

Our Ref: 13-562.05L

17<sup>th</sup> February 2015

Paul Elliott  
Anthony Watson Chartered Architects  
5 Douro Terrace  
Sunderland  
Tyne & Wear  
SR2 7DX



Arc Environmental Ltd  
Solum House  
1 Elliott Court  
St Johns Road  
Meadowfield  
Durham  
DH7 8PN

Dear Paul,

**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH**

### **1.0 Introduction:-**

At the request of Anthony Watson Chartered Architects of Sunderland, Tyne & Wear, and in conjunction with a Phase 1: Desk Top Study Report produced for the site (reference; 13-562, October 2013) Arc Environmental Limited (ARC) undertook a programme of follow-up intrusive ground investigation works. The site was formerly occupied by a Day Centre, and is located adjacent to Temple Green and Temple Park Road in South Shields, Tyne & Wear. The site is centered on National Grid Reference: 437150, 564480. The Day Centre structure was present on site at the time when the Phase 1: Desk Top Study Report was produced, and this was demolished and the site was levelled and topsoil deposits were imported, prior to the intrusive ground investigation works being undertaken. The site redevelopment works will involve the construction of residential apartments with onsite car parking facilities and occasional minor areas of soft landscaping.

The initial intrusive ground investigation works undertaken by ARC during 2013 comprised the sinking of 5 no. windowless sampling boreholes, labelled BH's 1 – 5, 2 no. deep rotary (open hole) boreholes, labelled RBH's 1 & 2, accompanied the installation of 3 no. combined ground gas & groundwater monitoring wells at the location of BH's 1, 2 & 4. Asbestos fibres were recorded within the imported topsoil deposits, during the initial contamination analysis undertaken by ARC and as a result these soils were removed off-site during 2014, post completion of the investigation works listed above. Following the recent removal of the imported topsoil deposits, a series (4 no.) of manually excavated trial pits, labelled TP's A – D were undertaken on Friday 5<sup>th</sup> December 2014 primarily to collect further soil samples to determine the levels of contamination present in the soils exposed at the surface.

The borehole and trial pit positions can be seen on the borehole and trial pit location plan attached, and this plan should be used for orientating purposes only, as the positions shown are approximate and the plan is not to a standard scale.

---

T: 0191 378 6380  
F: 0191 378 0494  
E: admin@arc-environmental.com  
W: www.arc-environmental.com  
Registered in England No. 05539784



**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

**2.0 Investigation Rationale:-**

The intrusive ground investigation works undertaken by ARC were designed to determine the ground and groundwater conditions below the site area in order to facilitate with the construction of the proposed residential development. The rationale behind the location of each intrusive investigation position is summarised in Table 1 below.

**Table 1**

<b><u>Potential issue</u></b>	<b><u>Position / date of works</u></b>
Determine the nature of the underlying shallow ground conditions, including shallow groundwater	BH's 1 – 5 (2013)
Determine the levels of contamination present within the initial topsoil deposits with a view to determining the risks posed towards the site end-users	BH's 1 – 5 (2013)
Determine the risks posed to the site from past shallow coal mining activities – A permit to enter or disturb the Coal Authority's mining interests was obtained during October 2013 – Permit reference; 8474	RBH's 1 & 2 (2013)
Determine the risks posed to the site from hazardous ground gas production and migration	BH's 1, 2 & 4 (2013)
Further sampling to determine the levels of contamination present within the initial soil deposits, as current (2014) with a view to further determining the risks posed towards the site end-users	TP's A – D (2014)

**3.0 Ground Conditions:-**

For an accurate description of the ground conditions encountered at each exploratory location, reference should be made to the borehole record sheets attached. It should be noted that there is always the possibility of variation in the ground conditions around and between the borehole locations. Made ground deposits were recorded at each borehole location to depths ranging from between c.0.40m to c.1.20m below existing site levels. Below the made ground deposits natural stiff (high strength) sandy, gravelly clay deposits were encountered. The natural clay deposits were proven to depths of between c.19.20m and c.19.50m below existing site levels before bedrock deposits were recorded. The underlying bedrock deposits consisted mainly of mudstone and these were proven to a maximum depth of c.35.00m below existing site levels. There was no evidence of the Hebburn Fell or Usworth coal seams (shallowest recorded coal seams identified within the Phase 1: Desk Top Study Report) being present below the site area. In addition, there was no evidence of ancient coal workings within the depths penetrated and as a result the site is not deemed to be at risk from future instability issues normally associated with past shallow coal mining activities. As a result no further works, or remediation measures are required with respect to the issue of shallow subjacent coal workings.

## **Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

### **3.0 Ground Conditions (Cont'd):-**

Approximately 0.50m of the initial made ground deposits were stripped and removed off-site during 2014. Following on from this work, ARC attended site in order to obtain further representative samples of the soils left exposed at the surface. The soils present at the surface comprised mainly of dark brown / black, sandy, gravelly soil deposits, similar to those previously recorded on site within the boreholes.

### **4.0 Groundwater:-**

All of the boreholes and trial pits remained dry during the exploratory period. Based on the ground conditions identified, significant or heavy water ingresses are unlikely to occur within shallow construction related excavations. However, it would be prudent to allow for the introduction of temporary groundwater control techniques (i.e. sump pumping equipment), in order to take care of any localised ingresses of groundwater which may occur during the construction period, especially during the wetter periods of the year.

Combined ground gas & groundwater monitoring wells have been installed at the location of BH's 1, 2 & 4 to allow for further assessment in relation to gas and groundwater. The monitoring results obtained to date are discussed below in Section 5.0, sub-section 5.2 of this report.

### **5.0 Insitu Testing:-**

#### **5.1 Hand Shear Vane Tests:-**

Insitu hand vane tests were carried out using a portable insitu hand vane tester (upper limit 130kN/m<sup>2</sup>) on the natural clay deposits encountered within the boreholes, the results are displayed on the borehole record sheets against the appropriate depth. The insitu hand vane tester takes direct readings of shear strength. Three vane sizes allow for the direct determination of undrained shear strength of extremely low strength to high strength clays. The peak vane value is determined by a calibrated scale ring built into the head assembly. The dial is used both to push the vane to the desired test depth and apply the shearing torque. Values ranging from between 72kN/m<sup>2</sup> (medium strength) up to 130kN/m<sup>2</sup> (high strength) have been recorded for the natural clay deposits encountered.

#### **5.2 Insitu Ground Gas & Groundwater Monitoring:-**

Combined ground gas & groundwater monitoring standpipes were installed at the location of BH's 1, 2 & 4 primarily to determine the ground gas regime for the site.



**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

**5.0 Insitu Testing (Cont'd):-**

**5.2 Insitu Ground Gas & Groundwater Monitoring (Cont'd):-**

A standard 50mm diameter HDPE standpipe, with gravel and / or geo-wrap surround, bentonite seal, gas valve cap and security cover, were installed to depths ranging from c.4.00m to c.5.00m below current ground levels, and the ground gas and water levels were allowed to reach equilibrium, prior to the first monitoring visit. Copies of the ground gas monitoring certificates can be seen attached to this report.

Monitoring was undertaken using a Gas Data GFM 430 soil gas analyser, with integral flow meter, and a Geotechnical Instruments electronic dip-meter. In accordance with CIRIA Report C665, November 2007, the current NHBC Document; Guidance on evaluation of development proposals on site where methane and carbon dioxide are present, Report Edition No. 04, March 2007 and BS8485:2007: Code of practice for the characterization and remediation from ground gas affected developments, it is felt that an adequate risk assessment for this site can be undertaken based on the following limiting factors:

- The proposed development is considered as a moderate sensitivity – this is based on a residential development (flats).
- The risk associated with the gas generation potential of sources for this particular site is considered as very low. This has been based on the results of the Phase 1: Desk Top Study Report produced for the site.
- Therefore in accordance with CIRIA Report C665 (Assessing risks posed by hazardous ground gases to buildings, 2007), it was deemed appropriate to allow for 6 no. monitoring visits to be completed over a minimum period of 2 months. This would be adequate for the proposed development providing gas readings were obtained during periods of falling and low atmospheric pressures.

A summary of the results for the visits undertaken, compared with the 'inert' background gas levels are presented in Table 2 below and continues on the following page, and copies of the monitoring certificates can be found attached to this report.

**Table 2**

<b><u>BH Position</u></b>	<b><u>Date</u></b>	<b><u>Atmospheric pressure (mbar)</u></b>	<b><u>Water (m bgl)</u></b>	<b><u>CH<sub>4</sub> (%v/v)</u></b>	<b><u>LEL (%v/v)</u></b>	<b><u>CO<sub>2</sub> (%v/v)</u></b>	<b><u>O<sub>2</sub> (%v/v)</u></b>	<b><u>Flow rate (l/hr)</u></b>
<b>Background</b>		~	~	0	0	0	21.0	0
BH1	08/11/2013	993 – 995 (rising)	Dry	0.0	0.0	0.1	19.5	<0.1
BH2			Dry	0.0	0.0	0.1	19.4	<0.1
BH4			Dry	0.0	0.0	0.1	19.4	<0.1

**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

**5.0 Insitu Testing (Cont'd):-**

**5.2 Insitu Ground Gas & Groundwater Monitoring (Cont'd):-**

**Table 2 (Cont'd)**

<u>BH Position</u>	<u>Date</u>	<u>Atmospheric pressure (mbar)</u>	<u>Water (m bgl)</u>	<u>CH<sub>4</sub> (%v/v)</u>	<u>LEL (%v/v)</u>	<u>CO<sub>2</sub> (%v/v)</u>	<u>O<sub>2</sub> (%v/v)</u>	<u>Flow rate (l/hr)</u>
<b>Background</b>		~	~	0	0	0	21.0	0
BH1	19/11/2013	1008 (steady)	Dry	0.0	0.0	0.1	19.3	<0.1
BH2			Dry	0.0	0.0	0.1	19.4	<0.1
BH4			Dry	0.0	0.0	0.1	19.4	<0.1
BH1	02/12/2013	1022 (steady)	Dry	0.0	0.0	0.1	19.5	<0.1
BH2			Dry	0.0	0.0	0.1	19.3	<0.1
BH4			Dry	0.0	0.0	0.1	19.4	<0.1
BH1	17/12/2013	1002 (steady)	Dry	0.0	0.0	0.1	19.2	<0.1
BH2			Dry	0.0	0.0	0.1	19.3	<0.1
BH4			Dry	0.0	0.0	0.1	19.2	<0.1
BH1	07/01/2014	985 – 983 (falling)	Dry	0.0	0.0	0.1	19.6	<0.1
BH2			Dry	0.0	0.0	0.1	19.5	<0.1
BH4			Dry	0.0	0.0	0.1	19.5	<0.1
BH1	27/01/2014	989 (steady)	Dry	0.0	0.0	0.1	19.6	<0.1
BH2			Dry	0.0	0.0	0.1	19.7	<0.1
BH4			Dry	0.0	0.0	0.1	19.6	<0.1

There have been no concentrations of Methane (CH<sub>4</sub>) recorded within any of the gas monitoring wells. However, low level concentrations of Carbon Dioxide (CO<sub>2</sub>) have been consistently recorded at 0.1%v/v. Flow rates have been consistently recorded at <0.1l/hr, with monitoring completed during periods of low and falling pressure. The site can be characterised based on the limiting borehole gas volume flow for methane and carbon dioxide known as the Gas Screening Value (GSV) which in turn determines the level of protection required. In accordance with CIRIA Report C665, the risk to the development from ground gases has been assessed by converting the results in Table 2 to a GSV, calculated by multiplying the typical maximum gas concentrations with the recorded maximum positive flow rates (after Wilson & Card). Due to the lack of CH<sub>4</sub> recorded, there is no GSV value for Methane. In order to complete the risk assessment the maximum GSV for the CO<sub>2</sub> levels recorded has been determined by multiplying the maximum concentration recorded (0.1%v/v) by the maximum flow rate (0.1l/hr). The GSV can be calculated as follows;

$$\text{Carbon Dioxide GSV} = 0.001 \times 0.1 = 0.0001\text{l/hr}$$



## **Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

### **5.0 Insitu Testing (Cont'd):-**

#### **5.2 Insitu Ground Gas & Groundwater Monitoring (Cont'd):-**

The calculated GSV value of 0.0001/hr for CO<sub>2</sub> places the site within the Characteristic Situation 1 (CS1) classification where no gas protection measures are deemed necessary.

When considering the results of the groundwater monitoring completed, it can be seen that boreholes remained dry during the monitoring period.

### **6.0 Laboratory Testing:-**

#### **6.1 Determination of pH & SO<sub>4</sub>:-**

In total nine representative samples of the made ground and natural strata recovered within the boreholes and trial pits during the two phases of investigation works undertaken were tested in order to determine their acidic (pH) and soluble sulphate (SO<sub>4</sub>) levels. The results are shown in Table 3 below, and are also contained within the Chemtech Environmental Limited Analytical Reports, reference; 49559(1) & 53756 copies of which can be seen attached to this report.

**Table 3**

<b><u>Position</u></b>	<b><u>Depth (m)</u></b>	<b><u>pH</u></b>	<b><u>SO<sub>4</sub>(mg/l)</u></b>	<b><u>Design SO<sub>4</sub> Class</u></b>	<b><u>ACEC Class</u></b>
BH1	0.50*	8.0	78	DS-1	AC-1
BH1	2.00^	8.2	41	DS-1	AC-1
BH2	0.50*	7.7	23	DS-1	AC-1
BH3	0.00-0.40*	7.6	1359	DS-2	AC-2
BH3	4.00-5.00^	8.5	133	DS-1	AC-1
BH4	0.00-0.60*	7.8	1064	DS-2	AC-2
BH5	0.00-0.80*	7.9	221	DS-1	AC-1
TPA	0.00-0.50*	7.8	89	DS-1	AC-1
TPB	0.00-0.50*	7.7	340	DS-1	AC-1
TPC	0.00-0.50*	7.9	126	DS-1	AC-1
TPD	0.00-0.50*	7.8	564	DS-2	AC-2

ACEC = Aggressive Chemical Environment for Concrete site classification, \* = Made ground, ^ = Natural strata

From these results it can be seen that the pH values for the samples tested range from 7.7 up to 8.5, and the amount of soluble sulphate present (23mg/l – 1359mg/l) falls below and above the negligible range of 500mg/l. Therefore, in accordance with BRE Special Digest 1: 2005, the site can be given a design class of DS-2.

T: 0191 378 6380

F: 0191 378 0494

E: admin@arc-environmental.com

W: www.arc-environmental.com

Registered in England No. 05539784



## **Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

### **6.0 Laboratory Testing (Cont'd):-**

#### **6.1 Determination of pH & SO<sub>4</sub> (Cont'd):-**

When considering the nature of the materials tested and assuming mobile groundwater the assessment of the Aggressive Chemical Environment for Concrete (ACEC) is AC-2.

