plant Used	Logged By C Evans

A: Window sample borehole WS01 was located behind a retaining wall at the northeast corner of the site.



B: WS02 was located at the north of the site behind the access road in front of a small row of outbuildings.

C: The access road behind the main building was set behind a retainment.

D: The site had been steeply banked at the north boundary.

E: The extreme west of the site was inaccessible.

F: The site watercourse had been culverted in the southeast of the site.

G: There was evidence of bonfires and building waste at the site.

H: Location of window sample borehole WS02

I: Location of window sample borehole WS03

J: Location of window sample borehole WS04

K: Location of window sample borehole WS05

L: Location of window sample borehole WS06

M: Location of window sample borehole WS07

N: Location of window sample borehole WS08

O: Location of window sample borehole WS09

P: Location of window sample borehole WS10

Q: Location of window sample borehole WS11

R: Location of window sample borehole WS12

S: Location of window sample borehole WS13

T: Sandy gravelly clay of completely weathered bedrock.

U: Dirty coal at the base of window sample borehole WS01.

V: Core from below WS02

W: Ground level to 1.00m from WS03.

X: Cores from window sample borehole WS07.

Y: Made ground below WS05

Z: Cores from WS13 showing a typical soil profile with clay grading to mudstone.

APPENDIX C

(i) Contamination Laboratory Testing Results

(ii) Geotechnical Laboratory Testing

PSL
Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL14/5010

Client's Reference: 14201 Report Date: 15 October 2014

Client Name: Silkstone Environmental
7 Hall Annex
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH

For the attention of: C Evans

Contract Title: Whites Bakery

Date Received: 03/10/2014
Date Commenced: 03/10/2014
Date Completed: 15/10/2014

Notes: Observations and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
M Beastall (Laboratory Manager)

D Lambe (Senior Technician)
S Royle (Senior Technician)

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

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
WSO2			0.80	Brown mottled grey sandy silty CLAY.
WSO7			0.70	Brown gravelly sandy silty CLAY.
WSO8			0.90	Brown gravelly slightly sandy silty CLAY.
WS11			0.90	Brown slightly gravelly slightly sandy silty CLAY.
WS13			0.90	Brown mottled grey slightly gravelly sandy silty CLAY.
WS13			1.00-2.00	Brown very gravelly very sandy silty CLAY.

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	15/10/14		15/10/14		15/10/14

WHITES BAKERY

Contract No: PSL14/5010

Client Ref: 14201

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	% Passing .425mm	Remarks
WSO2			0.80	17				37	19	18	96	Intermediate plasticity CI.
WSO7			0.70	18				38	20	18	82	Intermediate plasticity CI.
WSO8			0.90	26				54	25	29	86	High plasticity CH.
WS11			0.90	27				55	25	30	89	High plasticity CH.
WS13			0.90	25				49	24	25	92	Intermediate plasticity CI.

