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REPORT ON A GEO-ENVIRONMENTAL INVESTIGATION

at

THIRSTIN MILL, THIRSTIN ROAD, HONLEY

for

NORTHPARK (GREETLAND) LTD.

CONSULTANTS: BLAND AND SWIFT.

Report No J2270/12/E

October 2012

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REPORT ON ADDITIONAL ENVIRONMENTAL TESTING

at

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for

NORTHPARK (GREETLAND) LTD.

CONSULTANTS: BLAND AND SWIFT.

Report No J2270/12/E

October 2012

1. SYNOPSIS

This investigation has demonstrated some contamination was evident within the made ground. A remediation strategy has been recommended which includes the capping of the site. Consequently, careful consideration of the discussion of ground conditions should be made.

2. INTRODUCTION

Northpark (Greetland) Ltd propose to develop an area of land off Thirstin Lane, Honley. The site was formerly occupied by Thirstin Mill which was demolished a number of years ago. The area under consideration is located on the west side of the road and occupies a relatively flat area in the base of a valley. Within the southern part of the site the ground level in the valley bottom is significantly higher than the remaining site area. It is understood that the mill pond once occupied this area. The former stream in the valley has been culverted through the site. Additionally, a spring which issues from the western valley side via an inspection chamber also enters the culvert.

It is understood that the proposed development is to include the construction of a number of dwellings together with gardens and access roads. Accordingly, a geo-environmental investigation was undertaken in June 2011 by RGS and was subsequently reported in report number J1842/11/E. During that investigation four samples were subject to soluble sulphate and pH tasting, 2 samples for PCB testing and four samples for the Atkins ATRISK standard suite of chemical tests, which included the following.

- Metals – Cd, Cr, Cu, Hg, Ni Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN⁻ and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO₄²⁻.

The results of the chemical tests yielded the the following contaminants:

Table 1: Summary of contaminated areas from investigation June 2011.

Borehole Location	Contaminants found to be exceeding SSVs
TP1	PAH (indeno[1,2,3-cd]pyrene, benzo[g,h,i]perylene).
TP3	PAH (benzo[g,h,i]perylene).
TP5	PAH (benzo[a]pyrene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, benzo[g,h,i]perylene).
TP7	Lead, PAH (dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, benzo[g,h,i]perylene).

A site plan showing the positions of the test positions is included in Appendix 1 to this report.

As a consequence of the contaminants revealed a risk assessment was undertaken and a remediation strategy was suggested. However the Kirklees environmental team considered that the site had not been fully characterised thus it was agreed that a further 8 samples of the made ground to be tested. This report details the results of the further testing undertaken and includes an updated risk assessment and remediation strategy.

3. **LIMITATIONS**

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

4. **FIELDWORKS**

The fieldworks were undertaken on the 2nd October 2012 and included the eight shallow machine dug trial pits. The investigatory locations are shown on the site

plan which is presented in Appendix 1 to this report. The major details of this drawing were obtained from a topographical survey plan supplied by the consulting engineers, Bland and Swift Ltd.

4.1 Machine Dug Trialpits

A total of eight trialpits were excavated using a JCB back acting excavator in order to retrieve samples of the near surface made ground. The soils were logged on site in general accordance with BS5930: 1999, as amended in 2007, and full descriptions are given on the trialpit records which are presented in Appendix 2. Samples were taken from the trialpits and retained in the appropriate air tight containers within cool boxes for onward transition to the chemical laboratory.

5. GEOLOGY

An examination of the 1: 50 000 scale Geological Survey map of the area¹ indicates the valley bottom is underlain by mudstones and siltstones of the Carboniferous Millstone Grit Series. However, beneath the higher ground immediately to the east, west and south of the site, Rough Rock, a named sandstone unit within the Millstone Grit Series, is shown to outcrop. On the basis of this information it is considered that Rough Rock outcrops in the valley sides, but mudstones and siltstone outcrop in the bed of the valley. The shape of the site virtually mirrors the shape of the outcrop of the mudstone and siltstone, indicating that the bed of the valley is close to the interface between the mudstone/siltstone and Rough Rock.

6. STRATA CONDITIONS

6.1 Made ground

The made ground was generally described as grey-brown and yellow-brown locally clayey and silty sandy angular to subrounded fine to coarse gravel of fine and medium grained micaceous sandstone/medium and coarse grained feldspathic sandstone with many fine to medium gravel sized and cobble sized brick and concrete with clinker and ash traces.

7. LABORATORY TESTING - ENVIRONMENTAL

The suite of testing undertaken in the original investigation was undertaken on the samples recovered from across the site this included the following:

¹ Sheet 86, solid and drift edition, Glossop.

- Metals – Cd, Cr, Cu, Hg, Ni Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN⁻ and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO₄²⁻.

This testing was undertaken by Chemtech Environmental Ltd and the results of all of the chemical testing are presented in Appendix 3 of this report.

8. **DISCUSSION OF GROUND CONDITIONS - ENVIRONMENTAL**

8.1 **Discussion of Test Results**

As the proposed works are to include the construction of a housing estate with access roads and gardens, the site may be classified as being a residential with plant uptake.

8.1.1 **Soil Samples**

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website² and these include many local authorities.

A comparison of the results of the testing, together with the data given above, can be found within Appendix 8. These results indicate the following:

Table 2: Summary of contaminated areas.

Borehole Location	Contaminants found to be exceeding SSVs
Investigation June 2011	
TP1	PAH (indeno[1,2,3-cd]pyrene, benzo[g,h,i]perylene).
TP3	PAH (benzo[g,h,i]perylene).
TP5	PAH (benzo[a]pyrene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, benzo[g,h,i]perylene).
TP7	Lead, PAH (dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, benzo[g,h,i]perylene).

² <http://www.atriksoil.co.uk/pages/general/subscribers.asp>

Investigation October 2012	
TP1	None
TP2	Lead, PAH (chrysene, benzo[a]pyrene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, benzo[g,h,i]perylene). TPH(arpmatic C5-C7)
TP3	PAH (benzo[g,h,i]perylene).
TP4	PAH (benzo[g,h,i]perylene).
TP5	None
TP6	Mercury, Lead, PAH (pyrene, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, benzo[a]pyrene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, benzo[g,h,i]perylene).
TP7	PAH (indeno[1,2,3-cd]pyrene, benzo[g,h,i]perylene).
TP8	Lead, PAH (chrysene, benzo[a]pyrene, dibenzo[a,h]anthracene, benzo[g,h,i]perylene).

Concentrations of chromium, free cyanide and phenols were below the detection limits for the tests. Detectable levels of all other contaminants were recorded, but these fell below the associated Atrisk Soil Screening Values.

It should be appreciated that the soil screening values for the PAHs represents vapour saturation limits. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the combined assessment criterion³. In view of this, the ATRISK soil SSVs notes that the users may wish to consider using a combined assessment criterion given by CLEA if free product is not observed, the values for which are also provided on the summary of contamination analysis. As these products are formed by the incomplete combustion of organic materials it is probable that they are associated with the ash and clinker noted within the sample and residues and as such will not be present as free product. Therefore the poly aromatic hydrocarbon contaminants remaining that still exceed the screening criterion are listed below.