#### **6.2 Determination of Liquid & Plastic Limits (Cont'd):-**

Two representative samples of the natural clay deposits encountered within the boreholes were tested in order to determine their liquid and plastic limits, so these materials could be classified. The results are contained in the PSL Analytical Report, ref no. PSL13/4399 a copy of which can be seen attached to this report. From the results it can be seen that the samples tested are inorganic in nature, and when plotted on the plasticity chart fall within the intermediate plasticity range and from the resulting plasticity indices have a moderate volume change potential, when taking into account the amount passing the 425µm sieve. Therefore, it can be seen that the natural clay deposits may undergo potentially significant changes in volume, if large changes in their natural moisture content were to occur due to seasonal variations or the like, and if new foundations were to be based within these materials, they would need to be taken down to a minimum depth of 0.90m below finished ground levels. The minimum foundation depth may also need to be increased if the proposed structures are within close proximity to existing or envisaged vegetation, even if trees are to be removed, in order to ensure no additional future shrinkage and swelling of these materials occurs. Reference should be made to BS5837: 2012, "Trees in Relation to Design Demolition & Construction".

#### **6.3 Ground Contamination Screening:-**

To ascertain the nature and degree of contamination present within the shallow soil deposits present below the site, with a view to determining the risks posed towards the future site end-users, 9 no. representative samples of the made ground deposits were screened for the following range of analytes; Arsenic, Cadmium, Chromium (III & VI), Copper, Lead, Mercury, Nickel, Selenium, Zinc, Cyanide and Total Organic Carbon. This contamination suite is based on the current CLEA SGV listed analytes which includes some historical additions used to assess typical made ground i.e. disturbed natural strata mixed with anthropogenic debris, of an unknown source. For completeness, screening for Speciated Polycyclic Aromatic Hydrocarbons (PAH's), Speciated Total Petroleum Hydrocarbons (TPH's – Ali & Aro split) and the presence of asbestos has also been carried out. This suite of tests will also allow for the preliminary classification of the made ground for off-site disposal purposes. Leachate screening was also undertaken on selected samples of made ground to determine the risks posed to nearby sensitive receptors. The total analysis carried out is summarised on the following page.

---

T: 0191 378 6380

F: 0191 378 0494

E: admin@arc-environmental.com

W: www.arc-environmental.com

Registered in England No. 05539784

**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

**6.0 Laboratory Testing (Cont'd):-**

**6.3 Ground Contamination Screening (Cont'd):-**

**Soils:-**

- 9 no. soil samples screened using a Generic soils suite, comprising; Arsenic, Cadmium, Chromium III, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Zinc & Cyanide
- 9 no. soil samples screened for the presence of asbestos fibres, with quantification testing on 2 no. samples
- 6 no. soil samples screened for Speciated Polycyclic Aromatic Hydrocarbons (PAH's)
- 6 no. soil samples screened for Speciated Total Petroleum Hydrocarbons (TPH's – Ali & Aro split)
- 4 no. soil samples screened for Benzene, Toluene, Ethylbenzene, m & p-Xylene & o-Xylene (BTEX)

**Leachate:-**

- 4 no. soil samples chosen for a generic leachate suite which includes the following determinands; Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Zinc, pH, Sulphate and Cyanide
- 1 no. soil samples screened for leachable Speciated Polycyclic Aromatic Hydrocarbons (PAH's)
- 1 no. soil samples screened for leachable Speciated Total Petroleum Hydrocarbons (TPH's) & BTEX

A summary of the results, based on the soil concentrations recorded can be seen in Table 4, 5, 6, 7 & 8 below and continues on the following pages.

**Table 4 – Generic Suite**

<b><u>Analyte</u></b>	<b><u>Target Conc. (C<sub>T</sub>) mg/kg</u></b>	<b><u>No. of Samples Screened</u></b>	<b><u>Max. Conc. (C<sub>M</sub>) recorded (mg/kg)</u></b>
<b><u>Generic</u></b>			
Arsenic	40 <sup>(1)</sup>	9	13
Cadmium	85 <sup>(1)</sup>	9	0.9
Chromium III	910 <sup>(1)</sup>	9	74
Chromium VI	6 <sup>(1)</sup>	9	<1
Copper	7,100 <sup>(1)</sup>	9	114
Lead	310 <sup>(3)</sup>	9	279
Mercury	56 <sup>(1)</sup>	9	0.7
Nickel	180 <sup>(1)</sup>	9	40
Selenium	430 <sup>(1)</sup>	9	1.8
Zinc	40,000 <sup>(1)</sup>	9	493
Cyanide	34 <sup>(2)</sup>	9	<2

<sup>(1)</sup> = The LQM / CIEH S4UL's for Residential without homegrown produce, <sup>(2)</sup> = ATRISK<sup>SOIL</sup> SSV (2009), <sup>(3)</sup> = CL:AIRE C4SLs for Residential without homegrown produce



**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

**6.0 Laboratory Testing (Cont'd):-**

**6.3 Ground Contamination Screening (Cont'd):-**

**Table 5 – Speciated PAH's**

<u>Analyte</u>	<u>Target Conc. (C<sub>T</sub>) mg/kg</u>	<u>No. of Samples Screened</u>	<u>Max. Conc. (C<sub>M</sub>) recorded (mg/kg)</u>
<b>Speciated PAH's</b>			
Acenaphthene	6,000 <sup>(1)</sup>	6	1.28
Acenaphthylene	6,000 <sup>(1)</sup>	6	0.7
Anthracene	37,000 <sup>(1)</sup>	6	3.92
Benzo(a)anthracene	15 <sup>(1)</sup>	6	5.92
<b>Benzo(a)pyrene</b>	<b>3.2<sup>(1)</sup></b>	<b>6</b>	<b>4.56 (TPC)</b>
<b>Benzo(b)fluoranthene</b>	<b>4.0<sup>(1)</sup></b>	<b>6</b>	<b>6.15 (TPC)</b>
Benzo(ghi)perylene	360 <sup>(1)</sup>	6	2.39
Benzo(k)fluoranthene	110 <sup>(1)</sup>	6	2.61
Chrysene	32 <sup>(1)</sup>	6	5.01
<b>Dibenz(ah)anthracene</b>	<b>0.32<sup>(1)</sup></b>	<b>6</b>	<b>0.93 (TP's C, D, BH's 1 &amp; 4)</b>
Fluoranthene	1,600 <sup>(1)</sup>	6	13.18
Fluorene	4,500 <sup>(1)</sup>	6	1.74
Indeno(123cd)pyrene	46 <sup>(1)</sup>	6	2.78
Naphthalene	13 <sup>(1)</sup>	6	0.2
Phenanthrene	1,500 <sup>(1)</sup>	6	9.38
Pyrene	3,800 <sup>(1)</sup>	6	9.46

<sup>(1)</sup> = The LQM / CIEH S4UL's, based on 6% SOM for Residential without homegrown produce

**Table 6 – Speciated TPH's**

<u>Analyte</u>	<u>Target Conc. (C<sub>T</sub>) mg/kg</u>	<u>No. of Samples Screened</u>	<u>Max. Conc. (C<sub>M</sub>) recorded (mg/kg)</u>
<b>Speciated TPH</b>			
Aliphatic EC5-EC6	160 <sup>(1)</sup>	6	<0.1
Aliphatic EC6-EC8	530 <sup>(1)</sup>	6	<0.1
Aliphatic EC8-EC10	150 <sup>(1)</sup>	6	<0.1
Aliphatic EC10-EC12	770 <sup>(1)</sup>	6	5
Aliphatic EC12-EC16	4,300 <sup>(1)</sup>	6	28
Aliphatic EC16-EC35	110,000 <sup>(1)</sup>	6	582
Aliphatic EC35-EC44	110,000 <sup>(1)</sup>	6	149

<sup>(1)</sup> = The LQM / CIEH S4UL's, based on 6% SOM for Residential without homegrown produce

**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

**6.0 Laboratory Testing (Cont'd):-**

**6.3 Ground Contamination Screening (Cont'd):-**

**Table 6 – Speciated TPH's (Cont'd)**

<u>Analyte</u>	<u>Target Conc. (C<sub>T</sub>)</u> <u>mg/kg</u>	<u>No. of Samples</u> <u>Screened</u>	<u>Max. Conc. (C<sub>M</sub>)</u> <u>recorded (mg/kg)</u>
<u>Speciated TPH</u>			
Aromatic EC5-EC7	1,400 <sup>(1)</sup>	6	<0.01
Aromatic EC7-EC8	3,900 <sup>(1)</sup>	6	<0.01
Aromatic EC8-EC10	270 <sup>(1)</sup>	6	<0.01
Aromatic EC10-EC12	1,200 <sup>(1)</sup>	6	<1
Aromatic EC12-EC16	2,500 <sup>(1)</sup>	6	1
Aromatic EC16-EC21	1,900 <sup>(1)</sup>	6	38
Aromatic EC21-EC35	1,900 <sup>(1)</sup>	6	30
Aromatic EC35-EC44	1,900 <sup>(1)</sup>	6	1
Benzene	1.4 <sup>(1)</sup>	4	<0.01
Toluene	3,900 <sup>(1)</sup>	4	<0.01
Ethylbenzene	440 <sup>(1)</sup>	4	<0.01
m & p-Xylene	450 <sup>(1)</sup>	4	<0.01
o-Xylene	480 <sup>(1)</sup>	4	<0.01

<sup>(1)</sup> = The LQM / CIEH S4UL's, based on 6% SOM for Residential without homegrown produce

Due to some of the individual PAH's recorded (Benzo(a)pyrene, Benzo(b)fluoranthene & Dibenz(ah)anthracene), the made ground deposits present below the site represent a potential risk to the proposed end-users where exposure pathways will be available post completion of the proposed development and therefore protection measures, or further assessment will be required in order to break the linkage in the source-pathway-receptor model.

A suitable method of protection for this site would be to introduce a layer of clean cover (clean soil) within all areas of soft landscaping. Where the made ground lies below buildings and hardcover there will be no requirement for protection. Based on discussions held with South Tyneside Council, clean cover in the order of 600mm in thickness will suffice for this development site, based on the levels of PAH's identified.

Prior to undertaking any remedial measures a Remediation Strategy will need to be produced which details the remedial measures required in order to bring the risks currently posed by ground contamination to acceptable levels. The contents of this document will need to be agreed with South Tyneside Council prior to commencement.

**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

**6.0 Laboratory Testing (Cont'd):-**

**6.3 Ground Contamination Screening (Cont'd):-**

**Table 7 – Asbestos**

<u>Position</u>	<u>Depth (m)</u>	<u>Chrysotile (white)</u>	<u>Amosite (brown)</u>	<u>Crocidolite (blue)</u>	<u>Anthophyllite</u>	<u>Actinolite</u>	<u>Tremolite</u>
BH1	0.50	NAD	NAD	NAD	NAD	NAD	NAD
BH2	0.50	NAD	NAD	NAD	NAD	NAD	NAD
BH3	0.00-0.40	YES	NAD	NAD	NAD	NAD	NAD
BH4	0.00-0.60	YES	NAD	NAD	NAD	NAD	NAD
BH5	0.00-0.80	YES	NAD	NAD	NAD	NAD	NAD
TPA	0.00-0.50	NAD	NAD	NAD	NAD	NAD	NAD
TPB	0.00-0.50	YES	NAD	NAD	NAD	NAD	NAD
TPC	0.00-0.50	YES	NAD	NAD	NAD	NAD	NAD
TPD	0.00-0.50	YES	NAD	NAD	NAD	NAD	NAD

NAD = No asbestos fibres detected

In order to more accurately assess the level of potential risk associated with the Chrysotile asbestos identified within 6 no. samples out of the 9 no. screened, quantitative asbestos screening has been carried out on 2 no. of the samples tested from TP's B & D. The results of this testing recorded concentrations of <0.001% w/w. Based on the quantitative testing results obtained it is felt that the levels of asbestos (Chrysotile) identified represent a low risk towards the future site end-users (human health).

However, when considering the risks to the construction workforce, adequate PPE will be required to provide protection against the levels of contaminants recorded during these investigation works. Similarly, the results can also be used by the Main Contractor / Project Coordinator, when devising an adequate Site Health & Safety Plan, in accordance with current CDM Regulations. In addition, when considering the presence of Asbestos below the site, precautions will need to be taken with regards to protect the health of construction workers and members of the public during any groundwork preparation.

These will include, suitable PPE (typically dust masks, disposal overalls, etc.), the dampening down of the made ground during any excavations to prevent wind-blown particles / fibres from becoming airborne (especially during dry periods), and excavations left open for a long period of time being suitably covered to prevent wind-blown particles / fibres escaping from open excavations, so as to provide protection for workers and the general public.

**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

**6.0 Laboratory Testing (Cont'd):-**

**6.3 Ground Contamination Screening (Cont'd):-**

Based on the results of the soil screening carried out on the various samples chosen, appropriate leachate screening has been carried out and the results have been used to determine the potential impact on Controlled Waters. Where available, the results have been assessed against most appropriate Environmental Quality Standards (EQS) for priority substances and other certain pollutants, with the remaining analytes being assessed against current UK Drinking Water Standards (DWS). A summary of the results for this Level 1 Risk Assessment can be seen in Table 9 on the following page.

The Speciated PAH's & Speciated TPH's all fall below the analytical detection limits, and as a result these have not been included within Table 8 below.

**Table 8**

<b>LEVEL 1</b>	<b>Critical Conc. (C<sub>c</sub>)</b> <b>(µg/l)</b>	<b>Site Data</b>		
		<b>Max. Conc.</b> <b>(C<sub>M</sub>) (µg/l)</b>	<b>Has max. C<sub>M</sub></b> <b>Value</b> <b>Been Exceeded</b>	<b>Number of samples</b> <b>&gt;C<sub>c</sub></b>
<b>Analyte</b>				
Arsenic	50 <sup>(1)</sup>	2.03	NO	0
Boron	2000 <sup>(1)</sup>	55	NO	0
Cadmium	5 <sup>(1)</sup>	<0.07	NO	0
Chromium	5-250 <sup>(1)</sup>	3.0	NO	0
Copper	1-28 <sup>(1)</sup>	7.7	NO	0
Lead	4-250 <sup>(1)</sup>	1.9	NO	0
Mercury	1 <sup>(1)</sup>	0.102	NO	0
Nickel	50-200 <sup>(1)</sup>	2.6	NO	0
Selenium	10 <sup>(2)</sup>	0.47	NO	0
Zinc	8-500 <sup>(2)</sup>	4	NO	0
Cyanide	50 <sup>(2)</sup>	<20	NO	0

<sup>(1)</sup> = UK EQS Freshwater, <sup>(2)</sup> = UK Drinking Water Standard (DWS), <sup>(3)</sup> = UK Drinking Water Standard for PAH's. <sup>(4)</sup> = Analytical Detection Limit

The leachate results shown in Table 9, as well as the levels of Speciated PAH's and Speciated TPH's fall below the chosen critical concentration values for this site and as a result the risk posed towards Controlled Waters from the identified on-site ground contamination sources is deemed to be negligible.