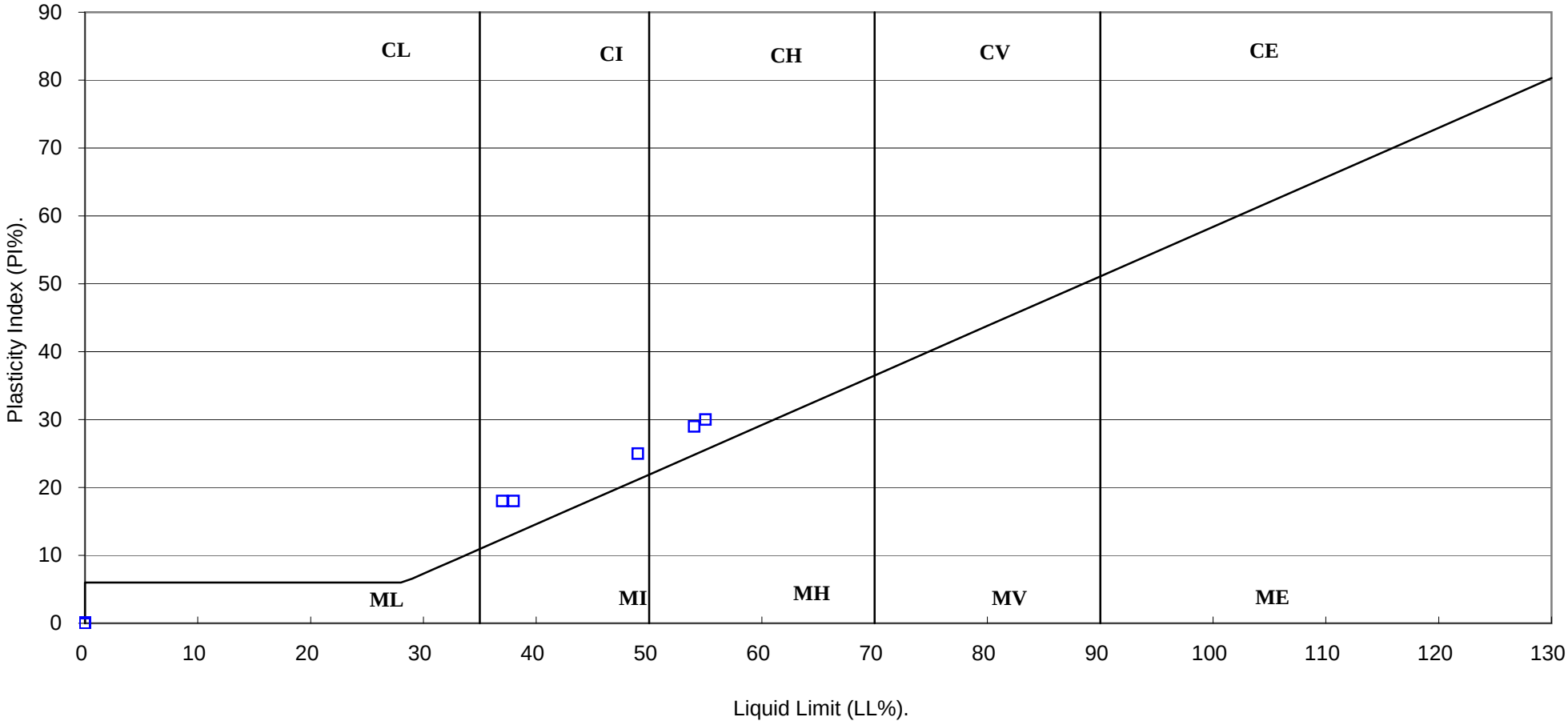
SYMBOLS : NP : Non Plastic *** : Liquid Limit and Plastic Limit Wet Sieved.**

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	15/10/14		15/10/14		15/10/14
WHITES BAKERY				**Contract No:**	**PSL14/5010**
				Client Ref:	**14201**