Table 3: Summary of PAHs exceeding CLEA SGVs.

Borehole Location	Contaminants found to be exceeding CLEA Criterion
Investigation June 2011	
TP1	None
TP3	None
TP5	PAH (benzo[a]pyrene).
TP7	None

³ Ref: ATRISK SSVs derived using CLEA for 6% SOM and sandy loam soil type, Commercial land use, March 2011.

Investigation October 2012	
TP1	None
TP2	PAH (benzo[a]pyrene)
TP3	None
TP4	None
TP5	None
TP6	PAH (benzo(a)anthracene, benzo[a]pyrene, benzo(b)fluoranthene, indeno[1,2,3-cd]pyrene,).
TP7	None
TP8	PAH (benzo[a]pyrene, dibenzo[a,h]anthracene).

On the basis of all the information provided above, it would appear that there is general contamination by lead and some poly aromatic hydrocarbons. Mercury was also noted in TP6. In addition a greater range of poly aromatic hydrocarbons were detected in areas occupied by the mill building.

In view of the above comments it is concluded that the whole site should be assumed to be contaminated.

8.2 Site Specific Risk Assessment

The presence of contamination hazards on the land has been identified and the risks associated with them have been assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency⁴ advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.⁵ This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'⁶

⁴ R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.

⁵ The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.

⁶ See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.

This advice also states that the effects of a pollution linkage and the groups at risk of harm (receptors) can be identified by the following categorisation:

- Human health – receptors: site personnel, visitors and the general public, and humans on surrounding sites.
- The water environment – receptors: humans, aquatic life and the wider ecosystem, and construction and building materials ie. concrete, cement, rubber and plastic.
- Plants and the wider eco-system – receptors: plants, animals

An appraisal of the sources of contamination, potential and actual, on and in the area of the site has therefore been completed with reference to this pollution linkage.⁷ The risk of harm to the receptors has also been evaluated with reference to the following ratings and definitions:

- Low - A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence.
- Moderate - The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary.
- High - The linkage exists and the available data indicates that significant harm may be caused and remedial action will be necessary.

Table 5: Site specific risk assessment.

Source	Contaminants	Pathway	Receptor	Risk/likelihood of harm occurring
Made Ground	Lead, Mercury, PAH	Ingestion of soil	Site operatives End user Neighbours	Moderate Moderate Low
		Ingestion of dust	Site operatives End user Neighbours	Moderate Moderate Low
		Dermal contact	Site operatives End user Neighbours	Moderate Moderate Low
		Inhalation of dust	Site operative End user Neighbours	Moderate Moderate Moderate
		Inhalation of vapours	Site operative End user Neighbours	Moderate High Low
		Consumption of veg. and fruit	End user	Moderate
		Uptake via contam. Groundwater	Site operative End user Vegetation	Moderate Moderate Moderate
		Vertical & lateral movement of mobile contam. To surface & groundwater	Vegetation	Moderate
			Controlled waters	High
			Structure and services	Moderate (buried concrete)
			Site operatives End Users	Moderate Moderate

⁷ This assessment has been based on the information as to the proposed development that has been provided by the client. If the plans should change, the assessment should be re-evaluated.

Solid geology	Radon	Radon gas	Site operative End user	Low Low
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It is considered that the site operatives may be at moderate risk of harm due to the ingestion of soil and dust, dermal contact and the inhalation of vapours and dust derived from the made ground. Whilst the end users can come into contact with soil and dust it is considered that they would be at a moderate risk of harm. However, as there are poly aromatic hydrocarbons present, there is considered to be a high risk of harm to occupiers of the dwellings (end users). Whilst it is considered that the neighbours would not be at significant risk of harm due to the ingestion of soil and dust or the inhalation of vapours, there is a moderate risk of harm due to the short term inhalation of dust during the construction period.

As the housing estate is to include gardens, there is considered to be a moderate risk of harm to the end users due to the consumption of home-grown vegetables and fruit. The uptake of contaminants via contaminated groundwater is considered to be of moderate risk as the investigation revealed the presence of groundwater across the site at depths in of around on 2.0m. Consequently there has also been deemed to be a moderate risk of harm due to the vertical and lateral movement of mobile contamination to vegetation, structures and services along with the end user. However a culvert runs through the site and a spring line appears to issue from the western banking on the site. The risk to controlled waters has therefore been considered to be high.

On the basis of information provided in the Phase 1 Desk Study it is considered that there is a low risk of harm due to the presence of radon.

8.3 **Remediation Strategy**

In view of the site specific risk assessment it is considered that remediation will be required at this site. Such a strategy should include the following main elements.

8.3.1 **Remediation Objectives**

Based on the site specific risk assessment the object of the remediation is likely to be as follows.

- To protect the site operatives during the construction process from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect the end user from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect the garden plants from the uptake of contamination from the made ground revealed at this site.

- To protect the end user from the elevated levels of carbon dioxide.

8.3.2 Development Requirements

Whilst the precise nature of this development has not been finalised it is understood that it is to be developed by the construction of a housing estate with associated access roads and garden areas. In view of the above a site specific remediation strategy should be undertaken after the proposed development has been finalised. However, for preliminary design and costing the following remediation proposals are offered.

8.3.3 Strategy

In order to fulfil the objectives defined above it is likely that the following remedial strategy could be utilised. It is recommended that a pragmatic approach be undertaken, with observational techniques being employed at each stage of the work.

Ground-works

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the hazards of working with contaminated soils.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use in dry weather.
- Where vehicles are transferring soil to the landfill site they should be covered to prevent contamination of the surrounding area by dust.
- Any stockpiles of contaminated soil on site should be sheeted over to prevent excessive amounts of airborne dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade would be required. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.

Construction

During the construction phase of the contract the following items are required to protect the end user from the potential contaminants revealed at this site.

- Beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- Due to the levels of CO₂ and in according to Table 8.6, *Typical scope of gas protection measures*, of CIRIA report C665, two levels of protection are considered necessary and should include:
 - Reinforced concrete cast *in situ* floor slab (suspended, non-suspended or raft) with at least 1200g DPM and underfloor venting.
 - Beam and block or pre cast concrete slab and 2000g DPM / reinforced gas membrane and underfloor venting

Note: All joints and penetrations must be sealed.

In view of the presence of hydrocarbons it will be necessary to upgrade the barrier to a proprietary vapour resistant membrane.

- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1.

Garden and Landscaped Areas

In view of the potential contamination it is considered that the gardens and landscaped areas will require some remediation. This should include the provision of a capping layer of say 600mm of inert material, which will put the contaminated ground out of the end users' dig range. At the base of this layer a granular capillary break of say 100mm of free draining granular soil should be placed. This expedient should also provide a suitable root barrier to isolate the plants from the underlying contaminated ground.