At this stage based on the contamination screening results obtained (generic, Speciated PAH's, Speciated TPH's and Asbestos), it is possible that the made ground deposits will be classified as Non-Hazardous for off-site disposal purposes. However, this is an approximation only as definitive waste disposal classifications should be confirmed with individual landfill operators, in accordance with their site licenses. To assist with off-site disposal, Waste Acceptance Criteria (WAC) screening has been undertaken on 2 no. soil samples.

T: 0191 378 6380

F: 0191 378 0494

E: admin@arc-environmental.com

W: www.arc-environmental.com

Registered in England No. 05539784



## **Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

### **6.0 Laboratory Testing (Cont'd):-**

#### **6.3 Ground Contamination Screening (Cont'd):-**

Therefore all of the contamination results attached should be presented to, and discussions held with, appropriate licensed operators for confirmation of disposal classification.

The results of all the testing undertaken on this site can be found in the Chemtech Environmental Limited Analytical Reports, reference no's. 49559(1), 53756(1) & 53848, copies of which can be seen attached.

### **7.0 Foundations Options:-**

Based on the nature of the natural clay deposits, these deposits will be a suitable foundation bearing medium for the proposed residential development (apartments) where a maximum allowable bearing pressure of 150kN/m<sup>2</sup> will be available. Foundations should be based at a minimum depth of 0.90m below finished ground levels and based wholly within the natural stiff (high strength) clay deposits. Foundation excavation depths may vary, due to the presence of made ground and / or buried obstructions.

Since variations in the ground conditions have been identified below the site area within the boreholes and trial pits, it is recommended that all foundation excavations are inspected by a suitably qualified Geotechnical Engineer in order to confirm the correct founding strata has been reached prior to pouring the concrete.

### **8.0 General Comments:-**

For future site works, adequate lateral trench support will be required for excavations, in order to prevent trench wall collapse or over excavations, as well as to create a safe working environment below a depth of 1.20m.

Any excavations on this site should remain open for as short a period as possible, since some of these materials may be susceptible to deterioration, if left open to the natural elements for any significant period of time. Reference to CIRIA 97 'Trenching Practice' would be beneficial to establish a suitable means of support or battering of excavation sides during construction. It is also recommended that adequate surface drainage is designed and installed by a competent contractor, in order to prevent surface water 'ponding' or collection, during and post construction, particularly where the existing surface drainage system is disrupted or damaged.



**Re: Land adjacent to Temple Park Road, South Shields, NE34 0HH (Cont'd)**

**8.0 General Comments (Cont'd):-**

In addition, for deeper excavations, drainage, service runs or the like that may pass close to or beneath any existing or proposed new foundations, these should be undertaken with care and completed prior to the preparation of any new foundations, so as not to allow any loose or granular material to move or 'flow', thus causing settlement to occur to any new or adjacent old foundation based at a higher level.

An "observational technique" can be applied to the design and construction of any new foundations on this site, and where ground conditions seem to vary from that indicated from the works completed on site to date, then advice from a suitably qualified Engineering Geologist / Geotechnical Engineer should be sought.

We trust the contents of this ground investigation report are to your satisfaction, and if you require any further information or clarification, please do not hesitate to contact us.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Terry McMenam', written over a dotted line.

For and on behalf of Arc Environmental Limited  
Terry McMenam BSc (Hons) CEnv CSci MEnvSc FGS MCMi MIOd  
Director



**Location Plan**

**Existing Site Layout Plan**

**Proposed Development Layout Plan**

**Site Photographic Record Sheet (November 2014)**



## **Borehole & Trial Pit Location Plan**

### **Borehole Record Sheets**

### **Gas Monitoring Certificates**





## Laboratory Results

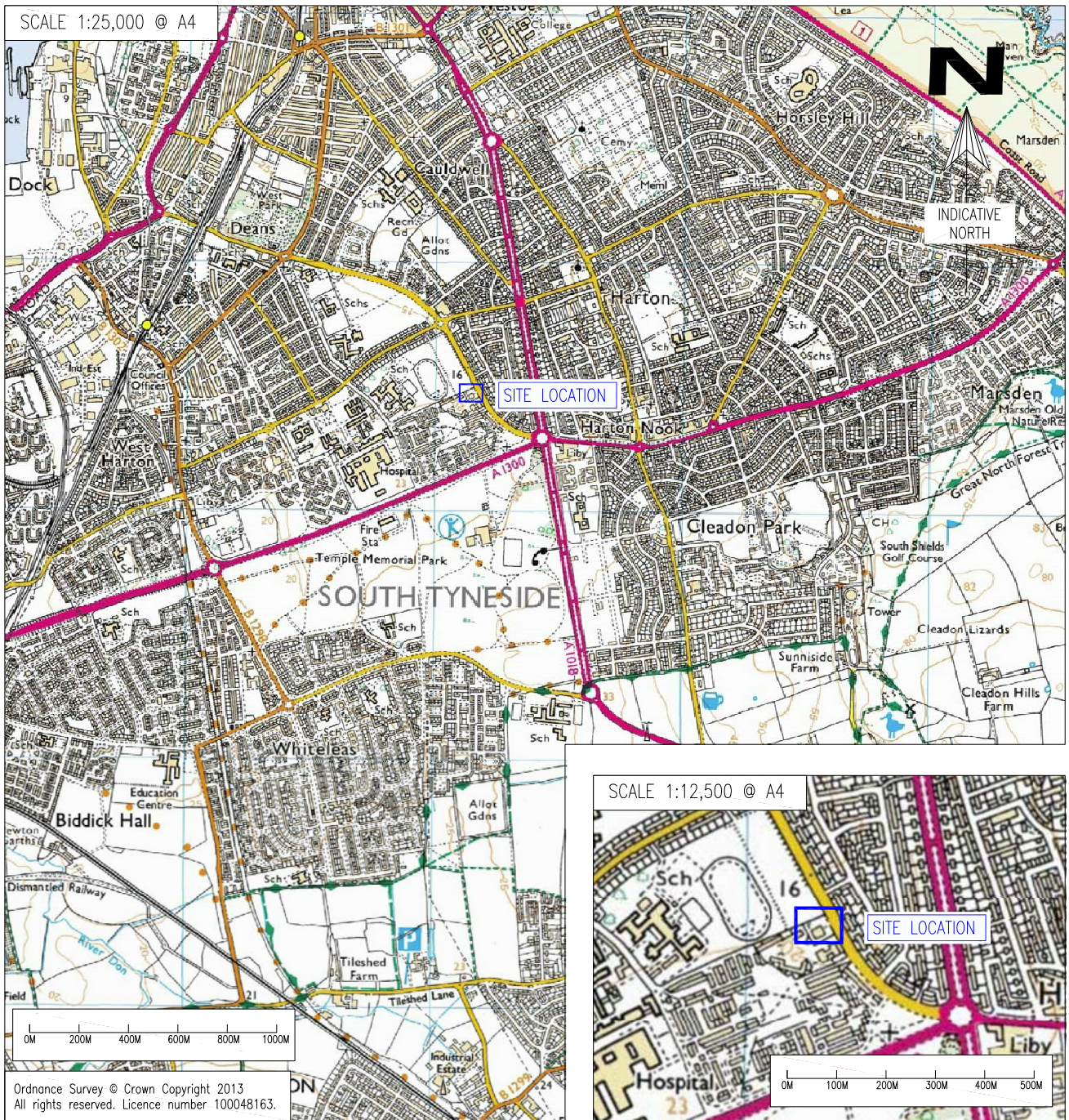


## Location Plan

## Existing Site Layout Plan

## Proposed Development Layout Plan

## Site Photographic Record Sheet (November 2014)



Client:  
**ISOS DEVELOPMENTS LIMITED**

Project Title:  
 Proposed Residential Development  
 Former Day Care Centre, Temple  
 Green, South Shields, NE34 0HH

Drawing Title:  
 Location Plan

Job Reference:  
 13-562

Drawing Number:  
 -

Revision:  
 -

Drawn by:  
 P.D

Date:  
 03.10.13

Scale at A4:  
 As Shown

Checked by:  
 T.M

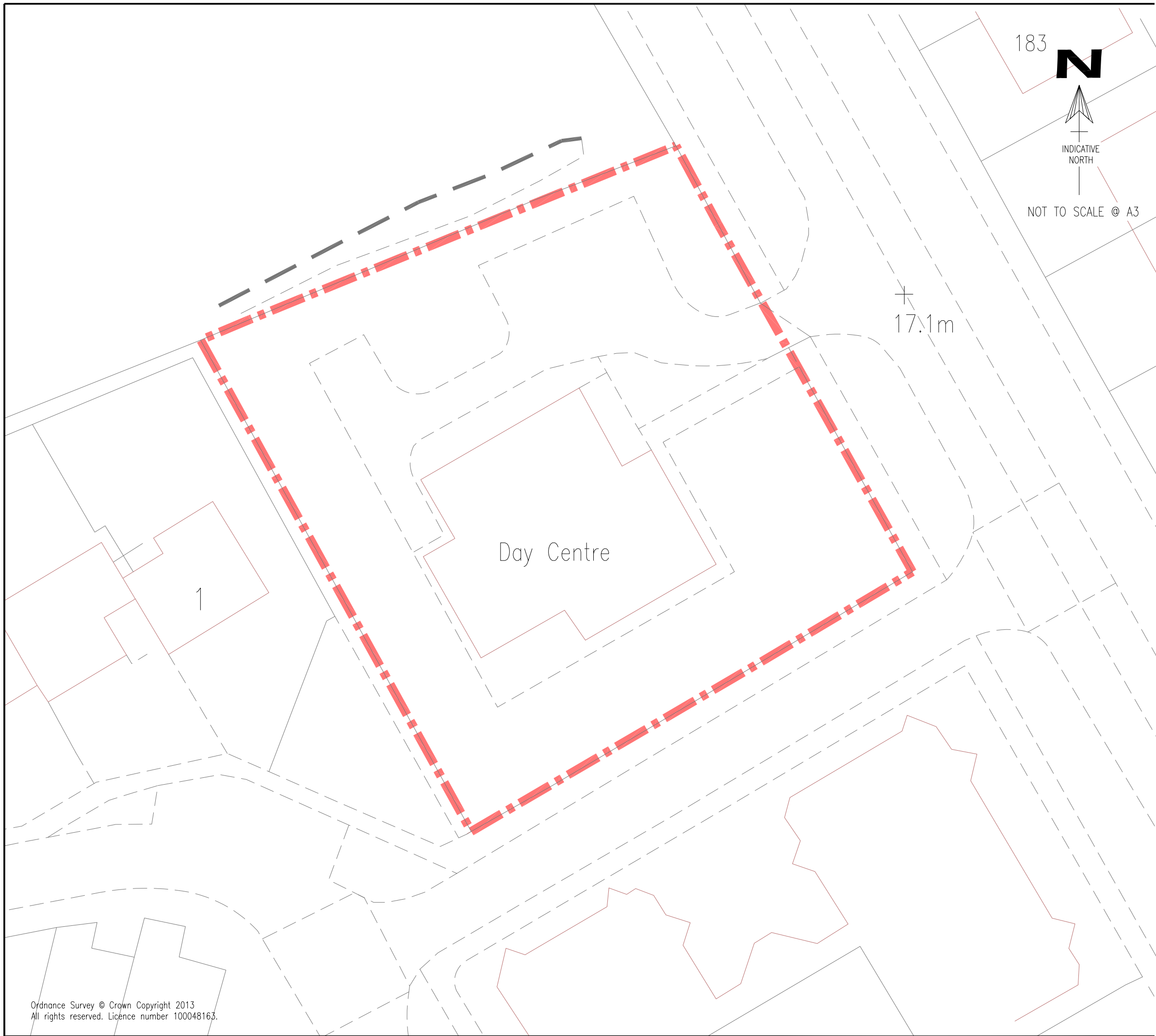
Approved by:  
 T.M

The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.  
 © Copyright Reserved

rev.	date	amendments	drawn	chckd

**ARC ENVIRONMENTAL LTD**  
 Solum House  
 Unit 1 Elliott Court  
 St. John's Road  
 Meadowfield  
 Durham  
 DH7 8PN  
 Tel: (0191) 378 6380  
 Fax: (0191) 378 0494  
 e-mail: admin@arc-environmental.com  
 web: www.arc-environmental.com





**ARC ENVIRONMENTAL LTD**

Solum House  
 Unit 1 Elliott Court  
 St. John's Road  
 Meadowfield  
 Durham, DH7 8PN  
 Tel: (0191) 378 6380  
 Fax: (0191) 378 0494  
 e-mail: admin@arc-environmental.com  
 web: www.arc-environmental.com