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



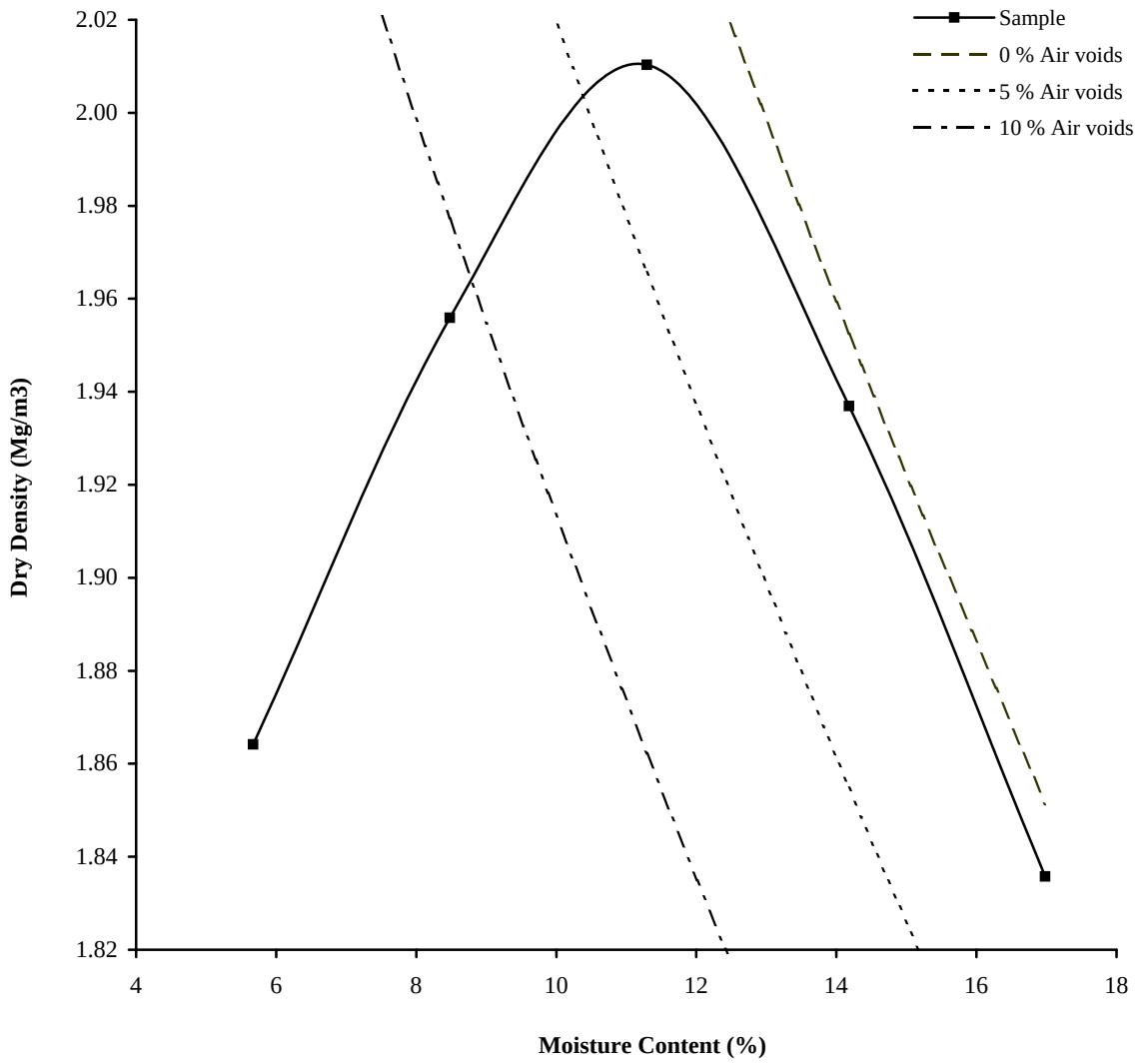
PSL Professional Soils Laboratory	Compiled by	Date	Checked by	Date	Approved by	Date
		15/10/14		15/10/14		15/10/14
	WHITES BAKERY				Contract No:	PSL14/5010
					Client Ref:	14201

Dry Density/Moisture Content Relationship Test

BS 1377 : Part 4 : 1990

Hole Number: **WS13** **Depth (m) :** **1.00-2.00**

Sample Number: **Sample Type:**



Initial Moisture Content:	17	Method of Compaction	4.5kg / Separate Sample	
Particle Density (Mg/m3):	2.70	Assumed	Material Retained on 37.5 mm Test Sieve (%):	0
Maximum Dry Density (Mg/m3):		2.01	Material Retained on 20.0 mm Test Sieve (%):	5
Optimum Moisture Content (%):		11		
Remarks	See Summary of Soil Descriptions.			

Checked By	Date	Approved By	Date
	15/10/14		15/10/14

PSL Professional Soils Laboratory

WHITES BAKERY

Contract No. PSL14/5010

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 14-17338

10-Oct-14

Client Silkstone Environmental Ltd.
7 Hall Annex
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH

Our Reference 14-17338

Client Reference 14201

Contract Title WHITES BAKERY

Description 14 Soil samples.

Date Received 03-Oct-14

Date Started 03-Oct-14

Date Completed 09-Oct-14

Test Procedures Identified by prefix DETSn (details on request), Asbestos Analysis DETSC 1101.