It should be appreciated that this could be achieved by removing 700mm of the soil to a licensed landfill, replacing it with clean inert fill. However, it is considered that this approach would be rather expensive thus it may be financially advantageous to raise the ground level by the appropriate amount

In any event it will be necessary to validate the thickness of the remedial works. This may be undertaken by the excavation of shallow hand auger boreholes through the topsoil and subsoil to the gravel capillary break. These should be undertaken on a random grid giving coverage of one borehole every 25m².

Imported Fill Material

It should also be appreciated that any imported fill should be subjected to the following validation testing to assess its suitability.

Table 6: Validation testing

Contaminant	Screening Value (mg/kg)	Reference
As	32	Atrisk soil screening values, 6% soil organic matter
Cd	10	Atrisk soil screening values, 6% soil organic matter
Cr	14.7	Atrisk soil screening values, 6% soil organic matter
Cu	4020	Atrisk soil screening values, 6% soil organic matter
Hg	1	Atrisk soil screening values, 6% soil organic matter
Ni	130	Atrisk soil screening values, 6% soil organic matter
Pb	168	Atrisk soil screening values, 6% soil organic matter
V	115	Atrisk soil screening values, 6% soil organic matter
Zn	17200	Atrisk soil screening values, 6% soil organic matter
TPH CWG	-	See Atrisk soil screening values
PAH 16 EPA	-	See Atrisk soil screening values

The frequency of such testing should be sufficient to give statistical confidence for the validation results. For sub-soil the frequency should be 1 per 250m³ or a minimum of three samples, whichever is the greater.

9. REFERENCES

- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes*, B.S.I., London.
Part 9: 1990: *In situ tests*.
- British Standards Institution (1999) BS5930: *Code of practice for site investigations*, B.S.I., London.
- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: Concrete in aggressive ground.
Part C: *Assessing the aggressive chemical environment*.
Part D: *Specifying concrete for general cast-in-situ use*.
- Building Research Establishment (BRE), Working platforms for tracked plant: *Good practice guide to the design, installation, maintenance and repair of ground-supported working platforms*, 2004.
- Building Research Establishment. 1999. *Radon: Guidance on protective measures for new dwellings*.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health*

toxicological assessment of contaminants in soil. Environment Agency, Bristol.

- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.
- Wilson S, Oliver S, Mallet H, Hutchings H, Card G, *Assessing risks posed by ground gasses to buildings*, CIRIA Report C665.

For and on behalf of
Rogers Geotechnical Services Ltd,

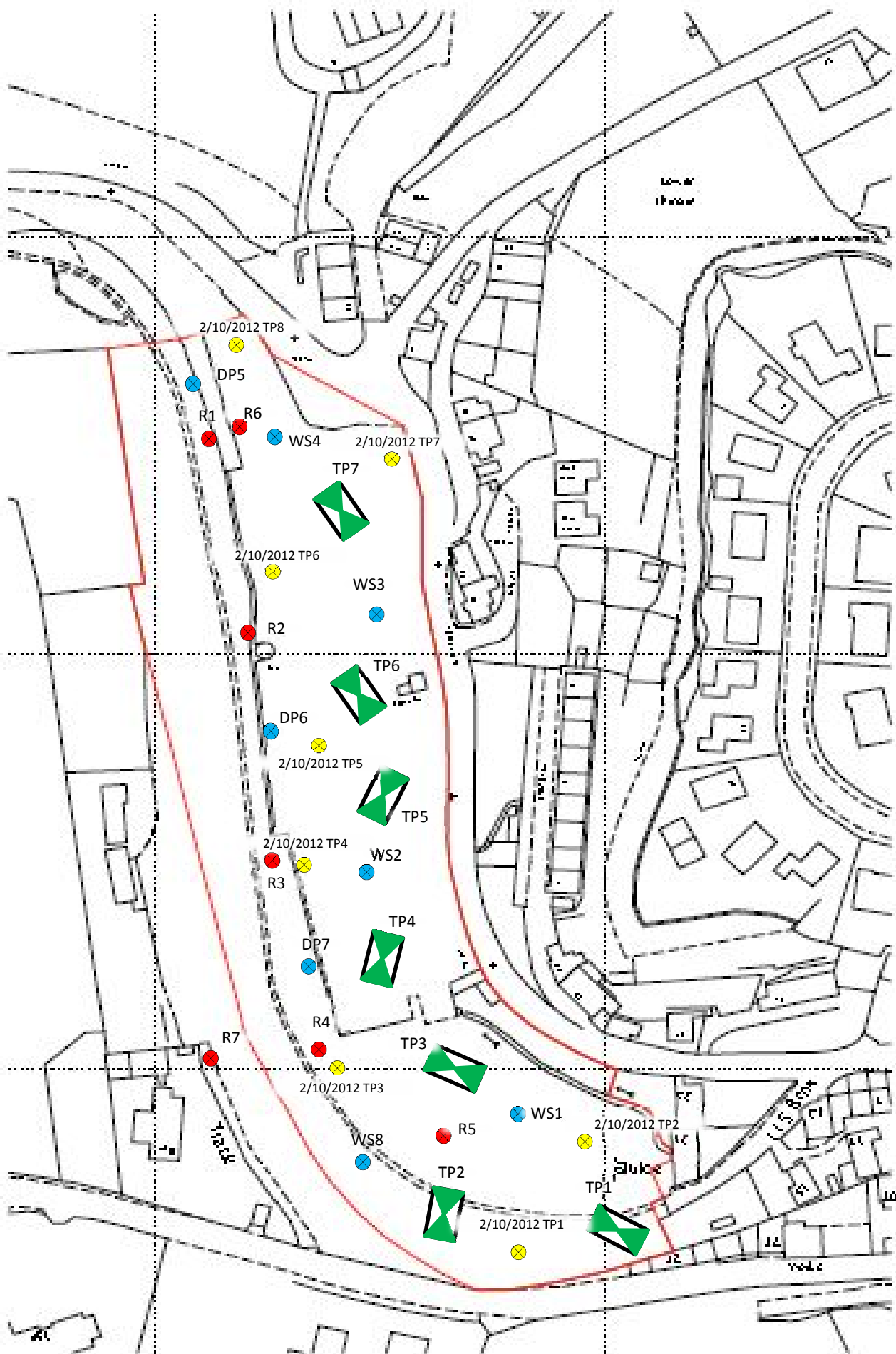
R Lewis S.P.
Geotechnical Engineer

Technical

Rogers CEng, CGeol, MICE, MCIHT, FGS
Director

APPENDIX 1

SITE PLAN



Title

Investigation Location Plan



**Rogers Geotechnical
Services Ltd**

**North Park Homes
Thirstin Mill, Honley**

Contract No:

J2270/12/E

APPENDIX 2

TRIALPIT RECORDS

RGS

Trialpit No

TP1

Sheet 1 of 1

Project Name
Thirstin MillProject No.
J2270/12/ECo-ords: -
Level: -Date
02/10/2012