183  
**N**



NOT TO SCALE @ A3

17.1m

Day Centre

1

LEGEND	
	INDICATIVE SITE BOUNDARY

The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.  
 © Copyright Reserved

rev.	date	amendments	drawn	chckd

Client:  
**ISOS DEVELOPMENTS LIMITED**

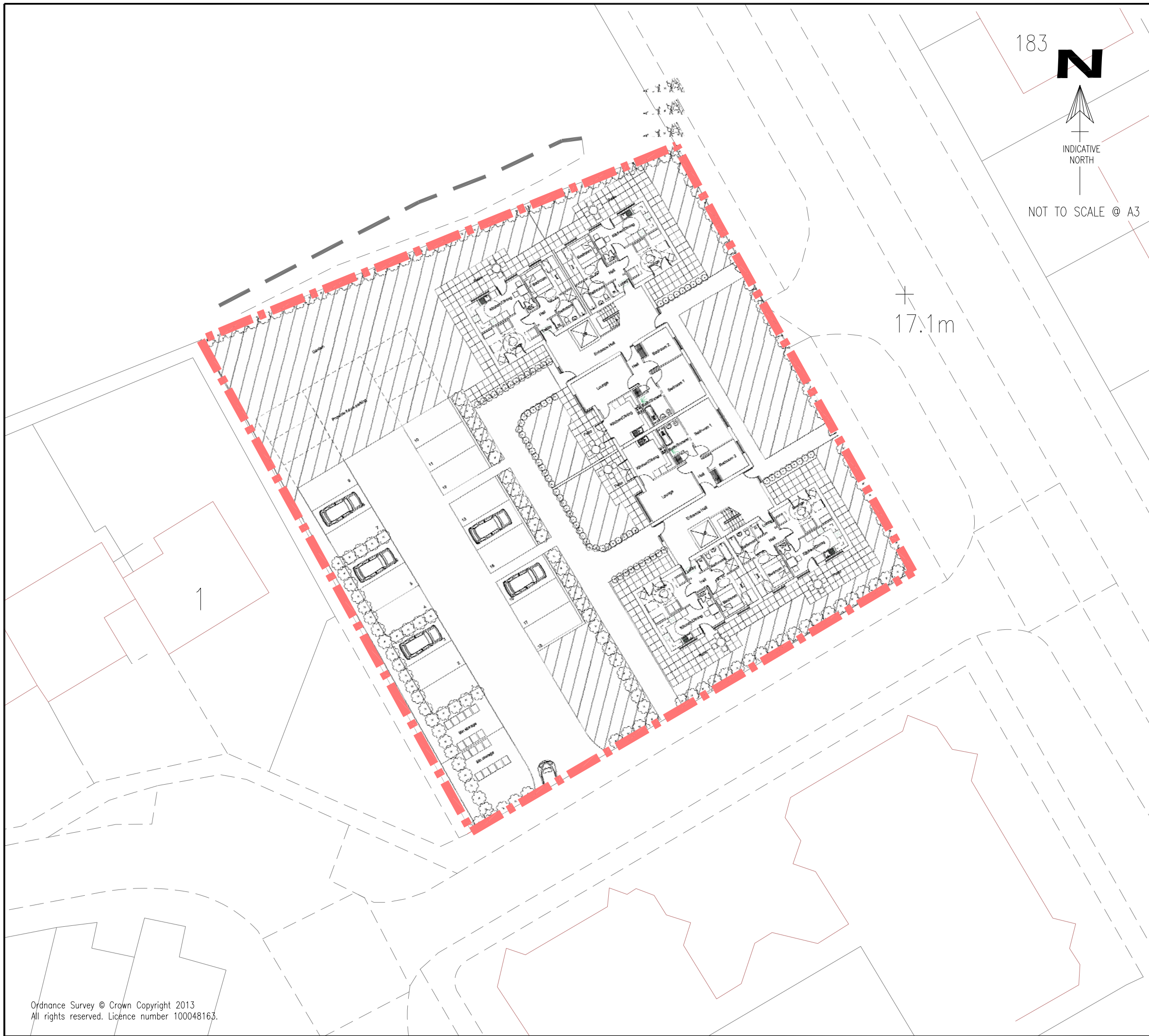
Project Title:  
 Proposed Residential Development  
 Former Day Care Centre  
 Temple Green, South Shields, NE34 0HH

Drawing Title:  
 Existing Site Layout Plan

Scale at A3: NTS @ A3	Date: 04.10.13	Drawn by: P.D	Approved by: T.M
--------------------------	-------------------	------------------	---------------------

Job Ref: 13-562	Drg no: -	Rev: -
--------------------	--------------	-----------

Ordnance Survey © Crown Copyright 2013  
 All rights reserved. Licence number 100048163.



183  
**N**



NOT TO SCALE @ A3

17.1m



**ARC ENVIRONMENTAL LTD**

Solum House  
Unit 1 Elliott Court  
St. John's Road  
Meadowfield  
Durham, DH7 8PN  
Tel: (0191) 378 6380  
Fax: (0191) 378 0494  
e-mail: admin@arc-environmental.com  
web: www.arc-environmental.com

The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.  
© Copyright Reserved

LEGEND	
	INDICATIVE SITE BOUNDARY

rev.	date	amendments	drawn	chckd

Client:  
**ISOS DEVELOPMENTS LIMITED**

Project Title:  
Proposed Residential Development  
Former Day Care Centre  
Temple Green, South Shields, NE34 0HH

Drawing Title:  
Proposed Development Layout Plan

Scale at A3: NTS @ A3	Date: 04.10.13	Drawn by: P.D	Approved by: T.M
--------------------------	-------------------	------------------	---------------------

Job Ref: 13-562	Drg no: -	Rev: -
--------------------	--------------	-----------

PLATE 1



PLATE 2



PLATE 3



PLATE 4



PLATE 5



PLATE 6



PLATE 7



PLATE 8



PLATE 9



PLATE 10



PLATE 11



PLATE 12



PLATE 13



**ARC ENVIRONMENTAL LTD**

Solum House  
Unit 1 Elliott Court  
St. John's Road  
Meadowfield  
Durham, DH7 8PN  
Tel: (0191) 378 6380  
Fax: (0191) 378 0494  
e-mail: [admin@arc-environmental.com](mailto:admin@arc-environmental.com)  
web: [www.arc-environmental.com](http://www.arc-environmental.com)

The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.  
© Copyright Reserved

rev.	date	amendments	drawn	chckd

Client:  
**ISOS DEVELOPMENTS LIMITED**

Project Title:  
Proposed Residential Development  
Former Day Care Centre  
Temple Green, South Shields, NE34 0HH

Drawing Title:  
Site Photographic Record Sheet – November 2014

Scale at A3: NTS @ A3	Date: 18.12.14	Drawn by: P.D	Approved by: T.M
--------------------------	-------------------	------------------	---------------------

Job Ref: 13-562	Drg no: -	Rev: -
--------------------	--------------	-----------



## **Borehole & Trial Pit Location Plan**

### **Borehole Record Sheets**

### **Gas Monitoring Certificates**



**ARC ENVIRONMENTAL LTD**  
 Solum House  
 Unit 1 Elliott Court  
 St. John's Road  
 Meadowfield  
 Durham, DH7 8PN  
 Tel: (0191) 378 6380  
 Fax: (0191) 378 0494  
 e-mail: admin@arc-environmental.com  
 web: www.arc-environmental.com

The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.  
 © Copyright Reserved

LEGEND	
	INDICATIVE SITE BOUNDARY
	WINDOWLESS SAMPLING BOREHOLE POSITION
	ROTARY BOREHOLE POSITION
	MANUALLY EXCAVATED FOUNDATION INSPECTION PIT

rev.	date	amendments	drawn	chckd

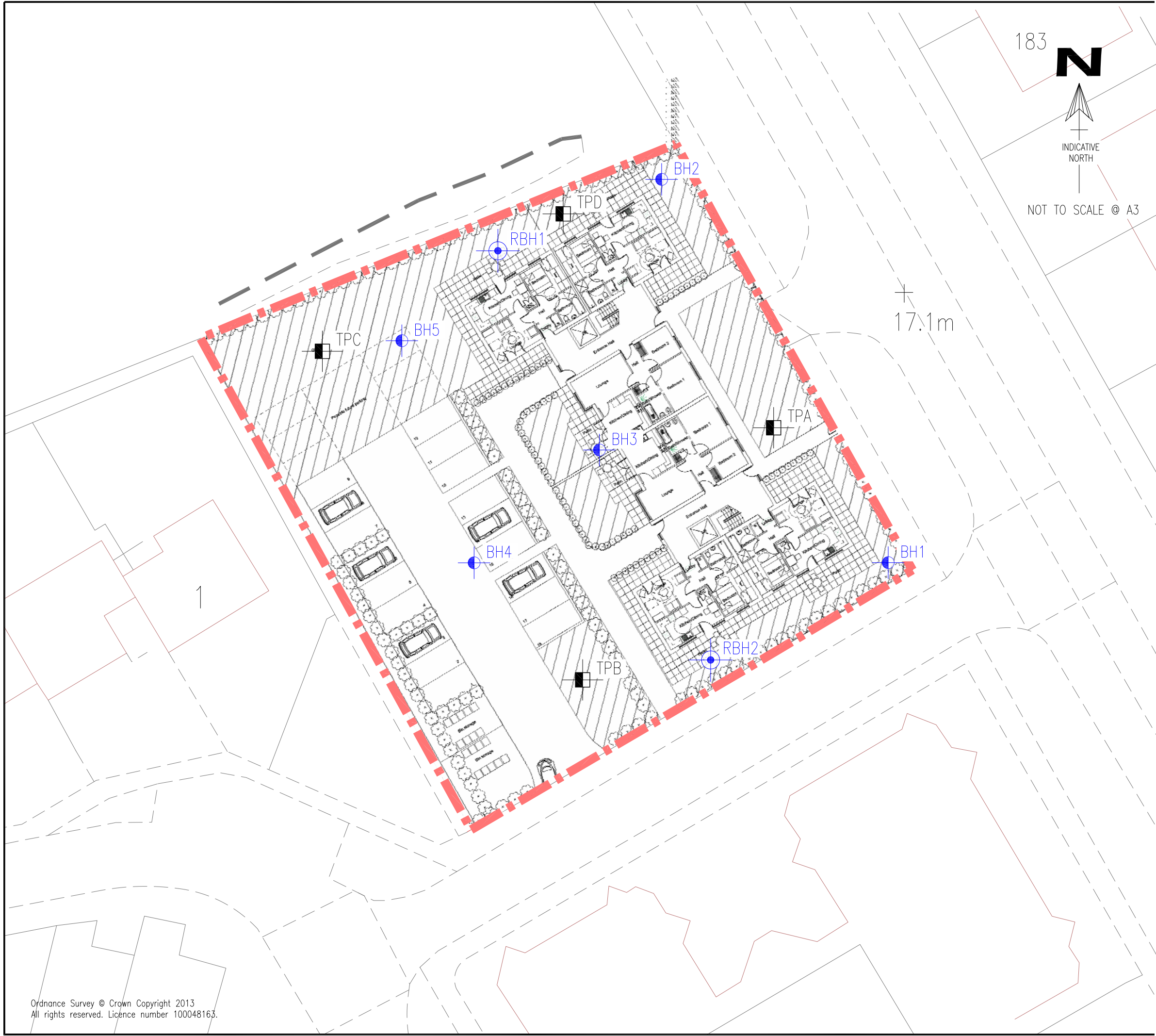
Client:  
**ISOS DEVELOPMENTS LIMITED**

Project Title:  
 Proposed Residential Development  
 Former Day Care Centre  
 Temple Green, South Shields, NE34 0HH

Drawing Title:  
 Borehole and Trial Pit Location Plan

Scale at A3: | Date: | Drawn by: | Approved by:  
 NTS @ A3 | 18.12.14 | P.D | T.M

Job Ref: | Drg no: | Rev:  
 13-562 | - | -



Ordnance Survey © Crown Copyright 2013  
 All rights reserved. Licence number 100048163.





Arc Environmental Ltd  
 Solum House, Unit 1 Elliott Court  
 St Johns Road, Durham, DH1 5TS  
 Telephone: 0191 378 6380  
 Fax: 0191 378 0494

## BOREHOLE LOG

Project <b>Proposed New Apartments at Temple Green, South Shields</b>				<b>BOREHOLE No BH1</b>
Job No 13-562	Date 22-10-13	Ground Level (m)	Co-Ordinates ( )	
Contractor <b>Arc Environmental Ltd.</b>				Sheet 1 of 1

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.20	B				[Cross-hatch pattern]	0.10 (0.50)	Black sandy gravelly soil (MADE GROUND). Firm dark brown sandy gravelly clay containing occasional fragments of ash coal brick concrete and dolomite (MADE GROUND).	[Black bar]	
0.50	B/J				[Cross-hatch pattern]	0.60 (0.80)	Compact yellow and brown dolomitic limestone (MADE GROUND).	[Dotted pattern]	
1.00	B	110kN/m <sup>2</sup>			[Stippled pattern]	(3.20)	Stiff (high strength) medium brown very sandy gravelly CLAY. Occasional cobbles noted (PELAW CLAY MEMBER).	[Dotted pattern]	
1.00	V								
1.50	B	130kN/m <sup>2</sup>							
1.50	V								
2.00	B	130kN/m <sup>2</sup>							
2.00	V								
2.50	B	130kN/m <sup>2</sup>							
2.50	V								
3.00	B	130kN/m <sup>2</sup>							
3.00	V								
3.50	B	130kN/m <sup>2</sup>							
3.50	V								
4.00	B	130kN/m <sup>2</sup>							
4.00	V						Borehole terminated at a depth of c.4.00m.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											WATER: Borehole remained DRY during the exploratory period.

All dimensions in metres Scale 1:37.5	Client <b>ISOS Developments Limited</b>	Method/ Plant Used <b>Windowless Sampling</b>	Logged By <b>SH</b>
--	--	---	------------------------

AGS3 UK BH BHS 13-562.GPJ AGS3\_ALL.GDT 19/12/14



Arc Environmental Ltd  
 Solum House, Unit 1 Elliott Court  
 St Johns Road, Durham, DH1 5TS  
 Telephone: 0191 378 6380  
 Fax: 0191 378 0494

## BOREHOLE LOG

Project <b>Proposed New Apartments at Temple Green, South Shields</b>				<b>BOREHOLE No</b>  <b>BH2</b>	
Job No 13-562	Date 22-10-13	Ground Level (m)	Co-Ordinates ( )		
Contractor <b>Arc Environmental Ltd.</b>				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.20	B			[Cross-hatch pattern]	0.10	Black sandy gravelly soil (MADE GROUND).		[Cross-hatch pattern]	
0.50	B/J			[Cross-hatch pattern]	(0.80)	Stiff medium brown very sandy gravelly clay containing occasional fragments of brick concrete and pieces of plastic (MADE GROUND).		[Cross-hatch pattern]	
1.00	B	90kN/m <sup>2</sup>		[Stippled pattern]	0.90	Stiff (high strength) medium brown very sandy gravelly CLAY. Occasional cobbles noted (PELAW CLAY MEMBER).		[Stippled pattern]	
1.00	V			[Stippled pattern]				[Stippled pattern]	
1.50	B	72kN/m <sup>2</sup>		[Stippled pattern]				[Stippled pattern]	
1.50	V			[Stippled pattern]				[Stippled pattern]	
2.00	B	88kN/m <sup>2</sup>		[Stippled pattern]				[Stippled pattern]	
2.00	V			[Stippled pattern]				[Stippled pattern]	
2.50	B	130kN/m <sup>2</sup>		[Stippled pattern]	(3.10)			[Stippled pattern]	
2.50	V			[Stippled pattern]				[Stippled pattern]	
3.00	B	130kN/m <sup>2</sup>		[Stippled pattern]				[Stippled pattern]	
3.00	V			[Stippled pattern]				[Stippled pattern]	
3.50	B	130kN/m <sup>2</sup>		[Stippled pattern]				[Stippled pattern]	
3.50	V			[Stippled pattern]				[Stippled pattern]	
4.00	B	130kN/m <sup>2</sup>		[Stippled pattern]	4.00			[Stippled pattern]	
4.00	V			[Stippled pattern]		Borehole terminated at a depth of c.4.00m.		[Stippled pattern]	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											WATER: Borehole remained DRY during the exploratory period.