Notes Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 14-17338
Client Ref 14201
Contract Title WHITES BAKERY

			Lab No	709005	709006	709007	709008	709009	709010
			Sample ID	WS01	WS01	WS03	WS05	WS06	WS07
			Depth	0.70	3.70	0.90	0.50	2.90	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	30/09/14	30/09/14	30/09/14	30/09/14	30/09/14	30/09/14
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	9.4		8.8	13		42
Cadmium	DETSC 2301#	0.1	mg/kg	3.5		0.9	0.9		1.2
Chromium	DETSC 2301#	0.15	mg/kg	18		20	26		45
Copper	DETSC 2301#	0.2	mg/kg	18		22	25		28
Lead	DETSC 2301#	0.3	mg/kg	130		17	54		63
Mercury	DETSC 2325#	0.05	mg/kg	0.06		< 0.05	0.08		0.15
Nickel	DETSC 2301#	1	mg/kg	14		25	20		17
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5		< 0.5	0.7		< 0.5
Zinc	DETSC 2301#	1	mg/kg	230		62	110		97
Inorganics									
pH	DETSC 2008#			8.6	5.7	6.0	8.1	7.0	8.2
Organic matter	DETSC 2002#	0.1	%	2.5		0.9	3.4		6.7
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	53	29	66	15	27	28
Total Sulphur as S	DETSC 2320	0.01	%		0.05			< 0.01	
Total Sulphate as SO4	DETSC 2321#	0.01	%		1.4			1.5	
Petroleum Hydrocarbons									
EPH (C6-C8)	DETSC 3321*	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
EPH (C8-C10)	DETSC 3321*	10	mg/kg	< 10		< 10	< 10		< 10
EPH (C10-C12)	DETSC 3311	10	mg/kg	< 10		< 10	< 10		< 10
EPH (C12-C16)	DETSC 3311	10	mg/kg	< 10		< 10	< 10		< 10
EPH (C16-C21)	DETSC 3311	10	mg/kg	< 10		< 10	< 10		< 10
EPH (C21-C40)	DETSC 3311	10	mg/kg	< 10		< 10	< 10		1000
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	0.4		< 0.1	0.4		3.1
Pyrene	DETSC 3301	0.1	mg/kg	0.4		< 0.1	0.3		3.5
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		< 0.1
PAH	DETSC 3301	1.6	mg/kg	< 1.6		< 1.6	< 1.6		6.5

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 14-17338
Client Ref 14201
Contract Title WHITES BAKERY

			Lab No	709011	709012	709013	709014	709015	709016
			Sample ID	WS07	WS08	WS08	WS09	WS10	WS11
			Depth	0.80	0.80	2.80	0.40	0.30	1.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	30/09/14	01/10/14	01/10/14	01/10/14	01/10/14	01/10/14
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg				8.9	12	
Cadmium	DETSC 2301#	0.1	mg/kg				0.8	0.9	
Chromium	DETSC 2301#	0.15	mg/kg				37	28	
Copper	DETSC 2301#	0.2	mg/kg				27	24	
Lead	DETSC 2301#	0.3	mg/kg				50	27	
Mercury	DETSC 2325#	0.05	mg/kg				0.16	< 0.05	
Nickel	DETSC 2301#	1	mg/kg				16	25	
Selenium	DETSC 2301#	0.5	mg/kg				0.6	< 0.5	
Zinc	DETSC 2301#	1	mg/kg				130	110	
Inorganics									
pH	DETSC 2008#			7.0	8.2	6.5	8.4	8.2	6.9
Organic matter	DETSC 2002#	0.1	%				3.2	2.3	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	49	11	23	27	11	34
Total Sulphur as S	DETSC 2320	0.01	%	0.02	< 0.01	< 0.01			0.02
Total Sulphate as SO4	DETSC 2321#	0.01	%	4.6	2.5	2.1			0.06
Petroleum Hydrocarbons									
EPH (C6-C8)	DETSC 3321*	0.1	mg/kg				< 0.1	< 0.1	
EPH (C8-C10)	DETSC 3321*	10	mg/kg				< 10	< 10	
EPH (C10-C12)	DETSC 3311	10	mg/kg				< 10	< 10	
EPH (C12-C16)	DETSC 3311	10	mg/kg				< 10	< 10	
EPH (C16-C21)	DETSC 3311	10	mg/kg				22	10	
EPH (C21-C40)	DETSC 3311	10	mg/kg				180	180	
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg				< 0.1	< 0.1	
Acenaphthylene	DETSC 3301	0.1	mg/kg				< 0.1	< 0.1	
Acenaphthene	DETSC 3301	0.1	mg/kg				< 0.1	< 0.1	
Fluorene	DETSC 3301	0.1	mg/kg				< 0.1	< 0.1	
Phenanthrene	DETSC 3301	0.1	mg/kg				1.0	< 0.1	
Anthracene	DETSC 3301	0.1	mg/kg				0.3	< 0.1	
Fluoranthene	DETSC 3301	0.1	mg/kg				2.0	0.4	
Pyrene	DETSC 3301	0.1	mg/kg				2.1	0.4	
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg				1.0	< 0.1	
Chrysene	DETSC 3301	0.1	mg/kg				1.4	< 0.1	
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg				< 0.1	< 0.1	
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg				< 0.1	< 0.1	
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg				< 0.1	< 0.1	
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg				0.4	< 0.1	
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg				0.3	< 0.1	
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg				1.2	< 0.1	
PAH	DETSC 3301	1.6	mg/kg				9.5	< 1.6	