Location: Thirstin Mill, Honley

Dimensions: -

Scale
1:50

Client: NORTHPARK (GREETLAND) LTD

Depth
0.30m

Logged By

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.30	ES		0.30			MADE GROUND(Grey-brown and yellow-brown locally clayey and silty sandy angular to subrounded fine to coarse gravel of fine and medium grained micaceous sandstone/medium and coarse grained feldspathic sandstone with many fine to medium gravel sized and cobble sized brick and concrete with clinker and ash traces) (MG)	1
						Trialpit Complete at 0.30 m	2
							3
							4
							5
							6
							7
							8
							9

Remarks:

Groundwater:



RGS

Trialpit No

TP2

Sheet 1 of 1

Project Name
Thirstin MillProject No.
J2270/12/ECo-ords: -
Level: -Date
02/10/2012

Location: Thirstin Mill, Honley

Dimensions: -

Scale
1:50

Client: NORTHPARK (GREETLAND) LTD

Depth
0.40m

Logged By

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.40	ES		0.40			MADE GROUND(Grey-brown and yellow-brown locally clayey and silty sandy angular to subrounded fine to coarse gravel of fine and medium grained micaceous sandstone/medium and coarse grained feldspathic sandstone with many fine to medium gravel sized and cobble sized brick and concrete with clinker and ash traces) (MG)	
						Trialpit Complete at 0.40 m	1
							2
							3
							4
							5
							6
							7
							8
							9

Remarks:

Groundwater:



RGS

Trialpit No

TP3

Sheet 1 of 1

Project Name
Thirstin MillProject No.
J2270/12/ECo-ords: -
Level: -Date
02/10/2012

Location: Thirstin Mill, Honley

Dimensions: -

Scale
1:50

Client: NORTHPARK (GREETLAND) LTD

Depth
0.20m

Logged By

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.20			0.20			MADE GROUND(Grey-brown and yellow-brown locally clayey and silty sandy angular to subrounded fine to coarse gravel of fine and medium grained micaceous sandstone/medium and coarse grained feldspathic sandstone with many fine to medium gravel sized and cobble sized brick and concrete with clinker and ash traces) (MG)	
						Trialpit Complete at 0.20 m	1
							2
							3
							4
							5
							6
							7
							8
							9

Remarks:

Groundwater:



RGS

Trialpit No

TP4

Sheet 1 of 1

Project Name
Thirstin MillProject No.
J2270/12/ECo-ords: -
Level: -Date
02/10/2012

Location: Thirstin Mill, Honley

Dimensions: -

Scale
1:50

Client: NORTHPARK (GREETLAND) LTD

Depth
0.50m

Logged By

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.50	ES		0.50		 MADE GROUND(Grey-brown and yellow-brown locally clayey and silty sandy angular to subrounded fine to coarse gravel of fine and medium grained micaceous sandstone/medium and coarse grained feldspathic sandstone with many fine to medium gravel sized and cobble sized brick and concrete with clinker and ash traces) (MG)	Trialpit Complete at 0.50 m	1 2 3 4 5 6 7 8 9

Remarks:

Groundwater:



RGS

Trialpit No

TP5

Sheet 1 of 1

Project Name
Thirstin MillProject No.
J2270/12/ECo-ords: -
Level: -Date
02/10/2012

Location: Thirstin Mill, Honley

Dimensions: -

Scale
1:50

Client: NORTHPARK (GREETLAND) LTD

Depth
0.20m

Logged By

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.20	ES		0.20			MADE GROUND(Grey-brown and yellow-brown locally clayey and silty sandy angular to subrounded fine to coarse gravel of fine and medium grained micaceous sandstone/medium and coarse grained feldspathic sandstone with many fine to medium gravel sized and cobble sized brick and concrete with clinker and ash traces) (MG)	
						Trialpit Complete at 0.20 m	1
							2
							3
							4
							5
							6
							7
							8
							9

Remarks:

Groundwater:



RGS

Trialpit No

TP6

Sheet 1 of 1

Project Name
Thirstin MillProject No.
J2270/12/ECo-ords: -
Level: -Date
02/10/2012

Location: Thirstin Mill, Honley

Dimensions: -

Scale
1:50

Client: NORTHPARK (GREETLAND) LTD

Depth
0.20m

Logged By

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.20	ES		0.20			MADE GROUND(Grey-brown and yellow-brown locally clayey and silty sandy angular to subrounded fine to coarse gravel of fine and medium grained micaceous sandstone/medium and coarse grained feldspathic sandstone with many fine to medium gravel sized and cobble sized brick and concrete with clinker and ash traces) (MG)	
						Trialpit Complete at 0.20 m	1
							2
							3
							4
							5
							6
							7
							8
							9

Remarks:

Groundwater:



RGS

Trialpit No

TP7

Sheet 1 of 1

Project Name
Thirstin MillProject No.
J2270/12/ECo-ords: -
Level: -Date
02/10/2012

Location: Thirstin Mill, Honley

Dimensions: -

Scale

1:50

Client: NORTHPARK (GREETLAND) LTD

Depth
0.40m

Logged By

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.40	ES		0.40			MADE GROUND(Grey-brown and yellow-brown locally clayey and silty sandy angular to subrounded fine to coarse gravel of fine and medium grained micaceous sandstone/medium and coarse grained feldspathic sandstone with many fine to medium gravel sized and cobble sized brick and concrete with clinker and ash traces) (MG)	
						Trialpit Complete at 0.40 m	1
							2
							3
							4
							5
							6
							7
							8
							9

Remarks:

Groundwater:



RGS

Trialpit No

TP8

Sheet 1 of 1

Project Name
Thirstin MillProject No.
J2270/12/ECo-ords: -
Level: -Date
02/10/2012

Location: Thirstin Mill, Honley

Dimensions: -

Scale
1:50

Client: NORTHPARK (GREETLAND) LTD

Depth
0.30m

Logged By

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.30	ES		0.30			MADE GROUND(Grey-brown and yellow-brown locally clayey and silty sandy angular to subrounded fine to coarse gravel of fine and medium grained micaceous sandstone/medium and coarse grained feldspathic sandstone with many fine to medium gravel sized and cobble sized brick and concrete with clinker and ash traces) (MG)	1
						Trialpit Complete at 0.30 m	2
							3
							4
							5
							6
							7
							8
							9

Remarks:

Groundwater:



APPENDIX 3

LABORATORY TESTING – ENVIRONMENTAL

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 11/02106
Issue Number: 1
Date: 25 May, 2011

Client: Rogers Geotechnical Services
Unit 12
Emley Business Park
Leys Lane
Emley
Huddersfield
UK
HD8 9QY

Project Manager: Steve Rogers / Rob Lewis
Project Name: Thirstin Mill, Honley
Project Ref: J1842/11/E
Order No: 0511-4
Date Samples Received: 17/05/11
Date Instructions Received: 17/05/11
Date Analysis Completed: 25/05/11

Prepared by:

Approved by:

Melanie Marshall
Laboratory Coordinator

John Gustafson
Director

Notes - Soil analysis

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

Stones >10mm are removed from the sample prior to analysis and results corrected where appropriate.

Notes - General

For soil samples subscript A indicates analysis performed on the sample as received, D indicates analysis performed on dried & crushed sample.

Superscript M indicates method accredited to MCERTS.