All dimensions in metres Scale 1:37.5	Client <b>ISOS Developments Limited</b>	Method/ Plant Used <b>Windowless Sampling</b>	Logged By <b>SH</b>
--	--	---	------------------------

AGS3 UK BH BHS 13-562.GPJ AGS3\_ALL.GDT 19/12/14



Arc Environmental Ltd  
 Solum House, Unit 1 Elliott Court  
 St Johns Road, Durham, DH1 5TS  
 Telephone: 0191 378 6380  
 Fax: 0191 378 0494

## BOREHOLE LOG

Project <b>Proposed New Apartments at Temple Green, South Shields</b>				<b>BOREHOLE No</b>  <b>BH3</b>	
Job No 13-562	Date 07-11-13	Ground Level (m)	Co-Ordinates ( )		
Contractor <b>Arc Environmental Ltd.</b>				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.00-0.40	B/J				(0.40) 0.40	Black sandy gravelly soil containing occasional fragments of concrete and dolomite (MADE GROUND).			
0.40-1.00	B					Stiff (high strength) medium brown very sandy gravelly CLAY. Occasional cobbles noted (PELAW CLAY MEMBER).			
1.00-2.00	B	100kN/m <sup>2</sup>							
1.00	V								
2.00-3.00	B	120kN/m <sup>2</sup>			(4.60)				
2.00	V								
3.00-4.00	B	120kN/m <sup>2</sup>							
3.00	V								
4.00-5.00	B	120kN/m <sup>2</sup>							
4.00	V								
5.00	V	120kN/m <sup>2</sup>			5.00	Borehole terminated at a depth of c.5.00m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											WATER: Borehole remained DRY during the exploratory period.

All dimensions in metres Scale 1:37.5	Client <b>ISOS Developments Limited</b>	Method/ Plant Used <b>Windowless Sampling</b>	Logged By <b>DO</b>
--	--	---	------------------------

AGS3 UK BH BHS 13-562.GPJ AGS3\_ALL.GDT 19/12/14



Arc Environmental Ltd  
 Solum House, Unit 1 Elliott Court  
 St Johns Road, Durham, DH1 5TS  
 Telephone: 0191 378 6380  
 Fax: 0191 378 0494

## BOREHOLE LOG

Project <b>Proposed New Apartments at Temple Green, South Shields</b>				<b>BOREHOLE No BH4</b>	
Job No 13-562	Date 07-11-13	Ground Level (m)	Co-Ordinates ( )		
Contractor <b>Arc Environmental Ltd.</b>				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-0.60	B/J				(0.60)	Black sandy gravelly soil containing occasional fragments of concrete and dolomite (MADE GROUND).			
0.60-1.00	B				0.60	Stiff (high strength) dark grey sandy CLAY (PELAW CLAY MEMBER).			
1.00-1.40	B	90kN/m <sup>2</sup>			(0.80)				
1.00	V					1.40	Stiff (high strength) medium brown very sandy gravelly CLAY. Occasional cobbles noted (PELAW CLAY MEMBER).		
1.40-2.00	B								
2.00-3.00	B	120kN/m <sup>2</sup>							
2.00	V								
3.00-4.00	B	120kN/m <sup>2</sup>							
3.00	V					(3.60)			
4.00-5.00	B	120kN/m <sup>2</sup>							
4.00	V								
5.00	V	120kN/m <sup>2</sup>			5.00	Borehole terminated at a depth of c.5.00m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											WATER: Borehole remained DRY during the exploratory period.

All dimensions in metres Scale 1:37.5	Client <b>ISOS Developments Limited</b>	Method/ Plant Used <b>Windowless Sampling</b>	Logged By <b>DO</b>
--	--	---	------------------------

AGS3 UK BH BHS 13-562.GPJ AGS3\_ALL.GDT 19/12/14



Arc Environmental Ltd  
 Solum House, Unit 1 Elliott Court  
 St Johns Road, Durham, DH1 5TS  
 Telephone: 0191 378 6380  
 Fax: 0191 378 0494

## BOREHOLE LOG

Project <b>Proposed New Apartments at Temple Green, South Shields</b>				<b>BOREHOLE No</b>  <b>BH5</b>
Job No 13-562	Date 07-11-13	Ground Level (m)	Co-Ordinates ( )	
Contractor <b>Arc Environmental Ltd.</b>				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.00-0.80	B/J				(0.80)	Black sandy gravelly soil. Gravel is fine to coarse comprising fragments of dolostone and concrete (MADE GROUND).			
0.80-1.20	B				(0.40)	Firm brown sandy gravelly clay. Gravel is fine to coarse comprising fragments of sandstone ash coal brick concrete and dolomite (MADE GROUND).			
1.20-2.00	B				1.20	Stiff (high strength) brown very sandy gravelly CLAY. Gravel is fine to coarse comprising sandstone and some coal. Cobbles noted (PELAW CLAY MEMBER).			
2.00-3.00	B V	120kN/m <sup>2</sup>							
3.00-4.00	B V	120kN/m <sup>2</sup>			(3.80)				
4.00-5.00	B V	120kN/m <sup>2</sup>							
5.00	V	120kN/m <sup>2</sup>			5.00	Borehole terminated at 5.00m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											WATER: Borehole remained DRY during the exploratory period.

All dimensions in metres Scale 1:37.5	Client <b>ISOS Developments Limited</b>	Method/ Plant Used <b>Windowless Sampling</b>	Logged By <b>DO</b>
--	--	---	------------------------

AGS3 UK BH BHS 13-562.GPJ AGS3\_ALL.GDT 19/12/14



Arc Environmental Ltd  
 Solum House, Unit 1 Elliott Court  
 St Johns Road, Durham, DH1 5TS  
 Telephone: 0191 378 6380  
 Fax: 0191 378 0494

## DRILLHOLE LOG

Project <b>Proposed New Apartments at Temple Green, South Shields</b>				<b>DRILLHOLE No</b>  <b>RBH1</b>	
Job No 13-562	Date 09-11-13	Ground Level (m)	Co-Ordinates ( )		
Contractor <b>Arc Environmental Ltd.</b>				Sheet 1	

RUN DETAILS			STRATA					of 2		
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION			Geology	Instrument/ Backfill
						Discontinuities	Detail	Main		
				(1.20)	1.20			Grass overlying dark brown soil (drillers description).		
				(12.30)	12.30			Dark brown sandy gravelly CLAY. Occasional cobbles noted (drillers description).		
				(5.70)	13.50			Reddish brown sandy gravelly CLAY. Occasional cobbles and boulders noted (drillers description).		
				(19.20)	19.20			Light brown and grey MUDSTONE (drillers description).		

Drilling Progress and Water Observations							Rotary Flush				GENERAL REMARKS
Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing	From	To	Type	Returns	
							0	35	Water	100	All descriptions are based purely on the drillers interpretation of cuttings brought to the surface and the drilling rates maintained during the creation of the boreholes. <b>WATER:</b> Borehole remained DRY during the exploratory period.
All dimensions in metres Scale 1:125							Client <b>ISOS Developments Limited</b>		Method/ Plant Used <b>Open Hole Rotary</b>		

AGS3 UK DH BHS 13-562.GPJ AGS3\_ALL.GDT 19/12/14



Arc Environmental Ltd  
 Solum House, Unit 1 Elliott Court  
 St Johns Road, Durham, DH1 5TS  
 Telephone: 0191 378 6380  
 Fax: 0191 378 0494

## DRILLHOLE LOG

Project <b>Proposed New Apartments at Temple Green, South Shields</b>				<b>DRILLHOLE No</b>  <b>RBH1</b>
Job No <b>13-562</b>	Date <b>09-11-13</b>	Ground Level (m)	Co-Ordinates ( )	
Contractor <b>Arc Environmental Ltd.</b>				Sheet <b>2</b>

of 2

RUN DETAILS			STRATA					Geology	Instrument/ Backfill	
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION				
						Discontinuities	Detail			Main
					(15.80)					
					35.00					
						Light brown and grey MUDSTONE (drillers description).(continued)				
						Borehole terminated at a depth of c.35.00m.				

Drilling Progress and Water Observations							Rotary Flush				<b>GENERAL REMARKS</b>
Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing	From	To	Type	Returns	
											All descriptions are based purely on the drillers interpretation of cuttings brought to the surface and the drilling rates maintained during the creation of the boreholes. WATER: Borehole remained DRY during the exploratory period.
All dimensions in metres Scale 1:125							Client <b>ISOS Developments Limited</b>		Method/ Plant Used <b>Open Hole Rotary</b>		

AGS3 UK DH BHS 13-562.GPJ AGS3\_ALL.GDT 19/12/14







Arc Environmental Ltd  
 Solum House, Unit 1 Elliott Court  
 St Johns Road, Durham, DH1 5TS  
 Telephone: 0191 378 6380  
 Fax: 0191 378 0494

## DRILLHOLE LOG

Project Proposed New Apartments at Temple Green, South Shields				<b>DRILLHOLE No</b>  <b>RBH2</b>	
Job No 13-562	Date 09-11-13	Ground Level (m)	Co-Ordinates ( )		
Contractor Arc Environmental Ltd.				Sheet 2	

RUN DETAILS			STRATA						of 2	
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION			Geology	Instrument/ Backfill
						Discontinuities	Detail	Main		
					(15.50)					
					35.00					
								Light brown and grey MUDSTONE (drillers description).(continued)		
								Borehole terminated at a depth of c.35.00m.		

Drilling Progress and Water Observations							Rotary Flush				<b>GENERAL REMARKS</b>
Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing	From	To	Type	Returns	
											All descriptions are based purely on the drillers interpretation of cuttings brought to the surface and the drilling rates maintained during the creation of the boreholes. <b>WATER:</b> Borehole remained DRY during the exploratory period.
All dimensions in metres Scale 1:125		Client	ISOS Developments Limited		Method/ Plant Used	Open Hole Rotary			Logged By IT		

AGS3 UK DH BHS 13-562.GPJ AGS3\_ALL.GDT 19/12/14

# Arc Environmental Ground Gas Monitoring Certificate



Equip: GFM430 Series

Site: Proposed New Appartments at Temple Green, South Shields

Ref: 13-562 Date: 08/11/2013

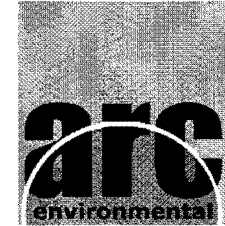
Visit by: Geoff Heron Time: 12:30pm

Signature: *Geoff Heron*

Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (PPM)			Depth to Water (m bgl)
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	PID	H <sub>2</sub> S	CO	
BH1	<0.1	993	0.0	0.0	0.0	0.0	0.1	0.1	19.5	19.5				Dry
BH2	<0.1	994	0.0	0.0	0.0	0.0	0.1	0.1	19.4	19.4				Dry
BH4	<0.1	995	0.0	0.0	0.0	0.0	0.1	0.1	19.4	19.4				Dry

Notes:  
 Detection limits - Methane = 0.0%, Carbon Dioxide = 0.0%, LEL = 0.0%, Oxygen = 0.0%, Flow = 0.1l/hr  
 Monitoring order is from **Left to Right** across table.  
 Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gasses initially recorded, monitoring should be for up to 10 minutes.  
 N/A = Not applicable

# Arc Environmental Ground Gas Monitoring Certificate



Equip: GFM430 Series

Site: Proposed New Appartments at Temple Green, South Shields

Ref: 13-562 Date: 19/11/2013

Visit by: Geoff Heron Time: 13:25pm

Signature: *Geoff Heron*

Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (PPM)			Depth to Water (m bgl)
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	PID	H <sub>2</sub> S	CO	
BH1	<0.1	1008	0.0	0.0	0.0	0.0	0.1	0.1	19.3	19.3				Dry
BH2	<0.1	1008	0.0	0.0	0.0	0.0	0.1	0.1	19.4	19.4				Dry
BH4	<0.1	1008	0.0	0.0	0.0	0.0	0.1	0.1	19.4	19.4				Dry

Notes:  
 Detection limits - Methane = 0.0%, Carbon Dioxide = 0.0%, LEL = 0.0%, Oxygen = 0.0%, Flow = 0.1l/hr  
 Monitoring order is from **Left to Right** across table.  
 Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gasses initially recorded, monitoring should be for up to 10 minutes.  
 N/A = Not applicable

# Arc Environmental Ground Gas Monitoring Certificate



Equip: GFM430 Series

Site: Proposed New Appartments at Temple Green, South Shields

Ref: 13-562 Date: 02/12/2013

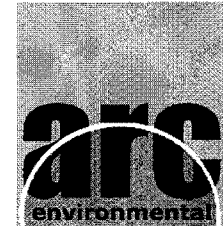
Visit by: Geoff Heron Time: 15:05pm

Signature: *G. Heron*

Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (PPM)			Depth to Water (m bgl)
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	PID	H <sub>2</sub> S	CO	
BH1	<0.1	1022	0.0	0.0	0.0	0.0	0.1	0.1	19.5	19.5				Dry
BH2	<0.1	1022	0.0	0.0	0.0	0.0	0.1	0.1	19.3	19.3				Dry
BH4	<0.1	1022	0.0	0.0	0.0	0.0	0.1	0.1	19.4	19.4				Dry

Notes:  
 Detection limits - Methane = 0.0%, Carbon Dioxide = 0.0%, LEL = 0.0%, Oxygen = 0.0%, Flow = 0.1l/hr  
 Monitoring order is from **Left to Right** across table.  
 Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gasses initially recorded, monitoring should be for up to 10 minutes.  
 N/A = Not applicable

# Arc Environmental Ground Gas Monitoring Certificate



Equip: GFM430 Series

Site: Proposed New Appartments at Temple Green, South Shields

Ref: 13-562 Date: 17/12/2013

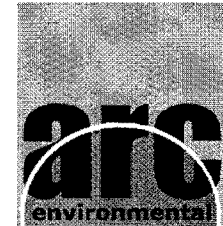
Visit by: Geoff Heron Time: 14:40pm

Signature: *[Handwritten Signature]*

Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (PPM)			Depth to Water (m bgl)
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	PID	H <sub>2</sub> S	CO	
BH1	<0.1	1002	0.0	0.0	0.0	0.0	0.1	0.1	19.2	19.2				Dry
BH2	<0.1	1002	0.0	0.0	0.0	0.0	0.1	0.1	19.3	19.3				Dry
BH4	<0.1	1002	0.0	0.0	0.0	0.0	0.1	0.1	19.2	19.2				Dry

Notes:  
 Detection limits - Methane = 0.0%, Carbon Dioxide = 0.0%, LEL = 0.0%, Oxygen = 0.0%, Flow = 0.1l/hr  
 Monitoring order is from **Left to Right** across table.  
 Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gasses initially recorded, monitoring should be for up to 10 minutes.  
 N/A = Not applicable

# Arc Environmental Ground Gas Monitoring Certificate



Equip: GFM430 Series

Site: Proposed New Appartments at Temple Green, South Shields

Ref: 13-562 Date: 07/01/2014

Visit by: Geoff Heron Time: 12:10pm

Signature: *Geoff Heron*

Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (PPM)			Depth to Water (m bgl)
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	PID	H <sub>2</sub> S	CO	
BH1	<0.1	985	0.0	0.0	0.0	0.0	0.1	0.1	19.6	19.6				Dry
BH2	<0.1	984	0.0	0.0	0.0	0.0	0.1	0.1	19.5	19.5				Dry
BH4	<0.1	983	0.0	0.0	0.0	0.0	0.1	0.1	19.5	19.5				Dry