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 14-17338
Client Ref 14201
Contract Title WHITES BAKERY

			Lab No	709017	709018
			Sample ID	WS12	WS13
			Depth	0.50	0.20
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	01/10/14	01/10/14
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Metals					
Arsenic	DETSC 2301#	0.2	mg/kg	9.5	12
Cadmium	DETSC 2301#	0.1	mg/kg	0.9	0.8
Chromium	DETSC 2301#	0.15	mg/kg	130	29
Copper	DETSC 2301#	0.2	mg/kg	23	29
Lead	DETSC 2301#	0.3	mg/kg	33	35
Mercury	DETSC 2325#	0.05	mg/kg	0.06	0.29
Nickel	DETSC 2301#	1	mg/kg	19	18
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	0.9
Zinc	DETSC 2301#	1	mg/kg	85	110
Inorganics					
pH	DETSC 2008#			11.3	8.4
Organic matter	DETSC 2002#	0.1	%	5.7	2.5
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	98	20
Total Sulphur as S	DETSC 2320	0.01	%		
Total Sulphate as SO4	DETSC 2321#	0.01	%		
Petroleum Hydrocarbons					
EPH (C6-C8)	DETSC 3321*	0.1	mg/kg	< 0.1	< 0.1
EPH (C8-C10)	DETSC 3321*	10	mg/kg	< 10	< 10
EPH (C10-C12)	DETSC 3311	10	mg/kg	< 10	< 10
EPH (C12-C16)	DETSC 3311	10	mg/kg	< 10	< 10
EPH (C16-C21)	DETSC 3311	10	mg/kg	< 10	< 10
EPH (C21-C40)	DETSC 3311	10	mg/kg	1400	< 10
PAHs					
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	3.0	0.2
Pyrene	DETSC 3301	0.1	mg/kg	1.7	0.2
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
PAH	DETSC 3301	1.6	mg/kg	4.7	< 1.6

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 14-17338
Client Ref 14201
Contract Title WHITES BAKERY

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
709005	WS01 0.70	SOIL	NAD	none	Colin Patrick
709008	WS05 0.50	SOIL	NAD	none	Colin Patrick
709010	WS07 0.30	SOIL	NAD	none	Colin Patrick
709014	WS09 0.40	SOIL	Chrysotile	free fibres	Colin Patrick
709018	WS13 0.20	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 14-17338
Client Ref 14201
Contract WHITES BAKERY

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
709005	WS01 0.70 SOIL	30/09/14	GJ 500ml		BTEX
709006	WS01 3.70 SOIL	30/09/14	GJ 500ml		
709007	WS03 0.90 SOIL	30/09/14	GJ 500ml		BTEX
709008	WS05 0.50 SOIL	30/09/14	GJ 500ml		BTEX
709009	WS06 2.90 SOIL	30/09/14	PT 1L		
709010	WS07 0.30 SOIL	30/09/14	GJ 500ml		BTEX
709011	WS07 0.80 SOIL	30/09/14	PT 1L		
709012	WS08 0.80 SOIL	01/10/14	GJ 500ml		
709013	WS08 2.80 SOIL	01/10/14	PT 1L		
709014	WS09 0.40 SOIL	01/10/14	GJ 500ml		BTEX
709015	WS10 0.30 SOIL	01/10/14	GJ 500ml		BTEX
709016	WS11 1.00 SOIL	01/10/14	GJ 500ml		
709017	WS12 0.50 SOIL	01/10/14	GJ 500ml		BTEX
709018	WS13 0.20 SOIL	01/10/14	GJ 500ml		BTEX

Key: G-Glass J-Jar P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months