Predominant Matrix Codes - 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.
Secondary Matrix Codes - A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis. NDP indicates No Determination Possible. NFI indicates No Fibres Identified.

Superscript # indicates method accredited to ISO 17025.

Accreditation for TPH (C6-C40) applies to the range C6-C36 only.

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

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

Envirolab Job Number: 11/02106

Client Project Name: Thirstin Mill, Honley

Client Project Ref: J1842/11/E

Lab Sample ID	11/02106/1	11/02106/2	11/02106/3	11/02106/4	11/02106/5	11/02106/6	11/02106/7	11/02106/8	Units	Method ref
Client Sample No										
Client Sample ID	WS3	WS4A	WS8	TP4	TP1	TP3	TP5	TP7		
Depth to Top	0.40	0.80	0.60	0.60	0.75	0.40	0.30	1.30		
Depth To Bottom										
Date Sampled										
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4AB	4AB	4AB	4ABE	6A	5A	4AB	4AB		
% Moisture~ _A [#]	-	-	-	-	16.1	18.3	10.6	11.2	% w/w	A-T-044
% Stones >10mm~ _A [#]	-	-	-	-	24.9	7.2	17.6	19.9	% w/w	A-T-044
pH _D ^{M#}	9.2	7.7	8.8	9.1	8.1	8.4	8.8	9.1	pH	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.05	0.06	0.03	0.04	0.06	0.05	0.09	0.10	g/l	A-T-026s
Sulphate (acid soluble) _D ^{M#}	-	-	-	-	400	270	650	720	mg/kg	A-T-028
Cyanide (free) _A ^{M#}	-	-	-	-	<1	<1	<1	<1	mg/kg	A-T-042sFCN
Phenols - Total by HPLC _A	-	-	-	-	<0.2	<0.2	<0.2	<0.2	mg/kg	A-T-050s
Organic matter _D ^{M#}	-	-	-	-	2.6	3.3	4.0	3.8	% w/w	A-T-032 OM
Arsenic _D ^{M#}	-	-	-	-	8	7	10	6	mg/kg	A-T-024
Cadmium _D ^{M#}	-	-	-	-	0.7	<0.5	<0.5	<0.5	mg/kg	A-T-024
Copper _D ^{M#}	-	-	-	-	44	32	27	78	mg/kg	A-T-024
Chromium (hexavalent) _D	-	-	-	-	<1	<1	<1	<1	mg/kg	A-T-040s
Lead _D ^{M#}	-	-	-	-	47	72	104	379	mg/kg	A-T-024
Mercury _D	-	-	-	-	<0.17	<0.17	0.17	0.38	mg/kg	A-T-024
Nickel _D ^{M#}	-	-	-	-	43	34	16	18	mg/kg	A-T-024
Selenium _D ^{M#}	-	-	-	-	<1	<1	<1	<1	mg/kg	A-T-024
Vanadium _D ^{M#}	-	-	-	-	23	34	21	22	mg/kg	A-T-024
Zinc _D ^{M#}	-	-	-	-	77	84	59	404	mg/kg	A-T-024

Envirolab Job Number: 11/02106

Client Project Name: Thirstin Mill, Honley

Client Project Ref: J1842/11/E

Lab Sample ID	11/02106/1	11/02106/2	11/02106/3	11/02106/4	11/02106/5	11/02106/6	11/02106/7	11/02106/8	Units	Method ref
Client Sample No										
Client Sample ID	WS3	WS4A	WS8	TP4	TP1	TP3	TP5	TP7		
Depth to Top	0.40	0.80	0.60	0.60	0.75	0.40	0.30	1.30		
Depth To Bottom										
Date Sampled										
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4AB	4AB	4AB	4ABE	6A	5A	4AB	4AB		
TPH CWG										
Ali >C5-C6 _A	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C6-C8 _A	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C8-C10 _A	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C10-C12 _A	-	-	-	-	<0.1	<0.1	<0.1	2.5	mg/kg	A-T-023s
Ali >C12-C16 _A	-	-	-	-	<0.1	<0.1	<0.1	8.7	mg/kg	A-T-023s
Ali >C16-C21 _A	-	-	-	-	<0.1	<0.1	<0.1	31.5	mg/kg	A-T-023s
Ali >C21-C35 _A	-	-	-	-	<0.1	<0.1	<0.1	130	mg/kg	A-T-023s
Total Aliphatics _A [#]	-	-	-	-	<0.1	<0.1	<0.1	172	mg/kg	A-T-022+23s
Aro >C5-C7 _A	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C7-C8 _A [#]	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C8-C9 _A	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C9-C10 _A	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C10-C12 _A	-	-	-	-	<0.1	<0.1	<0.1	3.1	mg/kg	A-T-023s
Aro >C12-C16 _A	-	-	-	-	<0.1	<0.1	2.6	4.6	mg/kg	A-T-023s
Aro >C16-C21 _A	-	-	-	-	<0.1	<0.1	17.1	13.2	mg/kg	A-T-023s
Aro >C21-C35 _A	-	-	-	-	<0.1	<0.1	45.0	61.3	mg/kg	A-T-023s
Total Aromatics _A [#]	-	-	-	-	<0.1	<0.1	64.6	82.1	mg/kg	A-T-022+23s
TPH (Ali & Aro) _A [#]	-	-	-	-	<0.1	<0.1	64.6	254	mg/kg	A-T-022+23s
BTEX - Benzene _A [#]	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Toluene _A [#]	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Ethyl Benzene _A [#]	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - m & p Xylene _A [#]	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - o Xylene _A [#]	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
MTBE _A [#]	-	-	-	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s

Envirolab Job Number: 11/02106

Client Project Name: Thirstin Mill, Honley

Client Project Ref: J1842/11/E

Lab Sample ID	11/02106/1	11/02106/2	11/02106/3	11/02106/4	11/02106/5	11/02106/6	11/02106/7	11/02106/8	Units	Method ref
Client Sample No										
Client Sample ID	WS3	WS4A	WS8	TP4	TP1	TP3	TP5	TP7		
Depth to Top	0.40	0.80	0.60	0.60	0.75	0.40	0.30	1.30		
Depth To Bottom										
Date Sampled										
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4AB	4AB	4AB	4ABE	6A	5A	4AB	4AB		
PAH 16										
Acenaphthene _A	-	-	-	-	0.45	0.25	0.04	0.14	mg/kg	A-T-019s
Acenaphthylene _A	-	-	-	-	<0.01	<0.01	0.12	0.02	mg/kg	A-T-019s
Anthracene _A ^{MF}	-	-	-	-	0.35	0.60	0.77	0.48	mg/kg	A-T-019s
Benzo(a)anthracene _A	-	-	-	-	0.19	0.34	1.62	0.32	mg/kg	A-T-019s
Benzo(a)pyrene _A	-	-	-	-	0.32	0.39	1.60	0.45	mg/kg	A-T-019s
Benzo(b)fluoranthene _A	-	-	-	-	0.25	0.25	1.18	0.34	mg/kg	A-T-019s
Benzo(ghi)perylene _A	-	-	-	-	0.28	0.23	0.99	0.38	mg/kg	A-T-019s
Benzo(k)fluoranthene _A	-	-	-	-	0.24	0.28	0.79	0.28	mg/kg	A-T-019s
Chrysene _A	-	-	-	-	0.48	0.92	2.49	0.77	mg/kg	A-T-019s
Dibenzo(ah)anthracene _A	-	-	-	-	<0.01	<0.01	0.32	0.04	mg/kg	A-T-019s
Fluoranthene _A	-	-	-	-	0.83	1.40	2.75	0.93	mg/kg	A-T-019s
Fluorene _A	-	-	-	-	0.32	0.17	0.08	0.10	mg/kg	A-T-019s
Indeno(123-cd)pyrene _A	-	-	-	-	0.13	0.10	0.57	0.17	mg/kg	A-T-019s
Napthalene _A	-	-	-	-	0.13	0.47	0.05	0.14	mg/kg	A-T-019s
Phenanthrene _A	-	-	-	-	0.85	1.41	0.96	0.64	mg/kg	A-T-019s
Pyrene _A	-	-	-	-	0.73	1.43	2.60	0.87	mg/kg	A-T-019s
Total PAH _A	-	-	-	-	5.57	8.24	16.9	6.06	mg/kg	A-T-019s