Notes:  
 Detection limits - Methane = 0.0%, Carbon Dioxide = 0.0%, LEL = 0.0%, Oxygen = 0.0%, Flow = 0.1l/hr  
 Monitoring order is from **Left to Right** across table.  
 Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gasses initially recorded, monitoring should be for up to 10 minutes.  
 N/A = Not applicable

# Arc Environmental Ground Gas Monitoring Certificate



Equip: GFM430 Series

Site: Proposed New Appartments at Temple Green, South Shields

Ref: 13-562 Date: 27/01/2014

Visit by: Geoff Heron Time: 15:30pm

Signature: *[Handwritten Signature]*

Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (PPM)			Depth to Water (m bgl)
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	PID	H <sub>2</sub> S	CO	
BH1	<0.1	989	0.0	0.0	0.0	0.0	0.1	0.1	19.6	19.6				Dry
BH2	<0.1	989	0.0	0.0	0.0	0.0	0.1	0.1	19.7	19.7				Dry
BH4	<0.1	989	0.0	0.0	0.0	0.0	0.1	0.1	19.6	19.6				Dry

Notes:  
 Detection limits - Methane = 0.0%, Carbon Dioxide = 0.0%, LEL = 0.0%, Oxygen = 0.0%, Flow = 0.1l/hr  
 Monitoring order is from **Left to Right** across table.  
 Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gasses initially recorded, monitoring should be for up to 10 minutes.  
 N/A = Not applicable



## Laboratory Results





# LABORATORY REPORT



4043

**Contract Number: PSL13/4399**

Client's Reference:

Report Date: 19 November 2013

Client Name: Arc Environmental  
Solum House  
Unit 1 Elliott Court  
St Johns Road, Meadowfield  
Durham  
DH7 8PN

**For the attention of: Terry McMenam**

Contract Title: Temple Green, South Shields

Date Received: 8/11/2013  
Date Commenced: 8/11/2013  
Date Completed: 19/11/2013

**Notes: Observations and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson  
(Director)

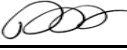
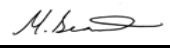
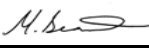
A Watkins  
(Director)

  
M Beastall  
(Laboratory Manager)

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
BH1		B	1.00	Brown slightly gravelly sandy CLAY.
BH2		B	1.50	Brown slightly gravelly sandy CLAY.




Compiled by	Date	Checked by	Date	Approved by	Date
	19/11/13		19/11/13		19/11/13
<b>TEMPLE GREEN, SOUTH SHIELDS.</b>				<b>Contract No:</b>	<b>PSL13/4399</b>
				<b>Client Ref:</b>	<b>13-562</b>

# SUMMARY OF SOIL CLASSIFICATION TESTS

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

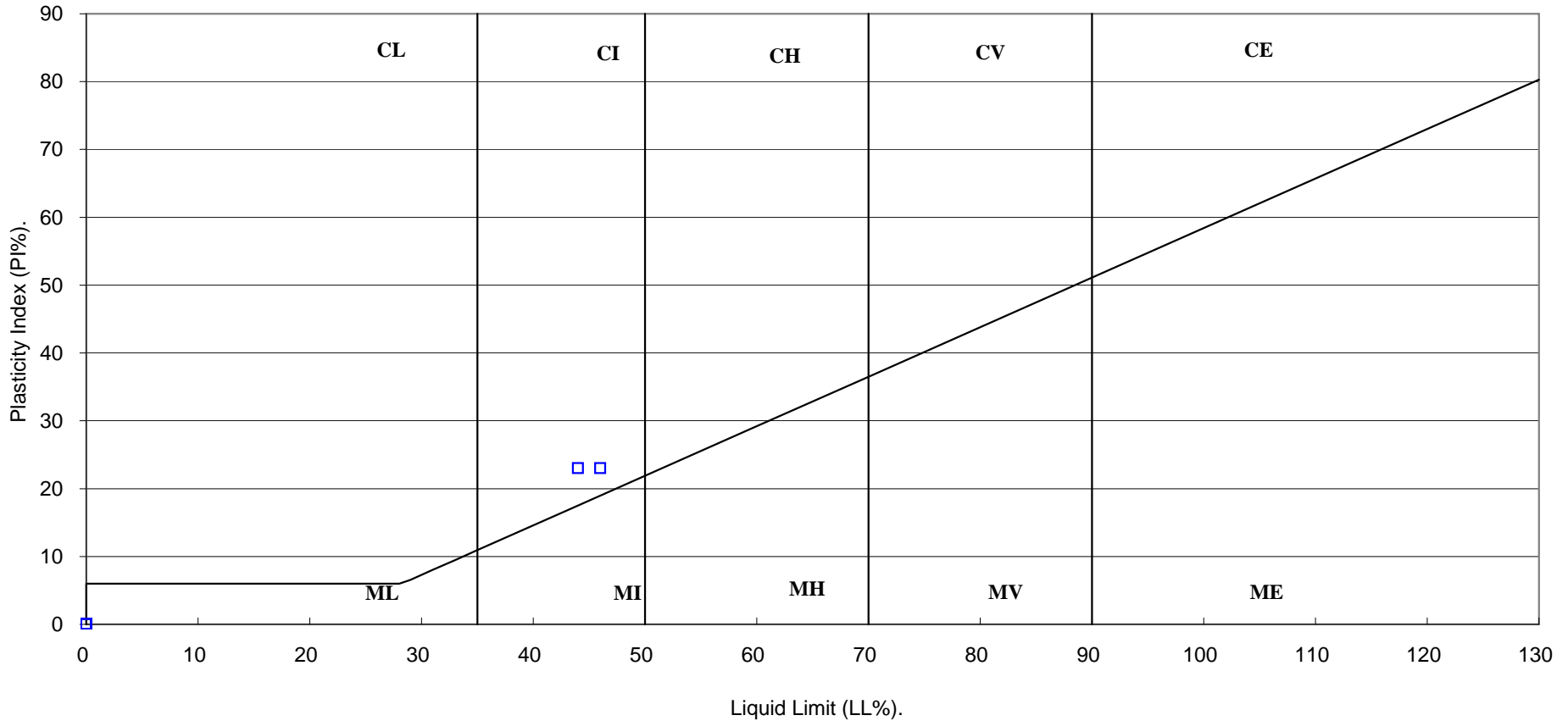
Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % <small>Clause 3.2</small>	Bulk Density Mg/m <sup>3</sup> <small>Clause 7.2</small>	Dry Density Mg/m <sup>3</sup> <small>Clause 7.2</small>	Particle Density Mg/m <sup>3</sup> <small>Clause 8.</small>	Liquid Limit % <small>Clause 4.3/4.4</small>	Plastic Limit % <small>Clause 5.</small>	Plasticity Index % <small>Clause 5.4</small>	% Passing .425mm	Remarks
BH1		B	1.00	22				46	23	23	93	Intermediate plasticity CI.
BH2		B	1.50	21				44	21	23	92	Intermediate plasticity CI.


SYMBOLS : NP : Non Plastic

	Compiled by	Date	Checked by	Date	Approved by	Date
	<i>[Signature]</i>	19/11/13	<i>[Signature]</i>	19/11/13	<i>[Signature]</i>	19/11/13
	TEMPLE GREEN, SOUTH SHIELDS.					

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



 <b>Professional Soils Laboratory</b>	<b>Compiled by</b>	<b>Date</b>	<b>Checked by</b>	<b>Date</b>	<b>Approved by</b>	<b>Date</b>
	<i>[Signature]</i>	19/11/13	<i>[Signature]</i>	19/11/13	<i>[Signature]</i>	19/11/13
	<b>TEMPLE GREEN, SOUTH SHIELDS.</b>					<b>Contract No:</b>
					<b>Client Ref:</b>	<b>13-562</b>



## ANALYTICAL TEST REPORT

**Contract no:** 49559(1)  
**Contract name:** Temple Green, South Shields  
**Client reference:** 13-562  
**Clients name:** ARC Environmental  
**Clients address:** Solum House  
Unit 1 Elliott Court  
St Johns Road, Meadowfield  
DH7 8PN

**Samples received:** 13 November 2013

**Analysis started:** 14 November 2013

**Analysis completed** 27 November 2013


**Report issued:** 28 November 2013

This is a supplementary report to report number 49559 issued 21 November 2013.

**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  
NAD No Asbestos Detected

**Approved by:**

  
\_\_\_\_\_  
Karan Campbell                      John Campbell  
Director                                      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 (%)
49559-1	BH 1	0.50	Loam	Stones & Gravel	54.6	17.5
49559-2	BH 1	2.00	Clay	Gravel	16.2	12.5
49559-3	BH 2	0.50	Loam	Stones & Gravel	35.4	17.5
49559-4	BH 3	0.00-0.40	Sandy Clay	Stones & Gravel	43.7	16.8
49559-5	BH 3	4.00-5.00	Sandy Clay	Gravel	16.2	9.4
49559-6	BH 4	0.00-0.60	Sandy Clay	Stones & Gravel	27.3	16.2
49559-7	BH 5	0.00-0.80	Sandy Loamy Clay	Slag & Gravel	43.4	14.9

# Chemtech Environmental Limited

## SOILS

Lab number			49559-1	49559-2	49559-3	49559-4	49559-5	49559-6
Sample id			BH 1	BH 1	BH 2	BH 3	BH 3	BH 4
Depth (m)			0.50	2.00	0.50	0.00-0.40	4.00-5.00	0.00-0.60
Date sampled			22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013
Test	Method	Units						
Arsenic (total)	CE054 <sup>M</sup>	mg/kg As	13	-	9.6	13	-	15
Cadmium (total)	CE054 <sup>M</sup>	mg/kg Cd	0.4	-	0.3	0.4	-	0.7
Chromium (total)	CE054 <sup>M</sup>	mg/kg Cr	25	-	26	36	-	30
Chromium (III)	-	mg/kg CrIII	25	-	26	36	-	30
Chromium (VI)	CE050	mg/kg CrVI	<1	-	<1	<1	-	<1
Copper (total)	CE054 <sup>M</sup>	mg/kg Cu	69	-	21	106	-	114
Lead (total)	CE054 <sup>M</sup>	mg/kg Pb	134	-	62	164	-	186
Mercury (total)	CE054	mg/kg Hg	0.6	-	<0.5	<0.5	-	<0.5
Nickel (total)	CE054 <sup>M</sup>	mg/kg Ni	25	-	23	32	-	30
Selenium (total)	CE054 <sup>M</sup>	mg/kg Se	1.3	-	1.3	1.2	-	1.3
Zinc (total)	CE054 <sup>M</sup>	mg/kg Zn	187	-	103	493	-	348
pH	CE004 <sup>M</sup>	units	8.0	8.2	7.7	7.6	8.5	7.8
Sulphate (2:1 water soluble)	CE049 <sup>U</sup>	mg/l SO <sub>4</sub>	78	41	23	1359	133	1064
Cyanide (free)	CE077	mg/kg CN	<2	-	<2	<2	-	<2
Total Organic Carbon (TOC)	CE072 <sup>M</sup>	% w/w C	4.85	-	2.81	3.64	-	4.68
<b>PAH</b>								
Acenaphthene	CE087	mg/kg	<0.1	-	-	-	-	0.5
Acenaphthylene	CE087	mg/kg	0.2	-	-	-	-	<0.1
Anthracene	CE087	mg/kg	0.7	-	-	-	-	0.9
Benzo(a)anthracene	CE087	mg/kg	2.3	-	-	-	-	1.9
Benzo(a)pyrene	CE087	mg/kg	1.8	-	-	-	-	1.7
Benzo(b)fluoranthene	CE087	mg/kg	2.7	-	-	-	-	2.5
Benzo(ghi)perylene	CE087	mg/kg	1.3	-	-	-	-	1.2
Benzo(k)fluoranthene	CE087	mg/kg	1.0	-	-	-	-	0.9
Chrysene	CE087	mg/kg	2.3	-	-	-	-	2.0
Dibenz(ah)anthracene	CE087	mg/kg	0.4	-	-	-	-	0.4
Fluoranthene	CE087	mg/kg	5.4	-	-	-	-	4.5
Fluorene	CE087	mg/kg	0.2	-	-	-	-	0.5
Indeno(123cd)pyrene	CE087	mg/kg	1.3	-	-	-	-	1.2
Naphthalene	CE087	mg/kg	0.2	-	-	-	-	0.2
Phenanthrene	CE087	mg/kg	3.0	-	-	-	-	3.4
Pyrene	CE087	mg/kg	4.5	-	-	-	-	3.6
PAH (total of USEPA 16)	CE087	mg/kg	27	-	-	-	-	25
Benzo(j)fluoranthene	CE087	mg/kg	0.2	-	-	-	-	0.2
PAH (total of OIL 8)	CE087	mg/kg	12	-	-	-	-	11
<b>TPH</b>								
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

# Chemtech Environmental Limited

## SOILS

Lab number			49559-1	49559-2	49559-3	49559-4	49559-5	49559-6
Sample id			BH 1	BH 1	BH 2	BH 3	BH 3	BH 4
Depth (m)			0.50	2.00	0.50	0.00-0.40	4.00-5.00	0.00-0.60
Date sampled			22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013
Test	Method	Units						
TPH Aliphatic EC12-EC16	CE068	mg/kg	6	-	-	-	-	9
TPH Aliphatic EC16-EC35	CE068	mg/kg	97	-	-	-	-	263
TPH Aliphatic EC35-EC44	CE068	mg/kg	4	-	-	-	-	17
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	14	-	-	-	-	13
TPH Aromatic EC21-EC35	CE068	mg/kg	12	-	-	-	-	11
TPH Aromatic EC35-EC44	CE068	mg/kg	1	-	-	-	-	1
Subcontracted analysis								
Asbestos	\$	-	NAD	-	NAD	Chrysotile	-	Chrysotile