SUMMARY OF CONTAMINATION ANALYSIS - including Atkins ATRISK SSVs

Job Number: J1842/11/E
Date: 10.6.11

Tox Data Report No.	Compound	Range of Values Found (mg/kg)		Residential with Homegrown Produce Landuse (mg/kg)		Reference
	<i>Metals</i>	<i>Min</i>	<i>Max</i>			
3	Cadmium	<0.5	0.7	10		A
4	Chromium	<1		14.7		A
	Copper	27	78	4020		A
7	Mercury	<0.17	0.38	1.00		A
8	Nickel	16	43	130		A
	Lead	47	379	168		A
	Zinc	59	404	17200		A
	Vanadium	21	34	115		A
	<i>Semi and Non Metals</i>					
1	Arsenic	6	10	32		A
10	Selenium	<1		350		A
	Free Cyanide	<1		34		A
9	Phenols (total)	<0.2		420		A
	<i>Poly Aromatic Hydrocarbons</i>			ATRISK	CLEA	
20	Napthalene	0.05	0.47	8.71		A
	Acenaphthene	0.04	0.45	937	2130	A
	Fluorene	0.08	0.32	746	1930	A
	Anthracene	0.35	0.77	20.9	18300	A
	Fluoranthene	0.83	2.75	113	2160	A
	Pyrene	0.73	2.6	13.2	1550	A
	Benzo(a)anthracene	0.19	1.62	8.54		A
2	Chrysene	0.48	2.49	2.64	927	A
2	Benzo(b)fluoranthene	0.25	1.18	7.29	9.86	A
2	Benzo(k)fluoranthene	0.24	0.79	4.12	100	A
2	Benzo(a)pyrene	0.32	1.6	0.998		A
2	Dibenzo(a,h)anthracene	<0.01	0.32	0.0236	1	A
2	Indeno(1,2,3-cd)pyrene	0.1	0.57	0.368	9.75	A
2	Benzo(g,h,i)perylene	0.23	0.99	0.112	103	A
	<i>Petroleum Hydrocarbons</i>					
	Aliphatic C5-C6	<0.01		26.1		A
	Aliphatic C6-C8	<0.01		87.8		A
	Aliphatic C8-C10	<0.01		14.5		A
	Aliphatic C10-C12	<0.01	2.5	87.7		A
	Aliphatic C12-C16	<0.01	8.7	126		A
	Aliphatic C16-C21	<0.01	31.5	88200		A
	Aliphatic C21-C35	<0.01	130	88200		A
	Aromatic C5-C7 (Benzene)	<0.01		0.33		A*
	Aromatic C7-C8 (Toluene)	<0.01		610		A
	Aromatic C8-C10	<0.1		23.7		A
	Aromatic C10-C12	<0.1	3.1	132		A
	Aromatic C12-C16	<0.1	4.6	452		A
	Aromatic C16-C21	<0.1	13.2	804		A
	Aromatic C21-C35	<0.1	61.3	1220		A
	<i>Others</i>					
	pH	7.7	9.2	-		-
	Organic Content (%)	2.6	4	-		-
	Soluble Sulphate (g/l)	0.03	0.1	-		-
	Total Sulphate (%)	0.027	0.072	-		-

A = WS ATKINS PLC, ATRISK SOIL SCREENING VALUES BASED ON 6% SOIL ORGANIC MATTER

For PAHs ATRISK assumes free product is available whilst CLEA assumes no free product

A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.



ANALYTICAL TEST REPORT

Contract no: 46226
Contract name: Thirstin Mill, Honley
Client reference: J2270/12/E
Clients name: Rogers Geotechnical Services
Clients address: Unit 12 Emley Business Park
Leys Lane, Emley
Huddersfield
HD8 9QY

Samples received: 05 October 2012

Analysis started: 05 October 2012

Analysis completed: 12 October 2012

Report issued: 12 October 2012

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:

Karan Campbell
Director

John Campbell
Director

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are exclusive of stones.

Lab ref	Sample id	Depth (m)	Soil description passing 2mm sieve	Description of material retained on 2mm sieve	% Retained on 2mm sieve	Moisture (%)
46226-1	TP 1	0.30	Sand	Stones, Clinker & Gravel	38.1	15.9
46226-2	TP 2	0.40	Sandy Clay	Stones, Gravel & Brick	43.6	13.4
46226-3	TP 3	0.20	Sandy Clay	Stones, Gravel & Brick	56.1	11.8
46226-4	TP 4	0.50	Sandy Clay	Stones & Gravel	64.3	16.9
46226-5	TP 5	0.20	Clayey Sand	Stones & Gravel	67.2	12.3
46226-6	TP 6	0.20	Sand	Stones & Gravel	65.0	10.2
46226-7	TP 7	0.40	Loamy Sandy Clay	Stones & Gravel	45.4	16.2
46226-8	TP 8	0.30	Loamy Clay	Stones & Gravel	45.3	18.5