# Chemtech Environmental Limited

## SOILS

<b>Lab number</b>			49559-7
<b>Sample id</b>			BH 5
<b>Depth (m)</b>			0.00-0.80
<b>Date sampled</b>			22/10/2013
<b>Test</b>	<b>Method</b>	<b>Units</b>	
Arsenic (total)	CE054 <sup>M</sup>	mg/kg As	22
Cadmium (total)	CE054 <sup>M</sup>	mg/kg Cd	0.5
Chromium (total)	CE054 <sup>M</sup>	mg/kg Cr	36
Chromium (III)	-	mg/kg CrIII	36
Chromium (VI)	CE050	mg/kg CrVI	<1
Copper (total)	CE054 <sup>M</sup>	mg/kg Cu	74
Lead (total)	CE054 <sup>M</sup>	mg/kg Pb	279
Mercury (total)	CE054	mg/kg Hg	0.7
Nickel (total)	CE054 <sup>M</sup>	mg/kg Ni	37
Selenium (total)	CE054 <sup>M</sup>	mg/kg Se	1.8
Zinc (total)	CE054 <sup>M</sup>	mg/kg Zn	221
pH	CE004 <sup>M</sup>	units	7.9
Sulphate (2:1 water soluble)	CE049 <sup>U</sup>	mg/l SO <sub>4</sub>	37
Cyanide (free)	CE077	mg/kg CN	<2
Total Organic Carbon (TOC)	CE072 <sup>M</sup>	% w/w C	5.91
<b>PAH</b>			
Acenaphthene	CE087	mg/kg	-
Acenaphthylene	CE087	mg/kg	-
Anthracene	CE087	mg/kg	-
Benzo(a)anthracene	CE087	mg/kg	-
Benzo(a)pyrene	CE087	mg/kg	-
Benzo(b)fluoranthene	CE087	mg/kg	-
Benzo(ghi)perylene	CE087	mg/kg	-
Benzo(k)fluoranthene	CE087	mg/kg	-
Chrysene	CE087	mg/kg	-
Dibenz(ah)anthracene	CE087	mg/kg	-
Fluoranthene	CE087	mg/kg	-
Fluorene	CE087	mg/kg	-
Indeno(123cd)pyrene	CE087	mg/kg	-
Naphthalene	CE087	mg/kg	-
Phenanthrene	CE087	mg/kg	-
Pyrene	CE087	mg/kg	-
PAH (total of USEPA 16)	CE087	mg/kg	-
Benzo(j)fluoranthene	CE087	mg/kg	-
PAH (total of OIL 8)	CE087	mg/kg	-
<b>TPH</b>			
TPH Aliphatic EC5-EC6	CE068	mg/kg	-
TPH Aliphatic EC6-EC8	CE068	mg/kg	-
TPH Aliphatic EC8-EC10	CE068	mg/kg	-
TPH Aliphatic EC10-EC12	CE068	mg/kg	-

# Chemtech Environmental Limited

## SOILS

<b>Lab number</b>	49559-7		
<b>Sample id</b>	BH 5		
<b>Depth (m)</b>	0.00-0.80		
<b>Date sampled</b>	22/10/2013		
<b>Test</b>	<b>Method</b>	<b>Units</b>	
TPH Aliphatic EC12-EC16	CE068	mg/kg	-
TPH Aliphatic EC16-EC35	CE068	mg/kg	-
TPH Aliphatic EC35-EC44	CE068	mg/kg	-
TPH Aromatic EC5-EC7	CE068	mg/kg	-
TPH Aromatic EC7-EC8	CE068	mg/kg	-
TPH Aromatic EC8-EC10	CE068	mg/kg	-
TPH Aromatic EC10-EC12	CE068	mg/kg	-
TPH Aromatic EC12-EC16	CE068	mg/kg	-
TPH Aromatic EC16-EC21	CE068	mg/kg	-
TPH Aromatic EC21-EC35	CE068	mg/kg	-
TPH Aromatic EC35-EC44	CE068	mg/kg	-
<b>Subcontracted analysis</b>			
Asbestos	\$	-	Chrysotile

# Chemtech Environmental Limited

## LEACHATES

Lab number			49559-1L	49559-3L	49559-4L
Sample id			BH 1	BH 2	BH 3
Depth (m)			0.50	0.50	0.00-0.40
Test	Method	Units			
Arsenic (dissolved)	CE128 <sup>U</sup>	µg/l As	2.03	0.81	1.29
Boron (dissolved)	CE128 <sup>U</sup>	µg/l B	6	34	55
Cadmium (dissolved)	CE128 <sup>U</sup>	µg/l Cd	<0.07	<0.07	<0.07
Chromium (dissolved)	CE128 <sup>U</sup>	µg/l Cr	0.3	3.0	0.2
Copper (dissolved)	CE128 <sup>U</sup>	µg/l Cu	7.7	5.8	6.8
Lead (dissolved)	CE128 <sup>U</sup>	µg/l Pb	1.9	0.3	0.3
Mercury (dissolved)	CE128 <sup>U</sup>	µg/l Hg	0.032	0.102	0.017
Nickel (dissolved)	CE128 <sup>U</sup>	µg/l Ni	0.9	2.6	1.6
Selenium (dissolved)	CE128 <sup>U</sup>	µg/l Se	0.35	0.25	0.47
Zinc (dissolved)	CE128 <sup>U</sup>	µg/l Zn	3	4	<1
pH	CE004 <sup>U</sup>	units	7.9	7.7	7.8
Sulphate	CE049 <sup>U</sup>	mg/l SO <sub>4</sub>	<10	<10	159
Cyanide (free)	CE077	µg/l CN	<0.02	<0.02	<0.02

# Chemtech Environmental Limited

## METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE054	Arsenic (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg As
CE054	Cadmium (total)	Aqua regia digest, ICP-OES	Dry	M	0.2	mg/kg Cd
CE054	Chromium (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Cr
-	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE050	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE054	Copper (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Cu
CE054	Lead (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Pb
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	Selenium (total)	Aqua regia digest, ICP-OES	Dry	M	0.3	mg/kg Se
CE054	Zinc (total)	Aqua regia digest, ICP-OES	Dry	M	3	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE049	Sulphate (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	10	mg/l SO <sub>4</sub>
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	Wet		2	mg/kg CN
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
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
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

# Chemtech Environmental Limited

## METHOD DETAILS

METHOD	LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Boron (dissolved)	ICP-MS	U	6	µg/l B
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE004	pH	Based on BS 1377, pH Meter	U	-	units
CE049	Sulphate	Ion Chromatography	U	10	mg/l SO <sub>4</sub>
CE077	Cyanide (free)	Distillation, Colorimetry		20	µg/l CN

# Chemtech Environmental Limited

## DEVIATING SAMPLE INFORMATION

### Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

### Key

- N No (not deviating sample)
- Y Yes (deviating sample)
- A Sampling date not provided
- B Sampling time not provided (waters only)
- C Sample exceeded holding time(s)
- D Sample not received in appropriate containers
- E Headspace present in sample container
- F Sample not chemically fixed (where appropriate)
- G Sample not cooled
- H Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
49559-1	BH 1	0.50	N	
49559-2	BH 1	2.00	N	
49559-3	BH 2	0.50	N	
49559-4	BH 3	0.00-0.40	N	
49559-5	BH 3	4.00-5.00	N	
49559-6	BH 4	0.00-0.60	N	
49559-7	BH 5	0.00-0.80	N	



## ANALYTICAL TEST REPORT

**Contract no:** 53756(1)  
**Contract name:** Temple Green, South Shields  
**Client reference:** 13-562  
**Clients name:** ARC Environmental  
**Clients address:** Solum House, Unit 1 Elliott Court  
St Johns Road  
Meadowfield  
DH7 8PN

**Samples received:** 05 December 2014

**Analysis started:** 08 December 2014

**Analysis completed** 18 December 2014

**Report issued:** 18 December 2014

This is a supplementary report to report number 53756(1) issued 15 December 2014.

**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  
NAD No Asbestos Detected

**Approved by:**

Karan Campbell  
Director

John Campbell  
Director

Dave Bowerbank  
Customer Services Co-ordinator

# 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 inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
53756-1	A	0.00-0.50	Clay	-	-	15.4
53756-2	B	0.00-0.50	Clay	-	-	22.7
53756-3	C	0.00-0.50	Sandy Clay with Gravel	-	-	19.5
53756-4	D	0.00-0.50	Sandy Clay	-	-	14.1



# Chemtech Environmental Limited

## SOILS

Lab number			53756-1	53756-2	53756-3	53756-4
Sample id			A	B	C	D
Depth (m)			0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50
Date sampled			05/12/2014	05/12/2014	05/12/2014	05/12/2014
Test	Method	Units				
Arsenic (total)	CE127 <sup>M</sup>	mg/kg As	6.0	7.2	11	9.9
Cadmium (total)	CE127 <sup>M</sup>	mg/kg Cd	<0.2	<0.2	0.6	0.9
Chromium (total)	CE127 <sup>M</sup>	mg/kg Cr	66	69	71	74
Chromium (III)	-	mg/kg CrIII	66	69	71	74
Chromium (VI)	CE050	mg/kg CrVI	<1	<1	<1	<1
Copper (total)	CE127 <sup>M</sup>	mg/kg Cu	19	27	95	57
Lead (total)	CE127 <sup>M</sup>	mg/kg Pb	25	55	129	173
Mercury (total)	CE127 <sup>M</sup>	mg/kg Hg	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 <sup>M</sup>	mg/kg Ni	32	34	40	25
Selenium (total)	CE127 <sup>M</sup>	mg/kg Se	1.2	1.3	1.2	1.0
Zinc (total)	CE127 <sup>M</sup>	mg/kg Zn	59	85	297	309
pH	CE004 <sup>M</sup>	units	7.8	7.7	7.9	7.8
Sulphate (2:1 water soluble)	CE061 <sup>M</sup>	mg/l SO <sub>4</sub>	89	340	126	564
Cyanide (free)	CE077	mg/kg CN	<2	<2	<2	<2
Total Organic Carbon (TOC)	CE072 <sup>M</sup>	% w/w C	0.85	1.39	4.40	3.27
<b>PAH</b>						
Acenaphthene	CE087	mg/kg	<0.01	<0.01	1.28	0.50
Acenaphthylene	CE087	mg/kg	<0.01	<0.01	0.07	0.05
Anthracene	CE087	mg/kg	<0.01	0.06	3.92	1.25
Benzo(a)anthracene	CE087	mg/kg	<0.01	0.21	5.92	2.86
Benzo(a)pyrene	CE087	mg/kg	<0.01	0.15	4.56	2.75
Benzo(b)fluoranthene	CE087	mg/kg	<0.01	0.24	6.15	3.76
Benzo(ghi)perylene	CE087	mg/kg	<0.01	0.08	2.39	1.89
Benzo(k)fluoranthene	CE087	mg/kg	<0.01	0.08	2.61	1.58
Chrysene	CE087	mg/kg	<0.01	0.19	5.01	2.62
Dibenz(ah)anthracene	CE087	mg/kg	<0.01	0.02	0.93	0.58
Fluoranthene	CE087	mg/kg	<0.01	0.42	13.18	6.40
Fluorene	CE087	mg/kg	<0.01	<0.01	1.74	0.61
Indeno(123cd)pyrene	CE087	mg/kg	<0.01	0.09	2.78	1.98
Naphthalene	CE087	mg/kg	<0.01	<0.01	0.16	0.18
Phenanthrene	CE087	mg/kg	0.01	0.19	9.38	4.46
Pyrene	CE087	mg/kg	<0.01	0.33	9.46	4.61
PAH (total of USEPA 16)	CE087	mg/kg	<0.16	2.06	69.6	36.1
Benzo(j)fluoranthene	CE087	mg/kg	<0.01	0.01	1.24	1.08
PAH (total of OIL 8)	CE087	mg/kg	<0.08	0.97	28.3	16.6
<b>BTEX &amp; TPH</b>						
Benzene	CE057 <sup>U</sup>	mg/kg	<0.01	<0.01	<0.01	<0.01
Toluene	CE057 <sup>U</sup>	mg/kg	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	CE057 <sup>U</sup>	mg/kg	<0.01	<0.01	<0.01	<0.01
m & p-Xylene	CE057 <sup>U</sup>	mg/kg	<0.01	<0.01	<0.01	<0.01
o-Xylene	CE057 <sup>U</sup>	mg/kg	<0.01	<0.01	<0.01	<0.01

# Chemtech Environmental Limited

## SOILS

Lab number			53756-1	53756-2	53756-3	53756-4
Sample id			A	B	C	D
Depth (m)			0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50
Date sampled			05/12/2014	05/12/2014	05/12/2014	05/12/2014
Test	Method	Units				
TPH Aliphatic EC5-EC6	CE068	mg/kg	<0.1	<0.1	<0.1	<0.1
TPH Aliphatic EC6-EC8	CE068	mg/kg	<0.1	<0.1	<0.1	<0.1
TPH Aliphatic EC8-EC10	CE068	mg/kg	<0.1	<0.1	<0.1	<0.1
TPH Aliphatic EC10-EC12	CE068	mg/kg	4	3	3	5
TPH Aliphatic EC12-EC16	CE068	mg/kg	4	5	7	28
TPH Aliphatic EC16-EC35	CE068	mg/kg	4	40	203	582
TPH Aliphatic EC35-EC44	CE068	mg/kg	<1	2	47	149
TPH Aromatic EC5-EC7	CE068	mg/kg	<0.01	<0.01	<0.01	<0.01
TPH Aromatic EC7-EC8	CE068	mg/kg	<0.01	<0.01	<0.01	<0.01
TPH Aromatic EC8-EC10	CE068	mg/kg	<0.01	<0.01	<0.01	<0.01
TPH Aromatic EC10-EC12	CE068	mg/kg	<1	<1	<1	<1
TPH Aromatic EC12-EC16	CE068	mg/kg	<1	<1	1	<1
TPH Aromatic EC16-EC21	CE068	mg/kg	<1	1	38	17
TPH Aromatic EC21-EC35	CE068	mg/kg	<1	1	30	18
TPH Aromatic EC35-EC44	CE068	mg/kg	<1	<1	1	1
Subcontracted analysis						
Asbestos	\$	-	NAD	Chrysotile	Chrysotile	Chrysotile
Asbestos (quantitative)	\$	% w/w	-	<0.001	-	<0.001