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SOILS

Lab number			46226-1	46226-2	46226-3	46226-4	46226-5	46226-6
Sample id			TP 1	TP 2	TP 3	TP 4	TP 5	TP 6
Depth (m)			0.30	0.40	0.20	0.50	0.20	0.20
Date sampled			02/10/2012	02/10/2012	02/10/2012	02/10/2012	02/10/2012	02/10/2012
Test	Method	Units						
Metals								
Cadmium (total)	CE054 ^M	mg/kg Cd	0.3	0.3	0.3	0.5	0.4	1.1
Chromium (VI)	CE050 ^U	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE054 ^M	mg/kg Cu	21	30	25	26	20	18
Mercury (total)	CE054	mg/kg Hg	0.6	<0.5	<0.5	0.5	0.5	1.6
Nickel (total)	CE054 ^M	mg/kg Ni	21	20	19	19	15	21
Lead (total)	CE054 ^M	mg/kg Pb	157	202	111	101	102	286
Zinc (total)	CE054 ^M	mg/kg Zn	56	102	81	88	69	565
Vanadium (total)	CE058	mg/kg V	29	35	23	23	20	24
Semi and Non Metals								
Arsenic (total)	CE054 ^M	mg/kg As	19	6.6	5.4	6.7	6.8	21
Selenium (total)	CE054 ^M	mg/kg Se	<0.3	0.5	0.4	0.4	0.5	0.5
Cyanide (free)	CE077	mg/kg CN	<2	<2	<2	<2	<2	<2
Phenols (total)	CE078	mg/kg PhOH	<0.5	0.8	0.5	0.6	<0.5	0.9
PAH								
Naphthalene	CE087	mg/kg	<0.1	<0.1	<0.1	0.8	<0.1	0.5
Acenaphthylene	CE087	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1	1.0
Acenaphthene	CE087	mg/kg	<0.1	0.9	<0.1	0.2	<0.1	0.2
Fluorene	CE087	mg/kg	<0.1	0.9	<0.1	0.2	<0.1	0.7
Phenanthrene	CE087	mg/kg	0.2	8.8	0.3	1.4	0.2	11.0
Anthracene	CE087	mg/kg	<0.1	2.5	<0.1	0.4	<0.1	4.2
Fluoranthene	CE087	mg/kg	0.1	11.3	0.5	1.2	0.3	28.5
Pyrene	CE087	mg/kg	0.1	9.8	0.5	1.2	0.3	26.2
Benzo(a)anthracene	CE087	mg/kg	<0.1	4.9	0.2	0.5	0.1	16.5
Chrysene	CE087	mg/kg	<0.1	4.5	0.3	0.6	0.1	15.3
Benzo(b)fluoranthene	CE087	mg/kg	<0.1	5.8	0.3	0.6	<0.1	20.7
Benzo(k)fluoranthene	CE087	mg/kg	<0.1	1.9	0.2	0.2	<0.1	7.6
Benzo(a)pyrene	CE087	mg/kg	<0.1	4.9	0.3	0.5	0.2	18.1
Indeno(123cd)pyrene	CE087	mg/kg	<0.1	2.3	0.2	0.2	<0.1	9.1
Dibenz(ah)anthracene	CE087	mg/kg	<0.1	0.6	<0.1	<0.1	<0.1	2.7
Benzo(ghi)perylene	CE087	mg/kg	<0.1	2.7	0.2	0.3	0.1	10.1
PAH (total)	CE087	mg/kg	<5	62	<5	8.3	<5	172

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SOILS

Lab number			46226-1	46226-2	46226-3	46226-4	46226-5	46226-6
Sample id			TP 1	TP 2	TP 3	TP 4	TP 5	TP 6
Depth (m)			0.30	0.40	0.20	0.50	0.20	0.20
Date sampled			02/10/2012	02/10/2012	02/10/2012	02/10/2012	02/10/2012	02/10/2012
Test	Method	Units						
TPH								
TPH Aliphatic EC5-EC6	CE068	mg/kg	<0.1	1.0	<0.1	<0.1	<0.1	<0.1
TPH Aliphatic EC6-EC8	CE068	mg/kg	0.3	1.1	0.1	<0.1	<0.1	<0.1
TPH Aliphatic EC8-EC10	CE068	mg/kg	0.1	3.5	0.2	0.1	0.1	0.1
TPH Aliphatic EC10-EC12	CE068	mg/kg	<1	1	<1	2	<1	1
TPH Aliphatic EC12-EC16	CE068	mg/kg	1	3	1	3	1	3
TPH Aliphatic EC16-EC21	CE068	mg/kg	10	37	4	25	4	37
TPH Aliphatic EC21-EC35	CE068	mg/kg	32	326	215	308	242	1171
TPH Aliphatic EC35-EC44	CE068	mg/kg	<1	27	22	20	29	252
TPH Aromatic EC5-EC7	CE068	mg/kg	<0.01	0.43	<0.01	<0.01	<0.01	<0.01
TPH Aromatic EC7-EC8	CE068	mg/kg	<0.01	0.43	<0.01	<0.01	<0.01	<0.01
TPH Aromatic EC8-EC10	CE068	mg/kg	<0.01	1.73	<0.01	<0.01	<0.01	<0.01
TPH Aromatic EC10-EC12	CE068	mg/kg	<1	<1	<1	<1	<1	<1
TPH Aromatic EC12-EC16	CE068	mg/kg	<1	1	<1	<1	<1	1
TPH Aromatic EC16-EC21	CE068	mg/kg	<1	33	1	4	1	71
TPH Aromatic EC21-EC35	CE068	mg/kg	<1	25	2	3	<1	90
TPH Aromatic EC35-EC44	CE068	mg/kg	<1	3	<1	<1	<1	10
Others								
pH	CE004 ^M	units	8.6	8.3	7.8	8.2	8.8	7.9
Organic matter content	CE005 ^M	% w/w	3.96	3.97	3.20	3.88	2.56	4.42
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	25	10	22	23	<10	11
Sulphate (total)	CE062 ^M	% w/w SO ₄	0.07	0.06	0.08	0.09	0.09	0.08

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SOILS

Lab number			46226-7	46226-8
Sample id			TP 7	TP 8
Depth (m)			0.40	0.30
Date sampled			02/10/2012	02/10/2012
Test	Method	Units		
Metals				
Cadmium (total)	CE054 ^M	mg/kg Cd	0.3	0.5
Chromium (VI)	CE050 ^U	mg/kg CrVI	<1	<1
Copper (total)	CE054 ^M	mg/kg Cu	30	47
Mercury (total)	CE054	mg/kg Hg	<0.5	<0.5
Nickel (total)	CE054 ^M	mg/kg Ni	21	25
Lead (total)	CE054 ^M	mg/kg Pb	111	174
Zinc (total)	CE054 ^M	mg/kg Zn	96	124
Vanadium (total)	CE058	mg/kg V	24	30
Semi and Non Metals				
Arsenic (total)	CE054 ^M	mg/kg As	6.0	10
Selenium (total)	CE054 ^M	mg/kg Se	0.4	0.4
Cyanide (free)	CE077	mg/kg CN	<2	<2
Phenols (total)	CE078	mg/kg PhOH	0.6	0.6
PAH				
Naphthalene	CE087	mg/kg	<0.1	0.2
Acenaphthylene	CE087	mg/kg	<0.1	0.2
Acenaphthene	CE087	mg/kg	<0.1	0.3
Fluorene	CE087	mg/kg	<0.1	0.4
Phenanthrene	CE087	mg/kg	0.5	3.7
Anthracene	CE087	mg/kg	0.3	1.3
Fluoranthene	CE087	mg/kg	1.6	7.7
Pyrene	CE087	mg/kg	1.4	6.8
Benzo(a)anthracene	CE087	mg/kg	0.7	4.2
Chrysene	CE087	mg/kg	0.7	3.9
Benzo(b)fluoranthene	CE087	mg/kg	0.9	5.1
Benzo(k)fluoranthene	CE087	mg/kg	0.3	1.5
Benzo(a)pyrene	CE087	mg/kg	0.7	4.2
Indeno(123cd)pyrene	CE087	mg/kg	0.4	2.0
Dibenz(ah)anthracene	CE087	mg/kg	<0.1	0.6
Benzo(ghi)perylene	CE087	mg/kg	0.5	2.2
PAH (total)	CE087	mg/kg	8.0	44