# Chemtech Environmental Limited

## LEACHATES

<b>Lab number</b>	53756-1L		
<b>Sample id</b>	A		
<b>Depth (m)</b>	0.00-0.50		
<b>Test</b>	<b>Method</b>	<b>Units</b>	
Arsenic (dissolved)	CE128 <sup>U</sup>	µg/l As	0.08
Boron (dissolved)	CE128 <sup>U</sup>	µg/l B	9
Cadmium (dissolved)	CE128 <sup>U</sup>	µg/l Cd	<0.07
Chromium (dissolved)	CE128 <sup>U</sup>	µg/l Cr	0.3
Copper (dissolved)	CE128 <sup>U</sup>	µg/l Cu	<0.4
Lead (dissolved)	CE128 <sup>U</sup>	µg/l Pb	<0.2
Mercury (dissolved)	CE128 <sup>U</sup>	µg/l Hg	<0.008
Nickel (dissolved)	CE128 <sup>U</sup>	µg/l Ni	<0.5
Selenium (dissolved)	CE128 <sup>U</sup>	µg/l Se	0.13
Zinc (dissolved)	CE128 <sup>U</sup>	µg/l Zn	<1
pH	CE004 <sup>U</sup>	units	8.4
Sulphate	CE049 <sup>U</sup>	mg/l SO <sub>4</sub>	16
Cyanide (free)	CE077	µg/l CN	<20
<b>PAHs</b>			
Acenaphthene	CE087	µg/l	<0.1
Acenaphthylene	CE087	µg/l	<0.1
Anthracene	CE087	µg/l	<0.1
Benzo(a)anthracene	CE087	µg/l	<0.1
Benzo(a)pyrene	CE087	µg/l	<0.1
Benzo(b)fluoranthene	CE087	µg/l	<0.1
Benzo(ghi)perylene	CE087	µg/l	<0.1
Benzo(k)fluoranthene	CE087	µg/l	<0.1
Chrysene	CE087	µg/l	<0.1
Dibenz(ah)anthracene	CE087	µg/l	<0.1
Fluoranthene	CE087	µg/l	<0.1
Fluorene	CE087	µg/l	<0.1
Indeno(123cd)pyrene	CE087	µg/l	<0.1
Naphthalene	CE087	µg/l	<0.1
Phenanthrene	CE087	µg/l	<0.1
Pyrene	CE087	µg/l	<0.1
PAH (total of USEPA 16)	CE087	µg/l	<1.6
Benzo(j)fluoranthene	CE087	µg/l	<0.1
PAH (total of OIL 8)	CE087	µg/l	<0.8
<b>BTEX &amp; TPH</b>			
Benzene	CE057 <sup>U</sup>	µg/l	<1
Toluene	CE057 <sup>U</sup>	µg/l	<1
Ethylbenzene	CE057 <sup>U</sup>	µg/l	<1
m & p-Xylene	CE057 <sup>U</sup>	µg/l	<1
o-Xylene	CE057 <sup>U</sup>	µg/l	<1
TPH Aromatic EC5-EC7	CE068	µg/l	<1
TPH Aromatic EC7-EC8	CE068	µg/l	<1

# Chemtech Environmental Limited

## LEACHATES

<b>Lab number</b>	53756-1L		
<b>Sample id</b>	A		
<b>Depth (m)</b>	0.00-0.50		
<b>Test</b>	<b>Method</b>	<b>Units</b>	
TPH Aromatic EC8-EC10	CE068	µg/l	<1
TPH Aromatic EC10-EC12	CE068	µg/l	<1
TPH Aromatic EC12-EC16	CE068	µg/l	<1
TPH Aromatic EC16-EC21	CE068	µg/l	<1
TPH Aromatic EC21-EC35	CE068	µg/l	<1
TPH Aromatic EC35-EC44	CE068	µg/l	<1
TPH Aliphatic EC5-EC6	CE068	µg/l	<1
TPH Aliphatic EC6-EC8	CE068	µg/l	<1
TPH Aliphatic EC8-EC10	CE068	µg/l	<1
TPH Aliphatic EC10-EC12	CE068	µg/l	<1
TPH Aliphatic EC12-EC16	CE068	µg/l	<1
TPH Aliphatic EC16-EC35	CE068	µg/l	<1
TPH Aliphatic EC35-EC44	CE068	µg/l	<1

# Chemtech Environmental Limited

## METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
-	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE050	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO <sub>4</sub>
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	Wet		2	mg/kg CN
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
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
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-
\$	Asbestos (quantitative)	HSG 248, Microscopy & Gravimetry	Dry		0.001	% w/w

# Chemtech Environmental Limited

## METHOD DETAILS

METHOD	LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Boron (dissolved)	ICP-MS	U	6	µg/l B
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE004	pH	Based on BS 1377, pH Meter	U	-	units
CE049	Sulphate	Ion Chromatography	U	10	mg/l SO <sub>4</sub>
CE077	Cyanide (free)	Distillation, Colorimetry		20	µg/l CN
CE087	PAH (speciated)	Solvent extraction, GC-MS		0.1	µg/l
CE068	TPH Aliphatic/Aromatic fractions (C5-C10)	Headspace GC-FID		1	µg/l
CE068	TPH Aliphatic/Aromatic fractions (C10-C44)	Solvent extraction, GC-FID		1	µg/l

# Chemtech Environmental Limited

## DEVIATING SAMPLE INFORMATION

### Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

### Key

- N No (not deviating sample)
- Y Yes (deviating sample)
- A Sampling date not provided
- B Sampling time not provided (waters only)
- C Sample exceeded holding time(s)
- D Sample not received in appropriate containers
- E Headspace present in sample container
- F Sample not chemically fixed (where appropriate)
- G Sample not cooled
- H Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
53756-1	A	0.00-0.50	N	
53756-2	B	0.00-0.50	N	
53756-3	C	0.00-0.50	N	
53756-4	D	0.00-0.50	N	



## ANALYTICAL TEST REPORT

**Contract no:** 53848  
**Contract name:** Temple Green, South Shields  
**Client reference:** 13-562  
**Clients name:** ARC Environmental  
**Clients address:** Solum House, Unit 1 Elliott Court  
St Johns Road  
Meadowfield  
DH7 8PN

**Samples received:** 05 December 2014

**Analysis started:** 15 December 2014

**Analysis completed** 18 December 2014

**Report issued:** 18 December 2014

**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

Dave Bowerbank  
Customer Services Co-ordinator



# 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 inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
53848-1	C	0.00-0.50	Sandy Clay with Gravel	-	-	19.5
53848-2	D	0.00-0.50	Sandy Clay	-	-	14.1

# Chemtech Environmental Limited

## SOILS

Lab number		53848-1	53848-2	
Sample id		C	D	
Depth (m)		0.00-0.50	0.00-0.50	
Date sampled		05/12/2014	05/12/2014	
Test	Method	Units		
Antimony (total)	CE127 <sup>M</sup>	mg/kg Sb	7.8	4.8
Arsenic (total)	CE127 <sup>M</sup>	mg/kg As	11	9.9
Barium (total)	CE127 <sup>M</sup>	mg/kg Ba	317	533
Cadmium (total)	CE127 <sup>M</sup>	mg/kg Cd	0.6	0.9
Chromium (total)	CE127 <sup>M</sup>	mg/kg Cr	71	74
Copper (total)	CE127 <sup>M</sup>	mg/kg Cu	95	57
Lead (total)	CE127 <sup>M</sup>	mg/kg Pb	129	173
Mercury (total)	CE127 <sup>M</sup>	mg/kg Hg	<0.5	<0.5
Molybdenum (total)	CE127 <sup>M</sup>	mg/kg Mo	7.4	6.1
Nickel (total)	CE127 <sup>M</sup>	mg/kg Ni	40	25
Selenium (total)	CE127 <sup>M</sup>	mg/kg Se	1.2	1.0
Zinc (total)	CE127 <sup>M</sup>	mg/kg Zn	297	309

# Chemtech Environmental Limited

## METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Antimony (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Sb
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Barium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ba
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Molybdenum (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Mo
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn

# Chemtech Environmental Limited

## DEVIATING SAMPLE INFORMATION

### Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

### Key

- N No (not deviating sample)
- Y Yes (deviating sample)
- A Sampling date not provided
- B Sampling time not provided (waters only)
- C Sample exceeded holding time(s)
- D Sample not received in appropriate containers
- E Headspace present in sample container
- F Sample not chemically fixed (where appropriate)
- G Sample not cooled
- H Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
53848-1	C	0.00-0.50	N	
53848-2	D	0.00-0.50	N	

# Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



## Sample Details

Contract Name Temple Green, South Shields  
 Lab Number 53848-1  
 Sample ID C 0.00-0.50m  
 Date Sampled 5 December 2014  
 Date Received 5 December 2014  
 Particle Size (<4mm) -  
 Method of size reduction N/A  
 Non-crushable matter N/A

## Test Values

Mass of Raw Test Portion (MW) kg 0.206  
 Mass of Dried Test Portion (MD) kg 0.175  
 Moisture Content Ratio (MC) % 15.05  
 Dry Matter Content Ratio (DR) % 84.95  
 Leachant Volume (1) (L2) Litre 0.324  
 Leachant Volume (2) (L8) Litre 1.400  
 Eluate Volume (1) (VE1) Litre 0.260  
 Eluate Volume (2) (VE2) Litre 1.305

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.2	9.2
Temperature (°C)	20	20
Conductivity (µS/cm)	413	170
Arsenic (µg/l As)	1.47	3.89
Barium (µg/l Ba)	51.2	23.6
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	2.6	1.4
Copper (µg/l Cu)	17.8	13.5
Mercury (µg/l Hg)	0.022	0.021
Molybdenum (µg/l Mo)	37.0	11.8
Nickel (µg/l Ni)	3.1	0.5
Lead (µg/l Pb)	0.5	1.2
Antimony (µg/l Sb)	10.9	6.1
Selenium (µg/l Se)	1.07	1.40
Zinc (µg/l Zn)	438	<1
Chloride (mg/l Cl)	11	5.6
Fluoride (mg/l F)	1.7	1.0
Sulphate (mg/l SO <sub>4</sub> )	88	21
Total Dissolved Solids (mg/l TDS)	315	130
Phenol Index (mg/l PhOH)	<0.01	<0.01
Dissolved Organic Carbon (mg/l C)	213	8.5

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.003	<b>0.035</b>	0.5	2	25
0.102	<b>0.277</b>	20	100	300
<0.0002	<b>&lt;0.0007</b>	0.04	1	5
0.005	<b>0.016</b>	0.5	10	70
0.036	<b>0.141</b>	2	50	100
0.00004	<b>0.00021</b>	0.01	0.2	2
0.074	<b>0.155</b>	0.5	10	30
0.006	<b>0.009</b>	0.4	10	40
0.001	<b>0.011</b>	0.5	10	50
0.022	<b>0.068</b>	0.06	0.7	5
0.002	<b>0.014</b>	0.1	0.5	7
0.877	<b>&lt;0.660</b>	4	50	200
22	<b>64</b>	800	15000	25000
3.4	<b>11</b>	10	150	500
176	<b>310</b>	1000	20000	50000
631	<b>1575</b>	4000	60000	100000
<0.02	<b>&lt;0.1</b>	1		
426	<b>389</b>	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	<b>4.4</b>	3%	5%	6%
Loss on Ignition	% w/w	<b>5.2</b>			10%
BTEX	mg/kg	<b>&lt;0.01</b>	6		
PCBs (7 congeners)	mg/kg	<b>&lt;0.035</b>	1		
Mineral Oil (C10 - C40)	mg/kg	<b>264</b>	500		
PAH (total)	mg/kg	<b>69.6</b>	100		
pH	pH units	<b>7.9</b>		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	<b>0.16</b>		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	<b>0.04</b>		To be evaluated	

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are provided for guidance only.  
 Chemtech Environmental Ltd does not take responsibility for any errors or omissions. Data is correct as of 01/09/2005.  
 Samples will be disposed of 6 weeks from initial receipt unless written instructions are received and further storage is agreed.  
 Waste Acceptance Criteria testing is outside the scope of the laboratory's UKAS accreditation.

## Comments

Authorised by:

*J. Campbell*

Name:

John Campbell

Report date:

18 December 2014

Position:

Director

# Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



## Sample Details

Contract Name Temple Green, South Shields  
 Lab Number 53848-2  
 Sample ID D 0.00-0.50m  
 Date Sampled 5 December 2014  
 Date Received 5 December 2014  
 Particle Size (<4mm) -  
 Method of size reduction N/A  
 Non-crushable matter N/A

## Test Values

Mass of Raw Test Portion (MW) kg 0.197  
 Mass of Dried Test Portion (MD) kg 0.175  
 Moisture Content Ratio (MC) % 11.17  
 Dry Matter Content Ratio (DR) % 88.83  
 Leachant Volume (1) (L2) Litre 0.331  
 Leachant Volume (2) (L8) Litre 1.400  
 Eluate Volume (1) (VE1) Litre 0.245  
 Eluate Volume (2) (VE2) Litre 1.285

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.1	9.7
Temperature (°C)	20	20
Conductivity (µS/cm)	979	209
Arsenic (µg/l As)	3.66	6.30
Barium (µg/l Ba)	44.2	15.4
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	14.6	4.5
Copper (µg/l Cu)	14.3	14.2
Mercury (µg/l Hg)	0.014	<0.008
Molybdenum (µg/l Mo)	18.2	5.4
Nickel (µg/l Ni)	0.9	<0.5
Lead (µg/l Pb)	<0.2	0.6
Antimony (µg/l Sb)	10.8	5.3
Selenium (µg/l Se)	1.58	1.43
Zinc (µg/l Zn)	9	<1
Chloride (mg/l Cl)	9.5	4.5
Fluoride (mg/l F)	1.3	0.6
Sulphate (mg/l SO <sub>4</sub> )	508	53
Total Dissolved Solids (mg/l TDS)	745	160
Phenol Index (mg/l PhOH)	<0.01	<0.01
Dissolved Organic Carbon (mg/l C)	13	9.3

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.007	<b>0.059</b>	0.5	2	25
0.089	<b>0.194</b>	20	100	300
<0.0002	<b>&lt;0.0007</b>	0.04	1	5
0.029	<b>0.059</b>	0.5	10	70
0.029	<b>0.142</b>	2	50	100
0.00003	<b>&lt;0.00009</b>	0.01	0.2	2
0.036	<b>0.072</b>	0.5	10	30
0.002	<b>&lt;0.006</b>	0.4	10	40
<0.0004	<b>&lt;0.006</b>	0.5	10	50
0.022	<b>0.061</b>	0.06	0.7	5
0.003	<b>0.015</b>	0.1	0.5	7
0.018	<b>&lt;0.022</b>	4	50	200
19	<b>52</b>	800	15000	25000
2.6	<b>7.0</b>	10	150	500
1018	<b>1167</b>	1000	20000	50000
1492	<b>2419</b>	4000	60000	100000
<0.02	<b>&lt;0.1</b>	1		
26	<b>98</b>	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	<b>3.3</b>	3%	5%	6%
Loss on Ignition	% w/w	<b>6.5</b>			10%
BTEX	mg/kg	<b>&lt;0.01</b>	6		
PCBs (7 congeners)	mg/kg	<b>&lt;0.035</b>	1		
Mineral Oil (C10 - C40)	mg/kg	<b>767</b>	500		
PAH (total)	mg/kg	<b>36.1</b>	100		
pH	pH units	<b>7.8</b>		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	<b>0.15</b>		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	<b>0.03</b>		To be evaluated	

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are provided for guidance only.  
 Chemtech Environmental Ltd does not take responsibility for any errors or omissions. Data is correct as of 01/09/2005.  
 Samples will be disposed of 6 weeks from initial receipt unless written instructions are received and further storage is agreed.  
 Waste Acceptance Criteria testing is outside the scope of the laboratory's UKAS accreditation.

## Comments

Authorised by:

*J. Campbell*

Name:

John Campbell

Report date:

18 December 2014

Position:

Director