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SOILS

Lab number			46226-7	46226-8
Sample id			TP 7	TP 8
Depth (m)			0.40	0.30
Date sampled			02/10/2012	02/10/2012
Test	Method	Units		
TPH				
TPH Aliphatic EC5-EC6	CE068	mg/kg	<0.1	<0.1
TPH Aliphatic EC6-EC8	CE068	mg/kg	<0.1	<0.1
TPH Aliphatic EC8-EC10	CE068	mg/kg	0.1	0.1
TPH Aliphatic EC10-EC12	CE068	mg/kg	<1	1
TPH Aliphatic EC12-EC16	CE068	mg/kg	2	3
TPH Aliphatic EC16-EC21	CE068	mg/kg	10	27
TPH Aliphatic EC21-EC35	CE068	mg/kg	181	300
TPH Aliphatic EC35-EC44	CE068	mg/kg	18	22
TPH Aromatic EC5-EC7	CE068	mg/kg	<0.01	<0.01
TPH Aromatic EC7-EC8	CE068	mg/kg	<0.01	<0.01
TPH Aromatic EC8-EC10	CE068	mg/kg	<0.01	<0.01
TPH Aromatic EC10-EC12	CE068	mg/kg	<1	<1
TPH Aromatic EC12-EC16	CE068	mg/kg	<1	<1
TPH Aromatic EC16-EC21	CE068	mg/kg	4	20
TPH Aromatic EC21-EC35	CE068	mg/kg	4	22
TPH Aromatic EC35-EC44	CE068	mg/kg	<1	2
Others				
pH	CE004 ^M	units	7.8	8.0
Organic matter content	CE005 ^M	% w/w	3.97	3.98
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	19	<10
Sulphate (total)	CE062 ^M	% w/w SO ₄	0.03	0.04

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE054	Cadmium (total)	Aqua regia digest, ICP-OES	Dry	M	0.2	mg/kg Cd
CE050	Chromium (VI)	Acid extraction, Colorimetry	Dry	U	1	mg/kg CrVI
CE054	Copper (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Cu
CE054	Mercury (total)	Aqua regia digest, ICP-OES	Dry		0.5	mg/kg Hg
CE054	Nickel (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Ni
CE054	Lead (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Pb
CE054	Zinc (total)	Aqua regia digest, ICP-OES	Dry	M	3	mg/kg Zn
CE058	Vanadium (total)	Aqua regia digest, ICP-OES	Dry		1	mg/kg V
CE054	Arsenic (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg As
CE054	Selenium (total)	Aqua regia digest, ICP-OES	Dry	M	0.3	mg/kg Se
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	Wet		2	mg/kg CN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	Wet		0.5	mg/kg PhOH
CE087	PAH (speciated)	Solvent extraction, GC-MS	Wet		0.1	mg/kg
CE087	PAH (total)	Solvent extraction, GC-MS	Wet		5	mg/kg
CE068	TPH Aliphatic/Aromatic fractions (C5-C10)	Headspace GC-FID	Wet		0.01-0.1	mg/kg
CE068	TPH Aliphatic/Aromatic fractions (C10-C44)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE005	Organic matter content	Based on BS 1377, Colorimetry	Dry	M	0.01	% w/w
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO ₄
CE062	Sulphate (total)	Acid extraction, ICP-OES	Dry	M	0.01	% w/w SO ₄

SUMMARY OF CONTAMINATION ANALYSIS - including Atkins ATRISK SSVs

Job Number: J2270/12/E
Date: 18/10/2012

Tox Data Report No.	Compound	Range of Values Found (mg/kg)		Residential with Homegrown Produce Landuse (mg/kg)		Reference
	Metals	Min	Max			
3	Cadmium	0.3	1.1	10		A
4	Chromium	<1		14.7		A
	Copper	18	47	4020		A
7	Mercury	<0.5	1.6	1.00		A
8	Nickel	15	25	130		A
	Lead	101	286	168		A
	Zinc	56	565	17200		A
	Vanadium	20	35	115		A
	Semi and Non Metals					
1	Arsenic	5.4	21	32		A
10	Selenium	<0.3	0.5	350		A
	Free Cyanide	<2	<2	34		A
9	Phenols (total)	<0.5	0.9	420		A
	Poly Aromatic Hydrocarbons			ATRISK	CLEA	
20	Napthalene	<0.1	0.8	8.71		A
	Acenaphthene	<0.1	0.9	937	2130	A
	Fluorene	<0.1	0.9	746	1930	A
	Anthracene	<0.1	4.2	20.9	18300	A
	Fluoranthene	0.1	28.5	113	2160	A
	Pyrene	0.1	26.2	13.2	1550	A
	Benzo(a)anthracene	<0.1	16.5	8.54		A
2	Chrysene	<0.1	15.3	2.64	927	A
2	Benzo(b)fluoranthene	<0.1	20.7	7.29	9.86	A
2	Benzo(k)fluoranthene	<0.1	7.6	4.12	100	A
2	Benzo(a)pyrene	<0.1	18.1	0.998		A
2	Dibenzo(a,h)anthracene	<0.1	2.7	0.0236	1	A
2	Indeno(1,2,3-cd)pyrene	<0.1	9.1	0.368	9.75	A
2	Benzo(g,h,i)perylene	<0.1	10.1	0.112	103	A
	Petroleum Hydrocarbons					
	Aliphatic C5-C6	<0.1	1	26.1		A
	Aliphatic C6-C8	<0.1	1.1	87.8		A
	Aliphatic C8-C10	0.1	3.5	14.5		A
	Aliphatic C10-C12	<1	2	87.7		A
	Aliphatic C12-C16	1	3	126		A
	Aliphatic C16-C21	4	37	88200		A
	Aliphatic C21-C35	32	1171	88200		A
	Aromatic C5-C7 (Benzene)	<0.01	0.43	0.33		A*
	Aromatic C7-C8 (Toluene)	<0.01	0.43	610		A
	Aromatic C8-C10	<0.01	1.73	23.7		A
	Aromatic C10-C12	<1	<1	132		A
	Aromatic C12-C16	<1	1	452		A
	Aromatic C16-C21	<1	71	804		A
	Aromatic C21-C35	<1	90	1220		A
	Others					
	pH	7.8	8.8	-		-
	Organic Content (%)	2.56	4.42	-		-
	Soluble Sulphate (mg/l)	<10	25	-		-
	Total Sulphate (%)	0.03	0.09	-		-

A = WS ATKINS PLC, ATRISK SOIL SCREENING VALUES BASED ON 6% SOIL ORGANIC MATTER

For PAHs ATRISK assumes free product is available whilst CLEA assumes no free product

A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.